

**MIL 81000  
3-WAY COMBINING AND DIVERTING  
SERVICE CONTROL VALVES**



**MIL Controls Limited**

## Table of Contents

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Numbering System .....	2
General Data .....	2
Rating and Seat Leakage .....	3
C <sub>v</sub> Charts .....	4
Construction .....	5,6
Actuator Selection .....	7
Dimensions .....	8
Air Failure Positions .....	9
Special Designs .....	10

## Foreword

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The 81000 Series provide a line of three-way control valves designed for either combining or diverting applications. Standard features include:

### **HIGH CAPACITY WITH LOW RECOVERY**

Flow capacity is at top levels for contemporary three-way valves and is attained with very little pressure recovery as indicated by its high critical flow factors.

### **HIGH PERFORMANCE MATERIALS**

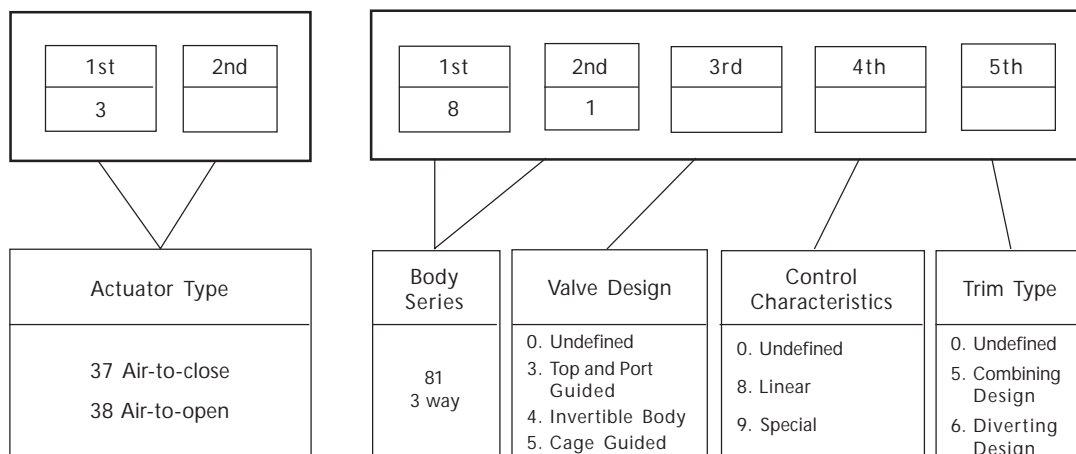
Material of construction have been selected for high performance and long life.

### **PLUG STABILITY**

Valves are designed to be installed with flow tending to open both ports. The important advantage of this flow direction is inherent plug stability.

## Numbering System

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## General Data

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### BODY

Type : 81000 series three-way  
 Flow direction : flow-to-open (both ports)  
 C<sub>v</sub> ratio : 50 : 1

### BONNET

Type : bolted  
 Packing box : bolted

### TRIM

Type : 81005 - combining  
 81006 - diverting  
 Optional : invertible body, combining and diverting action in the same body (81400)  
 cage guided, pressure balanced (81500)

### FLOW CHARACTERISTICS

linear, full capacity  
 (reduced capacity on request)

### ACTUATOR

Type : spring diaphragm  
 direct, air-to-push-down  
 reverse, air-to-push-up  
 Optional : piston cylinder, electrical etc.

## Seat Leakage & Temperature Range

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Value Size (inch)	ANSI Class	Temperature Range (Deg. C)		Maximum Seat Leakage, ANSI FCI 70.2 *
		min.	max.	
3/4 to 12	150 to 1500	- 30°C	+ 454°C	IV
3/4" to 2"	150 to 600	-30°C	+232°C	VI

\* For other requirements, consult MIL.

