GFC-T | Thermal Gas Flow Controller

ECONOMICAL SOLUTION

An economical thermal solution, servicing broader applications and markets. Pivotal Systems' GFC-T offers a thermal MFC solution for a wide flow range from 2 SCCM to 200 SLM. At Pivotal Systems, we aim to significantly enhance fab productivity and capital efficiency by utilizing our innovative solutions.

Benefits of GFC-T

- Wide flow range 2 SCCM – 200 SLM
- Economical solution
- Communications available in Analog, RS-485, DeviceNET, EtherCAT, Profibus, and Profinet

Key Features

- Pressure insensitive
- No fixed orifice
- Multi-gas configurable with 350+ gases supported

PIVOTAL SYSTEMS

Preliminary Spec 10-141-300 Rev P2 Updated September 2025

GFC-T Specifications

Performance	Flow Range (N2 Equivalent)	2 sccm–200,000 sccm (200 slm) F.S.
	Flow Accuracy	For bin sizes ≤50 slm: Standard Option ±1% of Setpoint at 25–100% F.S. & ±0.25% of F.S. at 2–25% F.S. For bin sizes >50 slm: ±2% F.S.
	Repeatability	±0.15% F.S.
	Response Time	N2 Eqv flow rates 50 sccm–50 slm: 1s to ±1% F.S. of target SP for 10–100% F.S. N2 Eqv flow rates 50 slm–500 slm: 3s to ±2% FS of target SP for 10–100% FS
	Leak Integrity	≤ 1E–9 atm·cc/sec (He)
	Leak by Rate	<0.5% F.S.
Operating Conditions	Differential Pressure Range	For 2 sccm–5 slm: 0.05–0.35 MPa (7.25–50.76 psid) For 5–23 slm: 0.07–0.25 MPa (10.15–36.26 psid) For 23–50 slm: 0.14–0.35 MPa (20.30–50.76 psid) For 50–200 slm: 0.15–0.30 MPa (21.75–43.51 psid) Low pressure drops can be customized
	Maximum Operating Pressure	0.48 MPa (~70psid), high operating pressure version can be customized
	Proof Pressure	1.03 MPa (~150psig), high pressure resistance version can be customized
	Operating Temperature	Standard: 15–45°C
	Temperature Coefficient	<0.05% F.S. / °deg C
	Valve Type	For 2 sccm–50 slm: Normally Open (N/O), Normally Closed (N/C) For 50 slm–200 slm: Normally Closed (N/C)
Materials	Wetted Surface Finish	5 µin Ra, Semi F19 compliant
	Wetted Surface Material	SUS 316L UHP, Semi F20 compliant PCTFE or PFA valve seats
	Fittings	1/4" VCR for 0–50 slm, 1/2" VCR for 50–200slm, C–Seal, W–Seal
	Seals	Metal
Electrical	ECAT	+24 VDC with M8 5–pin connector
	DeviceNet	+24 VDC with M12 5–pin connector
	Analog and RS–485	0–5V or 4–20mA I/O, Supports ±15 VDC 9–pin OR 24 VDC 9–pin
	ProfiBus–DP	Supports 24 VDC 9–pin and Profibus I/O 9–pin
	ProfiNet	+24 VDC with M8 5–pin connector

Note: Pressure insensitivity (PI) is currently only released for N2 equivalent flow rates >100 sccm. Please contact your Pivotal Systems sales representative for any questions or requests.

