SMVI intelligent control valves

Two-way metering valves with a stepping motor, four control modes and RS-485, up to 1000 sL/min air

The SMVI is a two-way metering needle valve for gases and liquids, in aluminium or 316 stainless steel. A linear stepping motor drives the spindle, so the valve keeps its position when power is off and never suffers from coil heating. It follows an analogue signal, RS-485 commands, direction and speed, or step clock and direction.



1000 sL/min	0.000125 in	100 ms	500 psig	4
Largest air flow (SMVI40); water 28 L/min	Resolution per full step, standard	Response (time constant)	Maximum operating pressure (35 bar g)	Control modes, set by push button or RS-485

Performance (21.11 °C, 1013.25 mbar)

Resolution	Standard: 0.000125 in per full step 1/16 microstepping (default): 0.0000078125 in per microstep Needle travel, closed to fully open: about 0.2 in, about 25 500 microsteps
Response time	100 ms time constant
Duty cycle	100 % (continuous) at low differential pressure
Maximum flow	1000 sL/min air, 28 L/min water (SMVI40); each size in the ranges table
Flow characteristic	Flow is not proportional to the valve opening; it depends on the differential pressure
Leak tightness	Outside: 1 × 10⁻⁷ smL/s helium maximum Valve closed: up to 0.5 % of full scale at 30 psid

Operating conditions

Media	Gases and liquids; flow rates are given for air and water
Maximum operating pressure	500 psig (35 bar g)
Maximum differential pressure	50 psid (3.45 bar)
Gas and ambient temperature	32–122 °F (0–50 °C)
Environment	Installation level II, pollution degree II (IEC 664)

Mechanical

Design	Two-way metering needle valve; a linear stepping motor drives the spindle and needle tip
Aluminium models	Aluminium housings and valve blocks, PFA closing pins
Stainless steel models	316 stainless steel valve blocks, PTFE-lined aluminium housing blocks, PFA closing pins
Wetted materials	Aluminium models: anodised aluminium, brass, 316 stainless steel, FKM O-rings Stainless steel models: 316 stainless steel, FKM O-rings Optional O-rings: NBR, EPR or FFKM
Connections	3/8", 1/2" and 3/4" compression; 3/4" female NPT
Mounting holes	Two 8-32 UNC-2B, 0.300 in deep, 61 mm and 35.6 mm apart, 7.6 mm from the edges
Ingress protection	IP40

Electrical and communication

Power supply	12–24 V DC, 800 mA maximum, ripple below 150 mV peak-to-peak; never above 26 V DC 900 mA resettable fuse on each power input
Connector	9-pin D connector at the side of the valve Power: + on pins 5 and 9, − on pins 1 and 6 Wire of 23 AWG or finer: use both pins of each pair
Analogue input	Pin 4 to pin 1 or 6 0–5, 1–5 or 0–10 V DC, about 100 kΩ; 4–20 mA, about 250 Ω Never above 10.5 V DC Dead band 0.4 % of full scale by default; below it the opening or speed is zero
Direction input	Pin 8, 5 V TTL, 10 kΩ pull-up, 5.5 V DC maximum; an open input reads high Low (< 0.8 V DC): needle moves down, valve closes High (> 2 V DC): needle moves up, valve opens
Step clock input	Pin 2, 5 V TTL, 10 kΩ pull-up, 5.5 V DC maximum Each falling edge moves the needle one microstep
Close and open overrides	Pin 3 to ground (pin 1 or 6) closes the valve; green light Pin 7 to ground (pin 1 or 6) opens it fully; red light TTL low active (< 0.8 V DC), 5.5 V DC maximum, 2 kΩ pull-ups to 5 V DC Switch with open-collector NPN transistors, relays or a toggle switch
RS-485 interface	Galvanically isolated, two-wire, half duplex; ASCII commands 9600 baud by default, 1200–115 200 baud; 8 data bits, 1 stop bit, no parity
RS-485 bus	Address 11 by default, 00 is global; up to 64 devices per segment, up to 2000 ft 120 Ω termination at the last device of a bus over 100 m
RS-485 connector	3.5 mm three-pin audio jack: tip A+, ring B−, sleeve ground Supplied: 3 ft cable, stereo plug to three stripped wires
Power off and power-up	Power off: the valve stays in its last position Power-up: the valve closes within 2–3 s, then follows its control mode

