



ISO Registered Company

31-N-TB

02-20

# MODEL 31-N

## LOW PRESSURE REDUCING SERVICE REGULATOR



MODEL 31-N

### OVERVIEW

The Model 31-N is a compact service regulator designed expressly for use in the process industry where gas needs to be controlled down to the Inches - W.C. range. Body is available in cast carbon steel or stainless steel materials only. Interior wetted trims for corrosive applications is standard. Design is non-relieving.

### FEATURES

- Body Material:** Carbon steel or stainless steel.
- Trim Material:** Choice of four combinations of materials, including 316L SST wetted.
- Setpoint Pressure Range:** Multiple springs covering 2.0 - 16.0" W.C. (50 - 400mm H<sub>2</sub>O)
- Accurate Regulation:** Optimum internals design to ensure rapid response to sudden load changes.
- Multiple Configurations:** Valve is factory assembled in four standard positions. Actuator section can be rotated 360° around the valve's throat. See Figure 1.
- Valve Seat Design:** One-piece, molded, resilient seat self-locks, self-aligns, and is easily field maintained. Design minimizes pressure build above setpoint at lockup (no flow) conditions. Buna-N, fluorocarbon elastomer, silicone or TFE seat material. Loading ring allows field adjustment of "boost effect".



### LINE SIZES AVAILABLE

1/2" (DN15), 3/4" (DN20), 1" (DN25), 1-1/2" (DN40), 2" (DN50)



### END CONNECTIONS

FNPT, RF FLANGED, EXTENDED NIPPLES, 14" FACE TO FACE



### COMMON APPLICATIONS

BLANKETING INERT GASES THAT ARE VOLATILE, CORROSIVE, OR LETHAL, AND FUEL GAS SERVICES



### DESIGN PRESSURE

INLET: UP TO 100 psig (6.9 Barg)  
OUTLET: 2 - 16" W.C. (50 - 400mm H<sub>2</sub>O)

Алматы (7273)495-231  
Ангарск (3955)60-70-56  
Архангельск (8182)63-90-72  
Астрахань (8512)99-46-04  
Барнаул (3852)73-04-60  
Белгород (4722)40-23-64  
Благовещенск (4162)22-76-07  
Брянск (4832)59-03-52  
Владивосток (423)249-28-31  
Владикавказ (8672)28-90-48  
Владимир (4922)49-43-18  
Волгоград (844)278-03-48  
Вологда (8172)26-41-59  
Воронеж (473)204-51-73  
Екатеринбург (343)384-55-89

Иваново (4932)77-34-06  
Ижевск (3412)26-03-58  
Иркутск (395)279-98-46  
Казань (843)206-01-48  
Калининград (4012)72-03-81  
Калуга (4842)92-23-67  
Кемерово (3842)65-04-62  
Киров (8332)68-02-04  
Коломна (4966)23-41-49  
Кострома (4942)77-07-48  
Краснодар (861)203-40-90  
Красноярск (391)204-63-61  
Курск (4712)77-13-04  
Курган (3522)50-90-47  
Липецк (4742)52-20-81

Магнитогорск (3519)55-03-13  
Москва (495)268-04-70  
Мурманск (8152)59-64-93  
Набережные Челны (8552)20-53-41  
Нижний Новгород (831)429-08-12  
Новокузнецк (3843)20-46-81  
Ноябрьск (3496)41-32-12  
Новосибирск (383)227-86-73  
Омск (3812)21-46-40  
Орел (4862)44-53-42  
Оренбург (3532)37-68-04  
Пенза (8412)22-31-16  
Петрозаводск (8142)55-98-37  
Псков (8112)59-10-37  
Пермь (342)205-81-47

Ростов-на-Дону (863)308-18-15  
Рязань (4912)46-61-64  
Самара (846)206-03-16  
Санкт-Петербург (812)309-46-40  
Саратов (845)249-38-78  
Севастополь (8692)22-31-93  
Саранск (8342)22-96-24  
Симферополь (3652)67-13-56  
Смоленск (4812)29-41-54  
Сочи (862)225-72-31  
Ставрополь (8652)20-65-13  
Сургут (3462)77-98-35  
Сыктывкар (8212)25-95-17  
Тамбов (4752)50-40-97  
Тверь (4822)63-31-35

Тольятти (8482)63-91-07  
Томск (3822)98-41-53  
Тула (4872)33-79-87  
Тюмень (3452)66-21-18  
Ульяновск (8422)24-23-59  
Улан-Уда (3012)59-97-51  
Уфа (347)229-48-12  
Хабаровск (4212)92-98-04  
Чебоксары (8352)28-53-07  
Челябинск (351)202-03-61  
Череповец (8202)49-02-64  
Чита (3022)38-34-83  
Якутск (4112)23-90-97  
Ярославль (4852)69-52-93

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## STANDARD / GENERAL SPECIFICATIONS

**Body Sizes:** 1/2", 3/4", 1", 1-1/2" and 2"  
(DN15, 20, 25, 40 and 50)  
**NOTE:** Inlet and outlet same size.

**End Connections:** Standard : NPT female  
Option-30: 150#RF flanges.  
Option-32: Extended plain end nipples.  
Option-34: 14" Face to Face Flange Dimension.

**Body/Diaphragm Case/Spring Chamber Material Combinations:** CS/SST/CS, SST/SST/CS.  
CS = Cast Carbon Steel  
SST = Cast Stainless Steel  
See Table 1 for materials specifications.

**Inlet Pressure Limits:** Maximum Operating Inlet Pressure is 100 psig (6.9 Barg). Function of orifice size. See Tables 5, 6, 7 and 8.  
Maximum Design Pressure is 150 psig (10.3 Barg).

**Outlet Pressure Limits:** Maximum Operating Outlet Pressure is 16" WC (400mm H<sub>2</sub>O).  
Maximum Design Pressure is 50 psig (3.45 Barg).  
Minimum Operating Outlet Pressure is 2.0" W.C. (50mm H<sub>2</sub>O).  
See Table 1.

**Temperature Limits:** Maximum Temperature—up to +400°F (204°C) - dependent on loading ring material.  
Minimum Temperature – down to -30° F (-34°C) dependent on composition seat material.  
  
See Tables 2a and 2b.

**Outlet Setpoint Pressure Ranges:** 2.0 to 16" W.C. (50 to 400mm H<sub>2</sub>O).  
**NOTE:** "Setpoint" defined @ 70 SCFH flow with S.G. = 0.97 gas.

**Pressure Drop:** Up to 100 psid (6.9 Bard), for 0.125 orifice. 60 psid (4.14 Bard) for all other orifice sizes.  
Max Inlet Pressure-to-Min Outlet Setpoint Pressure.

