

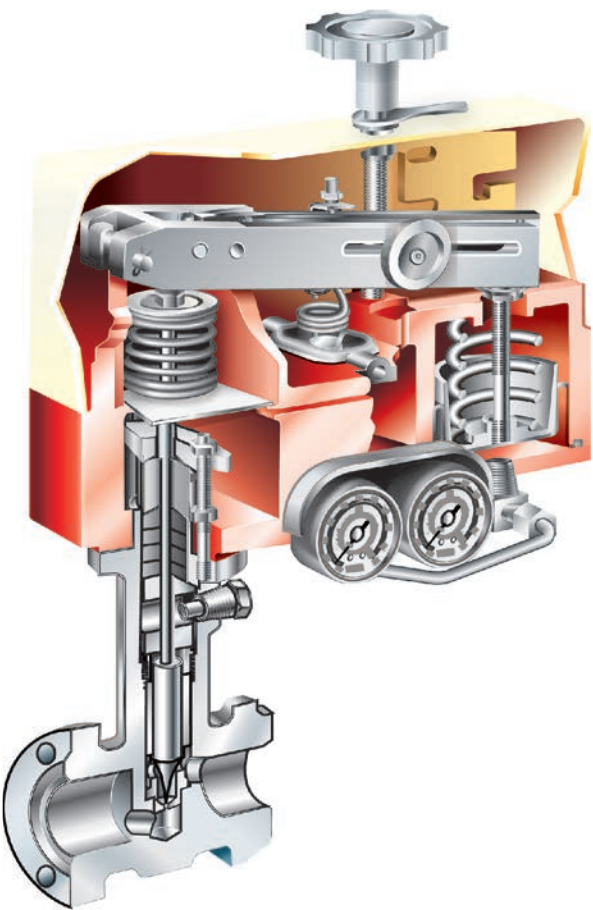
MIL 29000 - Micropak Control Valves for Precise Microflow Control





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Introduction

Designed specifically for microflow applications, MIL 29000 series Micropak provides excellent throttling control performance with a wide range of options and capabilities. Design optimization has also resulted in an extremely integrated and compact assembly. Rugged valve plug support is provided along the entire stroke length using an integrated plug guide and seat ring. This ensures excellent plug stability and control even under high pressure drop conditions. Micropak's simple top-entry body construction includes an integrated body and bonnet design, which allows easy access and removal of the quick change trim.

Features

Adjustable Cv

The rated Cv of the Micropak valve can be adjusted at site to suit the actual operating conditions by setting the knob provided in the actuator. This feature facilitates the user to tailor the control valve to the exact site conditions, avoiding any oversizing in flow capacity and can also help in rationalizing minor mistakes in estimating the process conditions.

