November 2014

Type Y692 Gas Blanketing Regulator System



Figure 1. Type Y692 Low-Pressure Gas Blanketing Regulator

Introduction

An Accu-Pressure™ Gas Blanketing Regulator System reduces a high-pressure gas, such as Nitrogen, to maintain a protective environment above any liquid stored in a tank or vessel when the liquid is being pumped out. Also when the vessel is suddenly cooled, causing vapors inside the vessel to contract, the regulator system replaces the volume of contracting vapors with a volume of blanketing gas to prevent the internal vessel pressure from decreasing. In both cases, a slight positive vessel pressure prevents outside air, moisture and other contaminants from entering the vessel and the possible collapse of the vessel walls.

The Type Y692 (Figure 1) is a direct-operated regulator used for accurate pressure control on very low-pressure blanketing systems. Downstream pressure is sensed through a pitot tube installed in the lower casing of the regulator for units with internal pressure registration or through a downstream control line for units with external pressure registration. The Type Y692 is available in NPS 1-1/2 and 2 / DN 40 and 50 body sizes.

Features

- Ease of Inspection and Maintenance—The union nut connection between the body and actuator permits access to the disk and orifice by only removing the diaphragm casing assembly without removing the body from the line.
- Accuracy of Control—Large diaphragm areas provide more precise control even at low-pressure settings and the pitot tube also creates a dynamic boost that helps provide greater capacity.
- Speed of Response—The downstream pressure is sensed directly by the diaphragm through the pitot tube providing quick response.
- Ease of Installation—The Type Y692 is easy to install in the pipeline because no additional connections are required.





Specifications

This section lists the specifications of the Type Y692 Gas Blanketing Regulator System. Factory specification, such as spring range and orifice size are stamped on the nameplate fastened on the regulator at the factory.

Available Configurations

Direct-operated pressure reducing regulator with external or internal pressure registration with seven outlet (control) pressure ranges from 1 in. w.c. to 7 psig / 2 mbar to 0.48 bar. Available in NPS 1-1/2 and 2 / DN 40 and 50 body sizes.

Body Sizes and End Connection Styles(1)

Cast Iron: NPS 1-1/2 / DN 40, NPT, NPS 2 / DN 50, NPT or CL125 FF

Steel: NPS 1-1/2 or 2 / DN 40 or 50, NPT, SWE,

CL150 RF, CL300 RF or PN 16/25/40 **Stainless steel:** NPS 1-1/2 or 2 / DN 40 or 50, NPT, CL150 RF, CL300 RF or PN 16/25/40

Maximum Inlet Pressure(2)

150 psig / 10.3 bar

Maximum Outlet (Casing) Pressure(2)

15 psig / 1.0 bar

Maximum Operating Outlet (Control) Pressure to Avoid Internal Part Damage⁽²⁾

3 psig / 0.21 bar above outlet (control) pressure setting

Control Pressure Ranges⁽²⁾

See Table 1

Flow Capacities

See Table 5

Relief Sizing Coefficients

See Table 6

Orifice Size

See Table 6

Pressure Registration

Internal (standard) or External

Spring Case Connection

1/4 NPT

Temperature Capabilities⁽²⁾

Nitrile (NBR):

-20 to 180°F / -29 to 82°C

Fluorocarbon (FKM):

0 to 300°F / -18 to 149°C

Perfluoroelastomer (FFKM):

-20 to 300°F / -29 to 149°C

EthylenePropylene (EPDM):

-20 to 275°F / -29 to 135°C

IEC Sizing Coefficients

X_T: 0.775 **F**_D: 0.50 **F**_L: 0.89

Approximate Weights

Cast Iron Body: 45 lbs / 20 kg

Steel/Stainless steel Body: 57 lbs / 26 kg

Canadian Registration Number (CRN)

Approved

PED (Pressure Equipment Directive) Category

The Type Y692 may be used as a safety accessory with pressure equipment in the PED 97/23/EC Category I.

Construction Materials

Body, Union Nut, Spring Case and Lower

Casing Assembly: Cast iron, WCC steel,

CF8M Stainless steel

Control Spring, Control Spring Seat, Split Ring

and Diaphragm Plate: Plated steel Diaphragm: Nitrile (NBR) (standard),

Fluorocarbon (FKM), Ethylenepropylene (EPDM),

Silicone (VMQ)

O-rings: Nitrile (NBR), Fluorocarbon (FKM),

Perfluoroelastomer (FFKM),

Ethylenepropylene (EPDM)

Orifice, Pusher Post, Pusher Post Connector, Lever Assembly, Stem and Pitot Tube:

Stainless steel

Gasket: Composition

Disk Assembly: Nitrile (NBR) and Stainless steel,

Fluorocarbon (FKM) and Stainless steel,

Polytetrafluoroethylene (PTFE) and Stainless steel or Ethylenepropylene (EPDM) and Stainless steel

^{1.} Fabricated by using slip-on flanges and socket welding nipples into body

^{2.} The pressure/temperature limits in this Bulletin and any applicable standard limitation should not be exceeded.

