

**Model 9100**

**Series 9000 Control Valves  
RESEARCH® Control Valves**

# **Technical Brief**



**Model 9100**

- 6 Sizes: 1/2" to 2"
- High Performance
- Rugged Design
- 316L SST Trim
- B62 Bronze Body/Bonnet
- Field Reversible Actuator
- Std Live Loaded TFE Packing
- Liquid • Gas • Steam
- Chemical • Petroleum
- Textiles • Pulp/Paper
- Pharmaceutical • HVAC
- Automotive • Tires
- Plastics • Rubber



**BadgerMeter, Inc.**

**941378**

5-01

## VALVE SPECIFICATIONS

### BODY ASSEMBLY DESCRIPTION

Type: 2-Way High Capacity Globe, Modulating  
 Size: 1/2", 3/4", 1", 1-1/4", 1-1/2", 2"  
 Pressure Rating: ANSI CL 150 [300 psi @ 100F]  
 Body Material: Bronze ASTM B62  
 Bonnet Material: Bronze ASTM B62

### ⚠CAUTION

Due to the elemental content of B62 bronze, it is **NOT** recommended for potable water.

Body Gasket Material: Copper  
 Innervalue Assembly: 316L SST  
 Seat Ring: 316L SST  
 Packing: PTFE "V" Rings-Live Loaded  
 Packing: Optional: Grafoil®  
 Packing Spring: 302 SST  
 Packing Follower: PTFE-PFA  
 Packing Follower: Optional Bronze [Grafoil®]  
 Other Hardware: 300 SST

### DESIGN CRITERIA

- Meets MSS SP-80 and ANSI B16.24
- Heavy Duty Hi-Capacity body
- Standard Characteristic: Equal Percent
- Standard Replaceable Seat/Innervalue
- Standard ANSI Class IV Shut-Off
- Standard Live-Loaded TFE Packing
- Heavy Duty Post Guided Innervalue
- Stem welded into innervalue guide
- Precision CNC cut NPT body threads

### ACTUATOR ASSEMBLY DESCRIPTION

Pneumatic Multi-Spring and Diaphragm Actuator  
 Effective Area: 35 in² [225 sq.cm]  
 Stroke: 3/4" or 1"  
 Spring [bench] Loading: Adjustable [some ranges]  
 Action: ATO or ATC [reversible without additional parts]  
 Accessory Mounting: IEC534 [Nimur]  
 Rec. max. oper. press.: 60 psig @ 70°F [4 Bar @ 21°C]  
 Max. Diaphragm Pressure: 90 psig@70°F [6 Bar @ 21°C]  
 Upper Ambient Temperature Limit: 160°F [71°C] @ 30psig  
 Lower Ambient Temperature Limit: -20°F [-29°C] @ 30psig  
 Signal Range: Standard [3-15 psig] Others Available  
 Pressure cases and yoke: Steel/Epoxy coated  
 Diaphragm Material: Nitrile/Polyester  
 Spring Material: 17-7Ph SST  
 Stem Seal: ELF Buna "O" Ring  
 Stem Guide Bushings: Filled Composite Bearing Material  
 Hardware Material: 300 SST  
 Travel Indication: Adjustable, Nylon Safety Pointer

### OPTIONS

- Linear Characteristic or Quick Open On-Off
- Double Packing, REK® fugitive emission packing
- Alarm/Purge port with double packing
- SST bonnet extensions for cryogenic service
- Positioners, Limit switches, Airset, etc.
- Carbon steel "Lap-Joint Flange Kit," for conversion to CL150 Flanges [meets ASME/ANSI face-to-face length]

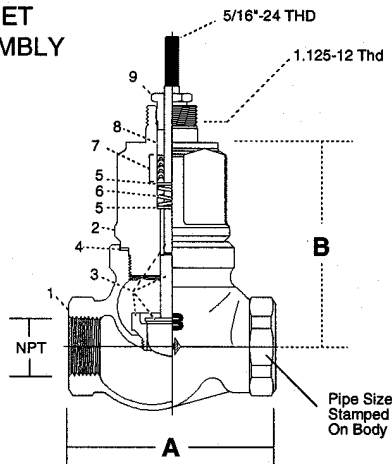
### INNERVALVE INFORMATION [Equal Percent Characteristic]