**Trim Design:** Composition seat design only.  
See Table 2a and 2b for trim designation numbers vs. trim materials.

### Lockup and Setpoint Development:

Orifice Size			Internal Sense Lockup Build Above P <sub>2</sub> Setpoint		* ΔP to Cause ΔP <sub>2</sub> of 0.1" W.C. (2.54 mm H <sub>2</sub> O)	
No.	inch	(mm)	"W.C.	(mm H <sub>2</sub> O)	psid	(Bard)
2	0.125"	(3.18)	0.4"	(10)	15	(1.0)
3	0.188"	(4.76)	0.5"	(13)	10	(0.7)
4	0.250"	(6.35)	0.6"	(15)	8.5	(0.6)
5	0.312"	(7.94)	0.7"	(18)	5	(0.3)
6	0.375"	(9.52)	0.8"	(20)	3.5	(0.25)

**External** Sense Lockup Build above P<sub>2</sub> Setpoint is 1.0- 1.2"WC (25 - 32 mm H<sub>2</sub>O)

\*As P<sub>1</sub> increases to P<sub>1</sub> + ΔP<sub>1</sub>, P<sub>2</sub> decreases to P<sub>2</sub> - ΔP<sub>2</sub>; as P<sub>1</sub> decreases to P<sub>1</sub> - ΔP<sub>1</sub>, P<sub>2</sub> increases to P<sub>2</sub> + ΔP<sub>2</sub>.

**Capacities:** Cv. vs. Droop  
Table 5

SCFH vs. Droop  
Table 6: Natural Gas  
Table 7: Nitrogen  
Table 8: Propane

Dependent on outlet connection size, orifice size, inlet and outlet pressure and level of allowable droop. See Table 4: Wide Open Capacity for Relief Valve Sizing.

**Seat Leakage:** Meets ANSI/FCI 70/2 (Rev. 1982) Standard — Class VI.

**Range Springs:** Standard: Heat treated steel. Covers 2.0-16" W.C. (50-400 mm H<sub>2</sub>O) using eight springs. See Table 3 for specific spring ranges.

**Gaskets:** Graphite/NBR Body Gasket.

**External Bolting:** Standard: 316 SST.

**Painting:** Standard: All non-corrosion resistant portions to be painted with corrosion resistant epoxy paint per Cashco Spec #S1606.

## OPTION SPECIFICATIONS

**Option -25:** TAPPED VENT. 1/4" NPT female tapped opening in spring chamber. Use for piping vent to remote location in event of diaphragm failure.

**Option -25P:** PLASTIC RAIN PROOF BUG VENT. (For Opt-25).

**Option -25S:** SST RAIN PROOF BUG VENT: (For Opt-25).

**Option -30:** FLANGED END CONNECTIONS. CS or SST body materials. Flange and pipe nipple materials of same general chemistry as body material. Available in 150# RF flange only.

**NOTES:** 1. The body P vs. T ratings of Table 1 are the limiting variables for flanged end connections.

**Option -32:** EXTENDED PLAIN END NIPPLES. CS or SST body materials. Schedule 80 plain end pipe nipples of same general chemistry as body material.

**Option -34:** SPECIAL 14" FACE TO FACE DIMENSION FOR FLANGED END CONNECTIONS. See Opt.-30 for standard face to face dimension.

**Option -37:** ALL SST/CLEAN UNIT. Used primarily for food and pharmaceutical industries. NPT end connections only. Uses SST body and lower casing. Spring chamber and seal cap are unpainted salt nitrated CS. All external bolting of 316 SST. All wetted cast SST parts are electropolished. Unit is cleaned to Cashco Spec. #S-1576. Suitable for operating temperature range of -30 to +100°F (-34 to +38°C).

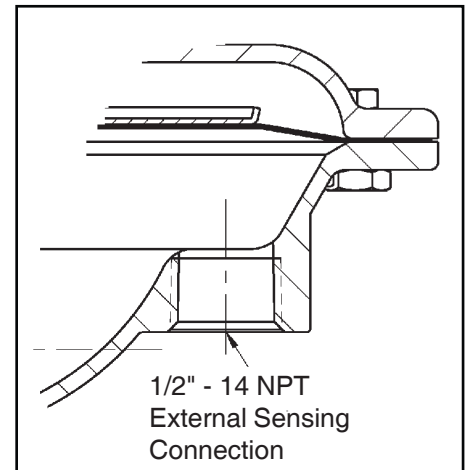
**Option -40:** CS NACE CONSTRUCTION. Internal wetted portions meet NACE standard MR0175, when exterior of the regulator is not directly exposed to a sour gas environment, buried, insulated or

otherwise denied direct atmospheric exposure. CS/CS body/spring chamber material with S40V, S40V-HT, and S50V only trim. Available all sizes.

**Option -40SST:** SST NACE CONSTRUCTION. Same as Opt-40, except uses SST/SST body/spring chamber construction.

**Option -56:** SPECIAL CLEANING. CS or SST body and lower casing only. Cleaning per Cashco Spec. #S-1542. Higher degree of cleaning than standard commercial cleaning.

**Option -ES:** External Sensing. 1/2x14 NPT threaded port in the lower case for connecting a remote sensing line downstream of the outlet. Requires o-ring seal on plug and stem assembly.



## TECHNICAL SPECIFICATIONS

**NOTE:** Regulators operating at “WC” (mm H<sub>2</sub>O) outlet (downstream) pressure levels have the passing gas at near fully expanded conditions; i.e. density is low. This creates high velocities. To prevent downstream pipe frictional effects from causing significant setpoint error, ensure proper downstream pipe sizing. Maximum recommended flow rate for a given pipe size may be calculated from Equation 1. Increase downstream pipe size until SCFH<sub>max</sub> is greater than the SCFH flow rate required.

