ISO Registered Company

MODEL 4381

PRESSURE REDUCING REGULATOR

MODEL 4381

OVERVIEW

The Model 4381 is a stainless steel pressure reducing regulator designed to handle small to mid-capacity flow rates in general, chemical, or cryogenic services. This unit is capable of controlling outlet pressure to a level between 2 and 500 psig (0.14 and 34.5 Barg).

FEATURES

Trim Removal:	Easily removable trim from regulator while in-line.
Trim Selections:	Thirteen different trim combinations for metallic or composition seated designs.
End Connections:	NPT and flanged.

APPLICATIONS

Designed to control a wide range of fluids including industrial gases, air, oil, steam, water, and many chemicals. See Table 1 for more information. Available for cryogenic service and NACE applications.

LINE SIZES AVAILABLE
1/4" (DN8), 3/8" (DN10), 1/2" (DN15)

END CONNECTIONS
NPT, RF FLANGED

COMMON APPLICATIONS
INDUSTRIAL GASES, AIR, OIL, STEAM, WATER, CHEMICALS

DESIGN PRESSURE
INLET: 1500 psig (103 Barg)
OUTLET: 2-500 psig (0.14-34.5 Barg)

STANDARD/GENERAL SPECIFICATIONS

Body Size/End Connection: NPT – 1/4", 3/8", 1/2" (DN8, 10, 15). Opt-30 or -34– 1/2" x 150#, 1/2" x 300# or 1/2" x 600# RF Flanges or with 3/4" or 1" Reducing Flanges

Body Materials: Standard - Wrought Barstock; ASTM A479, Type 316L stainless steel.

Spring Chamber Materials: Standard – Cast SST; ASTM A351, Gr, CF3M.
Cast Bronze; ASTM B62, Alloy C83600.
Opt-80 – Cast Aluminum Bronze; ASTM B-148, Alloy C95500.

Diaphragms: 302SST, Neoprene, EPDM, TFE coated SST, BUNA-N, FKM, EPDM + TFE Cover. See Table 4.

Trim: SST; metal seat or composition seat. See Table 4.

Gasket/Seal: TFE diaphragm gasket with metal diaphragm; TFE O-ring at pusher plate location. Alternate Material See Opt-45.

Operating Temperatures: Standard: -20 to +400°F (-29° to +205°C). See Table 2.
Cryogenic: See Option -36.

Inlet Pressure: 1500 Psig (103 Barg) maximum. Refer to Table A and Table 2.

Range Springs: Standard: Epoxy coated steel.
Cryogenic: SST; See Option -36.

TABLE A
Maximum Inlet Pressure P1 (Psig)

Seat Material	Liquid	Gas	Steam
Metal Seat	1000	1500	240
Composition Seat	1000	1000	NR

TABLE B
Maximum Recommended Pressure Drop Psid (Bard)

Range Spring	Liquid	Gas	Steam
2-6 (.14-.41)	200	200	150
5-30 (.34-2.1) 20-80 (1.4-5.5)	400	500	150
70-140 (4.8-9.7) 130-200 (9.0-13.8) 190-300 (13.1-20.7) 270-400 (18.6-27.6) 360-500 (24.8-34.5)	800	1200	150

NOTE: Opt-4 Stabilizer is for gaseous/vapor/steam service. Apply when $P1_{abs}/P2_{abs}$ is greater than 2. Otherwise use standard or cryogenic construction.

Cv's/Capacities: See Tables 5, 6, 7 and 8.

OPTION SPECIFICATIONS

Option -2: HANDWHEEL. Plastic handwheel on standard unit; aluminum handwheel for Option -2+80. Utilize for frequent set point changes.

Option -4: STABILIZER. Recommended for gaseous, vapor or steam service only. Stabilizer provides added guiding to maximize stability for internal trim, allowing improved pressure drop capability. Stabilizer materials are SST/TFE. For use with all trim designation numbers. **See NOTE in Table B for option applicability.**

Option -1+6: DIFFERENTIAL CONST. For differential pressure service. BRZ or SST spring chamber. Available only for range springs 2-6, 5-30, 20-80, and 70-140 Psid (0.07-2.1, 1.4-5.5, and 4.8-9.6 Bard). Max loading pressure 150 Psig (10.3 Barg) for BRZ spring chamber; 250 Psig (17.2 Barg) for SST spring chamber. Nylon insert sealing locknut. Internals of CS, BRZ or BR materials. No closing cap available. 1/8" (DN6) FNPT loading pressure connection.

⚠ CAUTION

Option-1+6 contains single diaphragm construction. In the event of diaphragm failure, the process fluid will mix with the loading fluid. Please alert your representative so an alternative product can be selected.

Option -20: DOME LOADING. Spring chamber and range spring replaced by bronze dome for external pressure loading up to 100 Psig (6.9 Barg); 1/4" NPT loading connection. Maximum capacity 0.5 Cv.

Option -22: PANEL MOUNTING. Includes a mounting nut and a handwheel.

Option -25: TAPPED VENT. 1/8" (DN6) NPT tapped opening in spring chamber for piping vent to remote location, in the event of diaphragm failure.

Option -25S: VENT SCREEN: Cap (For Opt-25).

Option -30: FLANGED END CONNS. Welded on 150#, 300#, or 600# raised face flanges for 1/2" (DN15) body size ONLY. Flanges and nipples of same basic body material. Nipples and Flanges are socket weld design.

With 150#, 300# or 600# flanges, the flange pressure rating is a limiting factor for the inlet rating, not the body inlet rating.

With 150# flanges, the flange pressure rating is the limiting factor for outlet rating, not the body outlet rating. With 300# or 600# flanges, the body outlet rating is the limiting factor.

Option -34: SPECIAL 14" FACE TO FACE DIMENSION FOR FLANGED END CONNECTIONS. Body size 1/2" only. See Opt.-30 for standard face to face dimension.

Option -36: CRYOGENIC SERVICE. Includes SST body and spring chamber. All wetted internal parts are of SST materials suitable for cryogenic service. The range spring, adjusting screw and locknut are SST; spring button and pressure plate are brass. TFE/SST spring loaded seal for diaphragm and pressure plate. Cleaned and packaged for oxygen service per Cashco Spec. #S-1134. **Suitable for cryogenic fluids from -325°F to +100°F (-198°C to +38°C).** The spring chamber has a 1/8" (DN6) NPT female connection for purge gas plus a 1/8" (DN6) NPT drilled drain hole. Mount in horizontal piping with adjusting screw oriented downwards. Use S1 or S36 trims. Suitable for outlet pressures up to 200 psig (13.8 Barg).