GFC-T Product Description Codes

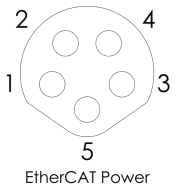
Code	Description	Option	Option Description
I	Base Model	GTS	GFC-T, Thermal GFC compliant to SEMI F20 and SEMI F19
II	Application	ST	Standard Application (15 °C- 45 °C)
		HA	5-100% Accuracy Option (15 °C- 45 °C)
		HT	High Temperature Application (up to 120 °C)
		LT	Low Temperature Application (-40 °C-Room Temperature)
III	Configurability	C	Multi-Gas Standard Bins
		X	Gas Configured
IV	Bin Size	PS60-010C	Bin-0: N2 Eqv 10 sccm F.S.
		PS61-030C	Bin-1: N2 Eqv 30 sccm F.S
		PS62-100C	Bin-2: N2 Eqv 100 sccm F.S
		PS63-300C	Bin-3: N2 Eqv 300 sccm F.S.
		PS64-001L	Bin-4: N2 Eqv 1,000 sccm F.S.
		PS65-003L	Bin-5: N2 Eqv 3,000 sccm F.S
		PS66-005L	Bin-6: N2 Eqv 5,000 sccm F.S.
		PS67-010L	Bin-7: N2 Eqv 10,000 sccm F.S.
		PS68-030L	Bin-8: N2 Eqv 30,000 sccm F.S.
		PS69-050L	Bin-9 N2 Eqv 50,000 sccm F.S.
		XXXX XXXX	Special Semi Gas Code and Range. For N2 Equivalent 51,000-200,000 sccm (51-200slm), gas configured is the only option
V	Fittings	01	1/4" VCR male
		02	1.125" C-seal
		03	1.125" W-seal
		12	1/4" Swagelok tube fitting male
		13	3/8" SwageLok tube fitting male
		14	1.5" C-seal
		15	1.5" W-seal
		16	1/2" SwageLok tube fitting male
		17	1/2" VCR male
VI	Valve Configuration	C	Normally Closed (N/C)
		O	Normally Open (N/O) *
VII	Seals	M	Metal
VIII	Communcation & Power Supply Options	AW	Analog, 4-20mA, 24V Power Supply
		AX	Analog, 0-5 VDC, 24V Power Supply
		AY	Analog, 4-20mA, ±15V Power Supply
		AZ	Analog, 0-5 VDC, ±15V Power Supply
		DU	RS485, 24V Power Supply
		DZ	RS485, ±15V Power Supply
		EZ	ECAT
		NZ	DeviceNet
		PZ	ProfiBus
		RZ	ProfiNet
IX	Special Requests	XXXX	Customer Special Request Number

* Normally Open (N/O) configuration is only available on bin sizes up to 50 slm

Sample Standard Application Model Code								
I	II	III	IV	V	VI	VII	VIII	IX
GTS	ST	C	PS61-030C	02	C	M	EZ	XXXX

GFC-T Communication Protocols

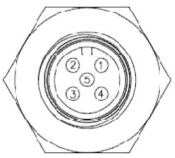
EtherCAT



EtherCAT Power

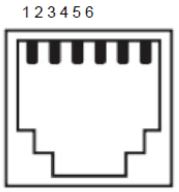
Pin	Signal
1	+24 VDC
2	CASE GND
3	PWR COM
4	RS485B
5	RS485A

DeviceNet



Pin	Signal
1	Drain
2	V+
3	V-
4	CAN_H
5	CAN_L

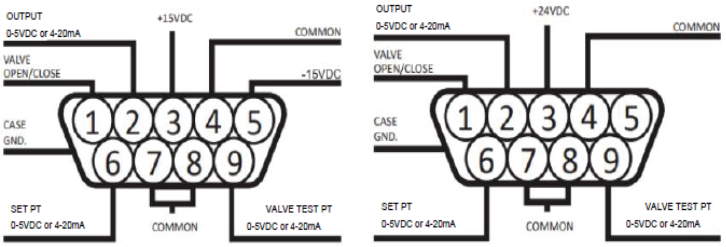
RS-485



RS485 interface definition diagram

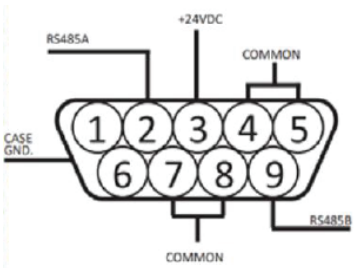
Pin	Signal
1	No connection
2	No connection
3	RS485B
4	RS485A
5	No connection
6	No connection