Table 1. Control Pressure Ranges

CONTROL PRESSURE RANGE WITH		CONTROL SPRING COLOR CODE	CONTROL SPRING	SPRING DIAM		SPRING FREE LENGTH	
	CASE BARREL POINTED DOWN		PART NUMBER	ln.	mm	ln.	mm
	1 to 3 in. w.c. / 2 to 7 mbar ⁽²⁾⁽³⁾	Brown	1D892527022	0.109	2.77	6.12	155
Light Chring	3 to 11 in. w.c. / 7 to 27 mbar(2)(4)	Iridite	0B019727052	0.148	3.76	6.00	152
Light Spring	6.5 in. w.c. to 1.2 psig / 16 mbar to 83 mbar(5)	Green	0B019427052	0.187	4.75	6.00	152
Assembly	0.7 to 2 psig / 48 mbar to 0.14 bar	Blue	0B019627032	0.225	5.71	6.00	152
	1 to 3.2 psig / 69 mbar to 0.22 bar	Orange	0A081127202	0.250	6.35	6.00	152
Heavy spring	2 to 5.5 psig / 0.14 to 0.38 bar	Silver with green stripe	0Y066427022	0.363	9.22	6.00	152
Assembly	4 to 10 psig / 0.28 to 0.69 bar	Silver	1H802427032	0.406	10.3	6.00	152

- Install with spring case pointing down to achieve low setpoints in these spring ranges.
 Do not use Fluorocarbon (FKM) diaphragm with these springs at diaphragm temperature lower than 60°F / 16°C.
 Installation with spring case pointing up will change outlet (control) pressure range to 3 to 5 in. w.c. / 7 to 12 mbar.
 Installation with spring case pointing up will change outlet (control) pressure range to 5.75 to 14 in. w.c. / 14 to 35 mbar.
 Installation with spring case pointing up will change outlet (control) pressure range to 7.5 in. w.c. to 1.3 psig / 19 to 90 mbar.

Table 2. Flow Rate Conversion(1)

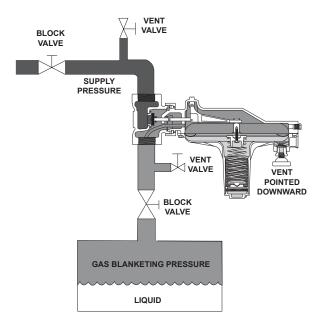
MULTIPLY MAXIMUM PUMP RATE OUT	BY	TO OBTAIN
U.S. GPM	8.021	SCFH
U.S. GPH	0.1337	SCFH
m³/hr	1.01	Nm³/H
Barrels/hr	5.615	SCFH
Barrels/day	0.2340	SCFH
Gas flow of blanketing gas to replace liquid pumped out.		

Table 3. Conversion Factors (for converting Nitrogen flow rates to other gas flow rates)

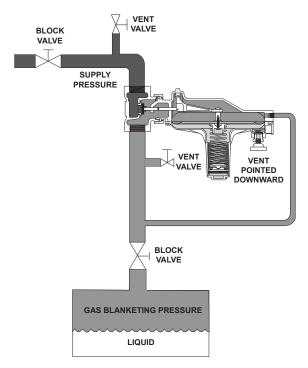
BLANKET GAS	SPECIFIC GRAVITY	CORRECTION FACTOR				
Natural Gas	0.60	1.270				
Air	1.00	0.985				
Dry CO ₂	1.52	0.797				
Correction Factor = $\frac{0.985}{\sqrt{\text{SG}}}$						

Table 4. Gas Flow Required for Thermal Heating (Outbreathing) or Cooling (Inbreathing) per API 2000 (Interpolate for Intermediate size)