Compliance

EMC, models with CE marking	Directive 2014/30/EU Emission: EN 61000-6-3; EN 55011, group 1, class A Immunity: EN 61000-6-1, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-6

Control modes

Analogue	Opening 0–100 % in proportion to 0–5, 1–5 or 0–10 V DC, or 4–20 mA
RS-485	Opening sent as 0.00–100.00 % in 0.01 % steps; every parameter readable and settable
Direction and speed	The SMV's mode; direction on pin 8, analogue speed on pin 4; 100 % is 991.8 full steps per second
Step clock and direction	One microstep per falling edge on pin 2, in the direction set on pin 8

Push button and indicator lights

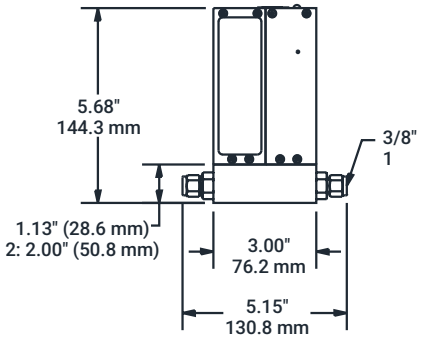
Indicator lights	Power, valve position (green closed, red fully open) and valve status
Push button, read	Released before 6 s: red flashes (1–4) show the control mode Released at 6–12 s: amber flashes (1–4) show the analogue input
Push button, set	Released at 12–18 s: select the control mode by the number of presses Released at 18–24 s: select the analogue input the same way Start within 16 s; hold each press until the green light goes out
Order of the options	Modes: analogue (1), RS-485 (2), direction and speed (3), step clock (4) Inputs: 0–5 V DC (1), 0–10 V DC (2), 1–5 V DC (3), 4–20 mA (4)

Flow rates, pressure drop (21.11 °C, 1013.25 mbar)

Model	Air, sL/min	Air, scfh	Water, L/min	Water, gal/min	Cv	Δp, psid	Δp, mbar	Connection	Orifice
SMVI20	200	424	5.6	1.48	0.336	5	350	3/8" compression	3/8"
SMVI30	500	1060	14.2	3.75	0.855	7	490	1/2" compression	3/8"
SMVI40	1000	2119	28	7.4	1.735	10	700	3/4" female NPT or 3/4" compression	1/2"

Maximum flow at 20 psid differential pressure and 70 °F. Δp: pressure drop at 100 % of full scale. Each size is made in aluminium and in stainless steel.

Dimensions, SMVI20

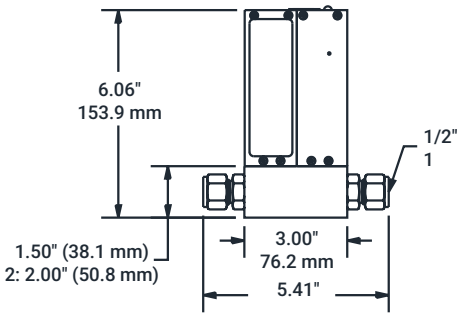


1 Compression fittings, both sides

2 Depth

Side view, inches with millimetres.

Dimensions, SMVI30

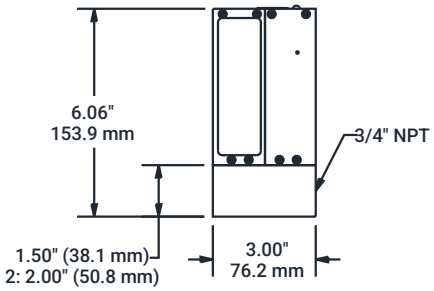


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2 Depth

Side view, inches with millimetres.