SCFH<sub>max</sub> = Flow Rate at which pipe friction causes an “h<sub>L</sub>” pressure loss in “L” equivalent feet of outlet pipe, with the outlet pipe size and body size equal; ft<sup>3</sup>/Hr.

$$SCFH_{max} = 479 \sqrt{\frac{h_L \times d_2^5 \times (P_2 + 407.37)^2}{f \times L \times SG \times T_2^2}}$$

where:

h<sub>L</sub> = head/pressure loss in downstream pipe.  
d<sub>2</sub> = outlet pipe internal diameter; inch  
P<sub>2</sub> = outlet pressure; "W.C.  
L = equivalent pipe length; feet  
SG = fluid specific gravity; dimensionless  
T<sub>2</sub> = outlet temperature; °R  
f = friction factor; dimensionless

d <sub>2</sub>	f	d <sub>2</sub>	f
3/4"	0.031	2"	0.021
1"	0.026	2-1/2"	0.020
1-1/4"	0.024	3"	0.018
1-1/2"	0.023		

**EQUATION 1**

**TABLE 1  
DESIGN PRESSURE –TEMPERATURE  
MATERIAL SPECIFICATIONS**

STANDARD, OPT -30 & OPT -32 CONSTRUCTIONS																			
Material Specifications (Body/Lower Casing/Sp. Ch.)		End Connections	Inlet		Outlet														
			Pressure	Temperature	Pressure	Trim Designation Nos.													
Description (Abbr.)	ASTM No.		psig (Barg)	°F(°C)	psig (Barg)	S40N, S50N, S40T	WS40N, WS50N	S40V, [S50V]	S40N-HT, WS40N-HT	S40V-HT									
						Temperature													
						°F(°C)	°F(°C)	°F(°C)	°F(°C)	°F(°C)									
CS/SST/CS	A216,	NPT–Std or Opt.–32 P. E. Pipe Nipples or Opt.–37	150 (10.3)	-30 to +400 (-34 to +204)	50 (3.44)	-30 to +220 (-34 to +104)	-30 to +220 (-34 to +104)	-15 to +220 (-26 to +104)	-30 to +250 (-34 to +121)	-15 to +400 (26 to +204)									
	Gr. WCB/																		
	A351,																		
	Gr. CF3M/																		
A216,																			
Gr. WCB																			
SST/SST/CS	A351,																		
	Gr. CF3M/																		
	A351,																		
	Gr. CF3M/																		
A216																			
Gr. WCB																			
CS/SST/CS	A216,	Opt.-30 or Opt-34: 150# Flgd.	150 (10.3)	-30 to +400 (-34 to +204)	50 (3.44)	-30 to +220 (-34 to +104)	-30 to +220 (-34 to +104)	-15 to +220 (-26 to +104)	-30 to +250 (-34 to +121)	-15 to +400 (26 to +204)									
	Gr. WCB/																		
	A351,																		
	Gr. CF3M/																		
A216,																			
Gr. WCB																			
SST/SST/CS	A351,										Opt.-30 or Opt-34: 150# Flgd.	150 (10.3)	-30 to +400 (-34 to +204)	50 (3.44)	-30 to +220 (-34 to +104)	-30 to +220 (-34 to +104)	-15 to +220 (-26 to +104)	-30 to +250 (-34 to +121)	-15 to +400 (26 to +204)
	Gr. CF3M/																		
	A351,																		
	Gr. CF3M/																		
A216																			
Gr. WCB																			
Pipe Materials		Nipples			Flanges														
CS		ASTM A106 Gr. B; or equal			ASTM A105 Forged, or equal														
SST		ASTM A240, Tp. 316L			ASTM A182 Forged, Gr. F316L														

**TABLE 2a**  
**TRIM MATERIALS**  
**For Sizes 1/2" - 1" (DN15 - DN25)**

Part Description	Trim Designation Nos.						
	S40N	WS40N	S40T	S40V (NACE)	S40N-HT	WS40N-HT	S40V-HT (NACE)
Seat	NBR	Silicone	TFE	FKM	NBR	Silicone	FKM
Loading Ring	Glass-filled Nylon	Glass-filled Nylon	Graph / PTFE	Glass-filled Nylon	Graph / PTFE	Graph / PTFE	Graph / PTFE
Orifice	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST
Stem	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST
Linkage Lever	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST
Link. Lever Screw	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST
Linkage Pin	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST
Diaphragm	NBR w/ Reinforcing Cores	NBR w/ Reinforcing Cores	NBR w/ Cotton Insert w&TFE cover	FKM w/ Reinforcing Cores	NBR w/ Reinforcing Cores	NBR w/ Reinforcing Cores	FKM w/ Reinforcing Cores
Lower Diaph. Plate	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST
Temperature Range	-30 to +220°F	-30 to +220°F	-30 to +220°F	-15 to +220°F	-30 to +250°F	-30 to +250°F	-15 to +400°F
	(-34 to +104°C)	(-34 to +104°C)	(-34 to +104°C)	(-26 to +104°C)	(-34 to +121°C)	(-34 to +121°C)	(-26 to +204°C)

(NBR = Buna-N; FKM = Fluorocarbon elastomer)

**TABLE 2b**  
**TRIM MATERIALS**  
**For Sizes 1-1/2" & 2" (DN40 & DN50)**

Part Description	Trim Designation Nos.		
	S50N	WS50N	S50V (NACE)
Seat	NBR	Silicone	FKM
Loading Ring	316L SST *	316L SST *	316L SST *
Orifice	316L SST	316L SST	316L SST
Stem	316L SST	316L SST	316L SST
Linkage Lever	316L SST	316L SST	316L SST
Link. Lever Screw	316L SST	316L SST	316L SST
Linkage Pin	316L SST	316L SST	316L SST
Diaphragm	NBR w/ Reinforcing Cores	NBR w/ Reinforcing Cores	FKM w/ Reinforcing Cores
Lower Diaph. Plate	316L SST	316L SST	316L SST
Temperature Range	-30 to +220°F	-30 to +220°F	-15 to +400°F
	(-34 to + 104°C)	(-34 to +104°C)	(-26 to +204°C)

\* Steel body uses steel loading ring.  
(NBR = Buna-N; FKM = Fluorocarbon elastomer)

**TABLE 3  
RANGE SPRINGS - ALL SIZES**

<b>Setpoint Pressure Range</b>	
<b>Inch W.C.</b>	<b>(mm H<sub>2</sub>O)</b>
2.0 to 3.0 *	(50 - 76)
3.0 to 4.5	(76 - 114)
4.5 to 5.5	(114 - 140)
5.0 to 7.0	(127 - 178)
5.5 to 8.0	(140 - 203)
7.0 to 11.0	(178 - 279)
8.0 to 12.0	(203 - 305)
11.0 to 16.0	(279 - 406)
* Spring case must be oriented down.	

