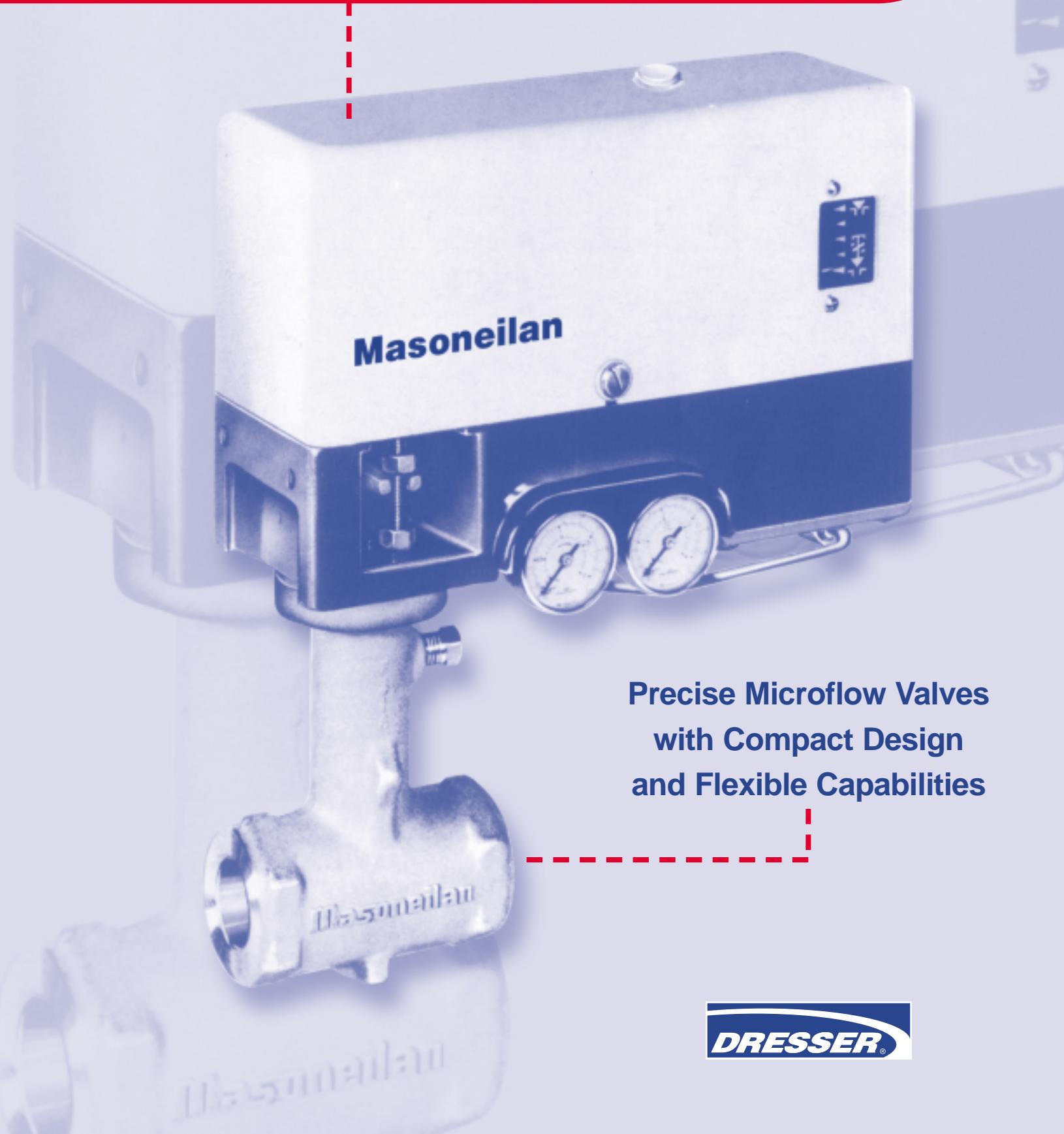


Masoneilan® 28000 Series Varipak® Control Valves

Specification Data

CH 4500

09/03



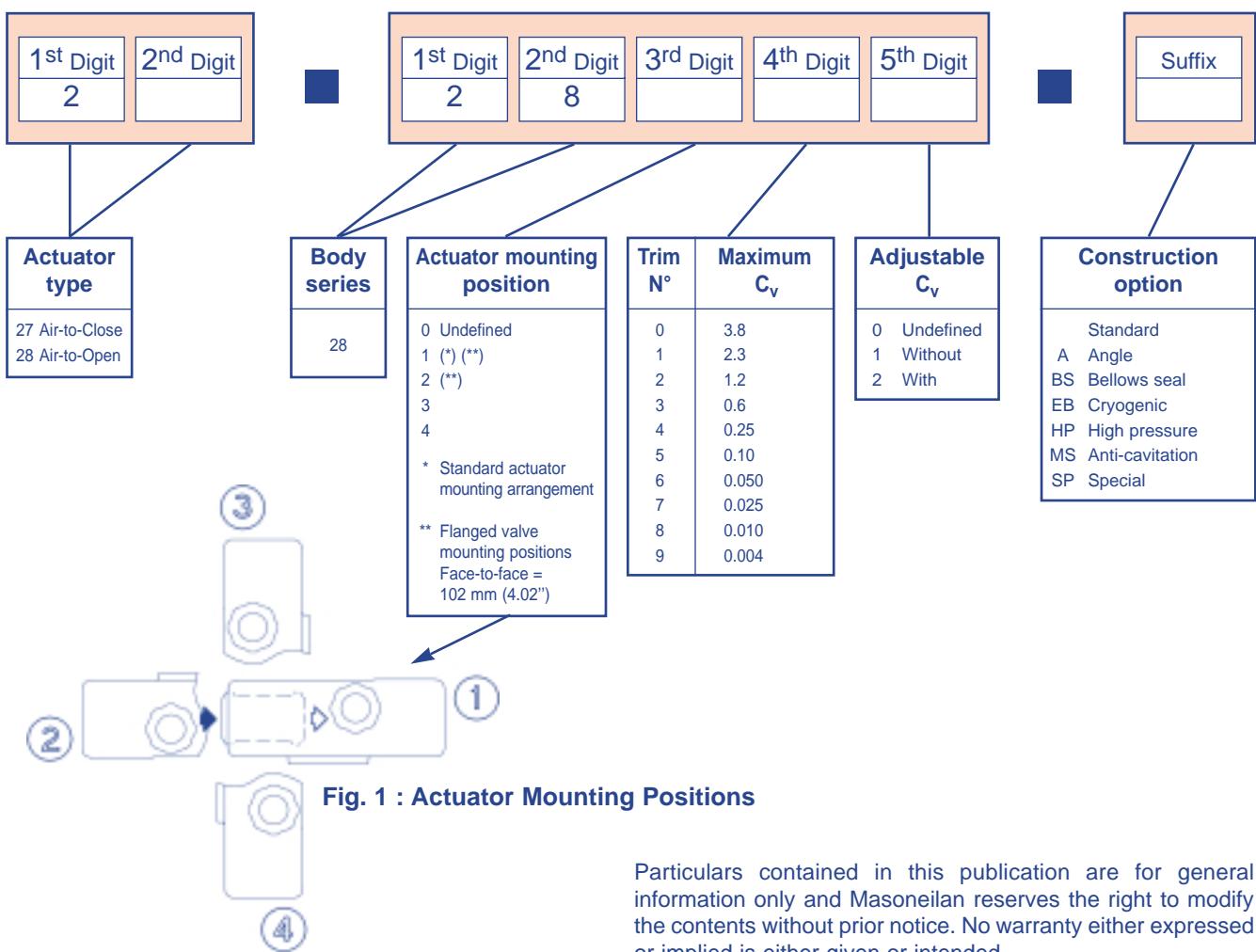
Precise Microflow Valves
with Compact Design
and Flexible Capabilities



