

Cryogenic and High Temperature Valves

U.S. Type 884 (Includes Sub-CFL and RC260) 14 in. Extended Bonnet

DESCRIPTION

The U.S. Type 884 extended bonnet globe control valve is available in varying lengths for 1/4 in. through 1 in. line sizes. It is specifically designed for control of extremely cold or hot fluids and gases. In cryogenic applications, the bonnet length serves to extend the packing area, as well as allow room for insulation around the body and bonnet. The design also facilitates cold box mounting. A casing flange is available as an option if sealing to the cold box is required. Other models are available to facilitate removal of the innervalue and seat from outside the cold box (Type CBX). In hot applications, the extended bonnet allows the standard TFE packing to be isolated from high temperatures. The factory should be consulted when service temperature exceeds 800° F (426° C).

NOTE: In all applications, the TFE ring packing should not be used when the temperature at the packing is below -120° F (-84° C) or above 350° F (176° C).

APPLICATIONS

The Type 884 valve is widely used in industrial applications, research, and process pilot plants for liquids and gases when temperatures are in the cryogenic range. The 14 in. (356 mm) bonnet normally performs well for temperatures down to -450° F (-268° C) such as: liquid CO₂, hydrogen and nitrogen. Bonnet lengths up to 6 in. (1524 mm) can be supplied. Also available are extended bellows seal bonnets for applications where stem sealing is critical.

CONSTRUCTION

Body and Bonnet	
Standard	316 SST
Optional	Monel®, Alloy C-4/C-276
Innervalue	
Standard	316 SST
Optional	Monel, Alloy C 276, Stellite® 316 SST, 316 and TFE (some types and sizes)
Packing	
Standard	TFE CV rings
Optional	Grafoil®, Reduced Emissions Kalrez® (REK)
Actuator (uses 1/2 in. size)	
Standard	Aluminum with epoxy paint
Optional	316 SST on standard models 1/2...1 in.

ACTUATOR CHOICES

Standard	Air-to-open, fail close Air-to-close, fail open
Optional	Same as standard but with integral top-mountd positioner
Standard Signals	3-15#, 3-27#, 6-30#
Optional Signals	With positioner, 3-9#, 9-15#
Accessories	Filter regulator, gauges, I/P converter, limit switches, solenoids

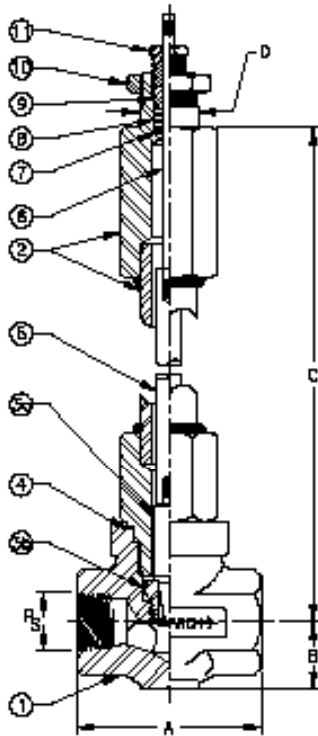


STANDARD FEATURES

- Wide range of interchangeable trims
- Choice of linear or equal percent on most trims
- TFE chevron ring packing
- ANSI Class IV shutoff (size "O" and larger)
- Guided innervalue

OPTIONAL FEATURES

- Flanges
- Shorter and longer extension lengths
- Socket weld and butt weld ends
- Bellows stem seal
- Casing flange
- Angle pattern body
- Graphite packing
- REK packing (Reduced Emissions)



COMPONENT DESCRIPTIONS

1. Valve Body
2. Bonnet assembly (welded)
3. Innervalve (trim) Set 3A: Plug assembly 3B: Seat
4. Body-Bonnet gasket
5. Lower stem
6. Upper stem
7. Packing adaptor
8. Packing-Chevron rings
9. Packing follower
10. Lock nut: 1/4 in. unit = 7/8 in. hex, 1/2 in., 3/4 in., 1 in. = 1-1/8 in. hex
11. Packing gland