Analog

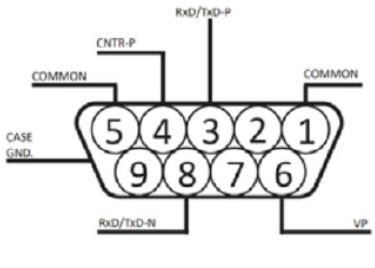


9-pin power interface definition diagram (±15 VDC) 9-pin power interface definition diagram (±24 VDC)

Profibus

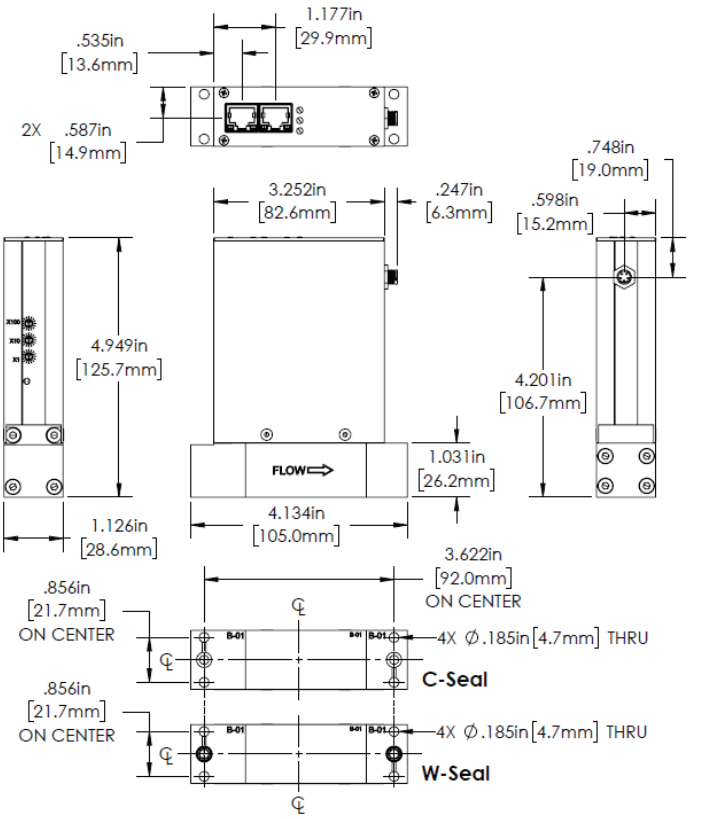


9Pin power interface definition diagram

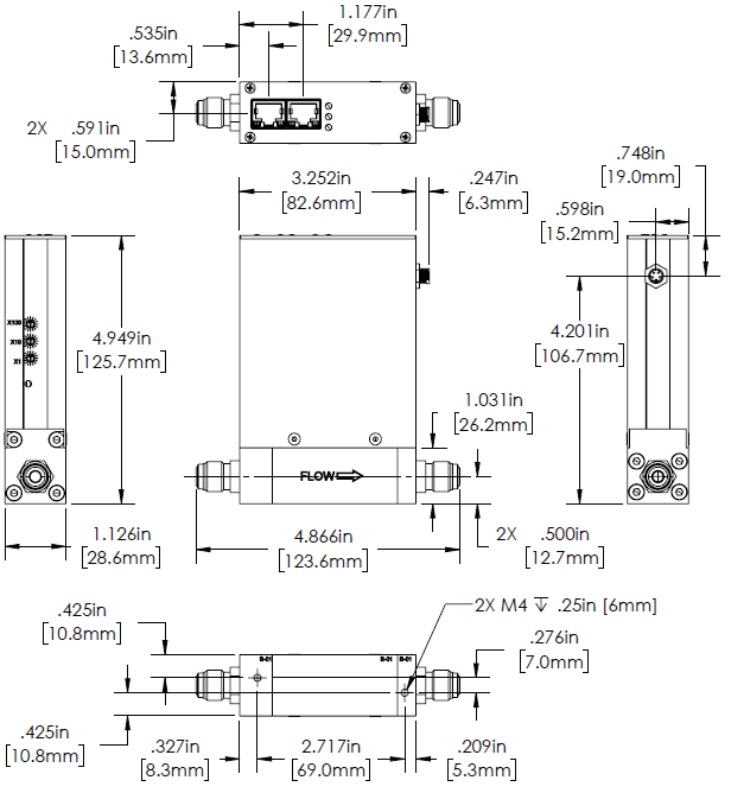


9Pin communication interface definition diagram

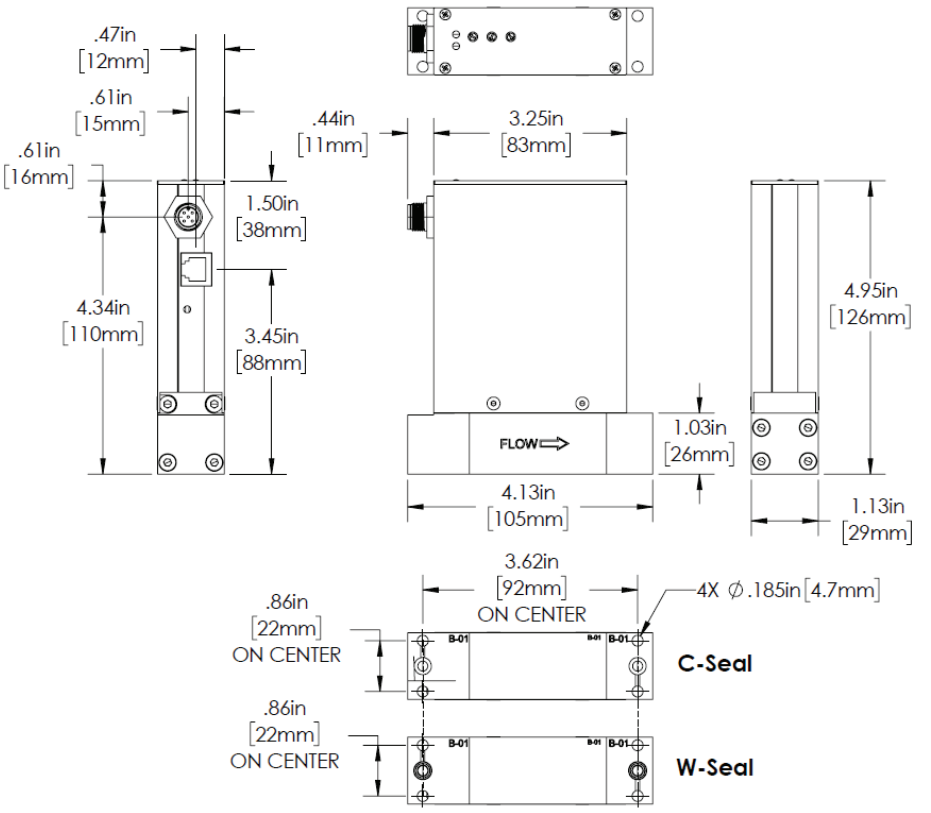
GFC-T C-Seal & W-Seal ECAT Dimensions



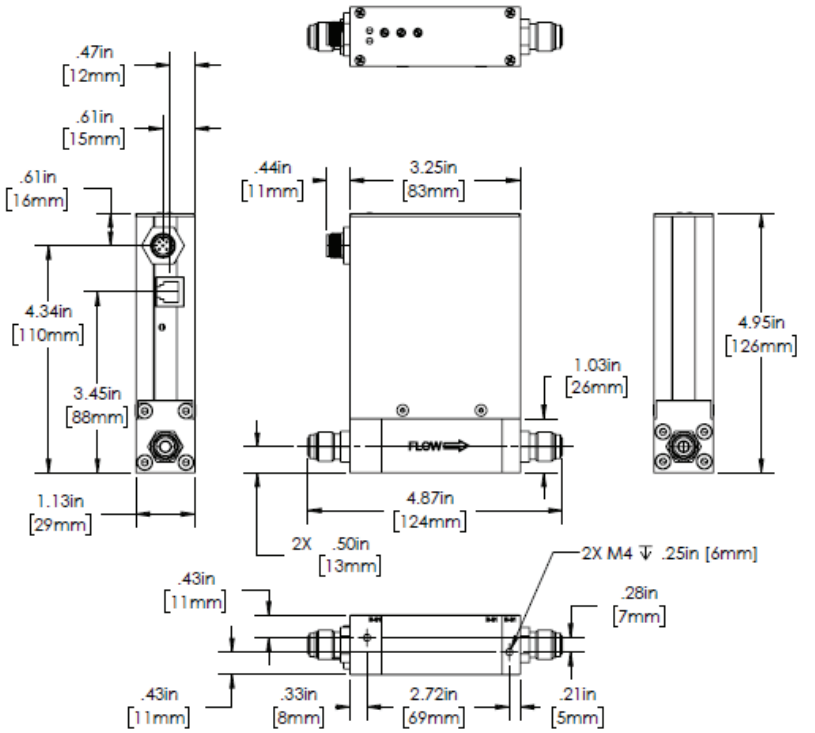
GFC-T VCR ECAT Dimensions



GFC-T C-Seal & W-Seal DNET Dimensions



GFC-T VCR DNET Dimensions



GFC-T Gas Table

Available Gases				
((CH3)3Si)2NH	C2ClF5	i-C4H10	CClF3	F2
