

# molbloc-S ranges with high pressure, standard pressure and low pressure calibrations

# FLUKE®

DH Instruments

			molbloc-S size, $K_f$ (sccm/kPa), and full scale flow (slm @ 0 °C)												
			Size	1E1-S	2E1-S	5E1-S	1E2-S	2E2-S	5E2-S	1E3-S	2E3-S	5E3-S	1E4-S		
			$K_f$ (sccm/kPa)	10	20	50	100	200	500	1000	2000	5000	10000		
Gases	Ratio	Cal type													
Inert	Nitrogen	N <sub>2</sub>	1.000	HP	20.00	40.00	100.0	200.0	400.0	1000.0	2000	4000	10000	20000	
				SP	5.00	10.00	25.0	50.0	100.0	250.0	500	1000	2500	5000	
				LP	2.00	4.00	10.0	20.0	40.0	100.0	200	400	1000	2000	4000
				minimum w/o vac	2.00	3.50	7.7	15.0	28.0	67.0	129	248	596	1173	
	Argon	Ar	0.837	HP	16.74	33.49	83.7	167.4	334.9	837.2	1674	3349	8372	16744	
				SP	4.19	8.37	20.9	41.9	83.7	209.3	419	837	2093	4186	
				LP	1.67	3.35	8.4	16.7	33.5	83.7	167	335	837	1674	
				minimum w/o vac	1.70	3.00	6.5	12.9	23.3	57.1	108	208	498	996	
	Helium	He	2.647	HP	52.94	105.87	264.7	529.4	1058.7	2646.8	5294	10587	26468	52936	
				SP	13.23	26.47	66.2	132.3	264.7	661.7	1323	2647	6617	13234	
				LP	5.29	10.59	26.5	52.9	105.9	264.7	529	1059	2647	5294	
				minimum w/o vac	9.40	13.10	25.7	51.4	91.5	199.4	399	695	1738	3281	
Sulfur hexafluoride	SF <sub>6</sub>	0.435	HP	8.70	17.39	43.5	87.0	173.9	434.8	870	1739	4348	8695		
			SP	2.17	4.35	10.9	21.7	43.5	108.7	217	435	1087	2174		
			LP	0.87	1.74	4.3	8.7	17.4	43.5	87	174	435	870		
			minimum w/o vac	0.80	1.40	3.1	5.9	11.4	26.9	54	100	250	500		
Xenon	Xe	0.460	HP	9.21	18.42	46.0	92.1	184.2	460.4	921	1842	4604	9209		
			SP	2.30	4.60	11.5	23.0	46.0	115.1	230	460	1151	2302		
			LP	0.92	1.84	4.6	9.2	18.4	46.0	92	184	460	921		
			minimum w/o vac	0.80	1.40	3.6	6.5	12.9	29.7	59	110	267	529		
Flammable	Ethane	C <sub>2</sub> H <sub>6</sub>	0.960	HP	19.21	38.42	96.0	192.1	384.2	960.4	1921	3842	9604	19208	
				SP	4.80	9.60	24.0	48.0	96.0	240.1	480	960	2401	4802	
				LP	1.92	3.84	9.6	19.2	38.4	96.0	192	384	960	1921	
				minimum w/o vac	1.50	3.00	6.7	13.4	25.2	61.9	119	229	552	1104	
	Ethylene	C <sub>2</sub> H <sub>4</sub>	0.996	HP	19.92	39.83	99.6	199.2	398.3	995.8	1992	3983	9958	19916	
				SP	4.98	9.96	24.9	49.8	99.6	248.9	498	996	2489	4979	
				LP	1.99	3.98	10.0	19.9	39.8	99.6	199	398	996	1992	
				minimum w/o vac	1.70	3.10	7.5	13.9	27.7	64.2	128	237	572	1144	
	Hydrogen	H <sub>2</sub>	3.730	HP	74.60	149.19	373.0	746.0	1491.9	3729.8	7460	14919	37298	74596	
				SP	18.65	37.30	93.2	186.5	373.0	932.4	1865	3730	9324	18649	
				LP	7.46	14.92	37.3	74.6	149.2	373.0	746	1492	3730	7460	
				minimum w/o vac	8.30	14.50	36.2	62.5	114.5	280.9	509	980	2312	4623	
Methane	CH <sub>4</sub>	1.320	HP	26.40	52.81	132.0	264.0	528.1	1320.2	2640	5281	13202	26403		
			SP	6.60	13.20	33.0	66.0	132.0	330.0	660	1320	3300	6601		
			LP	2.64	5.28	13.2	26.4	52.8	132.0	264	528	1320	2640		