**TABLE 4  
MAXIMUM Cv WITH PLUG WIDE OPEN  
(USE FOR RELIEF VALVE SIZING)**

<b>Orifice</b>			<b>Wide Open Cv</b>		
			<b>Body Size</b>		
<b>No.</b>	<b>Size</b>		<b>1/2" - 1" (DN15 - 25)</b>	<b>1-1/2" (DN40)</b>	<b>2" (DN50)</b>
	<b>Inch</b>	<b>(mm)</b>			
2	0.125"	(3.18)	.5	NA	NA
3	0.1875"	(4.76)	1.0	1.0	1.0
4	0.250"	(6.35)	1.7	1.7	1.7
5	0.3125"	(7.94)	2.7	2.7	2.7
6	0.375"	(9.52)	3.9	3.9	3.9

**TABLE 5**  
**CAPACITY – C<sub>v</sub> @ DROOP**

Range Spring	Pressure				1/2" - 1" (DN15 - 25) – Body Size										1-1/2" and 2" (DN40 & 50) – Body Size							
	Outlet P2		Inlet P1		No. 2 Orifice (0.125")		No. 3 Orifice (0.1875")		No. 4 Orifice (0.250")		No. 5 Orifice (0.3125")		No. 6 Orifice (0.375)		No. 3 Orifice (0.1875")		No. 4 Orifice (0.250")		No. 5 Orifice (0.3125")		No. 6 Orifice (0.375")	
	Inch W.C. (mm H2O)	Inch W.C. (mm H2O)	psig	(Barg)	Droop–"WC		Droop–"WC		Droop–"WC		Droop–"WC		Droop–"WC		Droop–"WC		Droop–"WC		Droop–"WC		Droop–"WC	
				0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	
2 to 3 (50 to 76)	2.5 (63)	5	(0.34)	0.40	0.40	0.84	0.85	1.34	1.46	1.52	1.89	1.56	2.10	0.80	0.87	0.97	1.52	1.21	1.87	2.34	2.82	
		10	(0.69)	0.38	0.39	0.84	0.86	1.40	1.47	1.37	1.72	1.35	1.77	0.63	0.85	0.73	1.36	0.99	1.48	2.32	2.98	
		15	(1.03)	0.36	0.37	0.83	0.84	1.42	1.46	0.99	1.39	1.10	1.41	0.64	0.83	0.62	1.10	0.87	1.17	2.86	3.10	
		20	(1.38)	0.36	0.37	0.82	0.82	1.34	1.41	1.10	1.36	1.15	1.39	0.52	0.82	0.46	0.95	0.75	0.97	2.90	3.04	
3 to 4.5 (76 to 114)	3.75 (95)	5	(0.34)	0.33	0.35	0.78	0.84	1.17	1.37	1.56	1.95	1.72	2.19	0.59	0.88	0.68	1.23	0.78	1.54	1.05	3.02	
		10	(0.69)	0.36	0.36	0.83	0.85	1.30	1.44	1.38	1.76	1.67	1.95	0.53	0.82	0.53	1.10	0.67	1.21	0.56	1.08	
		15	(1.03)	0.37	0.37	0.83	0.84	1.26	1.45	1.12	1.46	1.38	1.72	0.52	0.82	0.44	0.87	0.72	1.04	0.40	0.86	
		20	(1.38)	0.36	0.37	0.82	0.82	1.14	1.42	0.95	1.33	0.99	1.39	0.48	0.80	0.41	0.76	0.66	0.91	2.80	2.86	
4.5 to 5.5 (114 to 140)	5 (127)	5	(0.34)	0.35	0.38	0.80	0.96	1.09	1.57	0.93	1.65	1.15	1.90	0.41	0.80	0.67	1.33	0.86	1.40	0.89	3.50	
		10	(0.69)	0.36	0.39	0.81	0.96	1.02	1.39	0.87	1.54	1.19	1.69	0.41	0.80	0.64	1.32	0.81	1.50	0.82	2.64	
		15	(1.03)	0.37	0.40	0.81	0.95	0.91	1.43	0.81	1.44	1.06	1.49	0.42	0.80	0.61	1.32	0.76	1.60	0.76	2.72	
		20	(1.38)	0.38	0.41	0.82	0.95	0.81	1.29	0.75	1.33	0.84	1.33	0.42	0.80	0.57	1.32	0.72	1.70	0.69	2.81	
		30	(2.07)	0.40	0.42	0.83	0.95	0.78	1.13	0.63	1.11	0.76	1.20	0.42	0.81	0.51	1.32	0.62	1.90	0.56	2.98	
		40	(2.76)	0.42	0.44	0.84	0.94	0.68	1.01	0.51	0.90			0.42	0.81	0.44	1.31	0.53	2.10			
		50	(3.45)	0.45	0.45	0.86	0.94	0.62	0.84					0.43	0.82	0.37	1.31					
		60	(4.14)	0.47	0.47	0.87	0.93							0.43	0.82		1.31					
5.5 to 8.0 (140 to 203)	7 (178)	5	(0.34)	0.31	0.38	0.67	0.91	0.79	1.24	0.78	1.48	1.01	1.73	0.36	0.44	0.64	1.20	0.51	0.82	0.71	1.60	
		10	(0.69)	0.32	0.39	0.68	0.91	0.78	1.27	0.74	1.39	0.99	1.51	0.36	0.47	0.61	1.20	0.49	0.97	0.66	1.84	
		15	(1.03)	0.34	0.39	0.70	0.91	0.68	1.14	0.69	1.30	0.79	1.38	0.36	0.51	0.58	1.20	0.48	1.12	0.61	2.00	
		20	(1.38)	0.35	0.40	0.71	0.90	0.74	1.10	0.65	1.21	0.97	1.37	0.36	0.54	0.54	1.21	0.46	1.27	0.56	2.16	
		30	(2.07)	0.38	0.42	0.73	0.90	0.97	1.43	0.57	1.03	0.72	1.15	0.37	0.61	0.48	1.21	0.43	1.57	0.45	2.48	
		40	(2.76)	0.41	0.43	0.76	0.90	0.66	0.90	0.49	0.86			0.37	0.67	0.41	1.22	0.39	1.87			
		50	(3.45)	0.44	0.45	0.79	0.90	0.60	0.84					0.37	0.74	0.34	1.22					
		60	(4.14)	0.47	0.47	0.81	0.90							0.37	0.81		1.22					
8.0 to 12.0 (203 to 305)	11 (279)	5	(0.34)	0.19	0.30	0.30	0.52	0.51	0.76	0.46	0.81	0.50	1.06	0.27	0.45	0.36	0.45	0.36	0.50	0.45	0.50	
		10	(0.69)	0.20	0.31	0.31	0.54	0.50	0.75	0.43	0.78	0.74	1.13	0.26	0.43	0.35	0.49	0.35	0.55	0.41	0.59	
		15	(1.03)	0.20	0.32	0.31	0.56	0.50	0.73	0.40	0.74	0.57	0.98	0.25	0.42	0.33	0.54	0.33	0.61	0.38	0.71	
		20	(1.38)	0.20	0.33	0.32	0.57	0.49	0.72	0.38	0.70	0.60	0.99	0.24	0.41	0.31	0.60	0.31	0.66	0.35	0.83	
		30	(2.07)	0.21	0.35	0.34	0.61	0.47	0.69	0.32	0.63	0.62	0.87	0.22	0.38	0.28	0.72	0.26	0.77	0.28	1.07	
		40	(2.76)	0.21	0.37	0.36	0.64	0.46	0.66	0.27	0.56			0.20	0.36	0.24	0.83	0.22	0.88			
		50	(3.45)	0.22	0.39	0.38	0.68	0.44	0.63					0.18	0.34	0.21	0.95					
		60	(4.14)	0.22	0.41	0.39	0.71							0.16	0.31		0.95					
11.0 to 16.0 (279 to 406)	15 (381)	5	(0.34)	0.18	0.26	0.26	0.42	0.37	0.59	0.39	0.65	0.55	0.84	0.27	0.39	0.33	0.50	0.33	0.43	0.39	0.57	
		10	(0.69)	0.17	0.26	0.26	0.43	0.38	0.59	0.37	0.62	0.45	0.89	0.25	0.37	0.31	0.50	0.30	0.45	0.37	0.59	
		15	(1.03)	0.17	0.26	0.27	0.44	0.38	0.58	0.35	0.60	0.43	0.72	0.24	0.36	0.30	0.50	0.28	0.47	0.34	0.60	
		20	(1.38)	0.16	0.26	0.27	0.45	0.38	0.58	0.33	0.58	0.46	0.73	0.22	0.35	0.28	0.50	0.26	0.49	0.32	0.62	
		30	(2.07)	0.15	0.26	0.28	0.47	0.38	0.58	0.29	0.53	0.50	0.70	0.19	0.32	0.25	0.50	0.21	0.53	0.26	0.65	
		40	(2.76)	0.14	0.26	0.28	0.50	0.39	0.58	0.25	0.49			0.15	0.29	0.22	0.51	0.17	0.57			
		50	(3.45)	0.12	0.26	0.29	0.52	0.39	0.57					0.12	0.26	0.19	0.51					
		60	(4.14)	0.11	0.26	0.29	0.54							0.08	0.23		0.51					
		70	(4.83)	0.17	0.28																	
		80	(5.52)	0.19	0.22																	
		90	(6.21)	0.10	0.27																	
		100	(6.90)	0.23	0.33																	

