

VariPak 28000 Series

The Microflow Valve
with Built-in C_v Adjustment



Masoneilan

DRESSER

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Foreword

Over a period of more than 25 years Masoneilan has acquired a well-proven expertise in the field of microflow control.

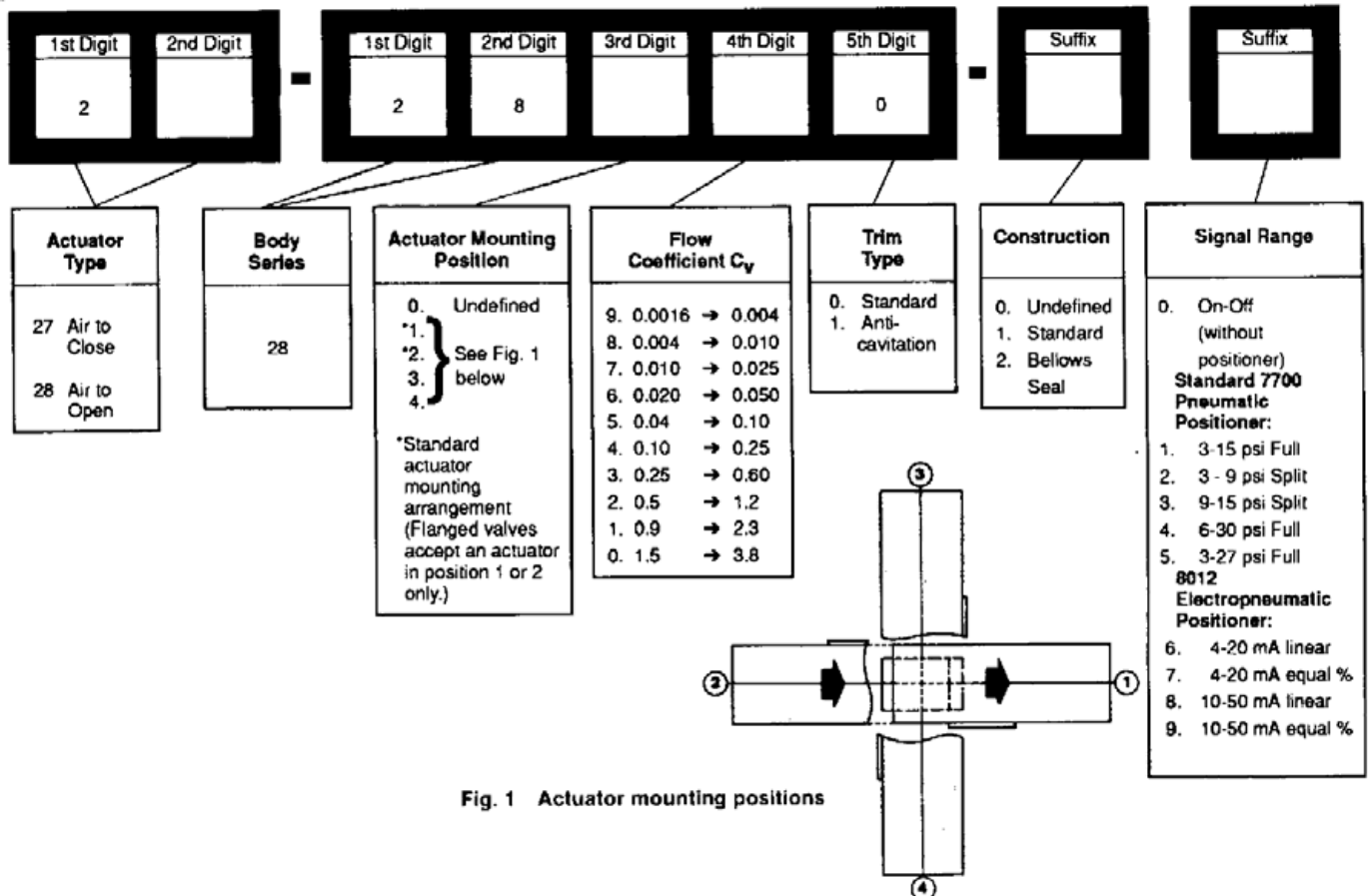
Increasing technical demands by users have persuaded Masoneilan to rethink the standard approach to this specialized field of microflow control. Possible approaches and solutions were proposed and, through the process of testing both

under laboratory and field conditions, a new solution took form.