			minimum w/o vac	2.60	4.40	10.2	20.1	36.7	88.2	170	327	786	1517		
Propane	C <sub>3</sub> H <sub>8</sub>	0.789	HP	15.77	31.55	78.9	157.7	315.5	788.7	1577	3155	7887	15774		
			SP	3.94	7.89	19.7	39.4	78.9	197.2	394	789	1972	3944		
			LP	1.58	3.15	7.9	15.8	31.5	78.9	158	315	789	1577		
			minimum w/o vac	1.30	2.30	5.5	10.5	20.8	48.8	98	181	453	907		
Fluoro-carbons	Carbon tetrafluoride	CF <sub>4</sub>	0.563	HP	11.26	22.51	56.3	112.6	225.1	562.9	1126	2251	5629	11257	
				SP	2.81	5.63	14.1	28.1	56.3	140.7	281	563	1407	2814	
				LP	1.13	2.25	5.6	11.3	22.5	56.3	113	225	563	1126	
				minimum w/o vac	0.90	1.80	4.1	7.9	15.7	36.3	70	134	323	647	
Hexafluoro-ethene	C <sub>2</sub> F <sub>6</sub>	0.447	HP	8.95	17.89	44.7	89.5	178.9	447.3	895	1789	4473	8947		
			SP	2.24	4.47	11.2	22.4	44.7	111.8	224	447	1118	2237		
			LP	0.89	1.79	4.5	8.9	17.9	44.7	89	179	447	895		
			minimum w/o vac	0.80	1.30	3.2	5.9	11.8	27.6	55	103	257	514		
Trifluoromethane	CHF <sub>3</sub>	0.629	HP	12.59	25.18	62.9	125.9	251.8	629.4	1259	2518	6294	12588		
			SP	3.15	6.29	15.7	31.5	62.9	157.3	315	629	1573	3147		
			LP	1.26	2.52	6.3	12.6	25.2	62.9	126	252	629	1259		
			minimum w/o vac	1.00	2.00	4.4	8.8	17.2	40.6	78	150	362	723		
Other	Air	Air	0.983	HP	19.67	39.34	98.3	196.7	393.4	983.5	1967	3934	9835	19670	
				SP	4.92	9.83	24.6	49.2	98.3	245.9	492	983	2459	4917	
				LP	1.97	3.93	9.8	19.7	39.3	98.3	197	393	983	1967	
				minimum w/o vac	2.00	3.40	7.6	15.2	27.4	67.1	127	244	585	1170	
	Carbon dioxide	CO <sub>2</sub>	0.795	HP	15.91	31.81	79.5	159.1	318.1	795.3	1591	3181	7953	15906	
				SP	3.98	7.95	19.9	39.8	79.5	198.8	398	795	1988	3977	
				LP	1.59	3.18	8.0	15.9	31.8	79.5	159	318	795	1591	
				minimum w/o vac	1.40	2.50	6.2	11.1	22.1	51.2	102	189	473	914	
	Carbon monoxide	CO	1.000	HP	20.00	40.00	100.0	200.0	400.0	1000.0	2000	4000	10000	19999	
				SP	5.00	10.00	25.0	50.0	100.0	250.0	500	1000	2500	5000	
				LP	2.00	4.00	10.0	20.0	40.0	100.0	200	400	1000	2000	
				minimum w/o vac	2.00	3.50	7.7	15.4	27.8	68.3	129	248	595	1190	
Nitrous oxide	N <sub>2</sub> O	0.795	HP	15.90	31.80	79.5	159.0	318.0	795.1	1590	3180	7951	15902		
			SP	3.98	7.95	19.9	39.8	79.5	198.8	398	795	1988	3976		
			LP	1.59	3.18	8.0	15.9	31.8	79.5	159	318	795	1590		
			minimum w/o vac	1.40	2.50	6.2	11.1	22.1	51.2	102	189	473	914		
Octafluoro-cyclobutane <sup>1</sup>	C <sub>4</sub> F <sub>8</sub>	0.367	LP	0.73	1.47	3.7	7.3	14.7	36.7	73	147	367	733		
			minimum w/o vac	0.60	1.10	2.4	4.8	9.2	22.7	44	84	211	421		
Oxygen	O <sub>2</sub>	0.935	HP	18.71	37.42	93.5	187.1	374.2	935.4	1871	3742	9354	18708		
			SP	4.68	9.35	23.4	46.8	93.5	233.9	468	935	2339	4677		
			LP	1.87	3.74	9.4	18.7	37.4	93.5	187	374	935	1871		
			minimum w/o vac	1.90	3.40	7.3	14.4	26.4	63.8	120	232	557	1113		