	VESSEL CAPACITY				
Barrel	Gallon	Liter	SCFH	Nm³/h	
60	2500	9500	60	1.6	
100	4200	16,000	100	2.7	
500	21,000	79,500	500	1.3	
1000	42,000	159,000	1000	26.8	
2000	84,000	318,000	2000	53.6	
3000	126,000	477,000	3000	80.4	
4000	168,000	636,000	4000	107	
5000	210,000	795,000	5000	134	
10,000	420,000	1,590,000	10,000	268	
15,000	630,000	2,385,000	15,000	402	
20,000	840,000	3,180,000	20,000	536	
25,000	1,050,000	3,975,000	24,000	643	
30,000	1,260,000	4,769,000	28,000	750	
35,000	1,470,000	5,564,000	31,000	831	
40,000	1,680,000	6,359,000	34,000	911	
45,000	1,890,000	7,154,000	37,000	992	
50,000	2,100,000	7,949,000	40,000	1072	
60,000	2,520,000	9,539,000	44,000	1179	
70,000	2,940,000	11,129,000	48,000	1286	
80,000	3,360,000	12,718,000	52,000	1394	
90,000	3,780,000	14,308,000	56,000	1501	
100,000	4,200,000	15,898,000	60,000	1608	
120,000	5,040,000	19,078,000	68,000	1822	
140,000	5,880,000	22,437,000	75,000	2010	
160,000	6,720,000	25,437,000	82,000	2198	
180,000	7,560,000	28,616,000	90,000	2412	



TYPE Y692 WITH INTERNAL REGISTRATION



TYPE Y692 WITH EXTERNAL REGISTRATION



Figure 2. Type Y692 Operational Schematics

Principle of Operation

The Type Y692 Gas Blanketing Regulator reduces a high-pressure gas to maintain a positive low-pressure of blanket gas over a stored liquid when the liquid is being pumped out of the vessel (see Figure 2). Also when the vessel (or tank) is suddenly cooled, causing vapors to contract, the regulator replaces the volume of contracting vapors with a volume of blanketing gas to prevent the internal vessel pressure from decreasing. In both cases, a positive vessel pressure prevents outside air from entering the vessel and reduces the possibility of atmospheric pressure collapsing the vessel.

Gas blanketing regulators respond to a slight decrease in internal vessel pressure by throttling open to increase the flow rate of gas into the vessel. When the vessel's liquid level has been lowered to the desired point and the vapor pressure re-established, the regulator throttles closed.

When the liquid level drops and vessel pressure decreases below the setting of the control spring, the spring force on the diaphragm opens the disk assembly to supply the required flow of gas to the vessel. When vessel pressure has been satisfied, control pressure tends to increase slightly, acting on the diaphragm. When the control (vessel) pressure exceeds the control spring setting, the diaphragm moves to close the disk assembly.

The Type Y692 Gas Blanketing Regulator provides a constant set pressure for accurate gas blanketing. When vessel pressure decreases below the control spring setpoint, the force of the spring moves the disk away from the orifice allowing gas to flow into the vessel. As the vessel pressure increases, the increase is sensed by the diaphragm through the pitot tube or control line. This movement of the diaphragm causes the disk to move toward the orifice, decreasing the flow of blanketing gas. When the vessel pressure reaches the system setpoint, the disk will seat against the orifice shutting off the flow of gas.

Installation

Install the Type Y692 regulator with the spring case barrel pointed down. This will assure that the lowest set pressure shown in Table 1 is achieved. Flow through the regulator body is indicated by the flow arrow cast on the body. If a block valve is required, install a full flow valve between the regulator and the blanketed vessel.

Sizing Tank Blanketing Systems

When sizing a gas blanketing regulator system for a low pressure blanketing application, you must consider the replacement of blanketing gas required for the liquid loss during pump out of the vessel and also the condensation/contraction of vessel vapors during atmospheric thermal cooling.

Direct Displacement

The direct displacement method should be used with extreme caution. The direct displacement method determines the amount of blanketing gas required to replace liquid pumped out of the tank. Direct displacement does not allow for fluctuating temperature or other factors that may affect pressure in the vapor space. This method is typically applied to tanks operating at constant temperature and containing non-flammable, non-volatile products.

$$Q_{total} = Q_{pump}$$

where,

 Q_{total} = Required Flow Rate

Q_{pump} = Required Flow Rate to replace pumped out liquid from Table 1

API 2000

The American Petroleum Institute Standard 2000 (API 2000) sizing method accounts for liquid pump-out as well as contraction of tank vapors due to cooling. When using API methods:

$$Q_{total} = Q_{pump} + Q_{thermal}$$

where,

Q_{total} = Required Flow Rate

Q_{pump} = Required Flow Rate to replace pumped out liquid from Table 1

Q_{thermal} = Required Flow Rate due to thermal cooling. See Thermal Equations 1 to 4 below or Table 2.

Thermal Equations

For tanks up to 840,000 gallons / 3179 m³ capacity, use one of the following equations:

Equation 1:

$$Q_{thermal}$$
 [SCFH Air] = V_{tank} x 0.0238

Equation 2:

$$Q_{thermal}$$
 [SCFH Nitrogen] = V_{tank} x 0.0238 x 1.015

Equation 3:

$$Q_{thermal}$$
 [Nm³/h Air] = V_{tank} x 0.169

Equation 1:

 $Q_{thermal}$ [Nm³/h Nitrogen] = V_{tank} x 0.169 x 1.015

where,

For Equations 1 and 2: V_{tank} = tank volume, gallons For Equations 3 and 4: V_{tank} = tank volume, m³

For tanks greater than 840,000 gallons / 3179 m³ capacity: See Table 2.