**TABLE 6**  
**NATURAL GAS CAPACITY — SCFH**  
**SG = 0.60 T = 60°F F<sub>L</sub> = 0.90**

Range Spring	Pressure		SCFH @ 1/2" - 1" (DN15 - 25) - Body Size										SCFH @ 1-1/2" and 2" (DN40 & 50) - Body Size								
	Outlet P2	Inlet P1	No. 2 Orifice (0.125")		No. 3 Orifice (0.1875")		No. 4 Orifice (0.250")		No. 5 Orifice (0.312")		No. 6 Orifice (0.375")		No. 3 Orifice (0.1875")		No. 4 Orifice (0.250")		No. 5 Orifice (0.3125")		No. 6 Orifice (0.375")		
			Drop - "WC	Drop - "WC	Drop - "WC	Drop - "WC	Drop - "WC	Drop - "WC	Drop - "WC	Drop - "WC	Drop - "WC	Drop - "WC	Drop - "WC	Drop - "WC	Drop - "WC	Drop - "WC	Drop - "WC	Drop - "WC	Drop - "WC	Drop - "WC	
4.5 to 5.5 (114 to 140)	5 (127)	5	(0.34)	229	249	524	629	714	1029	609	1081	754	1245	269	524	439	872	564	917	583	2294
		10	(0.69)	343	371	771	914	971	1324	828	1466	1133	1609	390	762	609	1257	771	1428	781	2514
		15	(1.03)	443	479	970	1138	1090	1713	970	1725	1270	1785	503	958	731	1581	910	1917	910	3258
		20	(1.38)	540	583	1166	1351	1152	1834	1067	1891	1195	1891	597	1138	811	1877	1024	2418	981	3996
		30	(2.07)	736	773	1528	1749	1436	2080	1160	2044	1399	2209	773	1491	939	2430	1141	3498	1031	5486
		40	(2.76)	947	992	1893	2119	1533	2277	1150	2029			947	1826	992	2953	1195	4734		
		50	(3.45)	1200	1200	2294	2507	1654	2241					1147	2187	987	3494				
		60	(4.14)	1449	1449	2682	2867							1325	2527						
		70	(4.83)	1469	1784																
		80	(5.52)	1526	1917																
		90	(6.21)	1688	2164																
		100	(6.90)	1613	2277																
		Maximum Flow Rate: 3/4" - 621 SCFH; 1" - 1241 SCFH. (Note 1)												Maximum Flow Rate: 1-1/2" - 3849 SCFH; 2" - 7524 SCFH. (Note 1)							
5.5 to 8.0 (140 to 203)	7 (178)	5	(0.34)	202	248	437	593	515	808	508	965	658	1128	235	287	417	782	332	534	463	1043
		10	(0.69)	304	371	646	865	741	1207	703	1321	941	1435	342	447	580	1141	466	922	627	1749
		15	(1.03)	407	467	838	1089	814	1365	826	1556	946	1652	431	610	694	1436	575	1341	730	2394
		20	(1.38)	498	569	1009	1279	1052	1564	924	1720	1379	1948	512	768	768	1720	654	1806	796	3071
		30	(2.07)	700	773	1344	1657	1786	2633	1049	1896	1326	2117	681	1123	884	2228	792	2891	828	4566
		40	(2.76)	924	969	1713	2029	1488	2029	1105	1939			834	1510	924	2750	879	4215		
		50	(3.45)	1174	1200	2107	2401	1601	2241					987	1974	907	3254				
		60	(4.14)	1449	1449	2497	2775							1141	2497						
		70	(4.83)	1259	1364																
		80	(5.52)	1174	1878																
		90	(6.21)	1601	1947																
		100	(6.90)	1281	2277																
		Maximum Flow Rate: 3/4" - 624 SCFH; 1" - 1247 SCFH. (Note 1)												Maximum Flow Rate: 1-1/2" - 3868 SCFH; 2" - 7560 SCFH. (Note 1)							
8.0 to 12.0 (203 to 305)	11 (279)	5	(0.34)	122	193	193	335	329	490	297	522	322	683	174	290	232	290	232	322	290	322
		10	(0.69)	189	294	294	511	474	710	407	739	701	1070	246	407	331	464	331	521	388	559
		15	(1.03)	239	382	371	669	598	873	478	884	681	1171	299	502	394	645	394	729	454	849
		20	(1.38)	284	469	455	810	696	1023	540	995	852	1407	341	583	440	852	440	938	497	1179
		30	(2.07)	387	644	626	1123	865	1270	589	1160	1141	1602	405	700	516	1326	479	1418	516	1970
		40	(2.76)	473	834	811	1443	1037	1488	609	1262			451	811	541	1871	496	1984		
		50	(3.45)	587	1040	1014	1814	1174	1681					480	907	560	2534				
		60	(4.14)	678	1264	1202	2189							493	956						
		70	(4.83)	1119	1714																
		80	(5.52)	1135	1721																
		90	(6.21)	1212	1731																
		100	(6.90)	1138	1802																
		Maximum Flow Rate: 3/4" - 630 SCFH; 1" - 1259 SCFH. (Note 1)												Maximum Flow Rate: 1-1/2" - 3905 SCFH; 2" - 7633 SCFH. (Note 1)							
11.0 to 16.0 (279 to 406)	15 (381)	5	(0.34)	115	166	166	268	236	376	249	414	287	535	172	249	210	319	210	274	249	363
		10	(0.69)	160	245	245	406	359	557	349	585	519	840	236	349	293	472	283	425	349	557
		15	(1.03)	203	310	322	525	453	692	418	716	513	859	286	430	358	597	334	561	406	716
		20	(1.38)	227	369	383	639	540	824	469	824	653	1037	312	497	398	710	369	696	454	880
		30	(2.07)	276	479	516	865	700	1068	534	976	921	1289	350	589	460	921	387	976	479	1197
		40	(2.76)	316	586	631	1127	879	1307	564	1105			338	654	496	1150	383	1285		
		50	(3.45)	320	694	774	1387	1040	1520					320	694	507	1360				
		60	(4.14)	339	802	894	1665							247	709						
		70	(4.83)	595	979																
		80	(5.52)	743	861																
		90	(6.21)	433	1168																
		100	(6.90)	1091	1565																
		Maximum Flow Rate: 3/4" - 636 SCFH; 1" - 1271 SCFH. (Note 1)												Maximum Flow Rate: 1-1/2" - 3943 SCFH; 2" - 7706 SCFH. (Note 1)							