<sup>1</sup> The vapor pressure of Octafluorocyclobutane is 230 kPa absolute. Only LP operation is possible. Downstream vacuum is recommended.

Ratio = Inverse square root density ratio of the indicated gas to that of nitrogen. Also the ratio of mass flow rates in each gas for a given molbloc-S element.

KF = Pressure to flow conversion ratio, sccm/kPa

To estimate a flow in a given gas at a given pressure: Flow (slm) =  $K_f \cdot \text{pressure in kPa absolute} / 1000 \cdot \text{gas ratio}$

All flows are approximate; in gases other than nitrogen and air, flows may vary up to 10% due to differences in nozzle characteristics and manufacturing

Cal Types: HP = High Pressure calibration 200 kPa to 2 Mpa absolute; table shows flow @ 2 Mpa, minimum flow is 10% of value shown

SP = Standard Pressure calibration 50 kPa to 500 kPa absolute (up to 600 kPa available); table shows flow @ 500 kPa, minimum flow with vacuum is 10% of value shown

LP = Low Pressure calibration 20 kPa to 200 kPa absolute; table shows flow @ 200 kPa, minimum flow with vacuum is 10% of value shown

minimum w/o vac = estimated minimum critical flow without vacuum when atmospheric pressure (100 kPa, 14.7 psia) is downstream of molbloc-S. The minimum calibrated flow for each calibration type is 10% of the full scale flow rate shown; downstream vacuum may be required.

## Nominal molbloc-S nitrogen (N2) flow rate at various upstream pressures

Designator	K <sub>v</sub> [sccm/kPa]	molbloc-S mass flow rate (slm @ 0 °C) when molbloc-S upstream pressure is: <sup>1,2</sup>								
		20 kPa (3 psia)	50 kPa (7 psia)	100 kPa (15 psia)	Minimum without vacuum <sup>3</sup>	200 kPa (30 psia)	500 kPa (70 psia)	800 kPa (116 psia) (typ. compressor)	1.2 MPa (174 psia)	2 MPa (290 psia)
1E1-S	10	0.2	0.5	1	1.8	2	5	8	12	20
2E1-S	20	0.4	1	2	3.2	4	10	16	24	40
5E1-S	50	1	2.5	5	7.7	10	25	40	60	100
1E2-S	100	2	5	10	15	20	50	80	120	200
2E2-S	200	4	10	20	28	40	100	160	240	400
5E2-S	500	10	25	50	67	100	250	400	600	1000
1E3-S	1000	20	50	100	129	200	500	800	1200	2000
2E3-S	2000	40	100	200	248	400	1000	1600	2400	4000
5E3-S	5000	100	250	500	596	1000	2500	4000	6000	10000
1E4-S	10000	200	500	1000	1173	2000	5000	8000	12000	20000