(CF3CO)2O	C2F4	n-C4H10	Cd(CH3)2	Ga(C2H5)3
(CH3)2CO	C2F6	C4H4O	CD4	Ga(CH3)3
(CH3)2O	C2H2	1,2-C4H6	CF3COOH	Ge(C2H5)4
(CH3)4H4Si4O4	trans-C2H2Cl2	1,3-C4H6	CF3I	Ge(OCH3)4
(Si(CH3)3)2O	C2H2F2	1-C4H8	CF3OF	GeCl4
(Si(CH3)2(OCH3))2O	C2H2F4	cis-2-C4H8	CF4	GeF4
Air	C2H3Br	trans-2-C4H8	CH2Cl2	GeH4
Al(C2H5)3	C2H3Cl	iso-C4H8	CH2F2	H2
Al(C4H9)3	C2H4	C4H9OH-1	CH3Br	H2O
Al(CH3)3	C2H4O	cyclo-C5F8	CH3CHO	H2S
Ar	C2H5Cl	C5H12	CH3Cl	H2Se
As(CH3)3	C2H5I	i-C5H12	CH3CN	HBr
As(OC2H5)3	C2H5OH	C5H2F6O2	CH3F	HCHO
AsCl3	C2H6	C5H5N	CH3I	HCl
AsH3	C2HCl2F3	cyclo-C5H8	CH3OH	HCN
B(CH3)3	C2HCl3	C6F6	CH4	He
B(i-OC3H7)3	C2HF5	cyclo-C6H12	CHCl2F	HF
B(OC2H5)3	C2N2	C6H14	CHCl3	HI