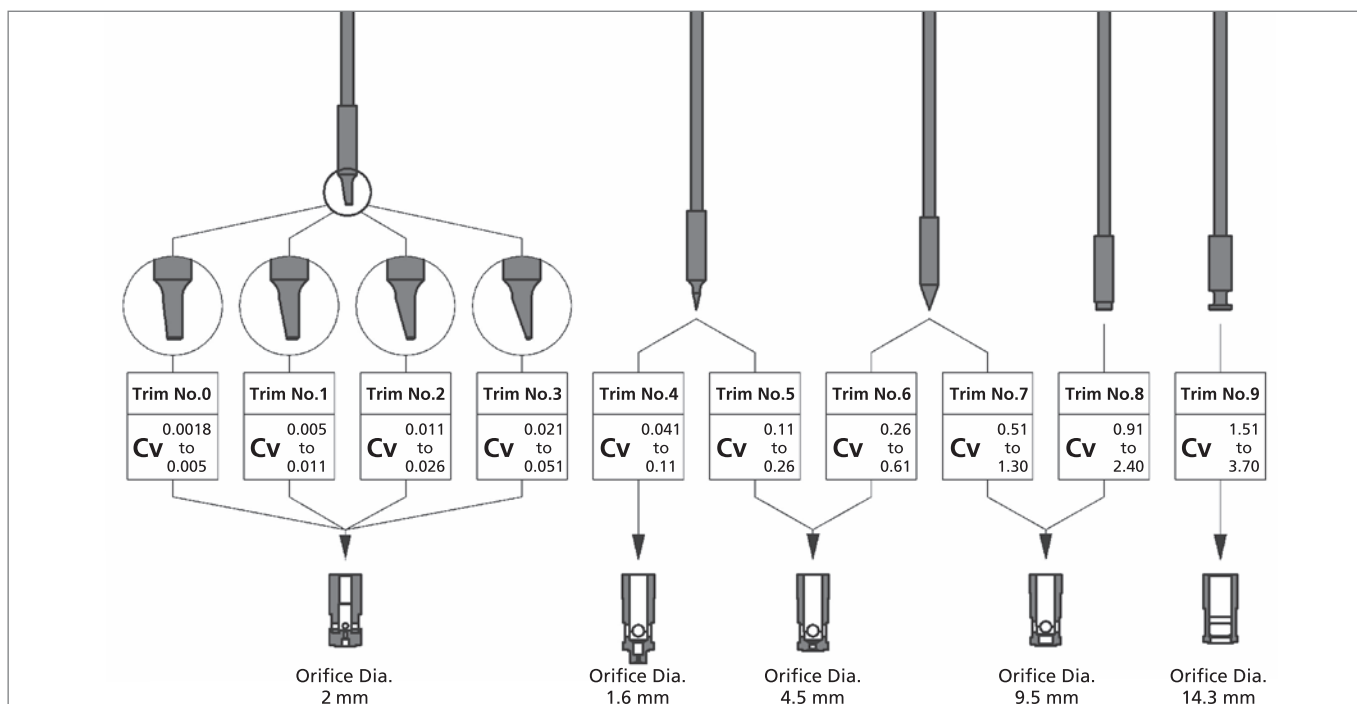


Compact and Field-reversible Actuator

The force amplifying technology together with the rolling diaphragm design makes the Micropak design extremely compact. The actuator action also can be easily reversed at site by just relocating the pivot pins.

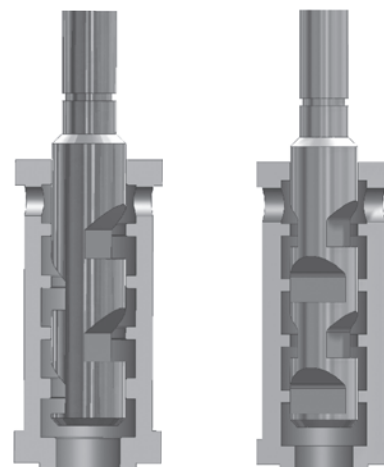
Versatile Trim Options

Eight plugs and five seat rings are used to make up the ten available plug and seat ring combinations thereby a total of 70 Cvs can easily be made starting from 0.0018 to 3.70. The integral liner and seat ring also reduces components and simplifies assembly and disassembly.



Multi-stage, Axial-flow, High Resistance Trim

Micropak is also available with an optional high pressure liquid letdown anti-cavitation trim solution. This unique design is based on the principle of multi-step high resistance axial-flow. The multi-stage design of this valve prevents cavitation by directing the fluid through a series of 3-dimensional, high impedance pressure reduction areas or stages. Pressure reduction occurs along the length of the plug through a series of throttling stages, designed to divide the total drop between the trim steps thereby maintaining constant velocity of flow.



Typical Applications

Micropak valves are widely used in all industry segments. It's field adjustable Cv, actuator action reversal features allows customers to change valve flow capacity or actuator action without additional parts and stripping of the valve. With an inherent rangeability of 500:1, Micropak valves provides improved process efficiency through accurate control in any low flow application, meeting a wide range of applications. In power plants, the most common

microflow application is spray water control in lower capacity units, where fine control of spray water is required to maintain the steam temperature accurately. Micropak valves are also the best option for any low flow or dosing application in chemical, petrochemical, refinery and pharmaceutical plants, where precise control and wide rangeability is essential to maintain the quality of the process or end-product.