DIMENSIONS

PS	1/4 in.	1/2 in.	3/4 in.	1 in.
A	2.12 in. (54 mm)	2.75 in. (70 mm)	3.37 in. (86 mm)	4.00 in. (102 mm)
B	0.68 in. (17 mm)	1 in. (25 mm)	1.18 in. (30 mm)	1.5 in. (38 mm)
C	14 in. (356 mm)	14 in. (356 mm)	14 in. (356 mm)	14 in. (356 mm)
D	0.625 in. (16 mm)	0.875 in. (22 mm)	0.875 in. (22 mm)	0.875 in. (22 mm)
Stroke	0.437 in. (11 mm)	0.562 in. (14 mm)	0.562 in. (14 mm)	0.562 in. (14 mm)

PRESSURE/TEMPERATURE RATING

Temperature °F (°C)	1/4 in. psig (barg)	1/2 in. psig (barg)	3/4 in. psig (barg)	1 in. psig (barg)
- 450 (-268)	2500 (172)	2500 (172)	1500 (103)	1500 (103)
100 (38)	2500 (172)	2500 (172)	1500 (103)	1500 (103)
200 (93)	2500 (172)	2375 (163)	1450 (103)	1450 (103)
300 (149)	2375 (163)	2155 (148)	1325 (91)	1325 (91)
400 (204)	2095 (144)	1930 (133)	1175 (81)	1175 (81)
500 (260)	2000 (138)	1820 (125)	1100 (76)	1100 (76)
600 (316)	1910 (132)	1735 (119)	1050 (72)	675 (46)
700 (371)	1820 (125)	1655 (114)	840 (58)	250 (17)
800 (427)	1790 (123)	1625 (112)	575 (40)	—
900 (482) *	1420 (101)	1595 (110)	—	—
1000 (538) *	580 (40)	930 (64)	—	—
Recommend Bonnet Torque	37 lb-ft (50 Nm)	122 lb-ft (165 Nm)	290 lb-ft (393 Nm)	345 lb-ft (468 Nm)

* Depending on industry design standard requirements; consult the factory.

For ratings on other materials, consult the factory.

For maximum allowable pressure drops, consult the factory or the technical selection guide for information.

The pressure/temperature ratings listed above are based on material thickness at the joint between the body and the bonnet. When the proper torque levels are used, the valve gasket will seal under normal static conditions. The above listed torque levels were used in hydrostatic tests at the factory at 70° F at maximum body rating and were found to provide acceptable sealing. Other factors such as high or cyclic temperatures, light process gases, or poor gasket surfaces can affect seal integrity. Under such conditions, the only way to be assured of tight sealing is to perform a test under the actual process conditions.

The above chart is not intended as an indication of optimum function or suitability for control service. Other charts are available to assist in the choosing of valve type, bonnet type, trim type and actuator.