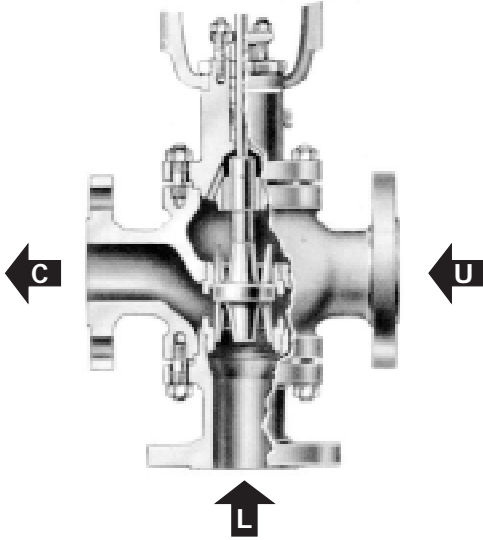
## Ratings (ANSI Class)

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Valve Size (Inch)	ANSI Class				
	150	300	600	900	1500
3/4	●	●	●		
1	●	●	●		
1 1/2	●	●	●		
2	●	●	●		
2 1/2	●	●	●		
3	●	●	●		
4	●	●	●		
6	●	●	●		
8	●	●	●	●*	●*
10	●	●	●		
12	●*	●*	●*		

\* For diverting service only, for other ranges, consult MIL.

## 81385 Combining Service Valves: Rated $C_v$



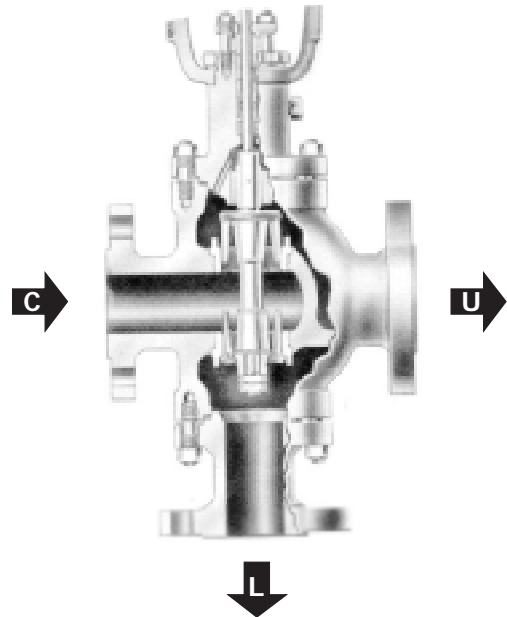
Valve Size (inch)	ANSI Rating	Stroke (inch)	Orifice (inch)	Rated $C_v$
¾, 1	150-600	½	1	6, 9*
1½	150-600	¾	1½	21
2	150-600	1	2	36
3	150-600	1½	2.63	54, 75
4	150-600	1½	3½	124
6	150-300	2	5¼	270
8	150-300	2½	7	400, 480
10	150-300	2½	8¾	750