Our solution is an actuator adjustment device which will broaden the range of controllable C_v .

Our VariPak valve arose from the will to provide new solutions to existing problems and to optimize low flow control.

Numbering System



General Data

• Body

type: globe style with integral bonnet
size: 1"
flow direction: flow-to-open
C_v ratio: 500:1 at Max. C_v
200:1 at Min. C_v
(with a positioner)
connections: flangeless with serrations and
1" NPT
material: **standard:** Forged 316L st. st.
optional: Hastelloy C
rating: ANSI Class 1500 (C_v Trim No. 1 to 9)
ANSI Class 600 (C_v Trim No. 0)
connections: flanged: ANSI Class 150-600
material: cast 316L St. St.
temperature range: -320°F through 650°F

Packing Box

type: bolted
packing: **standard:** TFE Aramid Fiber -
Crane 285K
optional: bellows seal

Trim

plug type: top entry
material: Stellite No. 6 (C_v Trim No. 0 to 5)
Stellite No. 12 (C_v Trim No. 6 to 9)

Flow Characteristics

type: linear (C_v Trim No. 0 to 5)
modified (C_v Trim No. 6 to 9)
seat leakage: ANSI B16.104:
standard: Class IV
optional: Class V

Actuator

type: spring-opposed rolling
diaphragm with force amplifying
lever and C_v adjustment knob
material: die-cast aluminum-anodized
epoxy painted
action: direct or reverse (reversible)
spring range: 3-15 psi
6-24 psi
(according to C_v)

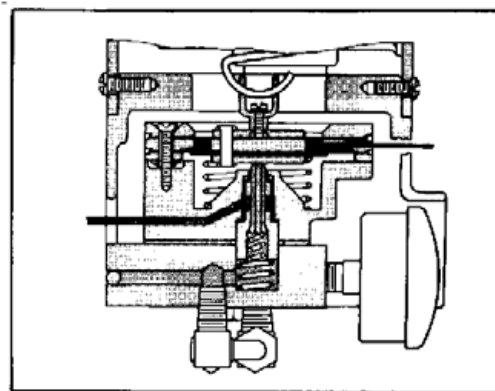
• Actuator (continued)