Note 1: Based on the flow rate that will give 0.1" W.C. pressure loss per 5 equivalent feet of pipe with outlet pipe size and body size equal; this condition is "Maximum Flow Rate".

**TABLE 7**  
**NITROGEN GAS CAPACITY — SCFH**  
**SG = 0.987 T = 60°F F<sub>L</sub> = 0.90**

Range Spring	Pressure		SCFH @ 1/2" - 1" (DN15 - 25) - Body Size										SCFH @ 1-1/2" and 2" (DN40 & 50) - Body Size								
	Outlet P2	Inlet P1	No. 2 Orifice (0.125")		No. 3 Orifice (0.1875")		No. 4 Orifice (0.250")		No. 5 Orifice (0.312")		No. 6 Orifice (0.375")		No. 3 Orifice (0.1875")		No. 4 Orifice (0.250")		No. 5 Orifice (0.3125")		No. 6 Orifice (0.375")		
			Droop - "WC		Droop - "WC		Droop - "WC		Droop - "WC		Droop - "WC		Droop - "WC		Droop - "WC		Droop - "WC		Droop - "WC		
Inch W.C. (mm H2O)	Inch W.C. (mm H2O)	psig	(Barg)	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"
4.5 to 5.5 (114 to 140)	5 (127)	5	(0.34)	180	196	413	495	562	810	480	851	593	980	211	413	346	686	443	722	459	1805
		10	(0.69)	270	292	607	719	764	1041	652	1154	891	1266	307	599	479	989	607	1124	614	1978
		15	(1.03)	349	377	763	895	857	1347	763	1356	998	1404	396	754	575	1243	716	1507	716	2562
		20	(1.38)	425	458	917	1062	905	1442	838	1487	939	1487	469	894	637	1476	805	1900	771	3141
		30	(2.07)	579	608	1201	1374	1128	1635	911	1606	1099	1736	608	1172	738	1910	897	2749	810	4311
		40	(2.76)	744	779	1487	1664	1204	1788	903	1594			744	1434	779	2320	938	3718		
		50	(3.45)	943	943	1801	1969	1299	1760					901	1718	775	2744				
		60	(4.14)	1137	1137	2104	2249							1040	1983						
		70	(4.83)	1152	1399																
		80	(5.52)	1196	1503																
		90	(6.21)	1323	1696																
100	(6.90)	1264	1784																		
Maximum Flow Rate: 3/4" - 621 SCFH; 1" - 1241 SCFH. (Note 1)												Maximum Flow Rate: 1-1/2" - 3849 SCFH; 2" - 7524 SCFH. (Note 1)									
5.5 to 8.0 (140 to 203)	7 (178)	5	(0.34)	159	195	344	467	405	636	400	759	518	887	185	226	328	616	262	421	364	821
		10	(0.69)	239	292	508	680	583	950	553	1039	740	1129	269	351	456	897	366	725	494	1376
		15	(1.03)	320	367	659	857	640	1073	649	1224	744	1299	339	480	546	1130	452	1054	574	1883
		20	(1.38)	391	447	793	1006	827	1229	726	1352	1084	1531	402	603	603	1352	514	1419	626	2414
		30	(2.07)	550	608	1056	1302	1403	2069	825	1490	1042	1664	535	882	694	1750	622	2271	651	3588
		40	(2.76)	726	761	1346	1594	1169	1594	868	1523			655	1186	726	2160	691	3311		
		50	(3.45)	922	943	1655	1885	1257	1760					775	1550	712	2556				
		60	(4.14)	1137	1137	1959	2177							895	1959						
		70	(4.83)	988	1070																
		80	(5.52)	920	1472																
		90	(6.21)	1255	1526																
100	(6.90)	1003	1784																		
Maximum Flow Rate: 3/4" - 624 SCFH; 1" - 1247 SCFH. (Note 1)												Maximum Flow Rate: 1-1/2" - 3868 SCFH; 2" - 7560 SCFH. (Note 1)									
8.0 to 12.0 (203 to 305)	11 (279)	5	(0.34)	96	152	152	264	259	386	233	411	254	538	137	228	183	228	183	254	228	254
		10	(0.69)	149	231	231	402	373	559	320	581	551	842	194	320	261	365	261	410	305	440
		15	(1.03)	188	301	291	526	470	686	376	695	536	921	235	395	310	508	310	573	357	667
		20	(1.38)	223	369	357	637	547	804	424	782	670	1106	268	458	346	670	346	737	391	927
		30	(2.07)	304	506	492	882	680	998	463	911	897	1259	318	550	405	1042	376	1114	405	1548
		40	(2.76)	372	655	637	1133	815	1169	478	992			354	637	425	1470	390	1558		
		50	(3.45)	461	817	796	1424	922	1320					377	712	440	1990				
		60	(4.14)	532	992	943	1717							387	750						
		70	(4.83)	878	1344																
		80	(5.52)	890	1350																
		90	(6.21)	950	1357																
100	(6.90)	892	1412																		
Maximum Flow Rate: 3/4" - 496 SCFH; 1" - 991 SCFH. (Note 1)												Maximum Flow Rate: 1-1/2" - 3076 SCFH; 2" - 6012 SCFH. (Note 1)									
11.0 to 16.0 (279 to 406)	15 (381)	5	(0.34)	90	130	130	211	186	296	196	326	226	421	135	196	165	251	165	216	196	286
		10	(0.69)	126	193	193	319	282	438	275	460	408	661	186	275	230	371	223	334	275	438
		15	(1.03)	160	244	253	413	357	544	328	563	404	676	225	338	282	469	263	441	319	563
		20	(1.38)	179	290	301	502	424	647	368	647	513	815	246	391	313	558	290	547	357	692
		30	(2.07)	217	376	405	680	550	839	420	767	723	1013	275	463	362	723	304	767	376	940
		40	(2.76)	248	460	496	885	691	1027	443	868			266	513	390	903	301	1009		
		50	(3.45)	251	545	607	1089	817	1194					251	545	398	1068				
		60	(4.14)	266	629	701	1306							194	556						
		70	(4.83)	466	768																
		80	(5.52)	583	675																
		90	(6.21)	339	916																
100	(6.90)	855	1226																		
Maximum Flow Rate: 3/4" - 501 SCFH; 1" - 1001 SCFH. (Note 1)												Maximum Flow Rate: 1-1/2" - 3105 SCFH; 2" - 6070 SCFH. (Note 1)									