Technical Information

Model Decodification

1st —		2nd —	3rd 2	4th 9	5th —	6th —	7th —
ACTUATOR TYPE		BODY SERIES	TRIM TYPE	TRIM NO.	Cv RANGE ⁽⁴⁾		POSITIONER
					MIN	MAX	
1. Parallel to Pipe Line	6. Hand Operated	29.Micropak Control Valve for Precise Microflow Control	0. Undefined	0	0.0018	0.005	0. Undefined
				1	0.005	0.011	1. On-Off (No Positioner)
2. Perpendicular To Pipe Line ⁽¹⁾	7. Air to Close		1. Standard Trim	2	0.011	0.026	2. With Integral Pneumatic Positioner
				3	0.021	0.051	
	8. Air to Open		2. Anti-cavitation ⁽²⁾ Trim	4	0.041	0.11	3. With External Electro-pneumatic Positioner
				5	0.11	0.26	
			3. Special ⁽³⁾	6	0.26	0.61	4. With External Smart Positioner
				7	0.51	1.30	
				8	0.91	2.40	
				9	1.51	3.70	

(1) : Not available with cast body construction

(2) : Anti - cavitation trim available for trim no . 3 to 6 only

(3) : Available on request - Bellows sealed, Cryogenic versions etc.

(4) : For discrete Cv values, please refer page 4

Standard Sizes / Ratings / End Connections

VALVE SIZE (inch)	MAX. Cv	RATING (ASME Class) 150# TO 1500#				
		FLANGED	RAISED FLANGELESS (WAFER)	THREADED (NPT)	SOCKET WELD	BUTT WELD
0.5	2.4	*	*	*	*	
0.75	2.4	*	*	*	*	
1	3.7	*	*	*	*	*

* Available

General Data

BODY		
Type	:	Globe style with integral bonnet
Recommended flow direction	:	Flow to open

BONNET		
Type	:	Integral to body
Temperature range	:	-100 °C to 343 °C



MIL 29000

GLAND SEAL		
Type	:	Adjustable packing box with PTFE or Graphite moulded split rings
Temperature range	:	≤ 180 °C PTFE, > 180 °C Graphite

TRIM		
Plug type	:	Adjustable microflow with unbalanced contoured plug
Option	:	Multi-stage, Anti-cavitation
Seat type	:	Clamped (quick change) with metal seat
Guiding	:	Top & Cage guiding
Rangeability	:	500 : 1 at max. rated Cv 200 : 1 at min rated Cv
Characteristic	:	Mod. Linear

Seat Leakage Class / Temperature Range

TRIM TYPE	TEMPERATURE RANGE (°C)		SEAT LEAKAGE CLASS (FCI 70.2)	
	MIN	MAX	STANDARD	OPTIONAL
Standard trim	-100	343	Class IV	Class V
Anti-cavitation trim	-29	343		

Flow Coefficients (Rated Cv)

(Standard Trim)

VALVE SIZE (inch)			TRIM NO.	RATED Cv (WITH ADJUSTABLE Cv FUNCTION)							CRITICAL FLOW FACTOR C _f or F _L
0.5	0.75	1		MIN.			MID ⁽⁵⁾ SETTING			MAX.	
*	*	*	0	0.0018	0.002	0.0026	0.0030	0.0033	0.0037	0.005	0.85
*	*	*	1	0.005	0.006	0.007	0.008	0.009	0.010	0.011	0.85
*	*	*	2	0.011	0.014	0.017	0.020	0.022	0.024	0.026	0.85
*	*	*	3	0.021	0.026	0.031	0.036	0.041	0.046	0.051	0.85
*	*	*	4	0.041	0.05	0.06	0.065	0.085	0.10	0.11	0.85
*	*	*	5	0.11	0.14	0.17	0.20	0.22	0.24	0.26	0.90
*	*	*	6	0.26	0.31	0.36	0.41	0.46	0.56	0.61	0.90
*	*	*	7	0.51	0.61	0.71	0.81	0.91	1.20	1.30	0.92
*	*	*	8	0.91	1.11	1.31	1.51	1.71	2.20	2.40	0.92
		*	9	1.51	1.91	2.31	2.61	2.91	3.40	3.70	0.92