Option -37: ALL SST/CLEAN UNIT FOR LIQUIDS & GASES. 1/4", 3/8" & 1/2" NPT(DN8, DN10, DN15) sizes only. Uses SST body and spring chamber, SET trim only. SST spring, spring button, pressure plate, nuts and bolts. All wetted and external castings are electro-polished and unit is cleaned to Cashco Spec. #S-1576. Suitable for fluids of -20° to +300°F (-29° to +149°C); outlet pressures adjustable from 2 to 80 Psig (.14 to 5.5 Barg) with multiple range springs. Complete with 1/4" (DN8) NPT outlet gauge connection and SST pressure gauge. Suitable for food and pharmaceutical industry.

Option -37S: ALL SST/CLEAN UNIT FOR STEAM. Similar to Option -37 except uses S1 trim. Includes gauge connection but does not include the gauge. Suitable for steam/condensate service up to 350°F (170°C), inlet pressures to 100 psig (6.9 Barg) and outlet pressures adjustable from 5 to 80 Psig (.34 to 5.5 Barg) with multiple range springs. Suitable for food and pharmaceutical industry.

Option -40SST: SST NACE CONSTRUCTION. Internal wetted portions meet NACE standard MR0175 when the exterior of the regulator is not directly exposed to a sour gas environment, buried, insulated or otherwise denied direct atmospheric exposure. 316 SST body/spring chamber material only. S40B, S40C and S40T only trim selections available. Not available with Option -20 or -80.

Option -45: TFE GASKET. Primarily for oxygen service. Utilizes TFE diaphragm gasket. Limits temperature range to -20° to +400°F (-29° to +205°C).

Option -55: SPECIAL CLEANING. Cleaning per Cashco Spec. #S-1134 for Oxygen gas Service. **NOTE:** Design Pressure Rating shall not exceed 375 psig (26 Barg) when process medium is oxygen.

Option -56: SPECIAL CLEANING. Cleaned per Cashco Spec. #S-1542. Utilize when cleanliness level better than normal is required and unit is NOT for Oxygen Service.

Option -80: HIGH OUTLET PRESSURE. For controlling outlet pressure between 190 and 500 Psig (13.1 to 34.5 Barg). Available in aluminum bronze and SST spring chamber.

Option -85: OUTLET GAUGE TAP. 1/4" (DN8) NPT female connection on side of

body, outlet end, for incorporation of gauge. Gauge not included.

Option -86: OUTLET PRESSURE GAUGE. Glycerin filled pressure gauge. SST case, bourdon tube, socket, and movement. 2 1/2" (65 mm) dial size. Service application temperature range of 30 to +160°F (-1 to +71°C) maximum. Rear case 1/4" (DN8) NPT male connection. Dual range scales of Psig and Barg. Includes Option -85 body gauge tap when specified. DO NOT SPECIFY WITH OPTIONS -36, -37S OR -55. NOT AVAILABLE WITH OPT-6.

TABLE C - Opt-86

SPRING RANGE		NOMINAL[1] GAUGE RANGE	
Psig	**(Barg)**	**Psig**	**(Barg)**
2-6	(.14-.41)	0-15	(0-1.03)
5-30	(.34-2.1)	0-55	(0-4)
20-80	(1.4-5.5)	0-140	(0-10)
70-140	(4.8-9.6)	0-220	(0-16)
130-200	(9.0-13.8)	0-350	(0-25)
190-300	(13.1-20.7)	0-550	(0-40)
270-400	(18.6-27.6)	0-550	(0-40)
360-500	(24.8-34.5)	0-850	(0-60)

[1]Cashco will purchase gauges to the above specs.; ranges may vary from vendor to vendor.

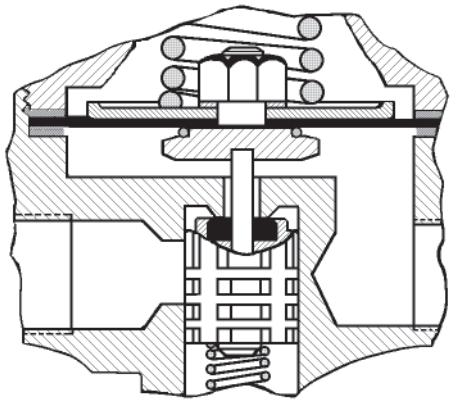


Figure 1: Composition Seat Design

TECHNICAL SPECIFICATIONS

TABLE 1
APPLICATIONS

FLUID	RECOMMENDED CONSTRUCTION	TRIM DESIGNATION NUMBER
He, H2	Metal Seat & Diaphragm	S1, S0
	Composition Seat & Metal Diaphragm	**S36**, S9
Air, Inert or Industrial Gases	Metal Seat & Diaphragm	S1
	Metal Seat & Composition Diaphragm	S8
	Composition Seat & Metal Diaphragm	S36
	Composition Seat & Diaphragm	S3, S6, S7, SET
Cryogenic Gases or Liquids	Metal Seat & Diaphragm	S1
	Composition Seat & Metal Diaphragm	**S36**
Hydrocarbons, Chemicals	Metal Seat & Diaphragm	S1, S0
	Metal Seat & Composition Diaphragm	S8
	Composition Seat & Metal Diaphragm	S36, S9
	Composition Seat & Diaphragm	S3, SET, SB
Sour Gas	Metal Seat & Composition Diaphragm	S40B
	Composition Seat & Diaphragm	S40C, S40T
Oxygen	Composition Seat & Diaphragm	S7
	Composition Seat & Metal Diaphragm	S9, S36
	Metal Seat & Diaphragm	S0, S1
Water and Condensate	Metal Seat & Diaphragm	S1
	Metal Seat & Composition Diaphragm	S8
	Composition Seat & Metal Diaphragm	S36
	Composition Seat & Diaphragm	**S3**, S6, SET
Saturated Steam[1] (240 Psig (16.5 Barg) & lower)	Metal Seat & Diaphragm	S1

[1] Pressure drops above 150 Psid (10.3 Bard) may cause accelerated trim and body wear.
Note: Trim Designation Nos. in "boldface" are the most commonly used. Cashco, or its representatives may make recommendations or suggestions as to the suitability of certain trims for specific services. These are trims that have been used successfully in the past in similar applications. However, the user has final responsibility for materials selected.