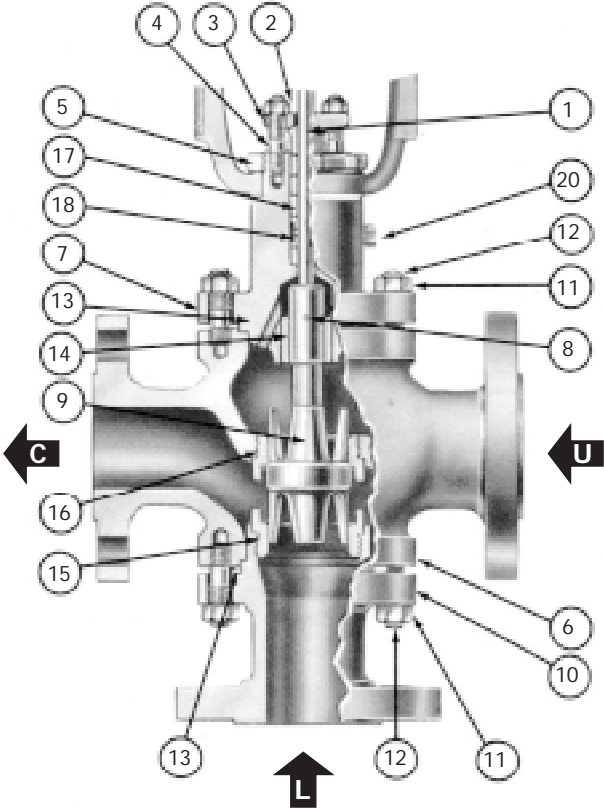
\*  $C_v = 9$  for 1" only

## 81386 Diverting Service Valves: Rated $C_v$

Valve Size (inch)	ANSI Rating	Stroke (inch)	Orifice (inch)	Rated $C_v$
¾, 1	150-600	¾	1½	6, 9*
1½	150-600	¾	1½	21
2	150-600	1	2	36
3	150-600	1½	2.63	54, 75
4	150-600	1½	3½	124
6	150-300	2	5¼	270
8	150-300	2½	7	400, 480
	900-1500			400
10	150-300	2½	8¾	750
12	150-300	3½	10½	1200

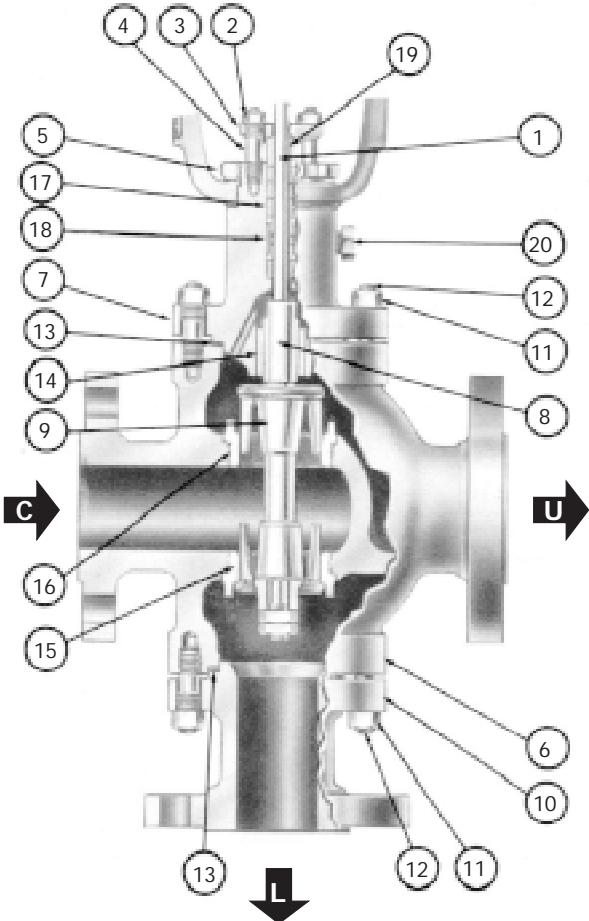
\*  $C_v = 9$  for 1" only





**81385**  
Combining Valve

**81386**  
Diverting Valve



## Materials

Part Ref.	Temperature	-30°C	+180°C	+427°C	+454°C
	Part Name	Standard Materials			
1	Valve Plug Stem	316 Stainless Steel ASTM A479 TY 316			
2	Packing Flange Nut	ASTM A 194 Gr 8			
3	Packing Flange	ASTM A 105 Gr 2			
4	Packing Flange Stud	ASTM A 193 Gr B8 / B7			
5	Drive Nut	ASTM A 105			
6	Body	Carbon Steel ASTM A 216 Gr WCC	(<427°C)		
		316 St. St. ASTM A351 Gr CF8M			
7	Bonnet	Carbon Steel ASTM A216 Gr WCC	(<427°C)		
		316 St. St. ASTM A351 Gr CF8M			
8	Plug Pin	316 Stainless Steel ASTM A479 TP 316			
9	Valve Plug	316 Stainless Steel ASTM A479 TP 316 or ASTM A351 Gr CF8M			
10	Bottom Flange	Carbon Steel ASTM A216 Gr WCC	(<427°C)		
		316 St. St. ASTM A351 Gr CF8M			
11	Valve Body Stud Nuts	ASTM A 194 Gr 2H			
12	Valve Body Studs	Alloy Steel ASTM A193 Gr B7			
13	Valve Body Gasket	SS304 + Asbestos **			
14	Guide Bushing	ASTM A276 TY 440C / SS 316 Stellite			
15	Lower Seat Ring	316 Stainless Steel ASTM A479 TY 316			
16	Upper Seat Ring				
17	Packing	Teflon Asbestos **	(<180°C)		
		Grafoil / Graphite Asbestos **			
18	Packing Spacer	303 Stainless Steel ASTM A582 TP 303 / A 479 TY 304			
19	Packing Follower	303 Stainless Steel ASTM A582 TP 303 / A 479 TY 304			
20	Pipe Plug	Carbon Steel			