Flow Coefficients (Rated Cv)

(Anti-cavitation Trim)

VALVE SIZE (inch)			TRIM NO.	RATED Cv (WITH ADJUSTABLE Cv FUNCTION)							CRITICAL FLOW FACTOR C _f or F _L
0.5	0.75	1		MIN.			MID ⁽⁵⁾ SETTING			MAX.	
*	*	*	3	0.021	0.026	0.031	0.036	0.041	0.046	0.051	0.98
*	*	*	4	0.041	0.05	0.06	0.065	0.085	0.10	0.11	0.98
*	*	*	5	0.11	0.14	0.17	0.20	0.22	0.24	0.26	0.98
*	*	*	6	0.26	0.31	0.36	0.41	0.46	0.56	0.61	0.98

* Available

⁽⁵⁾ : The Mid setting allows for easy valve capacity adjustments in the field to meet changing service conditions.



Actuator Selection

(Standard Trim)

TRIM NO.	ORIFICE (mm)	Cv RANGE		SHUT OFF PRESSURE (kg/cm ² g)				SPRING RANGE/ SUPPLY PRESSURE (psig)				
				CLASS IV ⁽⁶⁾		CLASS V ⁽⁶⁾						
				ATO [*]	ATC [*]	ATO [*]	ATC [*]					
0	2	0.0018 to 0.005	0.0018 to 0.0030	250	250	250	250	3-15 / 20				
			0.0033 & 0.0037			20						
			0.005			10						
1	2	0.005 to 0.011	0.005 to 0.008	250		250			250			
			0.009 & 0.010			20						
			0.011			10						
2	2	0.011 to 0.026	0.011 to 0.020	250		250				250		
			0.022 & 0.024			20						
			0.026			10						
3	2	0.021 to 0.051	0.021 to 0.036	250		250					250	
			0.041& 0.046			20						
			0.051			10						
4	1.6	0.041 to 0.11	0.041 to 0.065	250		250						250
			0.085 & 0.10			30						
			0.11			20						
5	4.5	0.11 to 0.26	0.11 to 0.20	250	250	250						
			0.22 & 0.24		180							
			0.26		60							
6	4.5	0.26 to 0.61	0.26 to 0.41	250	250		250					
			0.46 & 0.56		250							
			0.61		180							
7	9.5	0.51 to 1.30	0.51	215	115			215				
			0.61		120							
			0.71 & 0.81		40							
8	9.5	0.91 to 2.40	0.91 to 1.30	70	40				70			
			0.91		20							
			1.11		-							
9	14.3	1.51 to 3.70	1.31 & 1.51	130	250					250		
			1.71 to 2.40		120							
			1.51		40							
10	14.3	1.51 to 3.70	1.91	85	90	90						
			2.31& 2.61		25							
			2.91 & 3.4		10							
11	14.3	1.51 to 3.70	3.70	25	15		15					
			1.51		5							
			1.91		-							

Actuator Selection

(Anti-cavitation Trim)