TABLE 2
MODEL 4381 DESIGN PRESSURE vs. TEMPERATURE RATINGS
NPT RATING PER ASME B31.3; FLANGED RATINGS PER ASME B16.5

End Connection	Materials of Construction (Body/Spring Chamber)	Option	Design Conditions							
			Inlet				Outlet			
			Pressure		Temperature		Pressure		Temperature	
			Psig	(Barg)	°F	(°C)	Psig	(Barg)	°F	(°C)
NPT	SST/BRZ	Std	1500	(103)	-325 to +400	(-198 to +204)	400	(27.5)	-325 to +400	(-198 to +204)
			1445	(100)	450	(232)	385	(26.5)	450	(232)
		-80	1500	(103)	-20 to +400	(-29 to +204)	600	(41.3)	-20 to +400	(-29 to +204)
			1390	(95.8)	500	(260)	555	(38.2)	500	(260)
	SST/SST	STD	1500	(103)	-425 to +400	(-254 to +204)	400	(27.5)	-425 to +400	(-254 to +204)
			1395	(96.2)	500	(260)	370	(25.5)	500	(260)
			1325	(91.3)	600	(316)	350	(24.1)	600	(316)
			1270	(87.5)	700	(371)	335	(23.1)	700	(371)
			1230	(84.8)	800	(425)	325	(22.4)	800	(425)
		-80	1500	(103)	-20 to +400	(-29 to +204)	600	(41.3)	-20 to +400	(-29 to +204)
			1390	(95.8)	500	(260)	555	(38.2)	500	(260)
			1320	(91.0)	600	(316)	525	(36.2)	600	(316)
			1265	(87.2)	700	(371)	505	(34.8)	700	(371)
			1255	(86.5)	800	(425)	490	(33.7)	800	(425)
Class 150 Flanged SST	SST/BRZ	-30 & -34	275	(19.0)	-325 to +100	(-198 to +38)	275	(19.0)	-325 to +100	(-198 to +38)
			235	(16.2)	200	(93)	235	(16.2)	200	(93)
			215	(14.8)	300	(149)	215	(14.8)	300	(149)
			195	(13.4)	400	(204)	195	(13.4)	400	(204)
			180	(12.4)	450	(232)	180	(12.4)	450	(232)
	SST/SST	-30 & -34	275	(19.0)	-425 to +100	(-254 to +38)	275	(19.0)	-425 to +100	(-254 to +38)
			235	(16.2)	200	(93)	235	(16.2)	200	(93)
			215	(14.8)	300	(149)	215	(14.8)	300	(149)
			195	(13.4)	400	(204)	195	(13.4)	400	(204)
			170	(11.7)	500	(260)	170	(11.7)	500	(260)
			140	(9.6)	600	(316)	140	(9.6)	600	(316)
			110	(7.5)	700	(371)	110	(7.5)	700	(371)
			80	(5.5)	800	(425)	80	(5.5)	800	(425)
Class 300 Flanged SST	SST/BRZ	-30 & -34	720	(49.6)	-325 to +100	(-198 to +38)	400	(27.5)	-325 to +400	(-198 to +204)
			620	(42.7)	200	(93)				
			560	(38.6)	300	(149)				
			515	(35.5)	400	(204)				
			490	(33.7)	450	(232)	385	(26.5)	450	(232)
	SST/SST	-30 & -34	720	(49.6)	-425 to +100	(-254 to +38)	400	(27.5)	-425 to +400	(-254 to +204)
			620	(42.7)	200	(93)				
			560	(38.6)	300	(149)				
			515	(35.5)	400	(204)				
			480	(33.1)	500	(260)	370	(25.5)	500	(260)
			450	(31.0)	600	(316)	350	(24.1)	600	(316)
			435	(30.0)	700	(371)	335	(23.1)	700	(371)
			420	(29.1)	800	(425)	325	(22.4)	800	(425)
	SST/BRZ and SST/SST	-30+80 & -34+80	720	(49.6)	-20 to +100	(-29 to +38)	600	(41.3)	-20 to +400	(-29 to +204)
			620	(42.7)	200	(93)				
			560	(38.6)	300	(149)				
			515	(35.5)	400	(204)				
			480	(33.1)	500	(260)	555	(38.2)	500	(260)
	SST/SST	-30+80 & -34+80	450	(31.0)	600	(316)	530	(36.5)	600	(316)
			435	(30.0)	700	(371)	505	(34.8)	700	(371)
			420	(29.1)	800	(425)	490	(33.7)	800	(425)

* Pressure rating shall not exceed 375 psig (26 Barg) when body material is stainless steel and process medium is oxygen.
Temperature rating shall not exceed 400°F (200°C) for all above materials when the process medium is oxygen. (CGA G-4.4)

TABLE 2 (CONT.)
MODEL 4381 DESIGN PRESSURE vs. TEMPERATURE RATINGS
NPT RATING PER ASME B31.3; FLANGED RATINGS PER ASME B16.5