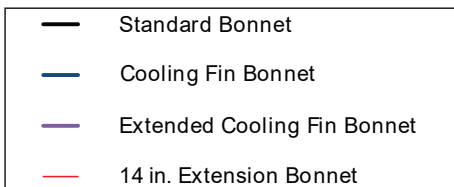
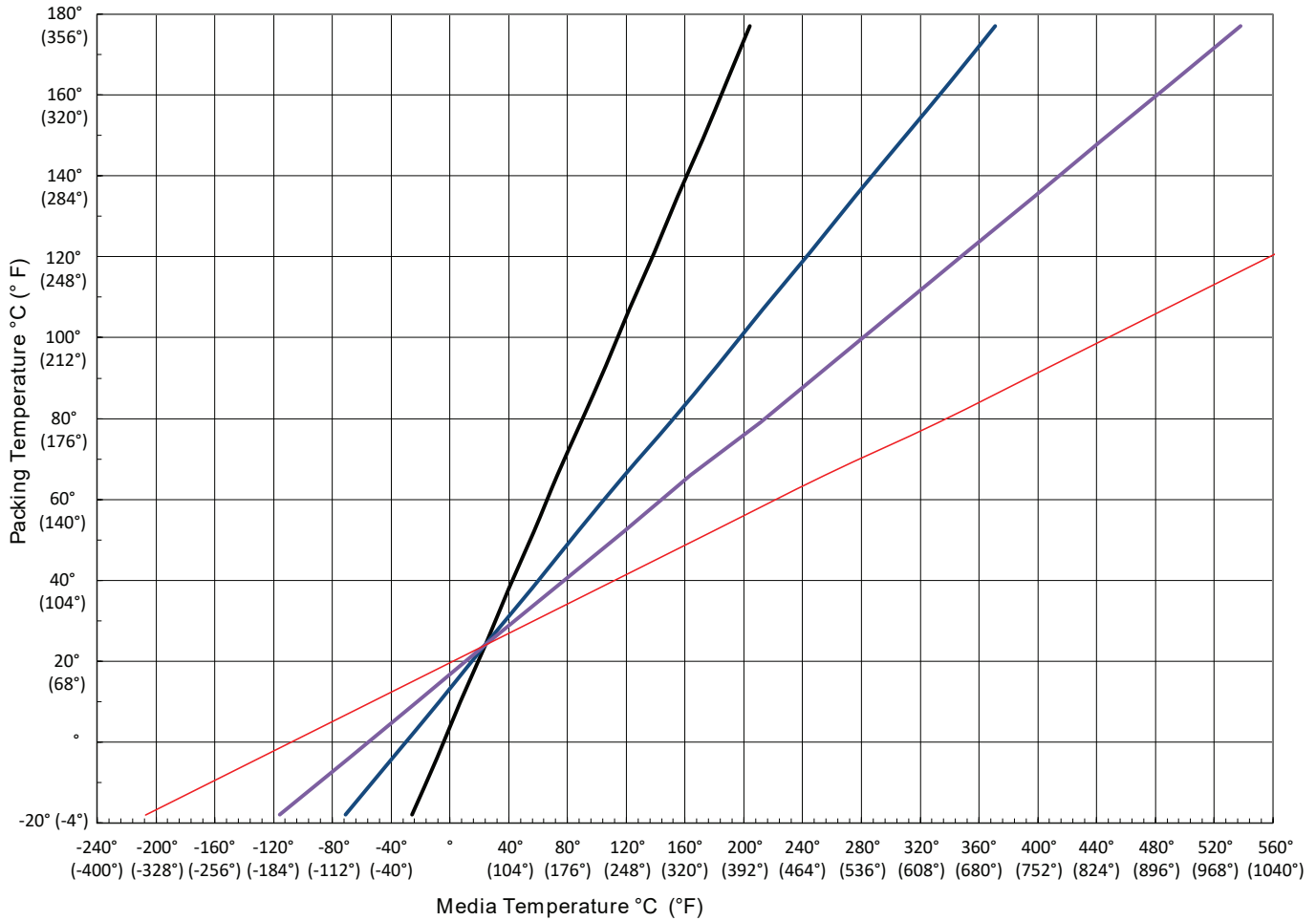
INNERVALVE CHART