Table of Contents

Numbering System	2
Features	3
Micro-Flow Control Innovation	4
General Data	5
Materials of Construction	6 & 7
Standard Flangeless Varipak	8
Standard Flanged Varipak	9
Varilog® Anti-cavitation Varipak	10
High Pressure Varipak	11
Bellows Seal Varipak	12
Cryogenic Varipak	13
Accessories and Options	14
Standard Actuator Options	15
Masoneilan Direct Sales Offices	16

Numbering System



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Designed specifically for low flow applications, the Masoneilan 28000 Series Varipak 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. Key design features include :

Heavy Top-Guiding

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. Heavy guiding is critical for controlling vibration damage, providing dependable control and seating performance, and minimizing trim mechanical wear.

Application Flexibility

Ten standard contoured trim designs are available providing flexible application using the same body platform. This helps to eliminate the effects of valve oversizing and improves control loop performance resulting in higher process efficiency.

Adjustable C_v

In addition to multiple standard trim sets, the Varipak is also available with an adjustable C_v option. This feature allows users to easily increase or decrease the C_v setting in order to accommodate changing operating conditions. Adjustment is achieved by simply setting a knob within the actuator assembly (see page 4 for details).

Compact Assembly

Maximum space savings is provided by the Varipak assembly through modular design and force amplification actuator technology. The actuator also includes a low profile top-mounted handwheel option.

Anti-Cavitation Trim

Varipak is also available with an effective high pressure liquid letdown anti-cavitation trim solution - the Varilog® trim. This unique design includes a multi-stage axial flow plug and liner, which provides dirt tolerant operation and high wear resistance.

Design Flexibility

Other standard configurations include a High Pressure ANSI Class 2500 design, a zero emissions Bellows Seal design, and a design for cryogenic applications. The Varipak is also available with an angle body design to accommodate existing piping configurations.

Ease of Maintenance

Varipak's simple top-entry body construction includes an integrated body and bonnet design, which allows for easy access and removal of the quick change trim. The integral liner and seat ring also reduces components and simplifies assembly and disassembly. Modularity of the actuator design further enhances maintainability of this unique valve assembly.



Fig. 2 : Varipak Family

Micro-Flow Control Innovation

Optimized C_v Characteristics

VariPak is far superior to conventional microflow valves in that it provides the user with a very wide range of nominal C_v ranges from 0.0016 to 3.8, using only eight plugs and five seats.

Precise C_v Calibration and Selection

C_v and F_L

Valve Sizes			Trim No.	Flow coefficient C_v								Critical Flow factor F_L
				With adjustable C_v function						Without adjustable C_v function		
15 mm (1/2")	20 mm (3/4")	25 mm (1")		Min	Risk-free (3)	Max						
●	●	●	9	0.0016	0.0020	0.0024	0.0028	0.0032	0.0036	0.0040	0.0040	0.85
●	●	●	8	0.004	0.005	0.006	0.007	0.008	0.009	0.010	0.010	0.85
●	●	●	7	0.010	0.013	0.016	0.019	0.021	0.023	0.025	0.025	0.85
●	●	●	6	0.020	0.025	0.030	0.035	0.040	0.045	0.050	0.050	0.85
●	●	●	5	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.10	0.90
●	●	●	4	0.10	0.13	0.16	0.19	0.21	0.23	0.25	0.25	0.90
●	●	●	3	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.60
●	●	●	2	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.2
●	●(2)	●(1)	1	0.9	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.3
			0	1.5	1.9	2.3	2.6	2.9	3.2	3.5	3.8	3.8

(1) : Flangeless, flanged or threaded connections.

(2) : Flangeless connections.

(3) : The "Risk-free" setting allows for easy valve capacity adjustments in the field to meet changing service conditions.