\*\* Non asbestos material available, Consult MIL

MIL reserves right to supply trade named material or its equivalent.

## 81385 / 81386 Actuator Selection : Allowable Pressure Drops (Kg/cm<sup>2</sup>)

Flow Direction: flow tending to open (both ports)

Body Ratings: ANSI Class 150 through 600

**Air-to-push-down or Air-to-push-up action**

*Seat Leakage: as per ANSI / FCI 70.2, Class IV*

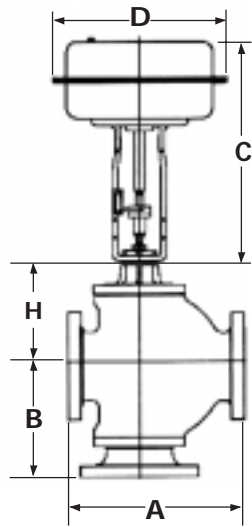
Valve Size inches	Stroke inches	C <sub>v</sub>	Actuator Size	Bench Range psig	Supply Pressure psig	Allowable Pres. Drop <b>81385</b>	Allowable Pres. Drop <b>81386</b>
3/4	1/2	6	11	3-15	25	8	8
				16-30	50	100	100
1	1/2, 3/4 **	9	11	3-15	25	4.5	4.5
				16-30, 11-30**	50	85	56
1 1/2	3/4	21	11	6-30	45	10 1/2	10 1/2
				11-30	50	27	27
2	1	36	11	3-15	-	-	-
				6-30	-	-	-
			13	3-15	25	2	2
				6-30	45	10	10
			15	3-15	25	6	6
				6-30	45	18	18
15-30	55	53	53				
2 1/2	1	54	11	3-15	-	-	-
				6-30	45	5	5
			13	3-15	25	2	2
				6-30	45	10	10
			15	3-15	25	6	6
				6-30	45	18	18
15-30	55	53	53				
3	1 1/2	75	13	3-15	-	-	-
				6-30	45	5	5
				12-31	50	14	14
			15	3-15	25	2.5	2.5
				6-30	45	9.5	9.5
			14-31	55	28	28	
18	3-15	25	6.5	6.5			
	12-30	50	38	38			
	18-30	60	59	59			
4	1 1/2	124	13	3-15	-	-	-
				6-30	45	2	2
				12-31	50	7	7
			15	6-30	45	5	5
				11-30	50	11	11
			18	6-30	45	9	9
12-30	50	21		21			
18-30	60	33	33				
6	2	270	15	3-15	-	-	-
				6-30	45	1 1/2	1 1/2
			18	10-31	50	4	4
				6-30	45	3 1/2	3 1/2
12-30	50	9	9				
17-30	55	13	13				
8	2 1/2	480	18	12-30	50	4 1/2	4 1/2
				15-30	55	6	6
10	2 1/2	750	24	15-30	55	9	9
				12-30	55	3	3
			18	15-30	60	4	4
24	15-30	55	5 1/2	5 1/2			