<sup>1</sup> Flow values in table are valid only when critical flow is established

<sup>2</sup> When volumetrically based mass flow units with reference temperatures other than 0 °C are used, flow values will generally be higher; the flow values for a given molbloc and upstream pressure are approximately 7% higher when expressed in slm at 20 °C. Flow values at a given pressure may vary by up to ±2% due to flowpath machining tolerances.

<sup>3</sup> Minimum upstream pressure to achieve critical flow with atmospheric pressure (approximately 100 kPa) downstream of molbloc-S (no vacuum).

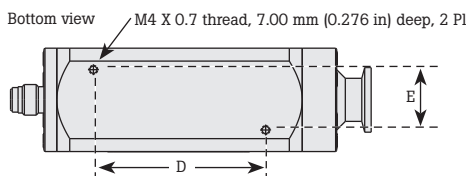
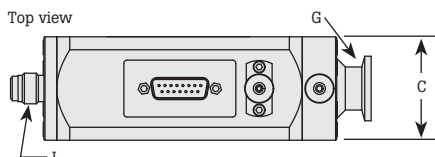
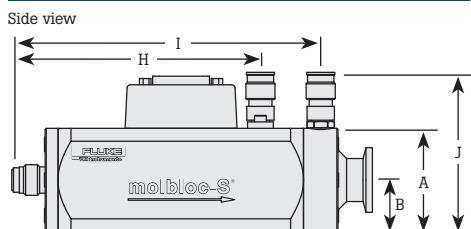
## molbloc-S dimensions