End Connection	Materials of Construction (Body/Spring Chamber)	Option	Design Conditions							
			Inlet				Outlet			
			Pressure		Temperature		Pressure		Temperature	
			Psig	(Barg)	°F	(°C)	Psig	(Barg)	°F	(°C)
Class 600 Flanged SST	SST/BRZ	-30 & -34	1440	(99.3)	-325 to +100	(-198 to +38)	400	(27.5)	-325 to +400	(-198 to +204)
			1240	(85.5)	200	(93)				
			1120	(77.2)	300	(149)				
			1025	(70.6)	400	(204)				
			990	(68.2)	450	(232)	385	(26.5)	450	(232)
	SST/SST	-30 & -34	1440	(99.3)	-425 to +100	(-254 to +38)	400	(27.5)	-425 to +400	(-254 to +204)
			1240	(85.5)	200	(93)				
			1120	(77.2)	300	(149)				
			1025	(70.6)	400	(204)				
			955	(65.8)	500	(260)	370	(25.5)	500	(260)
			900	(62.0)	600	(316)	350	(24.1)	600	(316)
			870	(60.0)	700	(371)	335	(23.1)	700	(371)
			845	(58.3)	800	(425)	325	(22.4)	800	(425)
	SST/BRZ and SST/SST	-30+80 & -34+80	1440	(99.3)	-20 to +100	(-29 to +38)	600	(41.3)	-20 to +400	(-29 to +204)
			1240	(85.5)	200	(93)				
			1120	(77.2)	300	(149)				
			1025	(70.6)	400	(204)				
			955	(65.8)	500	(260)	555	(38.2)	500	(260)
	SST/SST	-30+80 & -34+80	900	(62.0)	600	(316)	530	(36.5)	600	(316)
			870	(60.0)	700	(371)	505	(34.8)	700	(371)
			845	(58.3)	800	(425)	490	(33.7)	800	(425)
PN40 Flanged SST	SST/BRZ	-30 & -34	580	(40.0)	-325 to +200	(-198 to +93)	400	(27.5)	-325 to +400	(-198 to +204)
			525	(36.4)	300	(149)				
			485	(33.5)	400	(204)				
			470	(32.5)	450	(232)	385	(26.5)	450	(232)
	SST/SST	-30 & -34	580	(40.0)	-425 to +200	(-254 to +93)	400	(27.5)	-425 to +400	(-254 to +204)
			525	(36.4)	300	(149)				
			485	(33.5)	400	(204)				
			455	(31.4)	500	(260)	370	(25.5)	500	(260)
			425	(29.3)	600	(316)	350	(24.1)	600	(316)
			405	(28.0)	700	(371)	335	(23.1)	700	(371)
			390	(27.1)	800	(425)	325	(22.4)	800	(425)
	SST/BRZ and SST/SST	-30+80 & -34+80	580	(40.0)	-20 to +200	(-29 to +93)	580	(40.0)	-20 to +200	(-29 to +93)
			525	(36.4)	300	(149)	525	(36.4)	300	(149)
			485	(33.5)	400	(204)	485	(33.5)	400	(204)
			455	(31.4)	500	(260)	455	(31.4)	500	(260)
	SST/SST	-30+80 & -34+80	425	(29.3)	600	(316)	425	(29.3)	600	(316)
			405	(28.0)	700	(371)	405	(28.0)	700	(371)
			390	(27.1)	800	(425)	390	(27.1)	800	(425)

"* Pressure rating shall not exceed 375 psig (26 Barg) when body material is stainless steel and process medium is oxygen. Temperature rating shall not exceed 400°F (200°C) for all above materials when the process medium is oxygen. (CGA G-4.4)

TABLE 3
OUTLET PRESSURE LIMIT – SAFETY RELIEF VALVE SIZING & SET POINT

RANGE SPRING (Psig)	DIAPHRAGM MATERIAL	EMERGENCY [1] OVER-PRESSURE (Psig)	MAXIMUM Cv WITH VALVE PLUG WIDE OPEN
2-6, 5-30, 20-80, 70-140, 130-200, 190-300	ALL	Design limits from Table 2 or 1.5 x UVRS[2], Whichever is least	0.5

[1] "Emergency Over-Pressure" is defined as the level of pressure, which if exceeded, may cause internal mechanical damage.
[2] UVRS - "Upper Value of Range Spring"; i.e. 130-200 Psig (9 -13.8 Barg) range spring, value would be 200 Psig (13.8 Barg).

TABLE 4A
SST TRIM METAL SEAT MATERIAL COMBINATIONS

SST TRIM DESIGNATION NUMBER				
PART	**S0**	**S1**	**S8**	**S40B (NACE)**
Diaphragm	TFE Coated 302 SST	302 SST	BC	BC *
Piston	316L SST	316L SST	316L SST	316L SST
Seat[1]	316L SST	316L SST	316L SST	316L SST
Spring	302 SST	302 SST	302 SST	Inconel X-750
Pusher Plate	316L SST	316L SST	316L SST	316L SST
Body Cap	316L SST	316L SST	316L SST	316L SST
Temp. Range °F (°C)	-20 to +400 (-29 to +205)	-325 to +400 (-198 to +205)	-20 to +180 (-29 to +82)	-50 to +250 (-46 to +121)

[1] The fixed portion of the seat is integral to the body. Indicated seat is the moving portion, and is attached or integral with the piston.
* Special BC Material for Low Temperature.
NOTE: Cashco, Inc. does not recommend metal seated trim on any service where the flow will be dead ended downstream of the pressure reducing regulator.
BC = Neoprene, TFE = Polytetrafluoroethylene

TABLE 4B
SST TRIM COMPOSITION SEAT MATERIAL COMBINATIONS

SST TRIM DESIGNATION NUMBER									
PART	**S3**	**S6**	**S7**	**S9**	**S36**	**S40C (NACE)**	**S40T (NACE)**	**SB**	**SET**
Diaphragm	BC	EPDM	FKM	TFE Coated 302 SST	302 SST	BC *	FKM	BUNA-N	EPDM
Diaphragm Cover	–	–	–	–	–	–	–	–	TFE
Piston	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST
Seat[1]	TFE	EPR	TFE	TFE	TFE	TFE	TFE	BUNA-N	TFE
Spring	302 SST	302 SST	302 SST	302 SST	302 SST	Inconel X-750	Inconel X-750	302 SST	302 SST
Pusher Plate	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST
Body Cap	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST	316L SST
Temp. Range °F (°C)	-20 to +180 (-29 to +82)	-20 to +300 (-29 to +149)	-20 to +350 (-29 to +177)	-20 to +400 (-29 to +205)	-325 to +400 (-198 to +205)	-50 to +250 (-46 to +121)	-20 to +350 (-29 to +177)	-20 to +180 (-29 to +82)	-20 to +300 (-29 to +149)

[1] The fixed portion of the seat is integral to the body. Indicated seat is the moving portion, and is attached or integral with the piston.
* Special BC Material for Low Temperature.
NOTE: Cashco, Inc. does not recommend metal seated trim on any service where the flow will be dead ended downstream of the pressure reducing regulator.
BC = Neoprene, EPR = Ethylene Propylene, EPDM = Ethylene Propylene Diene, FKM = Fluorocarbon Elastomer, TFE = Polytetrafluoroethylene

TABLE 5
CAPACITY - Cv
(F_L = 0.95) — All Sizes

OUTLET (P2) PRESSURE (Psig)	METAL DIAPHRAGM % DROOP			COMPOSITION DIAPHRAGM % DROOP		
	10%	20%	30%	10%	20%	30%
2	–	–	–	.02	.04	.06
10	.05	.09	.15	.13	.22	.35
25	.13	.24	.33	.35	.47	.50
50	.07	.15	.22	.35	.47	.50
75	.12	.23	.32	.45	.50	.50
100	.11	.21	.30	.39	.49	.50
125	.13	.24	.33	.42	.50	.50
150	.10	.19	.28	.38	.48	.50
200	.11	.21	.30	.35	.47	.50
250	.13	.24	.34	.40	.49	.50
300	.16	.28	.38	.42	.50	.50
350	.15	.27	.37	.30	.45	.50
450	.18	.32	.42	.33	.46	.50
500	.19	.34	.43	.35	.47	.50
Metric conversion factor: Psig ÷ 14.5 = Barg; Cv ÷ 1.16 - kv.						