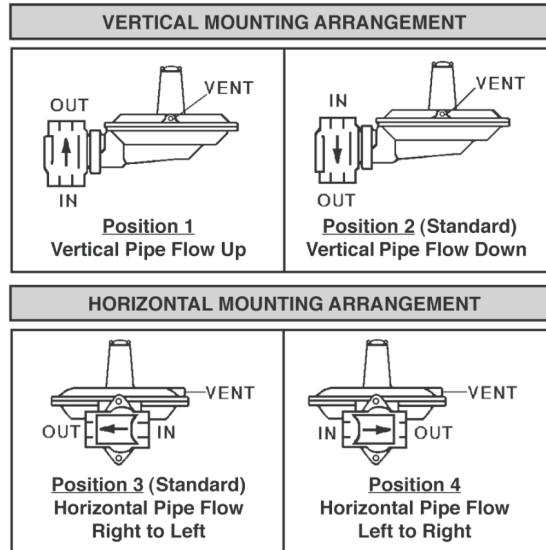
**Note 1:** Based on the flow rate that will give 0.1" W.C. pressure loss per 5 equivalent feet of pipe with outlet pipe size and body size equal; this condition is "Maximum Flow Rate".

**TABLE 8  
PROPANE GAS CAPACITY — SCFH  
SG = 1.52 T = 60°F F<sub>L</sub> = 0.90**

Range Spring	Pressure		1/2" - 1" (DN15 - 25) – Body Size										1-1/2" and 2" (DN40 & 50) – Body Size								
	Outlet P2	Inlet P1	No. 2 Orifice (0.125")		No. 3 Orifice (0.1875")		No. 4 Orifice (0.250")		No. 5 Orifice (0.3125")		No. 6 Orifice (0.375")		No. 3 Orifice (0.1875")		No. 4 Orifice (0.250")		No. 5 Orifice (0.3125")		No. 6 Orifice (0.375")		
			Droop—"WC	Droop—"WC	Droop—"WC	Droop—"WC	Droop—"WC	Droop—"WC	Droop—"WC	Droop—"WC	Droop—"WC	Droop—"WC	Droop—"WC	Droop—"WC	Droop—"WC	Droop—"WC	Droop—"WC	Droop—"WC	Droop—"WC	Droop—"WC	Droop—"WC
Inch W.C. (mm H2O)	Inch W.C. (mm H2O)	psig	(Barg)	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"	0.5"	1.0"
8.0 to 12.0 (203 to 305)	11 (279)	5	(0.34)	78	122	122	212	208	310	188	331	204	433	110	184	147	184	147	204	184	204
		10	(0.69)	120	186	186	324	300	450	258	468	444	678	156	258	210	294	210	330	246	354
		15	(1.03)	151	242	234	424	378	552	303	560	431	741	189	318	250	408	250	461	287	537
		20	(1.38)	180	297	288	512	440	647	341	629	539	890	216	368	279	539	279	593	315	746
		30	(2.07)	244	407	396	710	547	803	372	733	722	1013	256	442	326	838	303	896	326	1245
		40	(2.76)	299	527	513	911	655	940	385	798			285	513	342	1182	313	1253		
		50	(3.45)	371	657	640	1145	741	1061					303	573	354	1600				
		60	(4.14)	428	797	759	1381							311	603						
		70	(4.83)	706	1081																
		80	(5.52)	715	1085																
90	(6.21)	763	1090																		
100	(6.90)	717	1135																		
Maximum Flow Rate: 3/4" – 396 SCFH; 1" – 790 SCFH (NOTE 1)													Maximum Flow Rate: 1-1/2" – 2451 SCFH; 2" – 4791 SCFH (NOTE 1)								