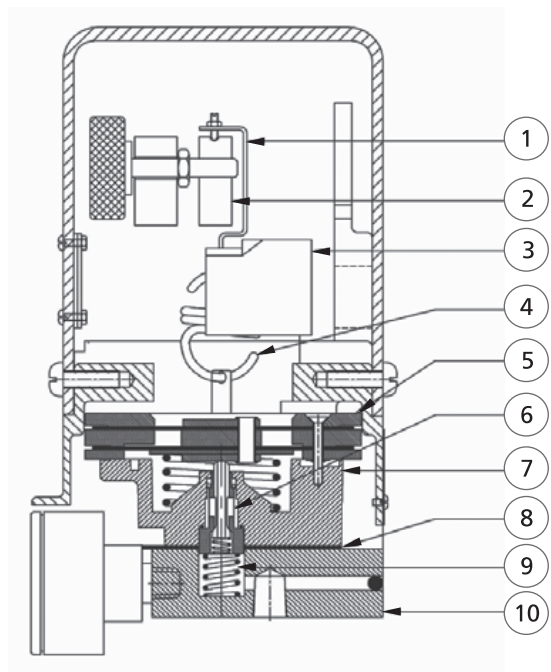
TRIM NO.	ORIFICE (mm)	Cv RANGE		SHUT OFF PRESSURE (kg/cm ² g)				SPRING RANGE/ SUPPLY PRESSURE (psig)		
				CLASS IV ⁽⁶⁾		CLASS V ⁽⁶⁾				
				ATO*	ATC*	ATO*	ATC*	ATO/ATC *		
3	6.7	0.021 to 0.051	0.021 & 0.026	250	250	250	250	6-24 / 30		
			0.031 & 0.036			150	130			
			0.041 & 0.046			190	150		50	20
			0.051			150	100		15	-
4	6.7	0.041 to 0.11	0.041 & 0.06	250	250	250	250			
			0.06 & 0.065			150	130			
			0.085 & 0.10			190	150		50	20
			0.11			150	100		15	-
5	9.5	0.11 to 0.26	0.11	250	250	190	210			
			0.14			220	220		120	130
			0.17 & 0.20			130	120		40	25
			0.22 to 0.26			70	40		10	-
6	9.5	0.26 to 0.61	0.26	250	250	190	210			
			0.31			220	220		120	130
			0.36 & 0.41			130	120		40	25
			0.46 to 0.61			70	40		10	-

* Actuator Action : ATO : Air To Open, ATC : Air To Close ⁽⁶⁾ : Seat Leakage Class : IV & V as per FCI 70.2



Construction

Integral Pneumatic Positioner Sub-assembly (Model 7700)



INTEGRAL PNEUMATIC POSTIONER		
Type	:	Pneumatic, force balance
Action	:	Direct
Characteristic	:	Linear
Instrument signal	:	3 to 15 psig
Connections	:	1/4" NPT input and supply, 1/8" NPT output
Average air consumption	:	0.26 Nm³/h at 2.1 barg supply (0.15 scfm at 30 psig supply)
Linearity	:	± 1 %
Hysterisis	:	± 1 %

Material of Construction

DRAWING REF.NO.	PART NAME	STANDARD MATERIAL	DRAWING REF. NO.	PART NAME	STANDARD MATERIAL
1	Spring Clamp	304 SST	6	Pilot S/A	-
2	Lever No.2	304 SST	7	Position Block	Aluminium
3	Lever Arm Stop	304 SST	8	Gasket S/A	-
4	Force balance spring	Spring steel	9	Spring	Spring Steel
5	Diaphragm S/A	-	10	Manifold Block	Aluminium