B(OCH3)3	C3F6	p-C6H4(CH3)2	CHClF2	IF5
B2H6	C3F6O	C6H5CH3	CHF3	In(C2H5)3
B5H9	C3F8	C6H5CHCH2	Cl2	In(CH3)3
BBr3	C3H4	C6H6	ClCN	Kr
BCl3	1,2-C3H4	cyclo-C7H14	ClF3	MoF6
BF3	C3H6	n-C7H16	CO	N(C2H5)3
Br2	cyclo-C3H6	CBr2F2	CO2	N(CH3)3
C(CH3)4	C3H8	CBrF3	COF2	N2
C2Cl2F4	C3HF7	CCl2F2	COS	N2O
C2Cl3F3	1,3-C4F6	CCl3F	CS2	N2O4
C2ClF3	C4F8	CCl4	D2	Ne
ND3	Si(CH3)2(OCH3)2	Zn(CH3)2	10% PH3 in Ar	2% B(CH3)3 in H2
NF3	Si(CH3)4	0.05% B2H6 in Ar	15% PH3 in Ar	0.01% B(OCH3)3 in H2
NH(C2H5)2	Si(CH3)Cl3	0.5% B2H6 in Ar	5% SiH2Cl2 in Ar	0.001% B2H6 in H2
NH(CH3)2	Si(OC2H5)4	1% B2H6 in Ar	2% SiH4 in Ar	0.01% B2H6 in H2
NH2(C2H5)	Si(OCH3)4	5% B2H6 in Ar	5% SiH4 in Ar	0.05% B2H6 in H2