Valve Size	Trim Size	Nominal Cv	Theoretical Turbulent Cv	Orifice Dia. in. (mm)	Orifice Area in. ² (mm ²)	Nominal Rangeability	
						Linear	Equal %
1 in. (25.4 mm)	6.0	6.0	6.0	0.6250 (15.9)	0.3068 (197.9)	50:1	60:1
	5.0	5.0	5.0	0.6250 (15.9)	0.3068 (197.9)	50:1	60:1
	4.5	4.5	4.5	0.5000 (12.7)	0.1963 (129.6)	50:1	60:1
3/4 in. (19.1 mm), 1 in. (25.4 mm)	4.0	4.0	4.0	0.4375 (11.1)	0.1503 (96.9)	50:1	60:1
	3.5	3.5	3.5	0.4375 (11.1)	0.1503 (96.9)	50:1	60:1
1/2 in. (12.7 mm), 3/4 in. (19.1 mm), 1 in. (25.4 mm)	A	2.5	2.5	0.3750 (9.5)	0.1104 (71.2)	40:1	50:1
	B	2.0	2.0	0.3750 (9.5)	0.1104 (71.2)	40:1	50:1
	C	1.25	1.25	0.2810 (7.1)	0.0620 (40.0)	40:1	50:1
	D	0.8	0.8	0.2500 (6.4)	0.0491 (31.7)	40:1	50:1
	E	0.5	0.5	0.2500 (6.4)	0.0491 (31.7)	40:1	50:1
1/4 in. (6.4 mm), 1/2 in. (12.7 mm), 3/4 in. (19.1 mm), 1 in. (25.4 mm)	F	0.32	0.32	0.1560 (3.9)	0.0191 (12.3)	30:1	40:1
	G	0.2	0.2	0.1560 (3.9)	0.0191 (12.3)	30:1	40:1
	H	0.13	0.13	0.1560 (3.9)	0.0191 (12.3)	30:1	40:1
	I	0.08	0.08	0.1560 (3.9)	0.0191 (12.3)	30:1	40:1
	J	0.05	0.05	0.1560 (3.9)	0.0191 (12.3)	30:1	40:1
	K	0.03	4.8E-02	0.0860 (2.2)	0.0058 (3.7)	25:1	—
	L	0.02	3.4E-02	0.0860 (2.2)	0.0058 (3.7)	25:1	—
	M	0.01	1.6E-02	0.0860 (2.2)	0.0058 (3.7)	25:1	—
	N	0.006	1.0E-02	0.0860 (2.2)	0.0058 (3.7)	25:1	—
1/4 in. (6.4 mm), 1/2 in. (12.7 mm)	O	0.003	5.3E-03	0.0860 (2.2)	0.0058 (3.7)	25:1	—
	P-1	0.002	3.6E-03	0.0625 (1.6)	0.0031 (2.0)	15:1	—
	P-2	0.0013	2.5E-03	0.0625 (1.6)	0.0031 (2.0)	15:1	—
	P-3	0.001	2.0E-03	0.0625 (1.6)	0.0031 (2.0)	15:1	—
	P-4	0.0006	1.4E-03	0.0625 (1.6)	0.0031 (2.0)	15:1	—
	P-5	0.0004	1.0E-03	0.0625 (1.6)	0.0031 (2.0)	15:1	—
	P-6	0.00027	8.3E-04	0.0625 (1.6)	0.0031 (2.0)	15:1	—
	P-7	0.00018	6.8E-04	0.0625 (1.6)	0.0031 (2.0)	15:1	—
	P-8	0.00012	5.6E-04	0.0625 (1.6)	0.0031 (2.0)	15:1	—
1/4 in. (6.4 mm)	P-9	0.00008	4.6E-04	0.0625 (1.6)	0.0031 (2.0)	15:1	—
	P-10	Consult the factory for these innervalve sizes.					
	P-11						
	P-12						
	P-13						
	P-14						
	P-15						
	P-16						
	P-17						
	P-18						

PACKING/MEDIA TEMPERATURE

IMPORTANT

To prevent the stem from freezing, avoid packing temperatures below 0° C (32° F).



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DESCRIPTION

The Type NRMA Non-Rotating Manual Actuation design is used in applications where either our low-flow trims, cooling fins or bellows are needed and when applications demand human interaction. The manual actuator can be mounted on all RC series valves, including all "P" Trims and all Bonnets. Exchanging between electrical, pneumatic and manual actuators is therefore possible at any time with simple additions. The actuator is encapsulated and completely maintenance-free—designed for fine control.

APPLICATIONS

When you turn the hand wheel, the valve interior moves in a linear motion. This linear movement, from the hand wheel to the internal coupling, prevents damage to the trim and seat, distinguishing this design from conventional manual control valves.