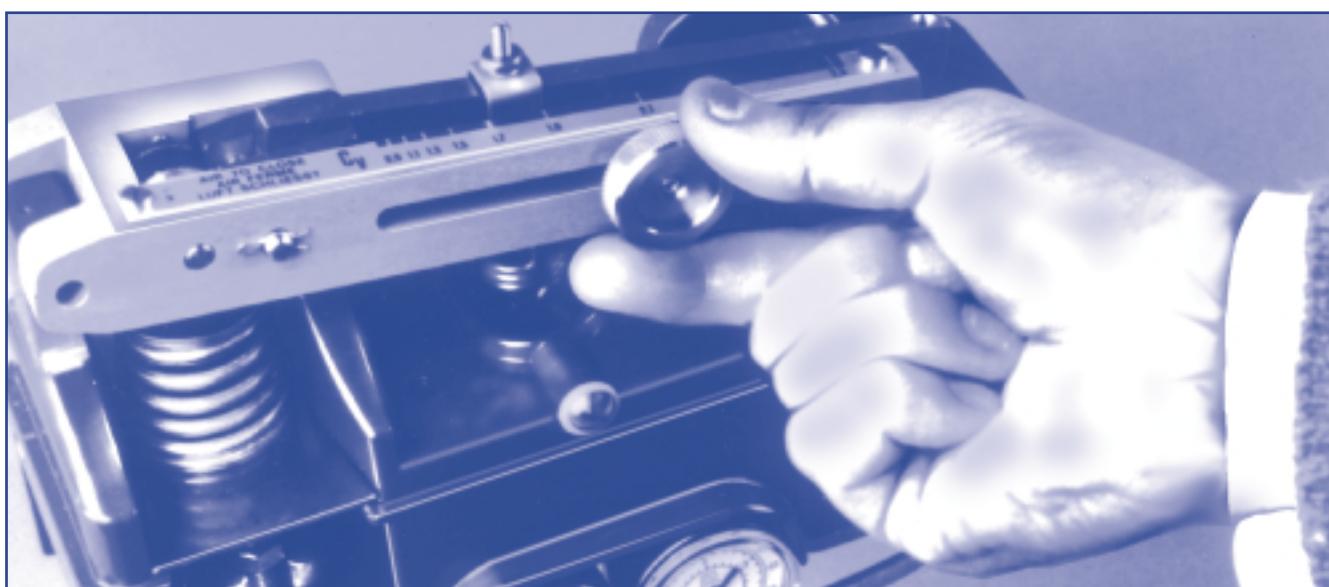


Fig. 3 : Flow Coefficient Adjustment

General Data

Body

Type :	globe style with angle style option
Sizes :	1" (DN 25) standard 1/2" (DN 15) and 3/4" (DN 20) optional
Materials :	Standard : type 316L st. st. Optional : Monel®, Hastelloy® C, Alloy 20, others
Options :	<ul style="list-style-type: none"> • Flanged valve • Anti-cavitation Varilog® • High pressure • Bellows seal • Cryogenic • Angle valve • NACE version

Actuator

Type :	spring-opposed rolling diaphragm
Action :	direct or reverse, easily performed without additional parts
C _v adjustment :	optional adjustable knob / lever
Handwheel :	optional top mounted
Air connection :	1/8" NPT

Trim

Plug type :	contoured, heavy top guided, multistaged anticavitation (Varilog)
Seat type :	metal seat
C _v ratio :	500/1 at max. C _v 200/1 at min. C _v
Flow characteristics :	linear (trim No. 0 to 5) modified linear (trim No. 6 to 9)
Flow direction :	flow-to-open

Temperature Range / Seat Leakage

Valve type	Temperature range ⁽¹⁾	Seat Class ⁽²⁾	
Standard and High Pressure valves	-196°C to +343°C (-320°F to +650°F)	IV	V
Cryogenic valves	-270°C to +150°C (-455°F to +300°F)		
Varilog anti-cavitation valves	-29°C to +343°C (-20°F to +650°F)		

(1) : Please consult Masoneilan for applications outside the temperature range.

(2) : Class IV seat leakage is standard and Class V is optional. Seat leakage class ratings per IEC 534-4 and ANSI/FCI 70-2.

Ratings / End Connections**

Valve sizes		Maximum C _v	ANSI Class 150-1500 ISO PN 20-250					ANSI Class 150-600 ISO PN 20-100	
Inches	mm		Flangeless	Threaded	SW	BW	Flanged Face-to-face : 160 mm (6.3")	Flanged Face-to-face : 102 mm (4")	
1/2	15	2.3	●	●	●		●	●	
3/4	20	2.3	● ^(*)	●	●		●	●	
1	25	3.8	●	●	●	●	●	●	

(*) : Available with maximum rating of ANSI Class 600 / ISO PN 100.

(**) : Please consult Masoneilan for applications requiring ANSI Class 2500 / ISO PN 420 rating.

Materials of Construction

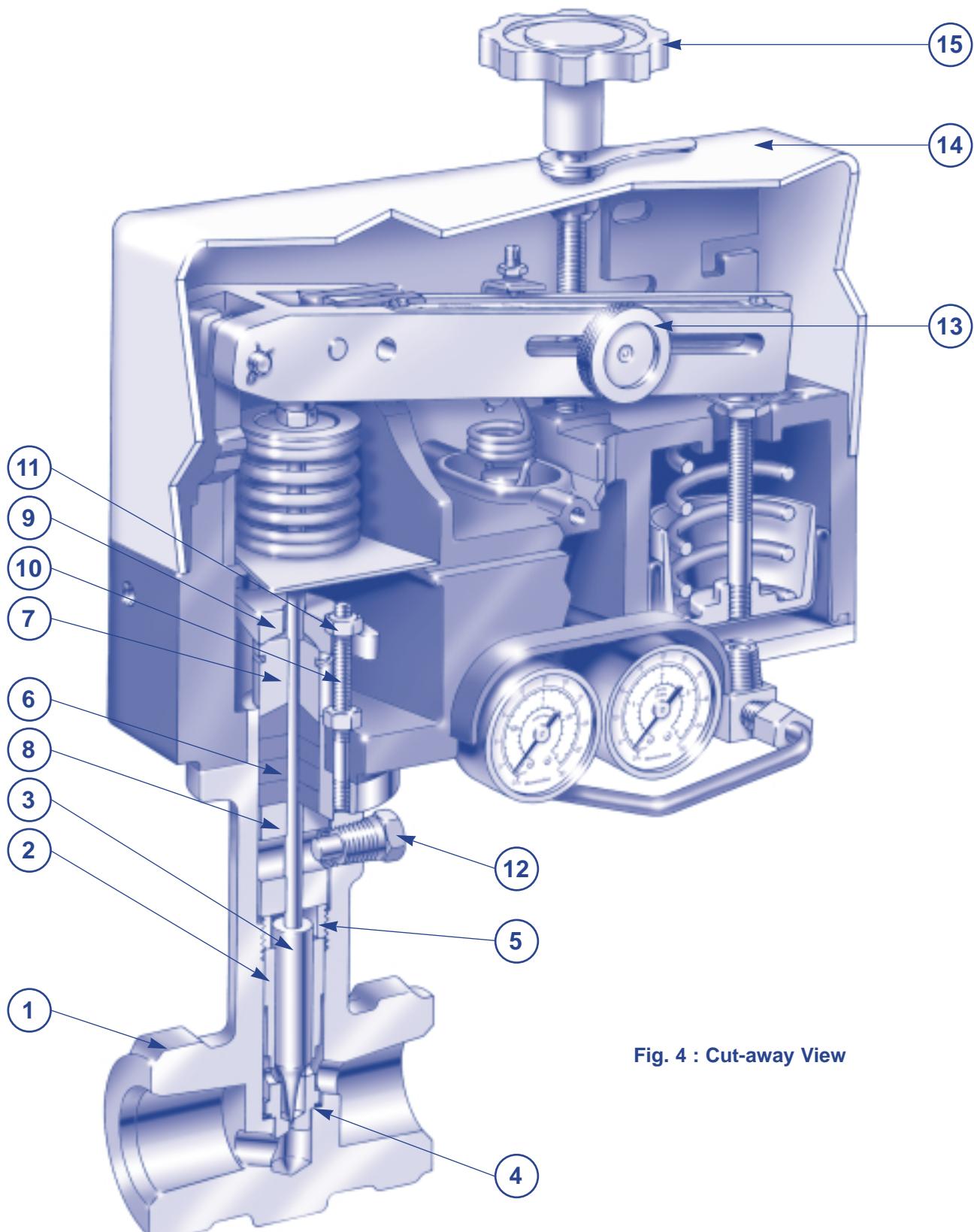


Fig. 4 : Cut-away View

Materials* (standard construction**)