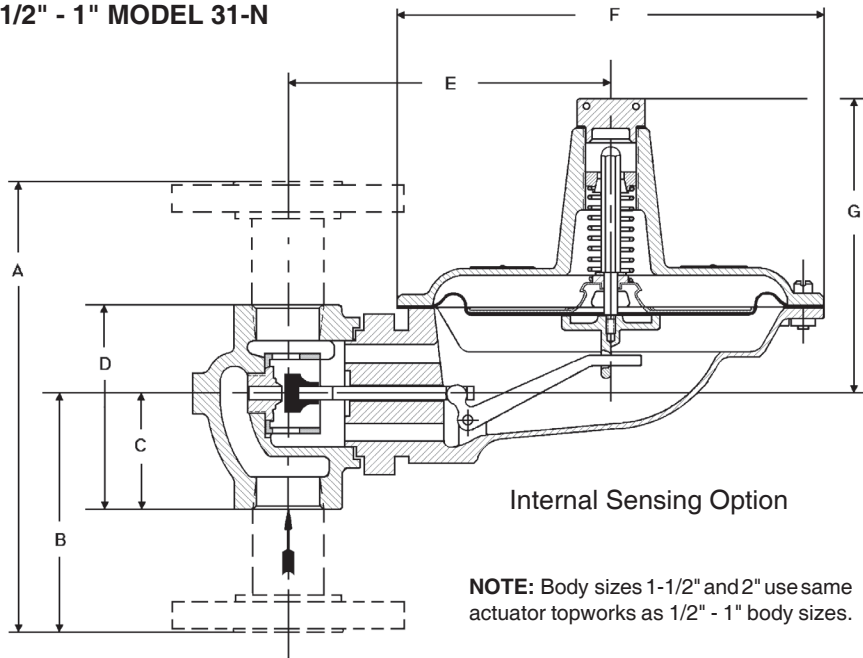
**Note 1:** Based on the flow rate that will give 0.1" W.C. pressure loss per 5 equivalent feet of pipe with outlet pipe size and body size equal; this condition is "Maximum Flow Rate".

**FIGURE 1  
MOUNTING ARRANGEMENT**

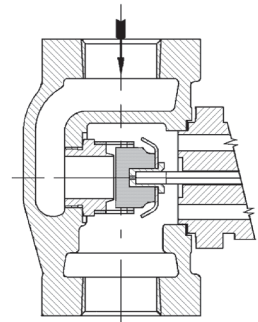


## DIMENSIONS AND WEIGHTS

**1/2" - 1" MODEL 31-N**



**1-1/2"- 2" MODEL 31-N BODY**



Size (Inches)	DIMENSIONS - ENGLISH (INCHES)									Shipping Weight (NPT) lbs.	Shipping Weight (Fig.) lbs.
	A <sup>1</sup>	A <sup>2</sup>	B <sup>1</sup>	B <sup>2</sup>	C	D	E	F	G		
1/2" - 1"	8.25	11.75	4.38	6.12	2.12	3.75	5.91	7.91	5.73	12	17
1-1/2" & 2"	11.75	13.75	5.88	6.88	2.88	5.75	6.06	7.91	5.73	17	25

Size (DN)	DIMENSIONS - METRIC (mm)									Shipping Weight (NPT) Kgs.	Shipping Weight (Fig.) Kgs.
	A <sup>1</sup>	A <sup>2</sup>	B <sup>1</sup>	B <sup>2</sup>	C	D	E	F	G		
15 - 25	210	298	111	156	54	95	150	201	146	5.45	7.72
40 & 50	298	349	149	175	73	146	154	201	146	7.72	11.34

<sup>1</sup> Flanged connections. - A<sup>1</sup> also available with Opt-34, special 14" (356mm) face to face dimension, (with B<sup>1</sup> = 7.25" (185 mm) for sizes 1/2" - 1". For 1-1/2" & 2" sizes B<sup>1</sup> = 7.00" (178 mm).

<sup>2</sup> Extended Nipples (Opt-32) connections.

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# MODEL 31-N PRODUCT CODER 02/07/20

An "X" in POS 12 followed by a 5-digit control number overrides remaining selections.



POSITION 3 - BODY / ORIFICE SIZES						
Orifice		Body Size				
		CODE				
No.	Size	1/2" (DN15)	3/4" (DN20)	1" (DN25)	1-1/2" (DN40)	2" (DN50)
2	0.125"	2	A	B	--	--
3	0.1875"	3	E	F	G	H
4	0.250"	4	J	K	L	M
5	0.312"	5	N	P	R	T
6	0.375"	6	V	W	Y	Z

POSITION 5 - BODY/LOWER CASING/ SPRING CHAMBER MATERIALS				
Body/Lower Case/Spring Chamber	Arrangement / Position *			
	1	2	3	4
	CODE			
CS/SST/CS	1	2	3	4
SST/SST /CS	5	6	7	8

\* Internal Sensing is considered Std Construction unless Opt-ES is selected in Position 12.  
**NOTE:** See TB Table 1 for material limitations of Design Pressure Ratings.

POSITION 6 & 7 - TRIM DESIGNATION NUMBERS			
Stainless Steel Trim			
Body Size 1/2" - 1" (DN20 & DN25)		Body Size 1-1/2" & 2" (DN40 & DN50)	
Desig.	CODE	Desig.	BR. CODE
S40N	4N	S50N	5N
WS40N	WN	WS50N	W5
S40V *	4V	S50V *	5V
S40T	4T		
S40N-HT	6N		
WS40N-HT	6W		
S40V-HT*	6V		

\* Only Trim Suitable For NACE.

POSITION 10 - END CONNECTIONS	
Description	CODE
NPT - Screwed	1
-30 Opt. - 150 LB RF Flanges *	6
-30 Opt. - PN40 RF Flanged *	D
-32 Opt. - SCH. 80 PE Ext. Nipples *	E
-34 Opt. - 150 LB RF Flgs. 14" F to F Dim. *	V

\*Nipples & flanges of same material as body.

POSITION 11 - RANGE SPRINGS	
Steel Range Spring Inch H <sub>2</sub> O	CODE
2.0-3.0 *	L
3.0-4.5	M
4.5-5.5	N
5.0-7.0	R
5.5-8.0	S
7.0-11.0	T
8.0-12.0	V
11.0-16.0	W

\* Spring case must be oriented down.

POSITION 12 - TRIM OPTIONS			
Description	Option	CODE	
No Option	—	0	
External Sensing.	-ES	E	
For Special Construction Contact Cashco for Special Product Code.	SPQ	X	

POSITION 16 - CERTIFICATE OPTIONS			
Description	Option	CODE	
No Option	—	0	
NACE Construction: CS/CS/XX Per MR0175, S40V, S40V-HT, S50V,Trims.	-40	J	
NACE Construction: SS/SS/XX Per MR0175, S40V, S40V-HT, S50V Trims.	-40SST	K	
SST Body & wetted parts / Clean Unit (Used primarily for food & pharmaceutical applications.) NPT end connections only.	-37	R	
Special Cleaning: Per Cashco Spec #S-1542.	-56	N	

POSITION 14 - SPRING CHAMBER OPTIONS			
Description	Option	CODE	
No Option	—	0	
1/4" NPT Spring Chamber Vent Tap.	-25	D	
Plastic Rain-proof Bug Vent (Includes Opt-25).	-25P	H	
SST Rain-proof Bug Vent (Includes Opt-25).	-25S	P	

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