TABLE 6
WATER CAPACITY - GPM
S.G. = 1.0 T - 60°F F_L = 0.95 — All Sizes — Composition Diaphragm Only

Outlet Flowing Pressure Psig	Inlet Pressure Psig	1/4" (DN8) Body Size % Droop			3/8" (DN10) Body Size % Droop			1/2" (DN15) Body Size % Droop		
		10%	20%	30%	10%	20%	30%	10%	20%	30%
2	50	0.14	0.28	0.42	0.14	0.28	0.42	0.14	0.28	0.42
	75	0.18	0.34	0.52	0.18	0.34	0.52	0.18	0.34	0.52
	100	0.20	0.40	0.60	0.20	0.40	0.60	0.20	0.40	0.60
	125	0.22	0.44	0.66	0.22	0.44	0.66	0.22	0.44	0.66
	150	0.24	0.48	0.74	0.24	0.48	0.74	0.24	0.48	0.74
5	50	0.9	1.5	**2.3**	0.9	1.5	2.3	0.9	1.5	2.3
	75	1.1	1.8	**2.9**	1.1	1.8	2.9	1.1	1.8	2.9
	100	1.3	**2.1**	**3.4**	1.3	2.1	3.4	1.3	2.1	3.4
	125	1.4	**2.4**	**3.8**	1.4	2.4	3.8	1.4	2.4	3.8
	150	1.6	**2.6**	**4.2**	1.6	2.6	4.2	1.6	2.6	4.2
10	50	**2.2**	**3.0**	**3.2**	2.2	3.0	3.2	2.2	3.0	3.2
	75	**2.8**	**3.8**	**4.0**	2.8	3.8	4.0	2.8	3.8	4.0
	100	**3.3**	**4.5**	**4.7**	3.3	4.5	4.7	3.3	4.5	4.7
	125	**3.8**	**5.0**	**5.4**	3.8	**5.0**	**5.4**	3.8	5.0	5.4
	150	**4.1**	**5.6**	**5.9**	4.1	**5.6**	**5.9**	4.1	5.6	5.9
15	50	**2.1**	**2.8**	**3.0**	2.1	2.8	3.0	2.1	2.8	3.0
	75	**2.7**	**3.6**	**3.9**	2.7	3.6	3.9	2.7	3.6	3.9
	100	**3.2**	**4.3**	**4.6**	3.2	4.3	4.6	3.2	4.3	4.6
	125	**3.7**	**4.9**	**5.2**	3.7	**4.9**	**5.2**	3.7	4.9	5.2
	150	**4.1**	**5.5**	**5.8**	4.1	**5.5**	**5.8**	4.1	5.5	5.8
25	50	**2.3**	**2.5**	**2.5**	2.3	2.5	2.5	2.3	2.5	2.5
	75	**3.2**	**3.5**	**3.5**	3.2	3.5	3.5	3.2	3.5	3.5
	100	**3.9**	**4.3**	**4.3**	3.9	4.3	4.3	3.9	4.3	4.3
	125	**4.5**	**5.0**	**5.0**	4.5	**5.0**	**5.0**	4.5	5.0	5.0
	150	**5.0**	**5.6**	**5.6**	**5.0**	**5.6**	**5.6**	5.0	5.6	5.6
35	50	1.5	1.9	1.9	1.5	1.9	1.9	1.5	1.9	1.9
	75	**2.5**	**3.1**	**3.2**	2.5	3.1	3.2	2.5	3.1	3.2
	100	**3.1**	**4.0**	**4.0**	3.1	4.0	4.0	3.1	4.0	4.0
	125	**3.7**	**4.6**	**4.7**	3.7	4.6	4.7	3.7	4.6	4.7
	150	**4.2**	**5.3**	**5.4**	4.2	**5.3**	**5.4**	4.2	5.3	5.4
50	75	1.9	**2.4**	**2.5**	1.9	2.4	2.5	1.9	2.4	2.5
	100	**2.7**	**3.4**	**3.5**	2.7	3.4	3.5	2.7	3.4	3.5
	125	**3.3**	**4.2**	**4.3**	3.3	4.2	4.3	3.3	4.2	4.3
	150	3.8	4.8	5.0	3.8	**4.8**	**5.0**	3.8	4.8	5.0
	175	**4.2**	**5.4**	**5.6**	4.2	**5.4**	**5.6**	4.2	5.4	5.6
	200	**4.7**	**5.9**	**6.1**	4.7	**5.9**	**6.1**	4.7	5.9	6.1
75	100	1.8	**2.4**	**2.5**	1.8	2.4	2.5	1.8	2.4	2.5
	125	**2.5**	**3.3**	**3.5**	2.5	3.3	3.5	2.5	3.3	3.5
	150	**3.0**	**4.1**	**4.3**	3.0	4.1	4.3	3.0	4.1	4.3
	175	**3.5**	**4.7**	**5.0**	3.5	4.7	**5.0**	3.5	4.7	5.0
	200	**3.9**	**5.3**	**5.6**	3.9	**5.3**	**5.6**	3.9	5.3	5.6
100	125	**2.0**	**2.5**	**2.5**	2.0	2.5	2.5	2.0	2.5	2.5
	150	**2.8**	**3.5**	**3.5**	2.8	3.5	3.5	2.8	3.5	3.5
	175	**3.5**	**4.2**	**4.3**	3.5	4.2	4.3	3.5	4.2	4.3
	200	**4.0**	**4.9**	**5.0**	4.0	**4.9**	**5.0**	4.0	4.9	5.0
125	150	**2.1**	**2.5**	**2.5**	2.1	2.5	2.5	2.1	2.5	2.5
	175	**3.0**	**3.5**	**3.5**	3.0	3.5	3.5	3.0	3.5	3.5
	200	**3.6**	**4.3**	**4.3**	3.6	4.3	4.3	3.6	4.3	4.3

Metric Conversion Factors: Psig / 14.5 = Barg; GPM X 3.785 = LPM.