NH2(CH2CHCH2)	Si2(CH3)6	15% B2H6 in Ar	8% SiH4 in Ar	0.1% B2H6 in H2
NH2(CH3)	Si2Cl6	0.5% C3H6 in Ar	10% SiH4 in Ar	0.2% B2H6 in H2
NH3	Si2H6	0.5% C3H8 in Ar	15% SiH4 in Ar	0.5% B2H6 in H2
NO	SiCl3F	4% CH4 in Ar	20% SiH4 in Ar	1% B2H6 in H2
NO2	SiCl4	10% CH4 in Ar	40% SiH4 in Ar	2% B2H6 in H2
NOCl	SiF4	10% CO in Ar	C4H10 Mixture	3% B2H6 in H2
O2	SiH(CH3)3	10% GeH4 in Ar	4% O2 in CF4	5% B2H6 in H2
O3	SiH[N(CH3)2]3	30% GeH4 in Ar	8% O2 in CF4	10% B2H6 in H2
P(CH3)3	SiH2(C2H5)2	2% H2 in Ar	9% O2 in CF4	20% B2H6 in H2
P(OC2H5)3	SiH2(CH3)2	3% H2 in Ar	17% O2 in CF4	1% BCl3 in H2
P(OCH3)3	SiH2[NH(C4H9)]2	4% H2 in Ar	20% O2 in CF4	5% C3H8 in H2