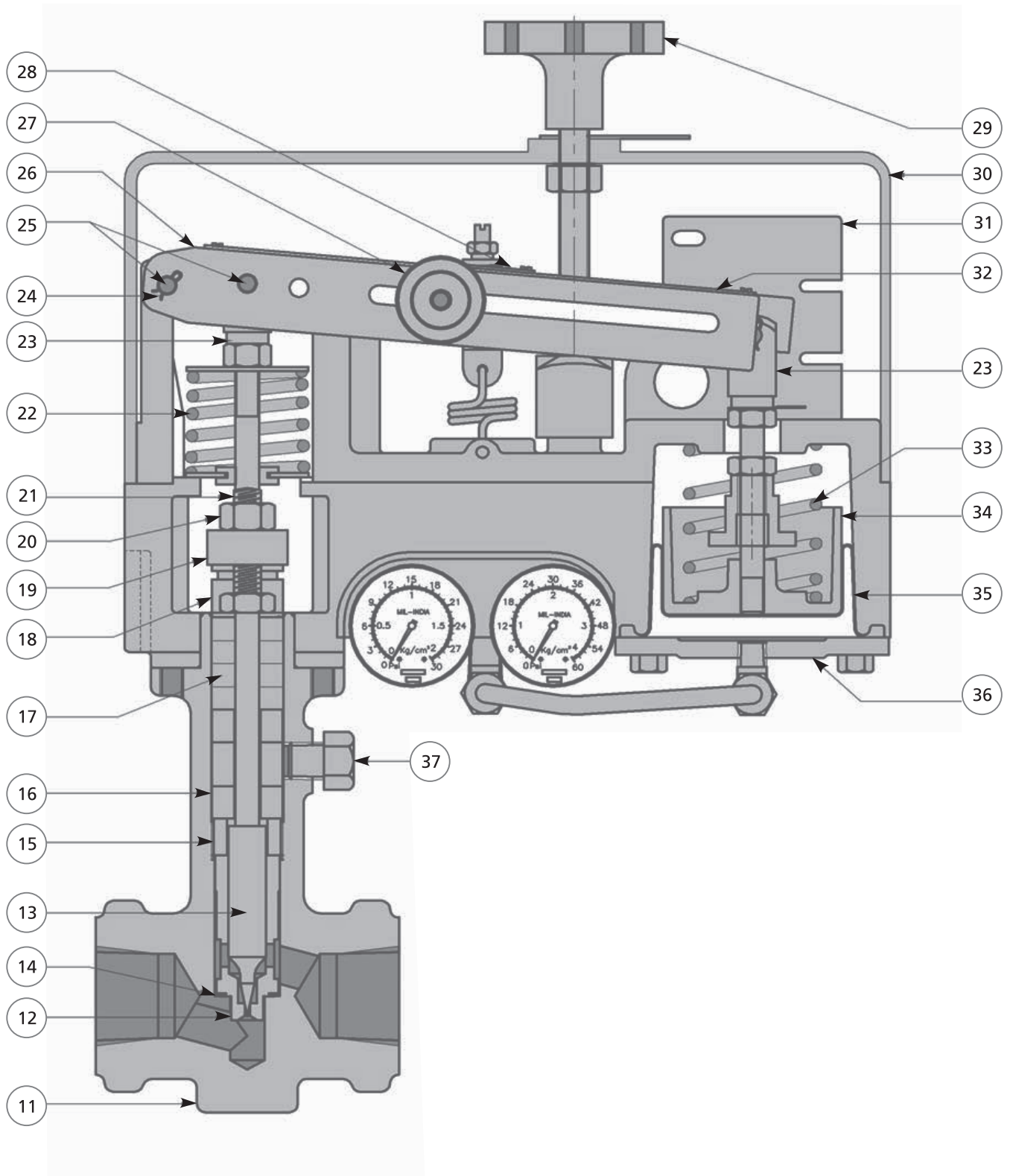
Accessory Combinations

WITHOUT POSITIONER	WITH INTEGRAL PNEUMATIC POSITIONER	WITH EXTERNAL POSITIONER
AS	AS	AS
LS	-	-
AS / AL	AS / AL	AS / AL
AS / LS	AS / LS	AS / LS
AS / PT	AS / PT	AS / PT
AS / SV	AS / SV	AS / SV
AS / AL / LS	AS / AL / LS	AS / AL / LS
AS / AL / PT	AS / AL / PT	AS / AL / PT
AS / LS / PT	AS / LS / PT	-
AS / LS / SV	AS / LS / SV	AS / LS / SV
AS / PT / SV	AS / PT / SV	AS / PT / SV
AS / AL / LS / PT	AS / AL / LS / PT	-
AS / LS / PT / SV	AS / LS / PT / SV	-

Legend: AS - Air Set, AL - MIL 776 Air Lock Relay, LS - MIL 496 Limit Switch, PT - MIL 400L Position Transmitter, SV - Solenoid Valve