TABLE 7
AIR CAPACITY - SCFH
S.G. = 1.0 T - 60°F F_L - 0.95 - All Sizes - Composition Diaphragm Only

Outlet Pressure Psig	Inlet Pressure Psig	1/4" (DN8) Body Size			3/8" (DN10) Body Size			1/2" (DN15) Body Size		
		% Droop			% Droop			% Droop		
		10%	20%	30%	10%	20%	30%	10%	20%	30%
2	25	30	60	90	30	60	90	30	60	90
	50	50	100	140	50	100	140	50	100	140
	75	70	130	200	70	130	200	70	130	200
	100	80	170	250	80	170	250	80	170	250
	150	120	240	360	120	240	360	120	240	360
	200	160	320	470	160	320	470	160	320	470
5	25	200	300	500	200	300	500	200	300	500
	50	300	500	800	300	500	800	300	500	800
	75	400	700	1100	400	700	1100	400	700	1100
	100	500	900	1400	500	900	1400	500	900	1400
	150	800	1300	**2000**	800	1300	2000	800	1300	2000
	200	1000	1700	**2700**	1000	1700	2700	1000	1700	2700
	300	1500	**2500**	SONIC	1500	2500	**3900**	1500	2500	3900
	400	1900	**3200**	SONIC	1900	3200	**5200**	1900	3200	5200
10	25	500	600	700	500	600	700	500	600	700
	50	800	1100	1100	800	1100	1100	800	1100	1100
	75	1100	1500	1600	1100	1500	1600	1100	1500	1600
	100	1400	1900	2000	1400	1900	2000	1400	1900	2000
	150	2000	**2700**	**2900**	2000	2700	2900	2000	2700	2900
	200	**2700**	**3600**	**3800**	2700	3600	3800	2700	3600	3800
	300	**3900**	SONIC	SONIC	3900	**5300**	**5600**	3900	5300	5600
	400	SONIC	SONIC	SONIC	**5200**	**6900**	**7400**	5200	6900	**7400**
15	25	400	600	600	400	600	600	400	600	600
	50	800	1100	1100	800	1100	1100	800	1100	1100
	75	1100	1500	1600	1100	1500	1600	1100	1500	1600
	100	1400	1900	2000	1400	1900	2000	1400	1900	2000
	150	2000	2700	2900	2000	2700	2900	2000	2700	2900
	200	2700	**3600**	**3800**	2700	3600	3800	2700	3600	3800
	300	**3900**	**5300**	**5600**	3900	5300	**5600**	3900	5300	5600
	400	**5200**	SONIC	SONIC	5200	**6900**	**7400**	5200	6900	7400
25	50	1000	1100	1100	1000	1100	1100	1000	1100	1100
	75	1400	1600	1600	1400	1600	1600	1400	1600	1600
	100	1800	2000	2000	1800	2000	2000	1800	2000	2000
	150	2600	2900	2900	2600	2900	2900	2600	2900	2900
	200	3400	3800	3800	3400	3800	3800	3400	3800	3800
	300	**5000**	**5600**	**5600**	5000	5600	5600	5000	5600	5600
	400	**6600**	**7400**	**7400**	6600	**7400**	**7400**	6600	7400	7400
	500	SONIC	SONIC	SONIC	**8300**	**9200**	**9200**	8300	9200	9200

Outlet Pressure Psig	Inlet Pressure Psig	All Body Sizes		
		% Droop		
		10%	20%	30%
35	50	700	900	900
	75	1200	1500	1500
	100	1600	2000	2000
	150	2300	2900	2900
	200	3000	3700	3800
	300	4400	5500	5600
	400	5800	7200	7400
	500	7200	9000	9200
50	75	1000	1300	1300
	100	1500	1800	1900
	150	2200	2800	2900
	200	2900	3600	3800
	300	4200	5400	5600
	400	5600	7100	7400
	500	7000	8800	9200
75	100	1100	1400	1500
	150	1900	2600	2700
	200	2600	3500	3700
	300	3900	5200	5600
	400	5200	6900	7400
	500	6400	8600	9200
	625	8000	10700	11400
100	150	2000	2400	2400
	200	2900	3500	3600
	300	4400	5400	5500
	400	5900	7200	7400
	500	7300	9000	9200
	625	9100	11200	11400

Outlet Pressure Psig	Inlet Pressure Psig	All Body Sizes		
		% Droop		
		10%	20%	30%
150	200	2400	2900	2900
	300	4400	5300	5300
	400	6100	7200	7200
	500	7700	9100	9100
	625	9600	11400	11400
	750	11500	13700	13700
200	300	3300	4400	4700
	400	4900	6600	6900
	500	6300	8500	9000
	625	7900	10800	11300
	750	9500	13000	13600
	1000	12700	17200	18200
250	300	2800	3500	3600
	400	5000	6300	6400
	500	6700	8500	8600
	625	8700	10900	11100
	750	10600	13300	13500
	1000	14100	17800	18100
300	400	4700	5600	5600
	500	6800	8100	8100
	625	9100	10800	10800
	750	11200	13300	13300
350	400	2500	3800	4200
	500	4400	6700	7400
	625	6200	9400	10400
	750	7800	11700	13100
450	500	3100	4300	4700
	625	5900	8300	9000
	750	8000	11200	12100

NOTES: Where "SONIC" is indicated within the above capacity tables, outlet velocity with Schedule 160 pipe has reached sonic velocity of 1118 fps. Additional flow cannot be obtained. Flow will be approximately the last indicated value in the column above "Sonic".