Depending on the method, there can be a significant difference in the calculated required capacity. No matter which method is used, the tank must be equipped with supplemental venting to protect the

tank, product and personnel in cases of equipment failure, fire exposure or other conditions that could cause the tank pressure or vacuum to exceed operating limits.

Sizing can be done by following these steps:

- 1. Determine the gas flow rate required to replace the liquid being pumped out (see Table 2).
- Using the established procedures from the American Petroleum Institute Standard 2000 (API 2000), determine the gas flow rate due to "inbreathing" caused by atmospheric thermal cooling (see Table 4).
- Add the requirements of 1 and 2 and select the regulator size, based on total capacity required from Table 6.

Sample sizing problem for blanketing applications:

Service Conditions:

Sizing and Selection Methodology:

- 1. From Table 2 the desired air flow rate due to pump out equals 150 GPM x 8.021 = 1203 SCFH / 32.2 Nm³/h air.
- 2. From Table 4, the required air flow due to thermal cooling = 1000 SCFH / 26.8 Nm³/h air.
- 3. Total flow required for pump out and thermal cooling is 1203 + 1000 = 2203 SCFH / 59.0 Nm³/h air.
- Convert to nitrogen by dividing the total air flow by the square root of the specific gravity of nitrogen: 2203 ÷ 0.97 = 2248 SCFH / 60.2 Nm³/h nitrogen (See Table 3 for the conversion).
- From Table 5, a Type Y692 in either an NPS 1-1/2 and 2 / DN 40 and 50 body sizes and a 3/8 in. / 9.5 mm orifice will flow 3620 SCFH / 97.0 Nm³/h nitrogen at 20 psig / 1.4 bar inlet pressure. This satisfies the required flow of 2248 SCFH / 60.2 Nm³/h nitrogen.

Capacity Information

Table 5 gives the typical regulating capacities at selected inlet pressures and outlet (control) pressure settings. Flows are in SCFH (60°F and 14.7 psia) of 0.97 specific gravity nitrogen. For gases of other specific gravities, multiply the given capacity of nitrogen by 0.985 and divide the given capacity by the square root of the appropriate specific gravity of the gas required. Then, if capacity is desired in normal cubic meters per hour at 0°C and 1.01325 bar, multiply SCFH by 0.0268.

To determine wide-open flow capacities for relief sizing, use the following formula:

$$Q = \sqrt{\frac{520}{GT}} C_g P_1 SIN \left(\frac{3417}{C_1} \sqrt{\frac{\Delta P}{P_1}} \right) DEG$$

where.

C_q = gas sizing coefficient from Table 6

 $C_1^{\circ} = C_q/C_v$ or 35 from Table 6

G = gas specific gravity (air = 1.0)

P_{1abs} = inlet pressure, psia (add 14.7 psi to gauge inlet pressure to obtain absolute inlet pressure)

Q = flow rate, SCFH

T = absolute temperature in °Rankine of gas at inlet

Ordering Information

When ordering, specify:

- Type of gas being controlled (nitrogen fuel gas, etc.); list any factors such as impurities in the gas that may affect compatibility of the gas with the regulator trim parts.
- 2. Specific gravity of the gas
- 3. Temperature of the gas
- 4. Range of flowing inlet pressures to regulator
- 5. Flow rates
 - a) Minimum controlled flow
 - b) Normal flow
 - c) Maximum flow
- Line size and end connection size of adjacent piping.
 Adjacent downstream piping must be the same size as the regulator body or longer.
- 7. Vessel size

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Table 5. Blanketing Regulating Capacities in SCFH / Nm³/h of 0.97 Specific Gravity Nitrogen