	1E1-S	2E1-S	5E1-S	1E2-S	2E2-S	5E2-S	1E3-S	2E3-S	5E3-S	1E4-S
<b>A</b>	48.0 mm (1.89 in) sq	48.0 (1.89 in) sq	48.0 (1.89 in) sq	48.0 mm (1.89 in) sq	48.0 mm (1.89 in) sq	48.0 mm (1.89 in) sq	48.0 mm (1.89 in) sq	48.0 mm (1.89 in) sq	80.0 mm (3.15 in) sq	80.0 mm (3.15 in) sq
<b>B</b>	24.0 mm (0.94 in)	24.0 mm (0.94 in)	24.0 mm (0.94 in)	24.0 mm (0.94 in)	24.0 mm (0.94 in)	24.0 mm (0.94 in)	24.0 mm (0.94 in)	24.0 mm (0.94 in)	40.0 mm (1.57 in)	40.0 mm (1.57 in)
<b>C</b>	48.0 mm (1.89 in) sq	48.0 mm (1.89 in) sq	48.0 mm (1.89 in) sq	48.0 mm (1.89 in) sq	48.0 mm (1.89 in) sq	48.0 mm (1.89 in) sq	48.0 mm (1.89 in) sq	48.0 mm (1.89 in) sq	80.0 mm (3.15 in) sq	80.0 mm (3.15 in) sq
<b>D</b>	80.0 mm (3.15 in)	80.0 mm (3.15 in)	80.0 mm (3.15 in)	80.0 mm (3.15 in)	80.0 mm (3.15 in)	80.0 mm (3.15 in)	80.0 mm (3.15 in)	80.0 mm (3.15 in)	176.0 mm (6.93 in)	176.0 mm (6.93 in)
<b>E</b>	28.0 mm (1.10 in)	28.0 mm (1.10 in)	28.0 mm (1.10 in)	28.0 mm (1.10 in)	28.0 mm (1.10 in)	28.0 mm (1.10 in)	28.0 mm (1.10 in)	28.0 mm (1.10 in)	44.0 mm (1.73 in)	44.0 mm (1.73 in)
<b>F</b>	167.5 mm (6.59 in)	167.5 mm (6.59 in)	167.5 mm (6.59 in)	167.5 mm (6.59 in)	171.0 mm (6.73 in)	171.0 mm (6.73 in)	171.0 mm (6.73 in)	175.0 mm (6.89 in) <sup>1</sup>	299.7 mm (11.80 in) <sup>1</sup>	331.0 mm (13.03 in) <sup>1</sup>
<b>G</b>	KF16 flange	KF16 flange	KF16 flange	KF16 flange	KF16 flange	KF16 flange	KF16 flange	KF16 flange	KF40 flange	KF40 flange
<b>H</b>	100.0 mm (3.94 in)	100.0 mm (3.94 in)	100.0 mm (3.94 in)	100.0 mm (3.94 in)	84.0 mm (3.31 in)	84.0 mm (3.31 in)	84.0 mm (3.31 in)	84.0 mm (3.31 in)	154.0 mm (6.06 in)	154.0 mm (6.06 in)
<b>I</b>	128.0 mm (5.04 in)	128.0 mm (5.04 in)	128.0 mm (5.04 in)	128.0 mm (5.04 in)	128.0 mm (5.35 in)	128.0 mm (5.35 in)	128.0 mm (5.35 in)	128.0 mm (5.35 in)	236.0 mm (9.29 in)	236.0 mm (9.29 in)
<b>J</b>	73.0 mm (2.87 in)	73.0 mm (2.87 in)	73.0 mm (2.87 in)	73.0 mm (2.87 in)	73.0 mm (2.87 in)	73.0 mm (2.87 in)	73.0 mm (2.87 in)	73.0 mm (2.87 in)	106.0 mm (4.17 in)	106.0 mm (4.17 in)
<b>K</b>	167.5 mm (6.59 in)	167.5 mm (6.59 in)	167.5 mm (6.59 in)	167.5 mm (6.59 in)	171.0 mm (6.73 in)	171.0 mm (6.73 in)	171.0 mm (6.73 in)	171.0 mm (6.73 in)	290.0 mm (11.42 in)	290.0 mm (11.42 in)
<b>L</b>	¼ in VCR Male <sup>2</sup>	¼ in VCR Male <sup>2</sup>	¼ in VCR Male <sup>2</sup>	¼ in VCR Male <sup>2</sup>	½ in VCR M <sup>2</sup>	½ in VCR M <sup>2</sup>	½ in VCR M <sup>2</sup>	½ in VCR M <sup>2</sup>	½ in VCR M <sup>2</sup>	KF25 flange

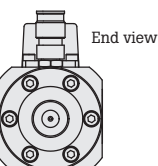
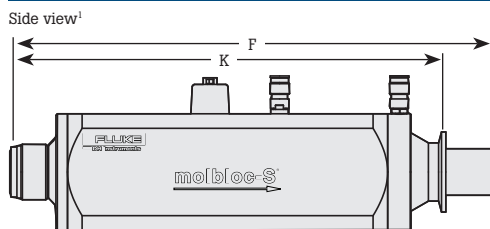
<sup>1</sup> On some molbloc-S elements, the venturi nozzle extends beyond the molbloc downstream flange, making the overall length dimension, F, longer than the fitting-to-fitting length dimension, K. A 40 mm diameter ISO-KF nipple is supplied with 5E3-S and 1E4-S molblocs because for these molbloc sizes the nozzle overhang may interfere with downstream connections or connection of a blank off cap for leak testing.

<sup>2</sup> Default connector type is listed. Additional upstream connector options may be available. Contact your DHI Sales Representative for details.

### All Except 5E3-S and 1E4-S



### 5E3-S and 1E4-S



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