air connection: 1/4" NPT
handwheel: **standard**

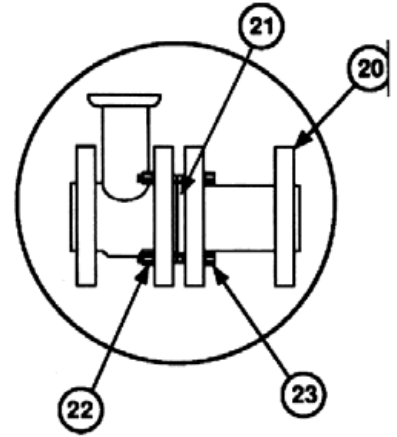
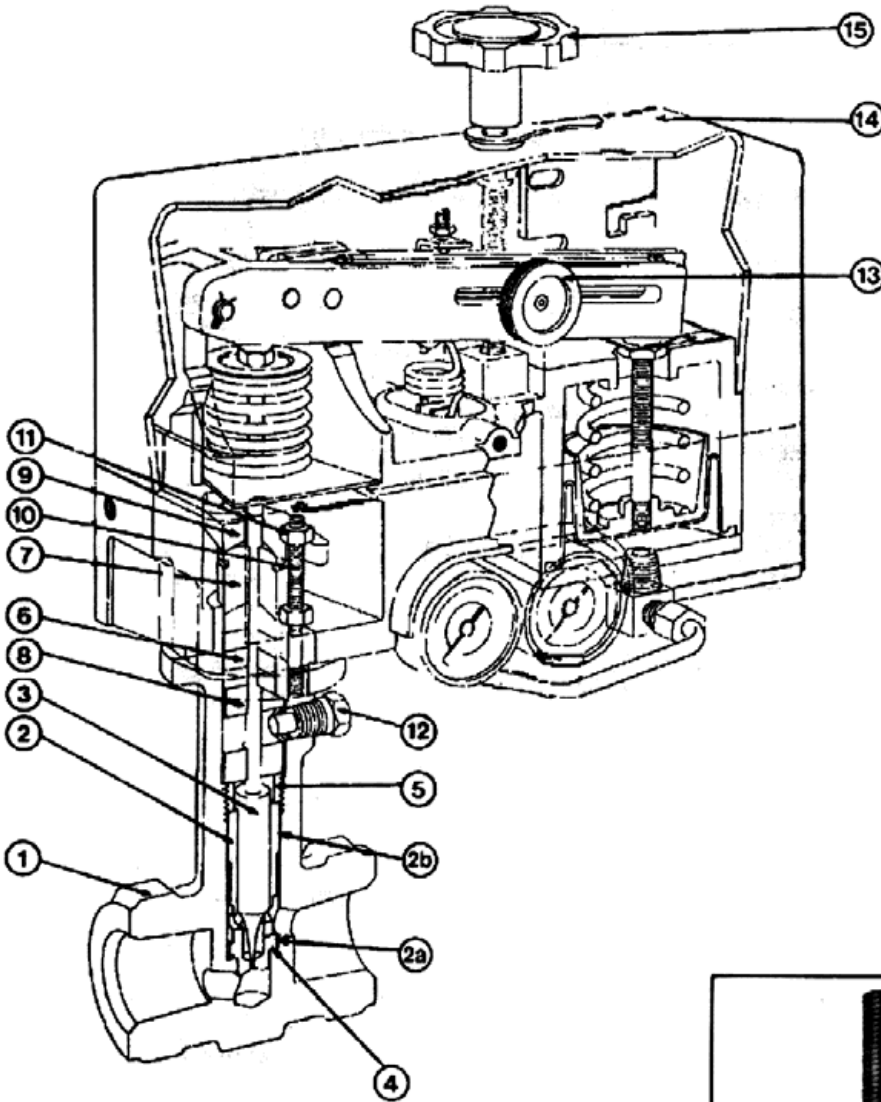
Note: To offer protection from corrosive atmospheres the cover of the actuator is slightly pressured and purged by supply air from the positioner.

• Positioner

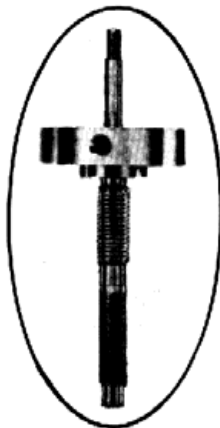
type: Model 7700 pneumatic force balance
mounting: integral
action: direct - increasing instrument
signal increases output air
characteristic: linear
instrument signal: 3-15, 6-30 or 3-27 psi
3-9 and 9-15 psi split range
connections: 1/4" NPT instrument and supply
average air
consumption: 9 SCFH
max. air output: 260 SCFH
supply pressure
effect: 0.05% of full stroke variation
per psi supply
open loop gain: 70
linearity: ± 0.5%
sensitivity: 0.1%
repeatability: 0.1%
full stroke time: less than one second



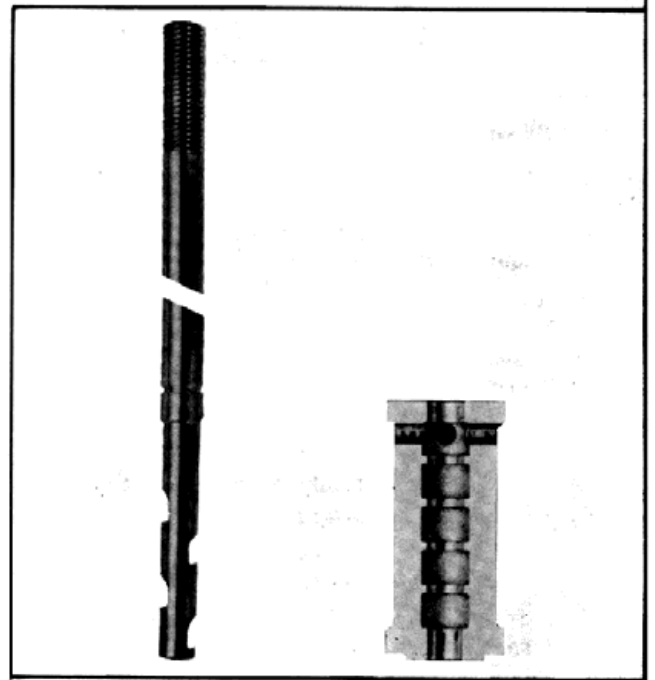
Model 7700 pneumatic positioner
mounted on VariPak