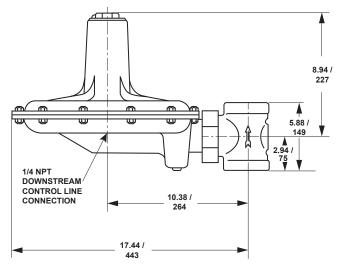
	OUTLET PRESSURE	OUTLET		ET					OR	IFICE SI	ZE, IN. /	mm				
BODY SIZE	RANGE ⁽¹⁾ , ACCURACY AND SPRING COLOR	PRESSURE SETTING	PRES	SURE	1/4	/ 6.4	3/8	/ 9.5	1/2	/ 13	3/4	/ 19	1	/ 25	1-3/1	6 / 30
	AND SPRING COLOR	SETTING	psig	bar	SCFH	Nm³/h	SCFH	Nm³/h	SCFH	Nm³/h	SCFH	Nm³/h	SCFH	Nm³/h	SCFH	Nm³/h
		1 in. w.c. / 2 mbar	2 5 10 20 40 60 80	0.14 0.34 0.69 1.4 2.8 4.1 5.5	360 680 1030 1580 2500 3410 4320	9.7 18.2 27.6 42.3 67.0 91.4 116	970 1560 2350 3620 3620 3620	26.0 41.8 63.0 97.0 97.0	1750 2800 4210 4900 4900	46.9 75.0 113 131 131	3280 3880 3880 3700	87.9 104 104 99.2	4750 3650 3650	127 97.8 97.8	3650 2840	97.8 76.1
	1 to 3 in. w.c. / 2 to 7 mbar -1 to 2 in. w.c. /		100 125 150	6.9 8.6 10.3	4510 4510 4510	121 121 121										
	-2 to 5 mbar Brown	3 in. w.c. / 7 mbar	2 5 10 20 40 60 80	0.14 0.34 0.69 1.4 2.8 4.1 5.5	360 680 1030 1580 2500 3410 4320	9.7 18.2 27.6 42.3 67.0 91.4 116	970 1560 2350 3620 3620 3620	26.0 41.8 63.0 97.0 97.0 97.0	1750 2800 4210 4900 4900	46.9 75.0 113 131 131	3280 3880 3880 3700	87.9 104 104 99.2	4750 3650 3650	97.8 97.8 97.8	3650 2840	97.8 76.1
			100 125 150	6.9 8.6 10.3	4510 4510 4510	121 121 121										
	3 to 11 in. w.c. / 7 to 27 mbar -1 to 2 in. w.c. / -2 to 5 mbar	7 in. w.c. / 17 mbar	0.5 1 2 5 13 25 50	0.03 0.07 0.14 0.34 0.9 1.7	330 470 770 1270 1850	8.8 12.6 20.6 34.0 49.6	630 950 1580 2590 4100	16.9 25.5 42.3 69.4 110	870 1300 2520 4900 6100	23.3 34.8 67.5 131 163	950 1340 2260 6070 6100 6100	25.5 35.9 60.6 163 163 163	1180 1810 3160 6100 6100	31.6 48.5 84.7 163 163	1330 2290 4730 6100	35.6 61.4 127 163
	Iridite		100 150	3.4 6.9 10.3	3040 5370 6100	81.5 144 163	6100 6100	163 163	6100	163	I					
NPS 1-1/2 /	6.5 in. w.c to 1.2 psig / 16 to 83 mbar, Green or 0.7 to 2 psig / 48 mbar to 0.14 bar, Blue 0.2 psig / 14 mbar	1.5 psig / 0.10 bar	2 6 14 30 50 150	0.14 0.41 0.97 2.1 3.4 10.3			789 1740 3156 4890 7120 18,030	21.1 46.6 84.6 131 191 483	1260 2760 5050 8050 11,990	33.8 74.0 121 216 321	2050 4730 9470 13,360	54.9 127 254 358	2660 9790 12,500	71.3 182 335	3220 7530	86.3 202
DN 40	1 to 3.2 psig / 69 mbar to 0.22 bar 0.6 psig / 41 mbar Orange	3 psig / 0.21 bar	3 7 14 30 50 150	0.21 0.48 0.97 2.1 3.4 10.3			1550 2370 4500 7020 17,250	41.5 63.5 121 188 462	2370 3700 7380 10,750	63.5 99.2 198 288	3950 7020 11,680	106 188 313	2450 5130 7470	64.7 137 200	2840 6312	76.1 169
	2 to 5.5 psig / 0.14 to 0.38 bar 0.5 psig / 34 mbar Silver with green stripe	5 psig / 0.34 bar	10 15 20 35 60 75 100	0.69 1.0 1.4 2.4 4.1 5.2 6.9	590 789 950 1420 2210 2760 3550	15.8 21.1 25.5 38.1 59.2 74.0 95.1	950 1030 1380 1970 2920 3470 5130	25.5 27.6 97.0 52.8 78.3 93.0 137	1180 1580 2200 2920 4730 5680	31.6 42.3 59.0 78.3 127 152	1810 2370 2920 4020	48.5 63.5 78.3 108	2200 2840 3310	59.0 76.1 88.7	2370 3310	63.5 88.7
	2 to 5.5 psig / 0.14 to 0.38 bar 1 psig / 69 mbar Silver with green stripe	5 psig / 0.34 bar	10 15 20 35 60 75 100	0.69 1.0 1.4 2.4 4.1 5.2 6.9	950 1180 1380 1970 3160 4100 5130	25.5 31.6 37.0 52.8 84.7 110	1500 1890 2200 3310 5290 6390 8680	40.2 50.7 59.0 88.7 142 171 233	2050 2760 3790 5130 7890 10,260	54.9 74.0 102 137 211 275	3230 4100 5130 7730	86.6 110 137 207	4100 5520 6310	110 148 169	4580 6310	123 169
	4 to 10 psig / 0.28 to 0.69 bar 1 psig / 69 mbar Silver	10 psig / 0.69 bar	15 20 25 40 60 75	1.0 1.4 1.7 2.8 4.1 5.2	708 944 1102 1810 2361 2754	19.0 25.3 29.5 48.5 63.3 73.8	1023 1377 1652 2203 3148 3541	27.4 36.9 44.3 59.0 84.4 94.9	1338 1967 2203 2912 4643 5666	35.9 52.7 59.0 78.0 124 152	1810 2597 3148 4720	48.5 69.9 84.4 127	2518 3148 4013	67.5 84.4 108	2990 4564	80.1 122
	4 to 10 psig / 0.28 to 0.69 bar 2 psig / 0.14 bar Silver	10 psig / 0.69 bar	100 15 20 25 40 60 75	6.9 1.0 1.4 1.7 2.8 4.1 5.2	3541 1023 1259 1574 2282 2990 4013	94.9 27.4 33.7 42.2 61.2 80.1 108	5193 1731 2125 2675 3934 5351 6531	139 46.4 57.0 71.7 105 143 175	2518 3384 3777 5272 8656 10,230	67.5 90.7 101 141 232 274	3620 5115 6453 8656	97.0 137 173 232	4721 6295 7082	127 169 190	6295 7869	169 211