Ref. No.	Temperature Range	-196°C (-320°F)	+232°C (+450°F)	+343°C (+650°F)	
		Part Name	Standard Materials (optional materials)		
1	Body	316L st. st. ASTM A182 Gr. F 316L (forging)			
		316L st. st. ASTM A351 Gr. CF3M (casting)			
		<i>Optional : Monel®, Hastelloy® C, Alloy 20</i>			
2	Seat	17-4 PH st. st. ASTM A564 Gr. 630 Condition H900 (Max. C _v ≥ 0.10, trims No. 0 to 5)			
		Solid Stellite® No. 6 (Max. C _v ≤ 0.05, trims No. 6 to 9)			
		<i>Optional : 440C st. st., Monel®, Hastelloy® C, Alloy 20</i>			
3	Plug	Solid Stellite® No. 6 (Max. C _v ≥ 0.10, trims No. 0 to 5)			
		Solid Stellite® No. 12 (Max. C _v ≤ 0.05, trims No. 6 to 9)			
		<i>Optional : 440C st. st., Monel®, Hastelloy® C, Alloy 20</i>			
4	Seat Ring Gasket	Grafoil® with 316 st. st. inserts			
5	Seat Ring Retainer	17-4 PH st. st. ASTM A564 Gr. 630 Condition H1075			
6	Packing	Kevlar® PTFE (standard up to ASME Class 1500)			
		Lattyflon® (with optional Viton® O-rings)			
7	Packing Follower	303 st. st. ASTM A582 TY 303			
8	Packing Spacer	316 st. st. ASTM A479 TY 316			
9	Packing Flange	304 st. st. AISI 304			
10	Packing Flange Studs	304 st. st. ASTM A193 Gr. B8			
11	Packing Flange Nuts	304 st. st. ASTM A193 Gr. 8			
12	Safety Pin	316 st. st. ASTM A479 TY 316			
13	Cv Adjustment Knob	Stainless steel			
14	Actuator Cover	Polycarbonate			
		<i>Optional : stainless steel</i>			
15	Handwheel (optional)	Lexan® + austenitic st. st.			

* Other materials suitable for corrosive fluids and NACE Specification are available on request.

** Materials noted throughout text are for reference only. Masoneilan reserves the right to supply trade name material or equivalent.

Material not applicable

Standard Flangeless Varipak - 28000 Series



Fig. 5 : Standard Flangeless Varipak

The standard flangeless Varipak valve is widely used in all industries. This can be attributed to the overall compactness and simplicity of the flangeless construction, and the wide application range of the stainless steel body design.

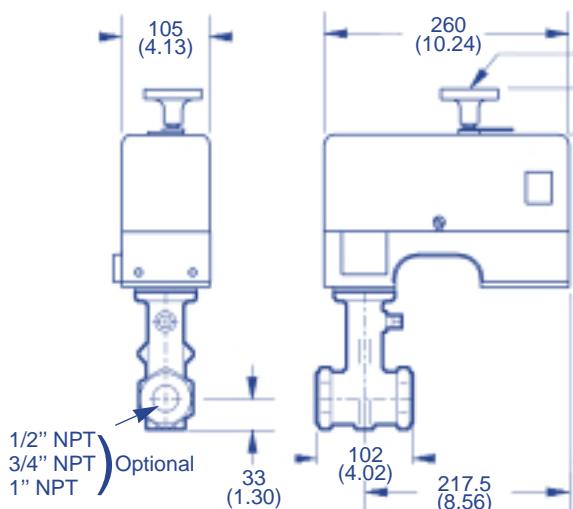
- Numbering system : see page 2.
- General data : see page 5.
- Materials : standard construction, see page 7.
- Accessories and options : see page 14.

Rated Cv Range / Weight

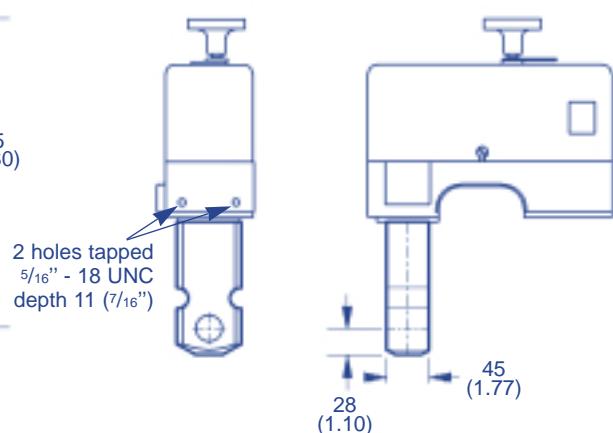
Body / actuator assembly weight	Rated Cv range
7 kg (15.4 lbs)	3.8 to 0.0040 (trim No. 0 to 9)

Dimensions - mm (inches)

Standard Varipak (stainless steel)



Bar stock body (for non-castable material)



Provide a removal clearance of 140 mm (5.5 inches)

Standard Flanged Varipak - 28000 Series



Fig. 6 : Standard Flanged Varipak

The Varipak is also available in flanged configurations with connections and ratings as indicated in the table below.

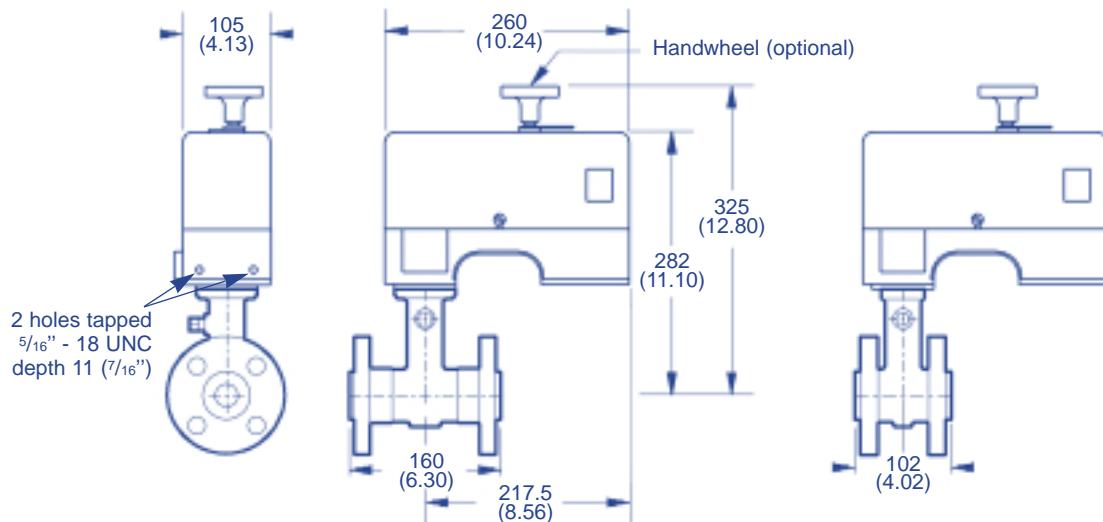
- Numbering system : see page 2.
- General data : see page 5.
- Materials : standard construction, see page 7.
- Accessories and options : see page 14.