Optional Adapter
per ISA S75.03
Face-to-face Dimension



A bellows seal is available for applications requiring zero leakage at the packing box. This type of valve is often needed for applications involving the handling of inflammable, toxic or explosive fluids.



The "Varilog" anticavitation trim solves the problem of high differential pressure liquid flow control. It minimizes erosion and vibration which can lead to the failure of conventional single-seat microflow valves. In conventional valves, the conversion of upstream pressure into kinetic energy results in excessive flow velocities between the seat and the plug.

Materials of Construction

Ref. No.	Description		Standard Materials
1	Body	Flangeless	316L Stainless Steel ASTM A182 Gr F316L Option: Hastelloy® C
		Flanged	316L Stainless Steel ASTM A351 Gr CF3M
2	Seat Ring	Trim No. 0-5	17-4 PH St. St. ASTM A564 Gr 630 Condition H900
2a	Seat Ring	Trim No. 6-9	Stellite No. 6
2b	Spacer	Trim No. 6-9	Stellite No. 6
3	Plug S/A	Plug	Trim No. 0-5
		Stem	Trim No. 0-5
	Plug	Trim No. 6-9	Stellite No. 12
4	Seat Ring Gasket ^①		Graphite with Stainless Steel
5	Seat Ring Retainer		17-4 PH St. St. ASTM A564 Gr 630 Condition H1075
6	Packing		TFE Aramid Fiber - Crane 285K
7	Packing Follower		303 Stainless Steel ASTM A582 TY 303
8	Packing Spacer		316 Stainless Steel ASTM A479 TY 316
9	Packing Flange		304 Stainless Steel ASTM A743 Gr CF8
10	Packing Flange Studs		304 Stainless Steel ASTM A193 Gr B8
11	Packing Flange Nuts		304 Stainless Steel ASTM A194 Gr 8
12	Safety Pin		316 Stainless Steel ASTM A479 TY 316
13	Cv Adjustment Knob		Stainless Steel
14	Actuator Cover		Polycarbonate
15	Handwheel		Polycarbonate
20	Adapter		Carbon Steel ASTM A216
			316L Stainless Steel ASTM A351
21	Gasket		304 Stainless Steel w/Grafoil Filler
22	Hex Nut		Steel
23	Studs		Steel

^① Trim No. 1-9 only.

Flow Coefficients (Rated C_v), Critical Flow Factor (F_L) / Allowable Pressure Drops (ΔP)

Standard 1" VariPak

Trim No.	Adjustable Flow Coefficient C_v								Spring Range	Max. Supply	Critical Flow Min. F_L
	Min.	Intermediate C_v						Max.	psi	psi	
9	0.0016	0.002	0.0024	0.0028	0.0032	0.0036	0.004	3 - 15	18.0	0.85	
8	0.004	0.005	0.006	0.007	0.008	0.009	0.010	3 - 15	18.0	0.85	
7	0.010	0.013	0.016	0.019	0.021	0.023	0.025	3 - 15	18.0	0.85	
6	0.020	0.025	0.030	0.035	0.040	0.045	0.050	3 - 15	18.0	0.85	
5	0.04	0.05	0.06	0.07	0.08	0.09	0.10	3 - 15	18.0	0.85	
4	0.10	0.13	0.16	0.19	0.21	0.23	0.25	3 - 15	18.0	0.90	
3	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	6 - 24	30.0	0.90
2	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	6 - 24	30.0	0.92
1	0.9	1.1	1.3	1.5	1.7	1.9	2.1	2.3	6 - 24	30.0	0.92
0	1.5	1.9	2.3	2.6	2.9	3.2	3.5	3.8	6 - 24	30.0	0.92