Spring ranges based on regulator installation with the spring case pointed down.
 Light shaded areas show where indicated droop would be exceeded regardless of capacity.
 Dark shaded areas show where maximum operating inlet pressure for a given orifice size is exceeded.

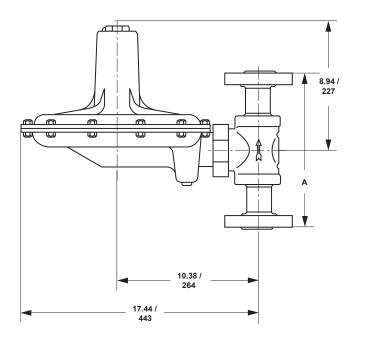
 Table 5. Blanketing Regulating Capacities in SCFH / Nm³/h of 0.97 Specific Gravity Nitrogen (continued)

	OUTLET PRESSURE	OUTLET	INL	.ET	ORIFICE SIZE, IN. / mm											
BODY SIZE	RANGE ⁽¹⁾ , ACCURACY	PRESSURE		SURE	1/4	/ 6.4	4 3/8 / 9.5 1/2 / 13 3/4 / 19 1 / 25						1-3/1	6 / 30		
	AND SPRING COLOR	SETTING	psig	bar	SCFH	Nm³/h	SCFH	Nm³/h	SCFH	Nm³/h	SCFH	Nm³/h	SCFH	Nm³/h	SCFH	Nm³/h
	1 to 3 in. w.c. / 2 to 7 mbar	1 in. w.c. / 2 mbar	2 5 10 20 40 60 80 100 125 150	0.14 0.34 0.69 1.4 2.8 4.1 5.5 6.9 8.6 10.3	320 680 1030 1580 2500 3410 3650 3650 3650 3650	8.6 18.2 27.6 42.3 67.0 91.4 97.8 97.8 97.8	930 1560 2350 3620 4420 4420	24.9 41.8 63.0 97.0 118 118	1750 2800 4210 3450 3450	46.9 75.0 113 92.5 92.5	4000 6050 3650 3650	107 162 97.8 97.8	5010 4630 4060	134 124 109	5930 4260	159 114
	-1 to 2 in, w.c. / -2 to 5 mbar Brown	3 in. w.c. / 7 mbar	2 5 10 20 40 60 80 100 125 150	0.14 0.34 0.69 1.4 2.8 4.1 5.5 6.9 8.6 10.3	320 680 1030 1580 2500 3410 3650 3650 3650 3650	8.6 18.2 27.6 42.3 67.0 91.4 97.8 97.8 97.8	930 1560 2350 3620 4420 4420	24.9 41.8 63.0 97.0 118 118	1750 2800 4210 3450 3450	46.9 75.0 113 92.5 92.5	4000 6050 3650 3650	107 162 97.8 97.8	5010 4630 4060	134 124 109	5930 4260	159 114
	3 to 11 in. w.c. / 7 to 27 mbar -1 to 2 in. w.c. / -2 to 5 mbar Iridite	7 in. w.c. / 17 mbar	0.5 1 2 5 13 25 50 100 150	0.03 0.07 0.14 0.34 0.90 1.7 3.4 6.9 10.3	330 470 770 1270 1850 3040 5370 7890	8.8 12.6 20.6 34.0 49.6 81.5 144 211	630 950 1580 2590 4100 6700 7890	16.9 25.5 42.3 69.4 110 180 211	870 1300 2520 4900 7180 7890	23.3 34.8 67.5 131 192 211	950 1340 2260 6080 7890 7890	25.5 35.9 60.6 163 211 211	1180 1810 3160 7890 7890	31.6 48.5 84.7 211 211	1330 2290 4730 7890	36.5 61.4 127 211
NPS 2 /	6.5 in. w.c to 1.2 psig / 16 to 83 mbar, Green or 0.7 to 2 psig / 48 mbar to 0.14 bar, Blue 0.2 psig / 14 mbar	1 psig / 69 mbar	2 6 14 30 50 150	0.14 0.41 0.97 2.1 3.4 10.3			1030 1970 3390 5130 7120	27.6 52.8 90.9 137 191	1340 2840 5130 8130 11,990	35.9 76.1 137 218 321	2450 5680 10,650 16,730	65.7 152 285 448	3230 7730 13,490	86.6 207 362	3390 8760	90.9 235