\*\* 1/2", 16-30 for 81385 and 3/4", 11-30 for 81386

*Note: Pressure drops must not exceed the ANSI body rating.*

## Dimensions (81385/81386) in millimeters)

(All dimensions



Actuator Size	37 (Air to Close)		38 (Air to Open)	
	C	D	C	D
11	417	331	613	331
13	511	381	752	381
15	646	445	897	445
18	681	527	935	527
18(SPL.)	844	527	1070	527
24	881	699	1156	699

## Valve Body S/A dimensions

Dimensions for 81385, 81386 Flanged valves (for raised face in mm)										
Model	Valve Size,	150#ANSI			300#ANSI			600#ANSI		
		A	B	H	A	B	H	A	B	H
81385	1	185.5	140	130	198.5	140	130	211	140	130
	1.5	222.5	159	133.5	235	159	133.5	251	159	133.5
	2	254	169.5	152.5	267	169.5	152.5	286	169.5	152.5
	3	298.5	203	203.5	317.5	203	203.5			
	4	352.5	229	213.5	368	229	213.5	393.5	257	213.5
	6	451	292	270.5	473	292	270.5			
	10	660.5	390.5	328	695.5	390.5	328			
81386	1	222.5	178	152.5	235	178	152.5	251	178	152.5
	1.5	222.5	178	152.5	235	178	152.5	251	178	152.5
	2	254	195	181	266.7	195	181			
	2.5	276	195	181	292	195	181			
	3	298.5	238	234				317.5	238	234
	4				368.5	270	238.5	393.2	283	238.5
	6	451	330	316.5	473	330	316.5			
	8				568.5	391	369.5			
	10	625.5	457.5	410.5	660.5	457.5	410.5			
	12				768.5	573.5	507.5			

## Air failure positions for 81385 / 81386

37 Actuators (air to close)				38 Actuators (air to open)			
81385		81386		81385		81386	
U → C : Closed L → C : Open		C → L : Closed C → U : Open		L → C : Closed U → C : Open		C → U : Closed C → L : Open	
Air Failure Positions							

## Typical C<sub>v</sub> versus Travel Values

ANSI Class 150 through 600  
Flow Direction: flow to open (both ports)

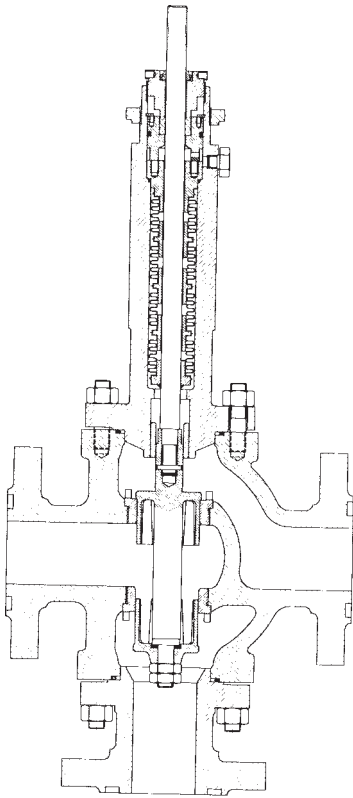
Sizes: 3/4" through 10"  
Flow Characteristic: linear