Valve Size	Orifice ø in.	Area in2	Lift in.	Max. ΔP *	Cv vs. Stem Travel **											
					100%	90%	80%	70%	60%	50%	40%	30%	20%	10%	5%	2.5%
3/4"	1.000	0.785	3/4"	300	12.0	10.7	9.32	6.75	4.49	3.01	2.29	1.69	1.10	0.53	0.264	0.132
3/4"	0.750	0.442	3/4"	300	8.0	5.3	3.56	2.37	1.58	1.05	0.70	0.47	0.31	0.15	0.076	0.038
3/4" & 1/2"	0.750	0.442	3/4"	300	6.0	4.0	2.67	1.78	1.19	0.79	0.53	0.35	0.23	0.11	0.057	0.029
3/4" & 1/2"	0.500	0.196	3/4"	300	3.0	2.0	1.34	0.89	0.59	0.40	0.26	0.18	0.11	0.06	0.029	0.014
1"	1.000	0.785	3/4"	300	15.0	12.3	9.36	6.37	4.81	3.66	2.75	2.05	1.35	0.66	0.329	0.165
1"	0.750	0.442	3/4"	300	10.0	6.7	4.44	2.97	1.98	1.32	0.88	0.59	0.38	0.19	0.096	0.048
1"	0.750	0.442	3/4"	300	6.0	4.0	2.67	1.78	1.19	0.79	0.53	0.35	0.23	0.11	0.057	0.029
1"	0.500	0.196	3/4"	300	3.0	2.0	1.33	0.89	0.59	0.40	0.26	0.18	0.11	0.06	0.029	0.014
1-1/4"	1.625	2.074	1"	135	29.0	25.2	21.5	17.7	10.5	6.78	5.02	3.69	2.51	1.29	0.642	0.321
1-1/4"	1.250	1.227	1"	225	20.0	13.3	8.90	5.92	3.95	2.63	1.76	1.17	0.76	0.38	0.189	0.095
1-1/4"	1.250	1.227	1"	225	12.0	8.0	5.34	3.55	2.37	1.58	1.05	0.70	0.46	0.23	0.113	0.057
1-1/2"	1.625	2.074	1"	135	35.0	31.0	26.8	20.7	14.4	10.0	6.74	4.49	2.95	1.54	0.766	0.383
1-1/2"	1.250	1.227	1"	225	24.0	16.0	10.7	7.11	4.74	3.16	2.11	1.40	0.91	0.46	0.226	0.113
1-1/2"	1.250	1.227	1"	225	15.0	10.0	6.67	4.45	2.96	1.98	1.32	0.88	0.57	0.29	0.142	0.071
2"	2.000	3.142	1"	90	54.0	45.4	36.4	28.2	20.3	14.5	10.1	6.98	4.67	2.40	1.181	0.590
2"	1.750	2.405	1"	115	36.0	24.0	16.0	10.7	7.10	4.74	3.16	2.11	1.38	0.69	0.338	0.169
2"	1.750	2.405	1"	115	22.0	14.7	9.78	6.51	4.34	2.90	1.93	1.29	0.84	0.42	0.207	0.103

\*Maximum shut-off ΔP for Air-To-Open configuration, with 6 springs [280 lbs spring loading] and 0-23 psi air, may require a positioner to achieve full travel. Constantly high flowing ΔP, such as those listed in the Max. ΔP column can cause deterioration of the guide or innervalue material. Caution is advised when flowing ΔP is above 1/2 of the shut-off pressure listed.

\*\* NOTE: Data is for comparison only. Controlling in the 0-5% travel range is not usually recommended due to normal system and valve hysteresis. Precise signaling and positioning of the stem is critical and may require a positioner to achieve acceptable results.

# VALVE BODY- BONNET ASSEMBLY



## BODY PRESSURE vs. TEMP

Temp. deg. F	Pressure in PSI	Temp. deg. C	Pressure in BAR
-20 to 150	300	-29 to 66	20.67
200	270	93	18.6
250	240	121	16.54
300	210	149	14.47
350	180	177	12.4
400	-	204	-
406	150	207	10.33

## ITEM DESCRIPTIONS

Note: Detailed assembly drawings, with part numbers, can be obtained from the factory. Item no's shown may not match prints. Part numbers listed are universal to all model 9100 valve sizes.

ITEM DESCRIPTION	PART NUMBER	MATERIAL
1: Body	Consult Factory	Bronze, B-62
2: Bonnet	Consult Factory	Bronze, B-62
3: Innervalue Set	Consult Factory	316L SST
4: Body Gasket	Consult Factory	Copper
5: Washer [2]	430002-0115	316 SST
6: Spring	510031-0158	302 SST
7: Packing Set [3 rings]	543242-0001	PTFE [std]
8: Follower	527241-0001	Teflon PFA
9: Packing Gland	525950-0001	316 SST

Items 5 through 8 are available as a kit: p.n. 544057-0001

## WEIGHTS

Valve Size

	1/2", 3/4" & 1"	1-1/4" & 1-1/2"	2"
Pounds	29	36	44
Kilograms	13.2	16.3	20

\* Appx. average weight per size. Depends on options and accessories.