DN 50	1 to 3.2 psig / 69 mbar to 0.22 bar 0.6 psig / 41 mbar Orange	3 psig / 0.21 bar	3 7 14 30 50 150	0.21 0.48 0.97 2.1 3.4 10.3			1740 3310 5130 7500 19,820	46.6 88.7 137 201 531	2600 4180 7930 11,400	69.7 112 213 306	4730 770 14,480	127 206 388	2550 5880 10,450	68.3 158 280	3050 7140	81.7 191
	2 to 5.5 psig / 0.14 to 0.38 bar 0.5 psig / 34 mbar Silver with green stripe	5 psig / 0.34 bar	10 15 20 35 60 75 100	0.69 1.0 1.4 2.4 4.1 5.2 6.9	590 789 950 1420 2210 2760 3550	15.8 21.1 25.5 38.1 59.2 74.0 95.1	950 1030 1380 1970 2920 3470 5130	25.5 27.6 37.0 52.8 78.3 93.0 137	1180 1580 2200 2920 4730 5680	31.6 42.3 59.0 78.3 127 152	1810 2370 2920 4020	48.5 63.5 78.3 108	2200 2840 2920	59.0 76.1 78.3	2370 3310	63.5 88.7
	2 to 5.5 psig / 0.14 to 0.38 bar 1 psig / 69 mbar Silver with green stripe	5 psig / 0.34 bar	10 15 20 35 60 75 100	0.69 1.0 1.4 2.4 4.1 5.2 6.9	950 1180 1380 1970 3160 4100 5130	25.5 31.6 37.0 52.8 84.7 110	1500 1890 2200 2050 5290 6390 8680	40.2 50.7 59.0 54.9 142 171 233	2050 2760 3790 5130 7890 10,260	54.9 74.0 102 137 207 275	4100 5520 6310	110 148 169	4100 5520 6310	110 148 169	4580 6310	123 169
	4 to 10 psig / 0.28 to 0.69 bar 1 psig / 69 mbar Silver	10 psig / 0.69 bar	15 20 25 40 60 75 100	1.0 1.4 1.7 2.8 4.1 5.2 6.9	708 944 1102 1810 2361 2754 3541	19.0 25.3 29.5 48.5 63.3 73.8 94.9	1023 1377 1652 2203 3148 3541 5193	27.4 36.9 44.3 59.0 84.4 94.9 139	1338 1967 2203 2912 4643 5666	35.9 52.7 59.0 78.0 124 152	2518 3148 4013	67.5 84.4 108	2518 3148 4013	67.5 84.4 108	2990 4564	80.1 122
	4 to 10 psig / 0.28 to 0.69 bar 2 psig / 0.14 bar Silver	10 psig / 0.69 bar	15 20 25 40 60 75	1.0 1.4 1.7 2.8 4.1 5.2 6.9	1023 1259 1574 2282 2990 4013 5115	27.4 33.7 42.2 61.2 80.1 108 137	1731 2125 2675 3934 5351 6531 8656	46.4 57.0 71.7 105 143 175 232	2518 3384 3777 5272 8656 10,230	67.5 90.7 101 141 232 274	4721 6295 7082	127 169 190	4721 6295 7082	127 169 190	6295 7869	169 211

Spring ranges based on regulator installation with the spring case pointed down.
 Light shaded areas show where indicated droop would be exceeded regardless of capacity.
 Dark shaded areas show where maximum operating inlet pressure for a given orifice size is exceeded.