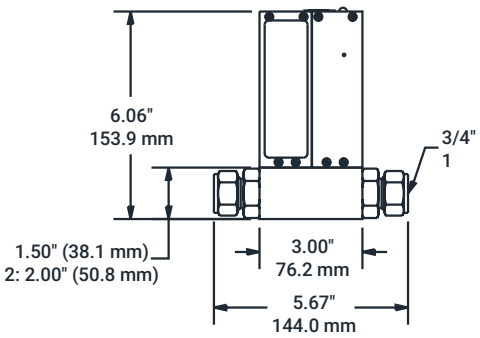
Dimensions, SMVI40



2 Depth

Side view with 3/4" female NPT ports, inches with millimetres.

Dimensions, SMVI40C



1 Compression fittings, both sides

2 Depth

SMVI40 with 3/4" compression fittings (code G), side view, inches with millimetres.

Order codes

Model	Version	Order code
SMVI20	Aluminium, NBR, 3/8" compression, RS-485, 0–5 V DC	SMVI20-ABD6-BA
SMVI30	Stainless steel, FKM, 1/2" compression, analogue, 0–5 V DC	SMVI30-SVE6-AA

Order from Analyt-MTC with the order codes. For any other version, build the code from the tables below and ask Analyt-MTC.

Model code: series, material and seals

Position	Code	Meaning
Series	20	SMVI20, 200 sL/min air
Series	30	SMVI30, 500 sL/min air
Series	40	SMVI40, 1000 sL/min air
Material	A	Aluminium
Material	S	Stainless steel

Position	Code	Meaning
Seals	V	FKM
Seals	B	NBR
Seals	E	EPR
Seals	T	PTFE/FFKM

The code reads SMVI, series, material, seals, fittings, power, control mode and analogue input, for example SMVI30-SVE6-AA.

Model code: fittings and power

Position	Code	Meaning	Series
Fittings	D	3/8" compression	SMVI20
Fittings	E	1/2" compression	SMVI30
Fittings	F	3/4" female NPT	SMVI40
Fittings	G	3/4" compression	SMVI40
Power	6	Universal 12–24 V DC	All

Model code: control mode and analogue input

Position	Code	Meaning
Control mode	A	Analogue, % of opening
Control mode	B	RS-485, every parameter including % of opening
Control mode	C	Direction and speed, the SMV's mode
Control mode	D	Step clock and direction

Position	Code	Meaning
Analogue input	A	0–5 V DC
Analogue input	B	0–10 V DC, set at the factory
Analogue input	C	1–5 V DC
Analogue input	D	4–20 mA

Analogue input for control modes A and C only. 0–10 V DC needs a jumper on the circuit board: specify it in the order.

Notes

1. Standard units (sL/min, smL/s) refer to 21.11 °C, 1013.25 mbar.
2. Example: SMVI30-SVE6-AA is an SMVI30 in stainless steel with FKM seals, 1/2" compression fittings, universal 12–24 V DC power, analogue control and a 0–5 V DC input.
3. Designs and dimensions can change without notice; ask Analyt-MTC for certified dimensions before you build a valve in.
4. Materials: FKM fluoroelastomer, FFKM perfluoroelastomer, NBR nitrile rubber, EPR ethylene propylene rubber, PTFE polytetrafluoroethylene, PFA perfluoroalkoxy. TTL: transistor-transistor logic; ASCII: the standard text character set.

ANALYT-MTC Messtechnik GmbH
Sales, service and calibration

www.analyt-mtc.com

German Headquarters
Klosterrunsstraße 18, 79379 Müllheim
+49 7631 5545
info@analyt-mtc.de

French Subsidiary
175 Avenue d'Alsace, 68000 Colmar
+33 3 89 41 47 78
info@analyt-mtc.fr

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