## DIMENSIONS

	1/2", 3/4" & 1"	1-1/4" & 1-1/2"	2"
A	4.5" [115 mm]	6.25" [159 mm]	7.0" [179 mm]
B	4.44" [113 mm]	5.22" [133 mm]	5.62" [143 mm]
C	10.5" [267 mm]	10.5" [267 mm]	10.5" [267 mm]
D	14.94" [380 mm]	15.72" [400 mm]	16.12" [410 mm]
E	3/4" Stroke	1" Stroke	1" Stroke

## ITEM DESCRIPTION [Qty]

- 1: Upper Housing [1]
- 2: \*Diaphragm [1]
- 3: Hex Screw [12]
- 4: Flat Washer, top [12]
- 5: Flat Washer, Bottom [12]
- 6: Lock Washer [12]
- 7: Hex Nut [12]
- 8: Lower Housing [1]
- 9: \*Piston [1]
- 10: \*Springs [3 or 6]
- 11: \*Diaphragm Retainer [1]
- 12: Hex Screw, Gr 8 [6]
- 13: Lock Washer [6]
- 14: Gasket [1]
- 15: Upper Guide Bushing [1]
- 16: "O" Ring [1]
- 17: Lower Guide Bushing [1]
- 18: Travel Scale [1]
- 19: Set Screw [1]
- 20: Pointer, Nylon [1]
- 21: Yoke [1]
- 22: Stem [1]
- 23: Hex Screw, Gr 8 [1]
- 24: Thrust Washer [1]
- 25: Nameplate [1]
- 26: Nameplate Screw [2]

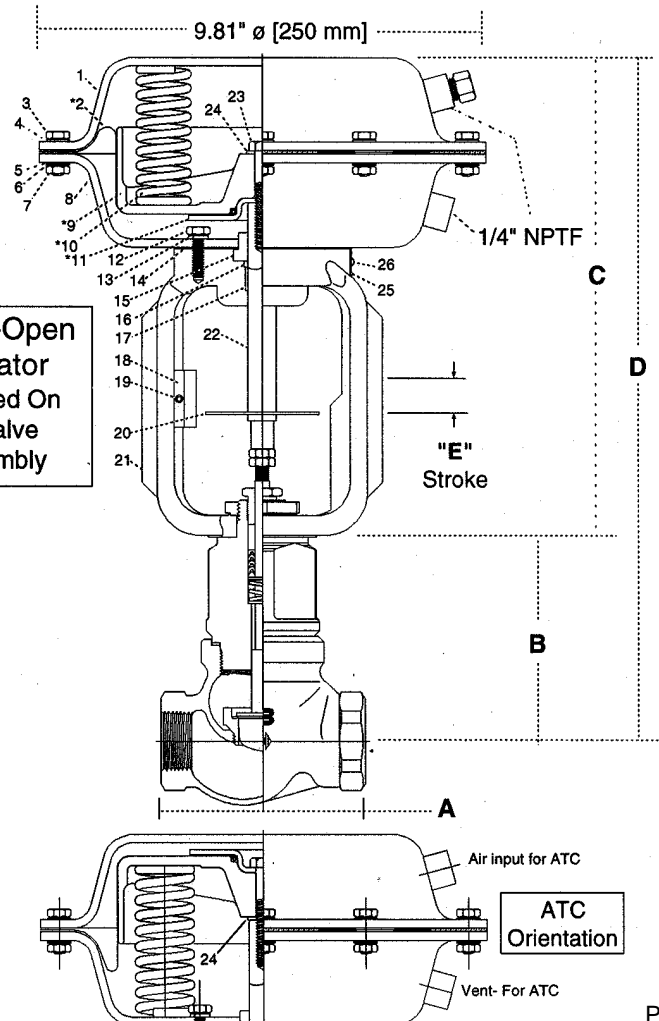
Note: Detailed assembly drawings, with part numbers, can be obtained from the factory. Item numbers shown may not match prints.

## REVERSING ACTUATOR ACTION

The items indicated (\*) above should be re-oriented as shown to convert to ATC action.

Details of this and other assemblies are available from the factory.