Construction



MIL 29000 Micropak Valve



Material of Construction

DRAWING REF. NO.	PART NAME	STANDARD MATERIAL*			
11	Valve Body	Carbon Steel : ASTM A 216 Gr.WCC ⁽⁷⁾ / ASTM A 105			
		Stainless Steel : ASTM A 351 Gr. CF3M ⁽⁷⁾ / ASTM A 182 Gr. F316 L			
12	Seat Ring	Standard	Trim 0 to 3	Std	Stellite No.6
				NACE	Inconel X-750 or Elgiloy
			Trim 4 to 9	Std	17-4 PH SST H900
				NACE	17-4 PH SST H1150M
		Anti-cavitation	Trim 3 to 6	Std	17-4 PH SST H900
				NACE	17-4 PH SST H1150M
13	Valve Plug	Standard	Trim 0 to 3	Std	Stellite No.12
				NACE	Inconel X-750 or Elgiloy
			Trim 4 to 9	Std	Stellite No.6
				NACE	Inconel X-750 or Elgiloy
		Anti-cavitation	Trim 3 to 6	Std	Stellite No.6
				NACE	Inconel X-750 or Elgiloy
14	Seat Ring Gasket	316 L SST + Graphite			
15	Seat Ring Retainer	17-4 PH SST H900 (17-4 PH SST H1150M for NACE)			
16	Packing Spacer	316 SST			
17	Packing	PTFE ≤ 180 °C / Graphite >180 °C			
18	Packing Follower	304 SST			
19	Packing Flange	304 SST			
20	Packing Nut	304 SST			
21	Packing Stud	304 SST			
22	Conical Spring	Spring Steel			
23	Clevis	EN 8 Zn Passivated			
24	Retainer Clip	304 SST			
25	Pivot Pins	17-4 PH SST			
26	Lever No.1	Aluminium			
27	Cv Adjusting Knob	304 SST			
28	Spring Adjustment Plate	304 SST			
29	Hand Wheel	Bakelite (for Pneumatic), SST (for Hand Operated)			
30	Cover	Polycarbonate			
31	Actuator Bracket	Aluminium			
32	Scale	304 SST			
33	Actuator Spring	Spring Steel			
34	Piston	Aluminium			
35	Rolling Diaphragm	Buna N			
36	Diaphragm Cover	IS 2062 Gr. A. Black Powder Coated			
37	Locking Screw	316 SST			

⁽⁷⁾ : Valve body in cast form available only for flanged valves ≤ 600#

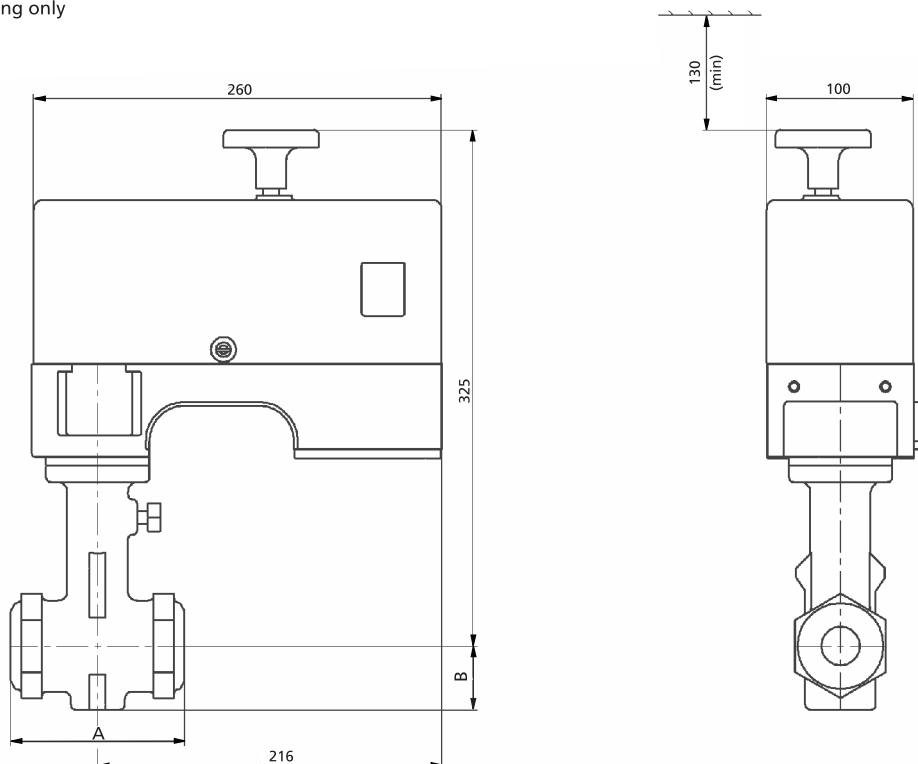
* : Material indicated above are for reference only. MIL reserves the right to supply alternate material/ forms due to constant product upgradation. Other specific material are available on request.