Metric Conversion Factors: Psig / 14.5 = Barg; SCFH / 35.31 = Sm^3/Hr; SCFH / 37.32 = Nm^3/Hr

TABLE 8
STEAM - LBS/HR

S.G. = Actual T = Saturated F_L = 0.95

All Sizes - Metal Diaphragm Only

Outlet Pressure Psig	Inlet Pressure Psig	All Body Sizes		
		% Droop		
		10%	20%	30%
5	25	2	3	5
	50	3	6	9
	75	5	8	13
	100	6	10	16
	125	7	12	20
	150	9	15	23
	175	10	17	27
	200	11	19	30
	240	13	22	36
10	25	4	5	8
	50	7	8	14
	75	9	12	20
	100	12	15	25
	125	15	19	31
	150	17	22	36
	175	20	25	42
	200	23	28	47
	240	27	33	56
15	25	4	10	14
	50	8	19	28
	75	12	27	39
	100	15	35	50
	125	19	43	62
	150	22	51	73
	175	25	58	83
	200	28	66	94
	240	33	78	111
25	50	13	25	30
	75	20	38	46
	100	26	49	59
	125	31	60	72
	150	37	71	85
	175	43	83	100
	200	49	94	113
	240	58	111	134

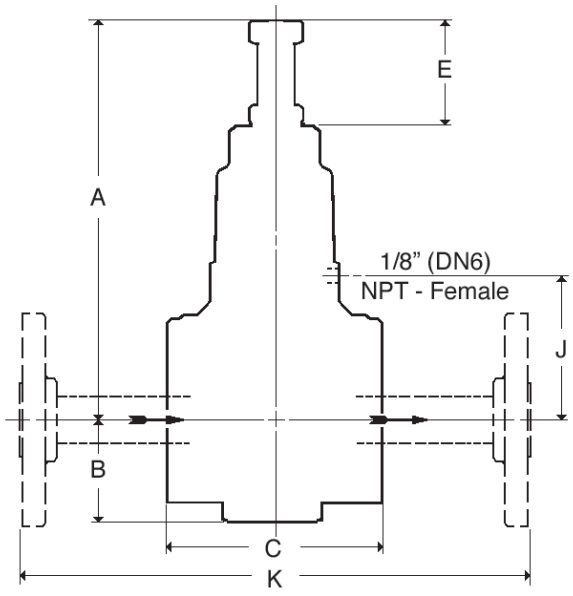
Outlet Pressure Psig	Inlet Pressure Psig	All Body Sizes		
		% Droop		
		10%	20%	30%
35	50	6	10	15
	75	10	17	26
	100	14	23	35
	125	17	29	43
	150	20	34	51
	175	23	39	58
	200	26	45	67
	240	31	53	80
50	75	10	21	30
	100	15	31	44
	125	19	40	56
	150	22	47	67
	175	26	55	77
	200	29	62	88
	240	35	74	104
75	100	17	32	45
	125	24	46	65
	150	30	58	82
	175	36	69	97
	200	41	79	111
	240	50	95	133
100	125	16	36	50
	150	23	51	72
	175	29	64	90
	200	34	76	107
	240	42	93	130
150	175	19	37	53
	200	27	52	76
	240	38	72	104
200	240	33	60	83

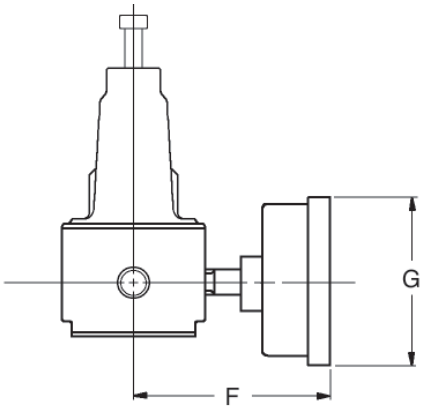
Metric Conversion Factors: Psig / 14.5 = Barg; LBS/HR X 0.4536 = KG/HR

DIMENSIONS AND WEIGHTS

ENGLISH UNITS (Inches)												
Body Size 1/4", 3/8", & 1/2"*	A	B	C		E	F **	G **	J	NPT Ship Weight	K*	K * Opt-34	Flgd. Ship Weight
			1/4" & 3/8"	1/2"								
Standard	5.12	1.43	2.50	3.00	—	—	—	—	3 lb	8.00	14.00	8 lb
-2 (Handwheel)	5.56	1.43	2.50	3.00	—	—	—	—				
-1+6 (Differential)	5.12	1.43	2.50	3.00	2.22	—	—	1.52				
-20 (Dome Load)	2.00	1.43	2.50	3.00	—	—	—	—				
-22 (Panel Mount)	5.56	1.43	2.50	3.00	2.22	—	—	—				
-2+80 (Handwheel + High Outlet Pressure)	8.19	1.43	2.50	3.00	2.38	—	—	—	5 lb	8.00	14.00	10 lb
-37 (Food & Pharmaceutical)	5.56	1.43	2.50	3.00	—	2.88	1.53	—	3 lb	8.00	14.00	8 lb
-80 (High Outlet Pressure)	7.44	1.43	2.50	3.00	—	—	—	—	5 lb	8.00	14.00	10 lb
-86 (Pressure Gauge)	—	—	—	—	—	3.62	2.88	—	1 lb	8.00	14.00	—
* Only body size 1/2" is available with Opt-30 flanged end connections. ** Not available for -37S.												

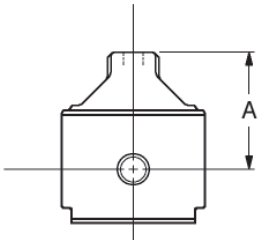
METRIC UNITS (mm)												
Body Size DN8, DN10, DN15*	A	B	C		E	F **	G **	J	NPT Ship Weight	K*	K * Opt-34	Flgd. Ship Weight
			DN8 & DN10	DN15								
Standard	130	36	64	76	—	—	—	—	1.36 kg	203	356	3.96 kg
-2 (Handwheel)	141	36	64	76	—	—	—	—				
-1+6 (Differential)	130	36	64	76	56	—	—	39				
-20 (Dome Load)	51	36	64	76	—	—	—	—				
-22 (Panel Mount)	141	36	64	76	56	—	—	—				
-2+80 (Handwheel + High Outlet Pressure)	208	36	64	76	60	—	—	—	2.3 kg	203	356	4.54 kg
-37 (Food & Pharmaceutical)	141	36	64	76	—	73	39	—	1.36 kg	203	356	3.96 kg
-80 (High Outlet Pressure)	189	36	64	76	—	—	—	—	2.3 kg	203	356	3.96 kg
-86 (Pressure Gauge)	—	—	—	—	—	92	73	—	.45 kg	203	356	—
* Only body size (DN15) is available with Opt-30 flanged end connections. ** Not available for -37S.												