Trim No.	ΔP Max. psi				
	Std ANSI 1500	Fig ANSI 150	Fig ANSI 300	Fig ANSI 600	Bellows ^① Seal
9	3000	275	720	1440	800
8	3000	275	720	1440	800
7	3000	275	720	1440	800
6	3000	275	720	1440	800
5	3000	275	720	1440	800
4	2320	275	720	1440	800
3	3000	275	720	1440	800
2	1450	275	720	1440	800
1	1450	275	720	1440	800
0	725	275	720	720	-----

① No product offering for Trim No. 0

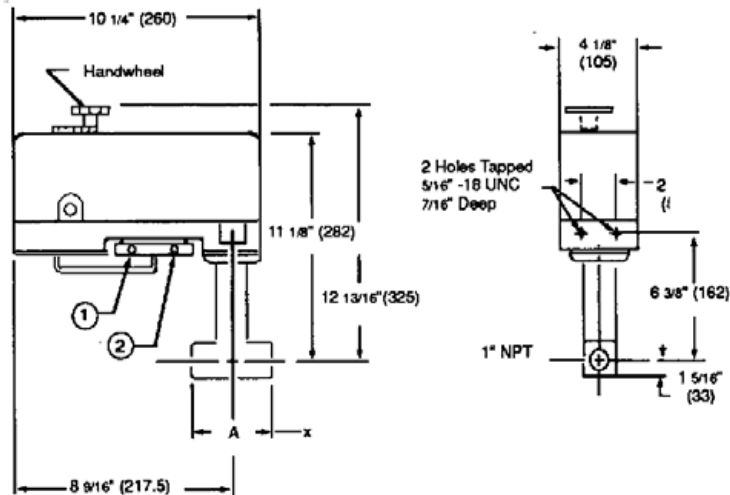
VariLog Anticavitation 1" (ANSI Class 1500)

Trim No.	Adjustable Flow Coefficient C_v (Critical Flow Factor F_L : better than 0.98)								Spring Range	Max. Supply	ΔP Max.
	Min.	Intermediate C_v						Max.	psi	psi	psi
6	0.02	0.025	0.03	0.035	0.04	0.045	0.05	6 - 24	30.0	2900	
5	0.04	0.05	0.06	0.07	0.08	0.09	0.10	6 - 24	30.0	2900	
4	0.10	0.13	0.16	0.19	0.21	0.23	0.25	6 - 24	30.0	2900	
3	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	6 - 24	30.0	1450

Note: Upstream pressure P_1 must not exceed ΔP max on the rating of flanges.

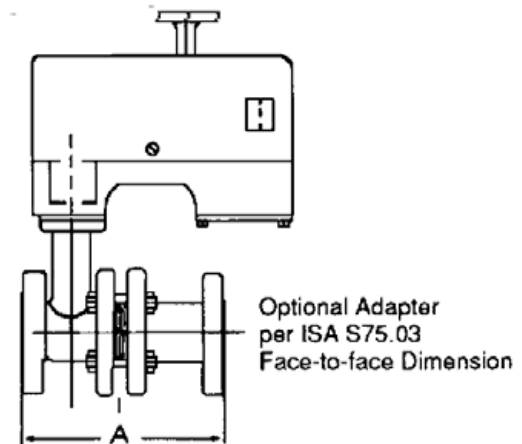
Dimensions and Weights

Metric units (mm) are shown in brackets.



Body Type	A		Weights (lb)
	Inches	mm	
Standard	4.00	102	15
Flanged	4.00	102	20
w/150 Adaptor	7.24	184	25
w/300 Adaptor	7.76	197	25
w/600 Adaptor	8.24	210	25

Provide a removal clearance of 5 1/2" (140 mm).