Flange Ratings / Weight

Face-to-face dimensions	Flange ratings	Body / actuator S/A weight *	Rated C _V range
102 mm (4")	ANSI Class 150-600 ISO PN 20-100 (raised face only)	8 to 10 kg (17.4 to 22 lbs)	3.8 to 0.0040 (trim No. 0 to 9)
160 mm (6.3")	ANSI Class 150-1500 ISO PN 20-250 DIN PN 10-250 (RF, FF, RTS, etc...)	10 to 12 kg (22 to 26.5 lbs)	

* depending on rating.

Dimensions - mm (inches)



Varilog® Anti-Cavitation Varipak - 28000 MS Series

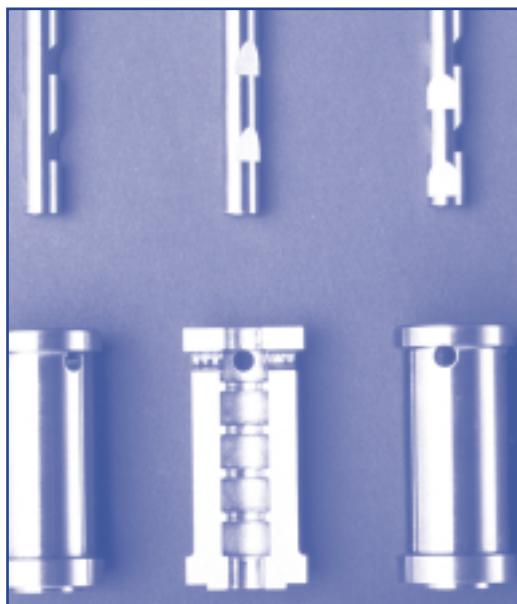


Fig. 7 : Varilog Trim Subassembly

The Varilog multi-stage trim design provides unmatched anticavitation performance in low flow applications.

It minimizes erosion and vibrations, which typically leads to failure in conventional single-seated valves. The Varilog trim is available with the standard Varipak body designs in either the flanged or flangeless configurations.

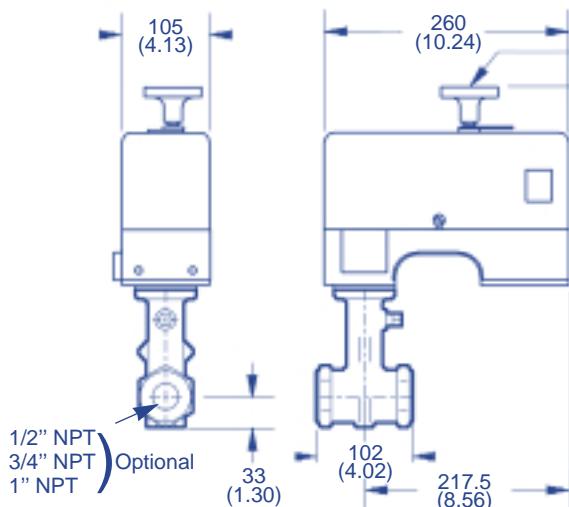
- Numbering system : see page 2.
- General data : see page 5.
- Accessories and options : see page 14.
- Materials : see chart below.

Specific Characteristics

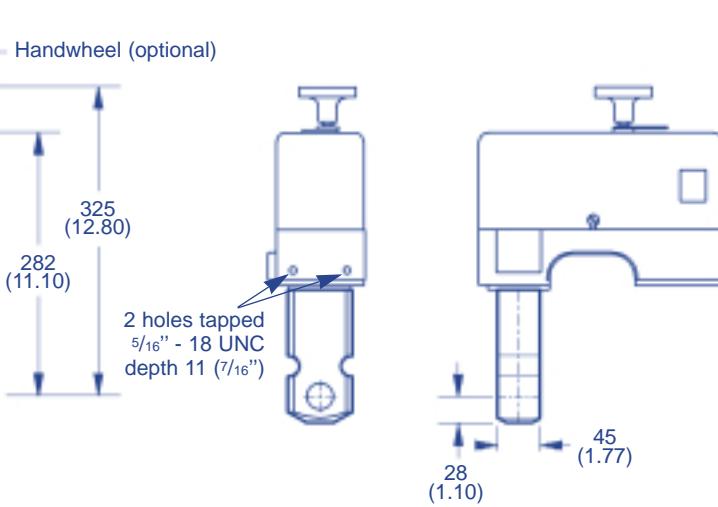
Rated Cv range	Critical flow factor F _L	Temperature range	Materials	
0.60 to 0.050 (trim No. 3 to 6)	≥ 0.98	-29°C to +350°C (-20°F to +660°F)	Seat	ASTM A 564 Gr. 630 Condition H900 Type 17-4 PH st. st.
			Plug	One part from solid stellite No. 12 or ASTM A 276 type 440 C st. st.
			Other parts	Standard construction : see page 7

Dimensions - mm (inches)

Standard Varipak (stainless steel)



Bar stock body (for non-castable material)



Provide a removal clearance of 140 mm (5.5 inches)

High Pressure Varipak - 28000 HP Series



Fig. 8 : High Pressure Varipak

Where very high upstream pressure occurs or where the pressure drop exceeds the pressure rating of the standard body (see page 8), a high pressure Varipak is the recommended choice.