Opt-86: Outlet Pressure Gauge

Opt-20: Dome Load



MODEL 4381-37 & -37S PRODUCT CODE

Food and Pharmaceutical Industry

MK	POS 3	–	A	POS 6 & 7	7	–	1	POS 11	0	0	0	0	0	0	C

POSITION 3 - SIZES		
Size		CODE
in	DN)	
1/4"	(8)	**2**
3/8"	(10)	**3**
1/2"	(15)	**4**

POSITION 6 & 7 - TRIM DESIGNATION NUMBERS	
Desig.	CODE
S1*	**S1**
SET	**ST**
* Trim utilized on steam service -37S only.	

POSITION 11 - RANGE SPRINGS		
Psig	(Barg)	CODE
2-6	(.14-.41)	**E**
5-30	(.34-2.1)	**A**
20-80	(1.4-5.5)	**B**

*** For information on ATEX see pages 9 & 10 on the IOM.**

MODEL 4381 PRODUCT CODER 02/07/20

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

M	POS 2	POS 3	—	POS 5	POS 6 & 7	7	—	POS 10	POS 11	POS 12	POS 13	POS 14	POS 15	POS 16	0	C

POSITION 2 - GASKETS * & SERVICE		
Service	**Options**	**CODE**
Standard: Non-Oxygen	--	**B**
Cryogenic: TFE - Oxygen (Below -20°F (-29°C))	-36**	**C**
TFE - Primarily for Oxygen (Above -20°F (-29°C))	-45	**D**

* Refer to Tech Bulletin for temperature limits.
**Cryogenic Construction includes special cleaning #S-1134 (Opt. -55)

POSITION 3 - SIZES		
Size		**CODE**
in	**(DN)**	
1/4"	(8)	**2**
3/8"	(10)	**3**
1/2"	(15)	**4**
3/4" *	(20)	**5**
1" *	(25)	**6**

* 1/2" size body w/ Reducing Flanges. 3/4" & 1" Size not available in NPT.

POSITION 5 - BODY & SPRING CHAMBER MATERIALS	
Body / Sp. Ch.	**CODE**
SST/BRZ	**8**
SST/SST *	**A**

*Required for -36 Option

POSITION 6 & 7 - TRIM DESIGNATION NUMBERS	
Desig.	**SST CODE**
S0	**S0**
S1*	**S1**
S3	**S3**
S6	**S6**
S7	**S7**
S8	**S8**
S9	**S9**
S36*	**36**
SB	**SB**
SET	**ST**
S40B	**4B**
S40C	**4C**
S40T	**4T**

*Suitable for Opt.-36

POSITION 10 - END CONNECTIONS	
Description	**CODE**
NPT - Screwed	**1**
-30 Opt.- 150 LB Flgs.	**A**
-30 Opt.- 300 LB Flgs.	**B**
-30 Opt.- 600 LB Flgs.	**C**
-30 Opt - DIN PN40 Flgs.	**D**
-34 Opt. - 150 LB RF Flgs. 14" F to F Dim.	**V**
-34 Opt. - 300 LB RF Flgs. 14" F to F Dim.	**W**
-34 Opt. - 600 LB RF Flgs. 14" F to F Dim.	**Y**
-34 Opt. - DIN PN40 Flgs. 14" F to F Dim.	**Z**

POSITION 11 - RANGE SPRINGS				
Spring Chamber Option	**Range Spring**		**STD**	**OPT-36 ‡**
	Psig	**(Barg)**	**CODE**	**CODE**
Std.	2-6	(.14-.41)	**8**	**E**
	5-30	(.34-2.1)	**1**	**A**
	20-80	(1.4-5.5)	**2**	**B**
	70-140	(4.8-9.7)	**3**	**C**
	130-200	(9.0-13.8)	**4**	**D**
Opt-80 *	190-300	(13.1-20.7)	**5**	
	270-400	(18.6-27.6)	**6**	
	360-500	(24.8-34.5)	**7**	
Opt-20	No Spring Dome Loaded		**Y**	

* Opt-80 for High Outlet Pressure construction.
‡ SST spring.

POSITION 12 - TRIM VARIATIONS		
Description	Option	**CODE**
No Option	--	**0**
Stabilizer (Recommended for gaseous service)	-4	**4**
For Special Construction Contact Cashco for Special Product Code.	SPQ	**X**

POSITION 13 - FEATURE OPTIONS		
Description	Option	**CODE**
No Option	-	**0**
Handwheel *	-2	**2**
Panel Mounting - (Opt-2 included) *	-22	**C**
* Not available with Cryogenic Construction		

POSITION 14 - SPRING CHAMBER OPTIONS		
Description	Option	**CODE**
No Option	-	**0**
Differential Construction.	-1+6	**6**
1/8" NPT Vent Tap.	-25	**D**
Bug Vent (Includes Opt-25)	-25S	**H**

POSITION 15 - BODY OPTIONS		
Description	Option	**CODE**
No Option	-	**0**
Outlet Gauge Tap (No Gauge).	-85	**V**
Outlet Pressure Gauge (Includes Opt-85). *	-86	**Y**
* Not available with Opt-1+6, Opt-36 or Opt-55		

POSITION 16 - CERTIFICATE OPTIONS		
Description	Option	**CODE**
No Option	-	**0**
NACE Const. SST/SST/XX Per MR0175, S40B, S40C, S40T Trims.	-40SST	**K**
Special Cleaning: Per Cashco Spec #S-1134. Suitable for Oxygen Service.	-55	**M**
Special Cleaning: Per Cashco Spec #S-1542.	-56	**N**

*** For information on ATEX see pages 9 & 10 on the IOM.**

Cashco, Inc.
P.O. Box 6
Ellsworth, KS 67439-0006
PH (785) 472-4461
Fax. # (785) 472-3539
www.cashco.com
email: sales@cashco.com
Printed in U.S.A. 4381-TB

Cashco GmbH
Handwerkerstrasse 15
15366 Hoppegarten, Germany
PH +49 3342 30968 0
Fax. No. +49 3342 30968 29
www.cashco.com
email: germany@cashco.com

Cashco do Brasil, Ltda.
Al.Venus, 340
Indaiatuba - Sao Paulo, Brazil
PH +55 11 99677 7177
Fax. No.
www.cashco.com
email: brazil@cashco.com