Accessories and Options

8012 Electropneumatic Valve Positioner
(See Specification Data CS5000)
Instrument Signals
10-50 mA; 104 ohms
4-20 mA; 173 ohms
4-12, 12-20 mA; 173 ohms

8005A and 8006A Electropneumatic Transducer
(See Specification Data CS6000)
Input Range 10-50 mA; 104 ohms
4-20 mA; 173 ohms
Output (Direct or Reverse)
Model 8005A: 3-15 psi
Model 8006A: 3-15, 6-30, 0-20 or 0-35 psi

I/PEX 9000 Electropneumatic Transducer
(See Specification Data CS9000)
Input Range: 4-20 mA or 10-50 mA
Split range up to 3 times
Output (Direct or Reverse)
3-15 psi, adjustable to 0-20 psi

80-4 or 80-40 Airset
(See Specification Data CY7800)
77-6 or 77-60 Lockup Valve
(See Specification Data CY7700)
2" Gauge 0-30 psi

2700 Pressure Controllers
(See Specification Data CW6000)

Additional Options Available

Cryogenic Body Construction
High Pressure ANSI Class 2500
Body Drain Plug
Other Trim Materials
Limit Switches
NACE Construction
Other Body Materials

Refer to specific accessory specification literature for complete information.

USEFUL EQUIVALENTS U.S. CUSTOMARY UNITS

Specific gravity of air G = 1 (reference for gases)

Specific gravity of water = 1 (reference for liquids)

U.S. gallon of water = 8.33 lbs @ std. cond.

1 cubic foot of water = 7.48 gallons

Air specific volume = 1/density = 13.1 cubic feet/lb

G of any gas = density of gas/0.076

T + 460

Standard conditions (U.S. customary) are at 14.69 psia & 60°F

Flow conversion of gas

$$\text{SCFH} = \frac{\text{Lbs/hr}}{\text{density}} \quad \text{SCFH} = \frac{\text{Lbs/hr} \times 379}{M} \quad \text{SCFH} = \frac{\text{Lbs/hr} \times 13.1}{G}$$

Flow conversion of liquid

$$\text{GPM} = \frac{\text{Lbs/hr}}{500 \times G}$$

Temperature Conversion

$$F \text{ (Fahrenheit)} = C(9/5) + 32$$

$$C \text{ (Celsius)} = (F - 32) / 9$$

METRIC CONVERSION TABLES

Multiply	By	To Obtain
<u>LENGTH</u>		
millimeters	0.039	inches
centimeters	0.394	inches
inches	2.54	centimeters
feet	30.48	centimeters
feet	0.304	meters
<u>AREA</u>		
sq. centimeters	0.155	sq. inches
sq. centimeters	0.001076	sq. feet
sq. inches	6.452	sq. centimeters
sq. inches	0.00694	sq. feet
sq. feet	929	sq. centimeters
<u>FLOW RATES</u>		
gallons US/minute (GPM)	3.785	liters/min
gallons US/minute	0.133	ft ³ /min
gallons US/minute	0.227	m ³ /hr
cubic feet/minute	7.481	GPM
cubic feet/hour	0.1247	GPM
cubic feet/hour	0.01667	ft ³ /min
cubic meters/hour	4.403	GPM
cubic meters/hour	35.31	ft ³ /hr
<u>VELOCITY</u>		
feet per second	0.3048	meters/second
feet per second	1.097	km/hr
feet per second	0.6818	miles/hr

Multiply	By	To Obtain
<u>VOLUME & CAPACITY</u>		
cubic feet	28.32	liters
cubic feet	7.4805	gallons
liters	61.02	cubic inches
liters	0.03531	cubic feet
liters	0.264	gallons
gallons	3785.0	cubic cm
gallons	231.0	cubic inches
gallons	0.1337	cubic feet
<u>WEIGHT</u>		
pounds	0.453	kilogram
kilogram	2.205	pounds
<u>PRESSURE & HEAD</u>		
pounds/sq. inch	0.06895	bar
pounds/sq. inch	0.06804	atmosphere
pounds/sq. inch	0.0703	Kg/cm ²
pounds/sq. inch	2.307	ft of H ₂ O (4°C)
pounds/sq. inch	0.703	m of H ₂ O (4°C)
pounds/sq. inch	5.171	cm of Hg (0°C)
pounds/sq. inch	2.036	in of Hg (0°C)
atmosphere	14.69	psi
atmosphere	1.013	bar
atmosphere	1.033	Kg/cm ²
atmosphere	101.3	kPa
bar	14.50	psi
kilogram/sq. cm	14.22	psi
kiloPascal	0.145	psi

Facilities: Brazil, Canada, France, Germany, Italy, Japan, Mexico, Netherlands, Singapore, Spain, United Kingdom, United States



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