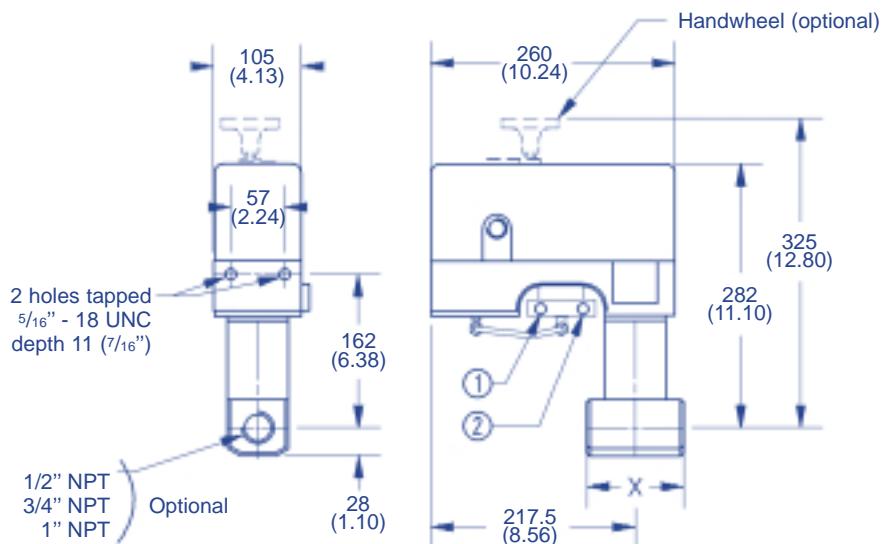
- Numbering system : see page 2.
- General data : see page 5.
- Accessories and options : see page 14.
- Materials : see chart below.

Specific Characteristics

Rated Cv range	Body rating	Seat leakage	Materials	
0.60 to 0.0040 (trim No. 3 to 9)	ANSI Class 2500 ISO PN 420	Class IV	Body	ASTM A 182 Gr. F 316L <i>Optional : ASTM A182 Gr. F 316</i>
			Other parts	Standard construction : see page 7

Note : Please consult Masoneilan for further information.

Dimensions - mm (inches)



- ① 1/4" NPT Supply Connection
- ② 1/4" NPT Instrument Connection

Valve Sizes		X	
mm	inches	mm	inches
15	1/2	80	3.15
20	3/4	102	4.02
25	1		

Provide a removal clearance of 140 mm (5.5 inches)

Bellows Seal Varipak - 28000 BS Series

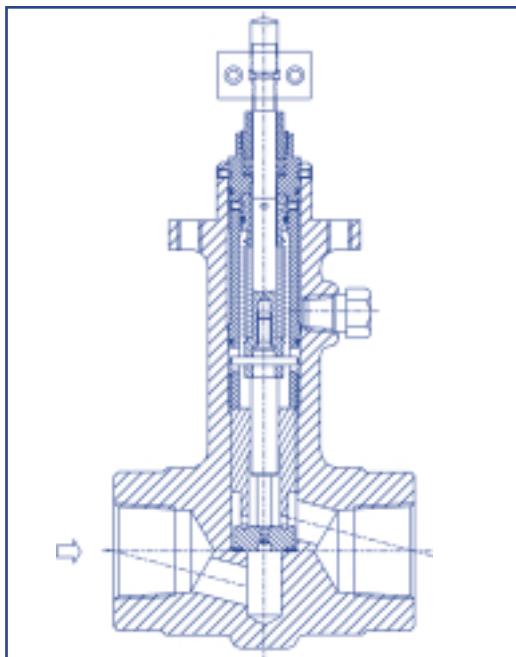


Fig. 9a : Bellows Seal Varipak

A version of the Varipak with 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 flammable, toxic or explosive fluids.

- Numbering system : see page 2.
- General data : see page 5.
- Accessories and options : see page 14.
- Materials : see chart below.

Specific Characteristics

Rated Cv range	Body rating	Seat leakage	Operating pressures	Materials	
2.3 to 0.0040 (trim No. 1 to 9)	ANSI Class 150-600 ISO PN 20-100	Class IV	55 bar at +100°C (800 psi at +212°F) 40 bar at +200°C (580 psi at +392°F)	Body	ASTM A 182 Gr. F 316L Optional : A182 Gr. F 316
				Plug / bellows subassembly	Plug and seat : standard materials Bellows assembly : 316L St. St. Viton® O-rings
				Other parts	Standard construction : see page 7

Dimensions - mm (inches)

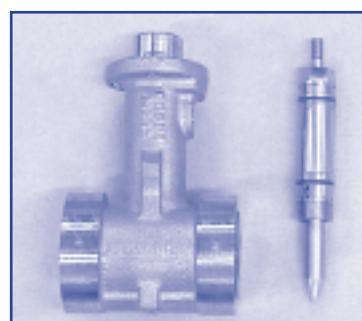
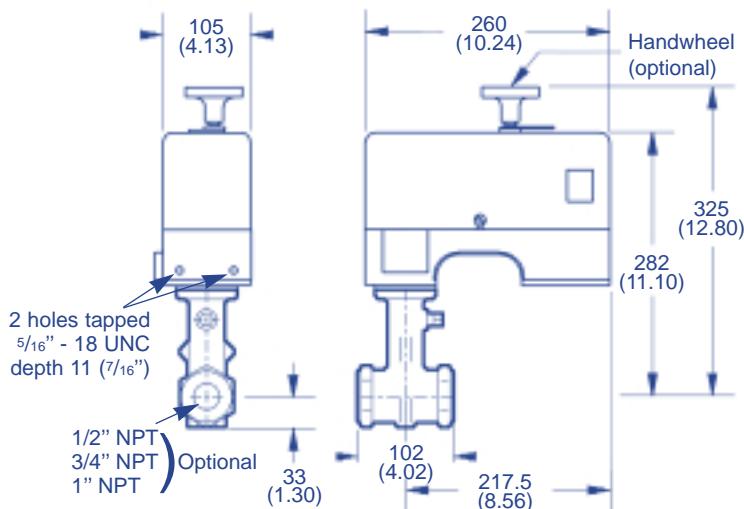


Fig. 9b : Plug and bellows subassembly

Simplified maintenance

The cryogenic Varipak meets the requirements of cryogenic processes requiring thermal insulation. An 'insulating interface' sets up between the valve body ('cold zone') and the body extension located in the higher temperature area ('warm zone'). The valve body assembly and its thermal extension are positioned inside the 'cold box'. The plug can be easily removed and inspected without disturbing the valve body. This precludes any preliminary, complicated dismounting, and more importantly, prevents interfering in any way with the 'cold box'.

Body

The valve body, manufactured from a material suitable for low temperatures, maintains ductility in service. It can be conveniently mounted to suit any specific piping needs. However, arrangements must be made so that the angle between the valve axis and vertical does not exceed 60°.

The bonnet is located away from the cryogenic fluid, which means that the body gasket is not inside the cold zone. This design prevents any leakage of the cryogen into the insulated zone.

Body extension

The body extension and coupling sleeve are thin-walled metal tubes so as to minimize the inflow of heat by conduction. The annular space is reduced in order to exclude any convection currents.