Air-To-Open  
Actuator  
Mounted On  
1" Valve  
Assembly



## Model 9100 Number System

[ Consists of 18 characters ]

[1] [2] [3] [4] [5] [6] [7] [8] [9] [10]  
**9106 - GC - N - BZ - SV - 1 - A - 54 - P - 36**

### [1] VALVE SIZE

9101 = 1/2"  
 9102 = 3/4"  
 9103 = 1"  
 9104 = 1-1/4"  
 9105 = 1-1/2"  
 9106 = 2"

### [2] BODY TYPE

GC = Globe Cast

### [3] END

#### CONNECTIONS

N = NPT

### [4] BODY ASSEMBLY MATERIAL

BZ = Bronze / ASTM B62

### [5] BONNET AND PACKING TYPE

SV = Standard bonnet/Spring loaded TFE "V" Rings

SG = Standard bonnet/Single Grafoil® packing

DV\* = Standard bonnet/Double TFE "V" Rings

DG\* = Standard bonnet/Double Grafoil packing

PV\* = Standard bonnet with 1/8" NPT purge port and Double TFE "V" Rings

PG\* = Standard bonnet with 1/8" NPT purge port and Double Grafoil packing

ES\* = Extended [4" SST] bonnet w/ Spg Loaded "V" Rings

EL\* = Extended [6" SST] bonnet w/ Spg Loaded "V" Rings

[ See Tech Brief 9100EXT for more information ]

\* Optional: Consult factory for price and delivery.

#### ABOUT THE MODEL NUMBER

When ordering by model number [not required by the factory], please give a full description of the unit also. This will decrease the possibility of error. The model number will be shown on all acknowledgements, as well as the nameplate attached to the actuator. When inquiring about a valve in service, please give the serial number and the model number from the nameplate. An [X] in any location within the model number denotes something "special".

### [6] ACTUATOR

1 = size 35, ATO, no positioner  
 2 = size 35, ATO, with positioner\*  
 3 = size 35, ATC, no positioner  
 4 = size 35, ATC, with positioner\*  
 \* Side [yoke] Mounted  
 5 = size 60, ATO, no positioner  
 6 = size 60, ATO, with positioner\*  
 7 = size 60, ATC, no positioner  
 8 = size 60, ATC, with positioner\*  
 9 = Electric Actuator  
 \* Side [yoke] Mounted

### [7] SIGNAL RANGE

A = 3-15 psig [adj. 3-4 psi]  
 B = 6-30 psig [adj. 6-8 psi]  
 C = 3-9 psig [positioner rq'd]  
 D = 9-15 psig [positioner rq'd]  
 E = 6-15 psig [3/4" Stroke, fixed rate]  
 F = 10-15 psig [3/4" Stroke, fixed rate]  
 H = 6-15 psig [1" Stroke, fixed rate]  
 J = 9-15 psig [1" Stroke, fixed rate]  
 K = 4-20mA [incr. signal opens valve]  
 L = 4-20mA [incr. signal closes valve]  
 [Note: K & L are for electric actuators only]  
 O = 4.0-14.5 psig [1" Stroke, Only]

### [8] INNERVALVE SIZE

3/4" Valve Size  
 Code Cv [%]  
 12 12.0 [3/4" only]  
 08 8.0 [3/4" only]  
 06 6.0 [1/2 or 3/4"]  
 03 3.0 [1/2 or 3/4"]

#### 1" Valve Size

Code Cv [%]  
 15 15.0  
 10 10.0  
 06 6.0  
 03 3.0

#### 1-1/4" Valve Size

Code Cv [%]  
 29 29.0  
 20 20.0  
 12 12.0

#### 1-1/2" Valve Size

Code Cv [%]  
 35 35.0  
 24 24.0  
 15 15.0

#### 2" Valve Size

Code Cv [%]  
 54 54.0  
 36 36.0  
 22 22.0

### [9] INNERVALVE CHARACTERISTIC

P = Equal Percent [%]  
 L = Linear [Special order]  
 Q = Quick Open [Special order]

### [10] INNERVALVE MATERIAL

36 = 316L SST  
 3T = 316L & TFE-PFA [Special order]  
 3S = Stellite 316L SST [Special order]  
 Note: For other innervalve sizes, characteristics and materials, consult the factory for price and delivery.

GRAFOIL® is a registered trademark of Graftech Inc.  
 RESEARCH® is a registered trademark of Badger Meter, Inc.



Please see our website at  
**www.badgermeter.com**  
 for specific regions and contacts.

Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding bid obligation exists.



**BadgerMeter, Inc.**

6116 E. 15th Street, Tulsa, Oklahoma 74112  
 (918) 836-8411 / Fax: (918) 832-9962  
 www.badgermeter.com