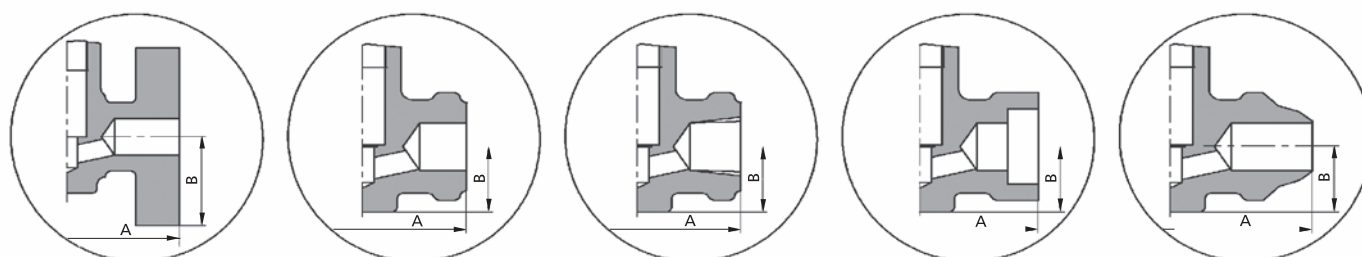
Dimensions and Weights

VALVE SIZE (inch)	END CONNECTION	RATING (ASME Class)	DIMENSIONS (mm)			UNPACKED WEIGHT (kg)
			A (STANDARD)	A (OPTIONAL)	B	
0.5	Flanged	150#	102 ⁽⁸⁾	126, 160	45	8
		300# - 600#	102 ⁽⁸⁾	126, 160	47.5	8
		900# - 1500#	160	168	60	10
0.75	Flanged	150#	102 ⁽⁸⁾	126, 160	50	9
		300# - 600#	102 ⁽⁸⁾	126, 160	57.5	9
		900# - 1500#	160	168	65	11
1	Flanged	150#	102 ⁽⁸⁾	126, 160	55	10
		300# - 600#	102 ⁽⁸⁾	126, 160	62	10
		900# - 1500#	160	168	75	12
0.5 to 1	Raised Flangeless (Wafer)	150# - 1500#	102	108	40	7.5
	Threaded	150# - 1500#	102	108	40	7.5
	SW	150# - 1500#	102	120	40	7.5
1	BW	150# - 1500#	102	120	40	7.5

⁽⁸⁾: Available in casting only



* All dimensions are in mm



Flanged

Raised Flangeless (Wafer)

Threaded (NPT)

Socket Weld

Butt Weld

Dimensional Reference



MIL 29000

Product Highlights

Unmatched Performance

- Rangeability of 500:1 to handle wide variations in microflow ranges
- Controls low flow applications efficiently
- Fully guided microflow plug tailored for high pressure drops

Innovative Design

- Compact construction with integral rolling diaphragm type actuator
- Cv adjustable at site to fine tune site conditions
- Force amplifying actuator technology with modular option for positioner
- Field-reversible actuator

Easy Maintenance

- Integral bonnet – No leaks & lesser soft parts
- Fewer parts, integral cage & seat, top-entry trim

High Performance Material is Standard

- Hardened trim for better longevity

Optional Designs

- Multi-stage, axial-flow, anti-cavitation trim for severe service
- Bellows sealed construction
- Cryogenic construction



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