NPT DIMENSIONS



A - CAST IRON FLANGES ARE 10 IN. / 254 mm FACE-TO-FACE; STEEL, STAINLESS STEEL AND HASTELLOY® C FLANGES ARE 14 IN. / 356 mm FACE-TO-FACE.

FLANGED DIMENSIONS

IN. /

mm

Figure 3. Dimensions

Table 6. Orifice Sizes and Coefficients for Relief Valve Sizing

BODY SIZE		ORIFICE SIZE		WIDE-OPEN C _v	WIDE-OPEN C _a	C ₁
NPS	DN	ln.	mm	WIDE-OPEN C	WIDE-OPEN Cg	C 1
1-1/2 and 2	40 and 50	1/4 3/8 1/2 3/4 1	6.4 9.5 13 19 25 30	1.51 3.14 5.43 11.9 20 26	53.0 111 190 415 700 910	35

 $\mbox{Hastelloy}{}^{\mbox{\tiny \ensuremath{\text{@}}}}\mbox{ C}$ is a mark owned by Haynes International, Inc.

Ordering Information

Carefully review the Specifications section, then specify the desired selection on the Ordering Guide. If a pilot

setpoint is not requested, the regulator will be factory set at the approximate midrange.

Ordering Guide

Body Size (Select One) ☐ NPS 1-1/2 / DN 40 ☐ NPS 2 / DN 50		Orifice Size (Select One) ☐ 1/4 in. / 6.4 mm*** ☐ 3/4 in. / 19 mn ☐ 3/8 in. / 9.5 mm*** ☐ 1 in. / 25 mm*					
Body Material and End Co Cast Iron NPT*** CL125 FF (NPS 2 / DN	nnection Style (Select One) 50 body only)*	☐ 1/2 in. / 13 mm*** Outlet Pressure Range ☐ 1 to 3 in. w.c. / 2 to 7 ☐ 3 to 11 in. w.c. / 7 to	7 mbar, Brown***				
WCC Steel □ NPT*** □ SWE** □ CL150 RF** □ CL300 RF** □ PN 16/25/40*	CF8M Stainless Steel □ NPT*** □ CL150 RF** □ CL300 RF** □ PN 16/25/40 RF*	□ 0.7 to 2 psig / 48 mb	oar to 0.22 bar, Orange*** o 0.38 bar, ripe***				
Spring Case Material (Sel ☐ Cast iron*** ☐ WCC steel*** ☐ CF8M Stainless steel**	ect One)	Pressure Registration (Select One) ☐ Internal*** ☐ External** PTFE Diaphragm Protector (Optional) ☐ Yes					
Diaphragm Case Material ☐ Cast iron*** ☐ WCC steel***		CRN (Canadian Registration Number) Required (Optional) ☐ Yes					
☐ CF8M Stainless steel** Trim Material (Select One) ☐ 304 Stainless steel***		PED (Pressure Equipment Directive) Conformity (Optional) ☐ Yes					
☐ 316 Stainless steel** Diaphragm Material (Seled In the Nitrile (NBR) (standard In the Interior (FKM)*** ☐ Ethylenepropylene (EP ☐ Silicone (VMQ)***	1)***	Replacement Parts Kit (Optional) ☐ Yes, send one replacement parts kit to mat this order.					
Disk Material (Select One) ☐ Nitrile (NBR) (standard ☐ Fluorocarbon (FKM)*** ☐ Polytetrafluoroethylene ☐ Ethylenepropylene (EP	(PTFE)***						

Ordering Guide (continued)

	Regulators Quick Order Guide				
* * *	Readily Available for Shipment				
* *	Allow Additional Time for Shipment				
*	Special Order, Constructed from Non-Stocked Parts. Consult your local Sales Office for Availability.				
Availability of the product being ordered is determined by the component with the longest shipping time for the requested construction.					

Tank Blanketing Specification Worksheet
Application Specifications:
Tank Size
Pump In Rate
Pump Out Rate
Blanketing Gas (Type and Specific Gravity)
Pressure Requirements:
Maximum Inlet Pressure (P _{1max})
Minimum Inlet Pressure (P _{1min})
Control Pressure Setting (P ₂)
Maximum Flow (Q _{max})
Accuracy Requirements:
□ 0.25 in. w.c. / 0.6 mbar □ 0.5 in. w.c. / 1 mbar
☐ 1 in. w.c. / 2 mbar ☐ 2 in. w.c. / 5 mbar
☐ Other
Other Specifications:
Is a vapor recovery regulator required? ☐ Yes ☐ No
Special Material Requirements: ☐ Ductile Iron ☐ Steel
☐ Stainless steel ☐ Other
Other Requirements:

Industrial Regulators

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