Plug

The design of the plug allows the working parts to be perfectly centered in relation to the seat and provides a uniform temperature zone for the guiding.

- Numbering system : see page 2.
- General data : see page 5.
- Accessories and options : see page 14.
- Materials : see chart below.

Specific Characteristics

Rated Cv range	Temperature range	Body rating	Seat leakage	Materials	
3.8 to 0.10 (trim No. 0 to 5)	-270°C to + 150°C (-455°F to +300°F)	ANSI Class 150-600 ISO PN 20-100 excepted trim No. 0 : ANSI Class 150-300 ISO PN 20-50	Class IV	Body and extension	ASTM A 182 Gr. F 316L
				Plug / stem	Standard material
				Seat	Trim No. 0 : standard material Trim No. 1 to 5 : ASTM A 564 Gr. 630 Condition H900 Type 17-4 PH. St. St.
				O-ring seat gasket	PTFE
				Other parts	Standard construction : see page 7

Dimensions - mm (inches)

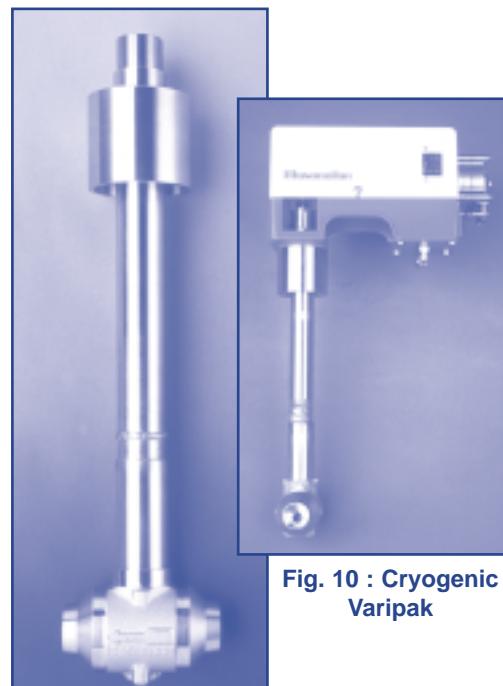
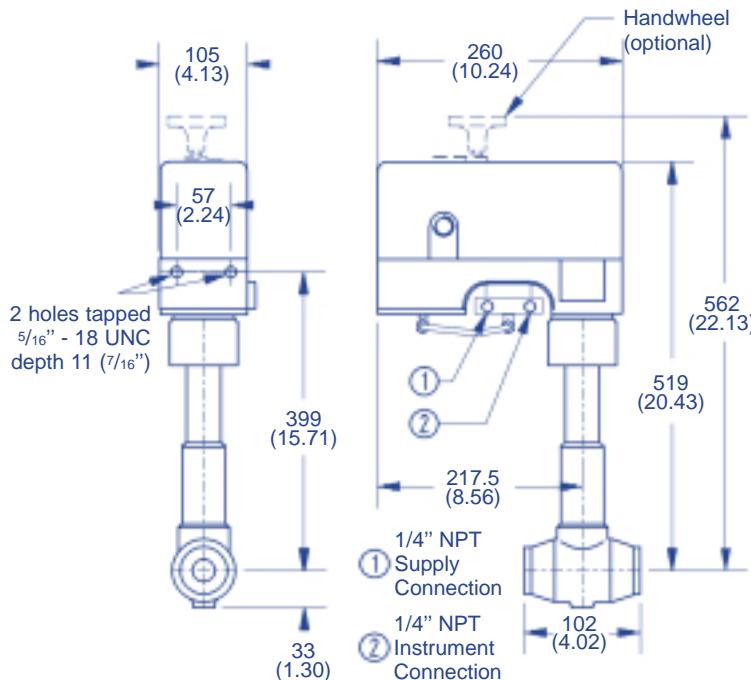


Fig. 10 : Cryogenic Varipak

Accessories and Options

Pneumatic positioner (model 7700P)

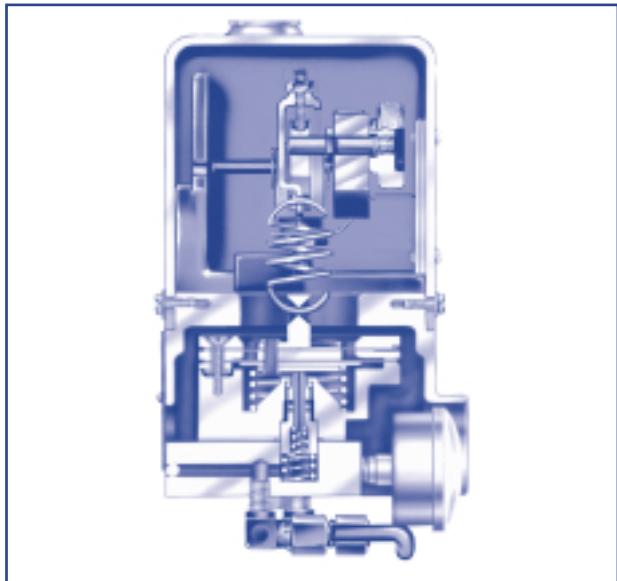


Fig. 11 : Model 7700P Pneumatic Positioner

Type :	pneumatic, force balance
Mounting :	built-in bracket in actuator
Action :	direct : increasing instrument signal increases air output
Characteristics :	linear
Instrument signal :	200 to 1000, 400 to 2050 or 200 to 1850 mbar (3 to 15, 6 to 30 or 3 to 27 psi)
	200 to 600 and 600 to 1000 mbar (3 to 9, and 9 to 15 psi)
	split range
Connections :	1/4" NPT instrument and supply - 1/8" NPT output
Average air consumption :	0.26 Nm ³ /h at 2.1 bar supply (0.15 scfm at 30 psi supply)
Max. air output :	7 Nm ³ /h (4.20 scfm)
Supply pressure effect :	0.07% of full stroke variation per 100 mbar supply pressure change (0.05% per psi)
Open loop gain :	70
Linearity :	± 0.5%
Sensitivity :	0.1%
Repeatability :	0.1%
Full stroke time :	less than one second
Weight :	1.5 kg (3.3 lbs)

Other Accessories

Proximity sensors and limit switches
Digital positioners - HART® and Fieldbus Foundation
Handwheel, airtsets and solenoid valves

Electropneumatic positioner (model 7700E)