FEATURES

- Hand drive, linear
- Suitable for Badger Meter® modular construction

MATERIALS

Case	1.4404 (316L)
Yoke	1.4404 (316L)
Hand Wheel	Duroplast

SPECIFICATIONS

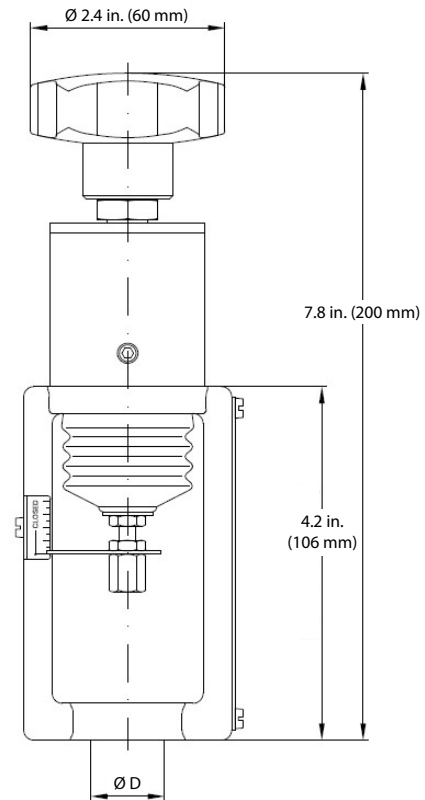
Weight	Approximately 3.3 lb (1.5 kg)
Temperature	-40...176° F (-40...80° C)
Valve Lift	0.04 in. (1 mm) / 360° turn

SIZES FOR RESEARCH CONTROL VALVES

Sizes	Ø Average	Stroke
1/4 in. standard	0.625 in.	11.1 mm
1/2 in., 3/4 in., 1 in. standard	0.875 in.	14.3 mm
1/2 in., 3/4 in., 1 in. heavy duty guiding	0.875 in.	14.3 mm



DIMENSIONS



RCV Valves		Trim Sizes Equal %															
% Lift	% Cv	6.0	5	4.5	4	3.5	A	B	C	D	E	F	G	H	I	J	% Lift
0%	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
5%	1.0%	0.06	0.05	0.04	0.04	0.03	0.02	0.02	0.01	0.008	0.005	0.003	0.002	0.001	0.001	0.000	5%
10%	1.9%	0.11	0.10	0.09	0.08	0.07	0.05	0.04	0.02	0.015	0.010	0.006	0.004	0.002	0.002	0.001	10%
20%	3.8%	0.23	0.19	0.17	0.15	0.13	0.10	0.08	0.05	0.031	0.019	0.012	0.008	0.005	0.003	0.002	20%
25%	4.8%	0.29	0.24	0.22	0.19	0.17	0.12	0.10	0.06	0.038	0.024	0.015	0.010	0.006	0.004	0.002	25%
30%	5.9%	0.35	0.29	0.26	0.23	0.20	0.15	0.12	0.07	0.047	0.029	0.019	0.012	0.008	0.005	0.003	30%
40%	8.8%	0.53	0.44	0.40	0.35	0.31	0.22	0.18	0.11	0.070	0.044	0.028	0.018	0.011	0.007	0.004	40%
50%	13.2%	0.79	0.66	0.59	0.53	0.46	0.33	0.26	0.16	0.105	0.066	0.042	0.026	0.017	0.011	0.007	50%
60%	19.8%	1.19	0.99	0.89	0.79	0.69	0.49	0.40	0.25	0.158	0.099	0.063	0.040	0.026	0.016	0.010	60%
70%	29.6%	1.78	1.48	1.33	1.19	1.04	0.74	0.59	0.37	0.237	0.148	0.095	0.059	0.039	0.024	0.015	70%
75%	36.3%	2.18	1.81	1.63	1.45	1.27	0.91	0.73	0.45	0.290	0.181	0.116	0.073	0.047	0.029	0.018	75%
80%	44.4%	2.67	2.22	2.00	1.78	1.56	1.11	0.89	0.56	0.356	0.222	0.142	0.089	0.058	0.036	0.022	80%
90%	66.7%	4.00	3.33	3.00	2.67	2.33	1.67	1.33	0.83	0.533	0.333	0.213	0.133	0.087	0.053	0.033	90%
100%	100%	6.00	5.00	4.50	4.00	3.50	2.50	2.00	1.25	0.800	0.500	0.320	0.200	0.130	0.080	0.050	100%
Valve Sizes		1"	1"	1"	1", 3/4"	1", 3/4"	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1-1/4"	1-1/4"	1-1/4"	1-1/4"	1-1/4"	