Valve Size (inch)	Percent of Plug Travel																					
	Plug Up 0%		10%		20%		30%		40%		50%		60%		70%		80%		90%		Plug Down 100%	
3/4	0	6	0.6	5.4	1.2	4.8	1.8	4.2	2.4	3.6	3.0	3.0	3.6	2.4	4.2	1.8	4.8	1.2	5.4	0.6	6	0
1	0	9	0.9	8.1	1.8	7.2	2.7	6.3	3.6	5.4	4.5	4.5	5.4	3.6	6.3	2.7	7.2	1.8	8.1	0.9	9	0
1 1/2	0	21	2.1	18.9	4.2	16.8	6.3	14.7	8.4	12.6	10.5	10.5	12.6	8.4	14.7	6.3	16.8	4.2	18.9	2.1	21	0
2	0	36	3.6	32.4	7.2	28.8	10.8	25.2	14.4	21.6	18.0	18.0	21.6	14.4	25.2	10.8	28.8	7.2	32.4	3.6	36	0
2 1/2	0	54	5.4	48.6	10.8	43.2	16.2	37.8	21.6	32.4	27	27	32.4	21.6	37.8	16.2	43.2	10.8	48.6	5.4	54	0
3	0	75	7.6	7.5	15	60	22.5	52.5	30	45	37.5	37.5	45	30	52.5	22.5	60	15	67.5	7.5	75	0
4	0	124	12.4	111.6	24.8	99.2	37.2	86.8	49.6	74.4	62	62	74.4	49.6	86.8	37.2	99.2	24.8	111.6	12.4	124	0
6	0	270	27	243	54	216	81	189	108	162	135	135	162	108	189	81	216	54	243	27	270	0
8	0	480	48	432	96	384	144	336	192	288	240	240	288	192	336	144	384	96	432	48	480	0
10	0	750	75	675	150	600	225	525	300	450	375	375	450	300	525	225	600	150	675	75	750	0

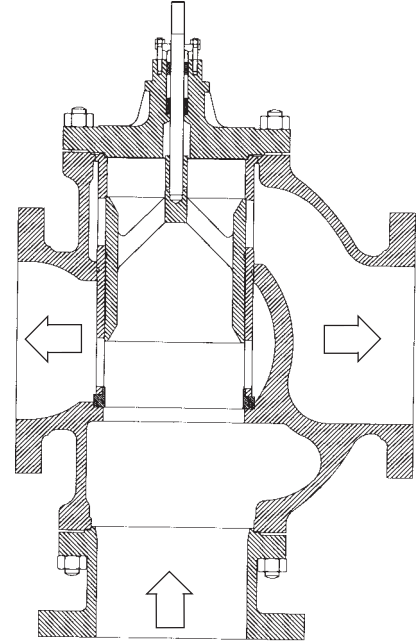
0% : Plug in up Position  
100% : Plug in Down Position

## Optional Designs

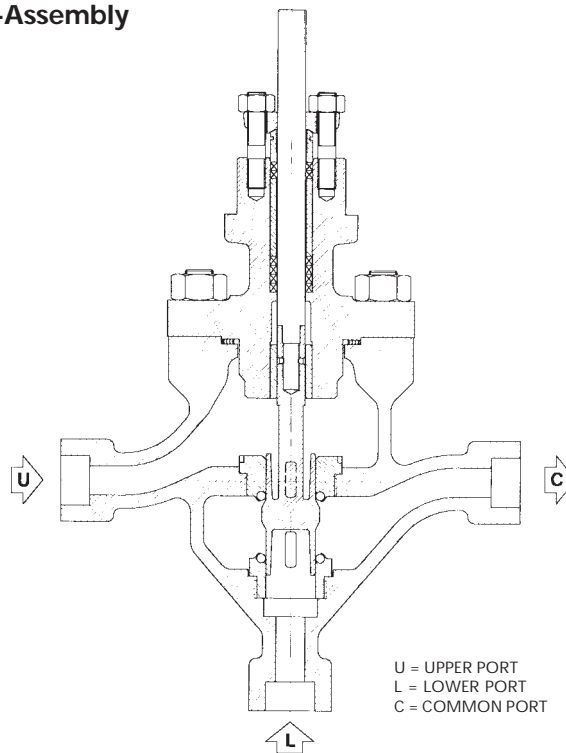
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**81000 Series 3-way Bellow  
Sealed  
Body Sub-Assembly**



**3-way Valve Body Sub-Assembly  
81500 Balanced Design**



*COMBINING SERVICE ILLUSTRATED, FOR DIVERTING SERVICE, COMMON PORT 'C' IS THE INLET.*

**3-way Valve Sub-Assembly  
81400 Combining / Diverting**



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A KSB Company



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