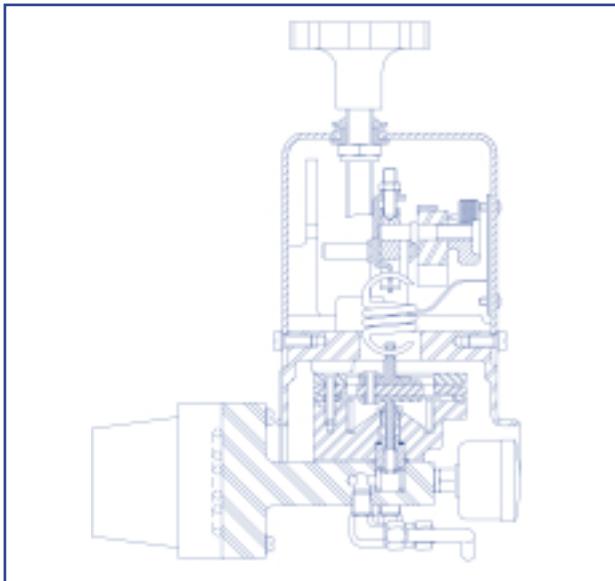


Fig. 12 : Model 7700E Electropneumatic Positioner

Type :	electropneumatic, force balance
Mounting :	compact, without external linkage to the actuator.
Action :	direct : increasing instrument signal increases air output
Characteristics :	linear
Instrument signal :	4-20 mA
Air connections :	1/4" NPT supply - 1/8" NPT output
Average air consumption :	0.4 Nm ³ /h (0.24 scfm)
Electrical connections :	1/2" NPT or M20
Weight :	3.5 kg (7.7 lbs)

Hazardous Location Protection

ATEX Approvals (94/9/EC Directive)

Explosionproof
No. SIRA 02 ATEX 1274
Intrinsic Safety
No. SIRA 02 ATEX 2277 X

FM (Factory Mutual) Approvals

Explosionproof
Intrinsic Safety
Non-incendive and Dust-ignitionproof

CSA Approvals (Canadian Standards Association)

Explosionproof
Intrinsic Safety
Non-incendive

Standard Actuator Options

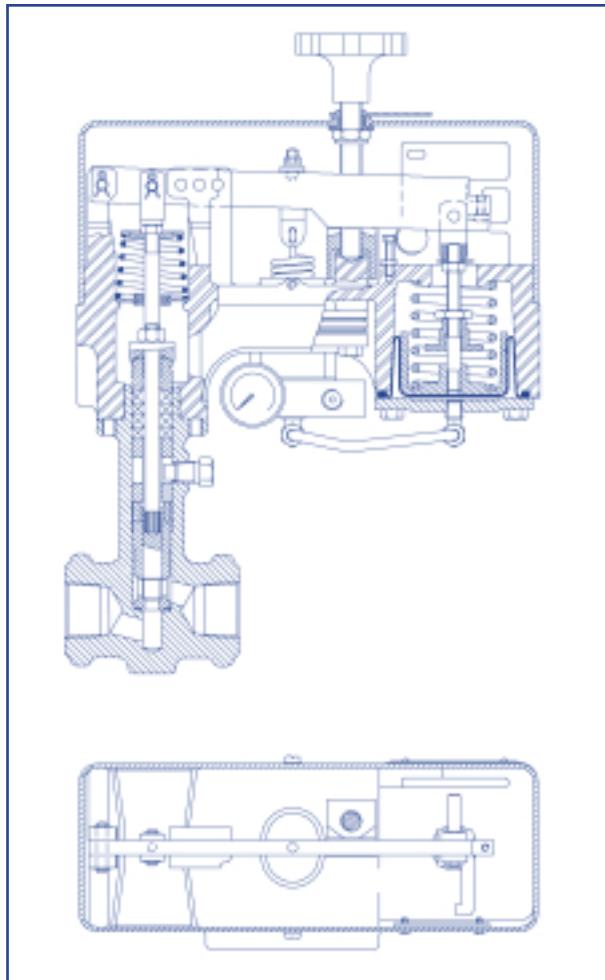


Fig. 13 : Non Adjustable C_v Actuator



Fig. 15 : Varipak with 7700E
Electropneumatic Positioner

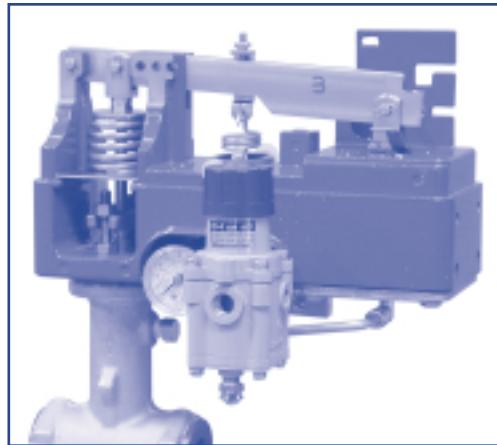


Fig. 14 : Varipak with Non-Adjustable
 C_v Actuator (cover removed)

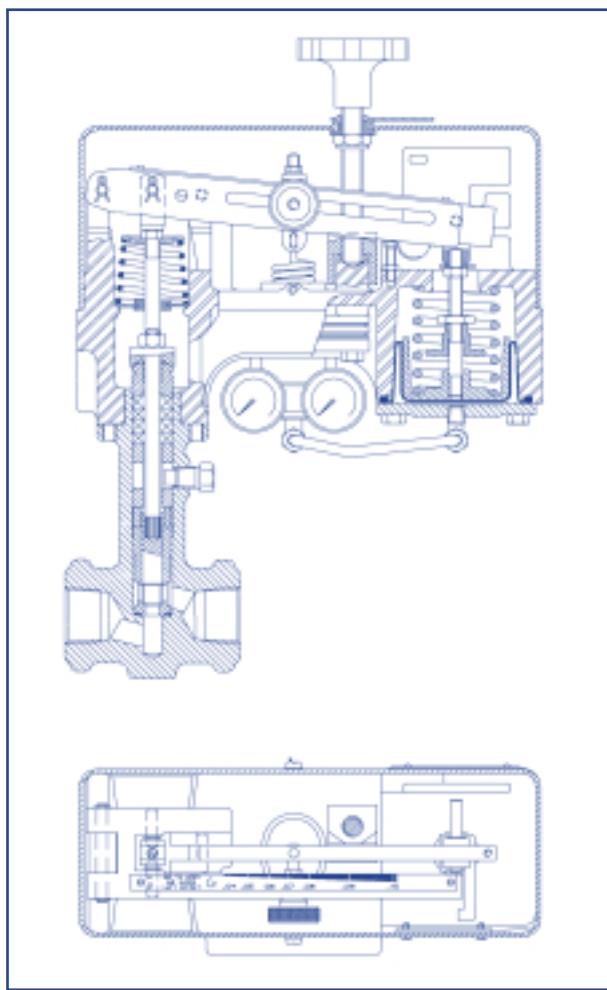


Fig. 16 : Adjustable C_v Actuator

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