Trim Sizes O through P-18 are available only in linear characteristic. See Product Data Sheets for maximum Cvs.

RCV Valves		Trim Sizes Equal %															
% Lift	% Cv	6.0	5	4.5	4	3.5	A	B	C	D	E	F	G	H	I	J	% Lift
0%	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
5%	1.0%	0.30	0.25	0.23	0.20	0.18	0.13	0.10	0.06	0.040	0.025	0.016	0.010	0.007	0.004	0.003	5%
10%	1.9%	0.60	0.50	0.45	0.40	0.35	0.25	0.20	0.13	0.080	0.050	0.032	0.020	0.013	0.008	0.005	10%
20%	3.8%	1.20	1.00	0.90	0.80	0.70	0.50	0.40	0.25	0.160	0.100	0.064	0.040	0.026	0.016	0.010	20%
25%	4.8%	1.50	1.25	1.13	1.00	0.88	0.63	0.50	0.31	0.200	0.125	0.080	0.050	0.033	0.020	0.013	25%
30%	5.9%	1.80	1.50	1.35	1.20	1.05	0.75	0.60	0.38	0.240	0.150	0.096	0.060	0.039	0.024	0.015	30%
40%	8.8%	2.40	2.00	1.80	1.60	1.40	1.00	0.80	0.50	0.320	0.200	0.128	0.080	0.052	0.032	0.020	40%
50%	13.2%	3.00	2.50	2.25	2.00	1.75	1.25	1.00	0.63	0.400	0.250	0.160	0.100	0.065	0.040	0.025	50%
60%	19.8%	3.60	3.00	2.70	2.40	2.10	1.50	1.20	0.75	0.480	0.300	0.192	0.120	0.078	0.048	0.030	60%
70%	29.6%	4.20	3.50	3.15	2.80	2.45	1.75	1.40	0.88	0.560	0.350	0.224	0.140	0.091	0.056	0.035	70%
75%	36.3%	4.50	3.75	3.38	3.00	2.63	1.88	1.50	0.94	0.600	0.375	0.240	0.150	0.098	0.060	0.038	75%
80%	44.4%	4.80	4.00	3.60	3.20	2.80	2.00	1.60	1.00	0.640	0.400	0.256	0.160	0.104	0.064	0.040	80%
90%	66.7%	5.40	4.50	4.05	3.60	3.15	2.25	1.80	1.13	0.720	0.450	0.288	0.180	0.117	0.072	0.045	90%
100%	100%	6.00	5.00	4.50	4.00	3.50	2.50	2.00	1.25	0.800	0.500	0.320	0.200	0.130	0.080	0.050	100%
Valve Sizes		1"	1"	1"	1", 3/4"	1", 3/4"	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1-1/4"	1-1/4"	1-1/4"	1-1/4"	1-1/4"	

Numbers are for reference or comparison only.

Research Control Valves

CV vs Lift Curve

% Lift	% Maximum Cv	
	Linear	Equal %
0%	0%	0%
5%	5%	1%
10%	10%	2%
20%	20%	4%
25%	25%	5%
30%	30%	6%
40%	40%	9%
50%	50%	13%
60%	60%	20%
70%	70%	30%
75%	75%	36%
80%	80%	44%
90%	90%	67%
100%	100%	100%

% Cv vs. % Lift