GFC-T Gas Table

Gas List				
PCl3	SiH2Cl2	5% H2 in Ar	5% O2 in CF4	1% CO and 24% CO2 in H2
PF3	SiH2F2	7% H2 in Ar	4% Ar in CH4	1% CO, 25% CO2 and 4% N2 in H2
PH2(t-C4H9)	SiH3(CH3)	8% H2 in Ar	2% C4H10-N, 4% C3H8 and 6% C2H6 in CH4	3% CO and 22% CO2 in H2
PH3	SiH4	15% H2 in Ar	10% H2 in CH4	1% GeH4 in H2
PO(OCH3)3	SiHCl3	45% He in Ar	0.06% AsH3 in H2	1.5% GeH4 in H2
POCl3	Sn(CH3)4	1% NO in Ar	0.1% AsH3 in H2	8% GeH4 in H2
ReF6	SO2	1% O2 in Ar	0.7% AsH3 in H2	10% GeH4 in H2
Sb(CH3)3	T2	5% O2 in Ar	1% AsH3 in H2	0.005% H2S in H2
SbCl5	Te(CH3)2	15% O2 in Ar	2% AsH3 in H2	2% HCl in H2
Se(CH3)2	TiCl4	20% O2 in Ar	5% AsH3 in H2	10% HCl in H2
SeF6	UF6	1% PH3 in Ar	7% AsH3 in H2	4% N2 in H2
SF4	WF6	3% PH3 in Ar	10% AsH3 in H2	5% N2 in H2
SF6	Xe	4% PH3 in Ar	15% AsH3 in H2	30% O2 in H2
Si(CH3)(OCH3)3	Zn(C2H5)2	5% PH3 in Ar	50% AsH3 in H2	0.001% PH3 in H2
0.1% PH3 in H2	5% CH4 in He	1% AsH3 in N2	10% H2 in N2	8.6% Ar in NF3
0.12% PH3 in H2	30% C2H4 in He	7% AsH3 in N2	50% H2 in N2	9.4% Ar in NF3
0.5% PH3 in H2	24% CO2 and 1% CO in He	0.05% B2H6 in N2	10% H2S in N2	5% F2 in NF3
1% PH3 in H2	1% F2 in He	0.1% B2H6 in N2	30% H2S in N2	4% H2 in O2
2% PH3 in H2	5% F2 in He	0.5% B2H6 in N2	10% H2Se in N2	20% He in O2
3% PH3 in H2	10% F2 in He	0.8% B2H6 in N2	20% NH3 in N2	30% He in O2
5% PH3 in H2	20% F2 in He	1% B2H6 in N2	10% NO in N2	50% He in O2
10% PH3 in H2	10% GeH4 in He	2% B2H6 in N2	20% O2 in N2	1% B2H6 in SiH4
15% PH3 in H2	20% GeH4 in He	3% B2H6 and 3% H2 in N2	0.1% PH3 in N2	10% N2 in SiH4
20% PH3 in H2	4% H2 in He	4% B2H6 in N2	0.5% PH3 in N2	0.3% PH3 in SiH4
50% PH3 in H2	4.5% H2 in He	5% B2H6 in N2	0.8% PH3 in N2	0.5% PH3 in SiH4
10% Si2H6 in H2	4.5% H2(1.017) in He(1.426)	0.5% BCl3 in N2	1% PH3 in N2	0.8% PH3 in SiH4
1% SiH3(CH3) in H2	5% H2 in He	1% BCl3 in N2	2% PH3 in N2	1% PH3 in SiH4
10% SiH3(CH3) in H2	3% O2 in He	3% BCl3 in N2	3% PH3 in N2	2% PH3 in SiH4
20% SiH3(CH3) in H2	10% O2 in He	0.05% C3H6 in N2	4% PH3 in N2	5% PH3 in SiH4
2% SiH4 in H2	20% O2 in He	0.02% CO in N2	5% PH3 in N2	8% PH3 in SiH4
5% SiH4 in H2	30% O2 in He	0.1% CO in N2	8% PH3 in N2	15% PH3 in SiH4
10% SiH4 in H2	0.8% PH3 in He	1% CO in N2	10% PH3 in N2	20% PH3 in SiH4
50% SiH4 in H2	1% PH3 in He	20% CO2 in N2	15% PH3 in N2	25% PH3 in SiH4
20% SiHCl3 in H2	3% PH3 in He	20% F2 in N2	2% SiH4 in N2	50% PH3 in SiH4
25% SiHCl3 in H2	4% PH3 in He	1% GeH4 in N2	4% SiH4 in N2	8% PH3 in H2
40% SiHCl3 in H2	5% PH3 in He	10% GeH4 in N2	5% SiH4 in N2	
0.4% Zn(CH3)2 in H2	10% PH3 in He	1% H2 in N2	8% SiH4 in N2	
0.5% Ar in He	5% SiH3(CH3) in He	3% H2 in N2	10% SiH4 in N2	
2.5% B(CH3)3 in He	2% SiH4 in He	3.5% H2 in N2	15% SiH4 in N2	
0.1% BCl3 in He	3% SiH4 in He	3.9% H2 in N2	20% SiH4 in N2	
1% BCl3 in He	20% SiH4 in He	3.9% H2(1.017) in N2	50% SiH4 in N2	
5% BCl3 in He	40% SiH4 in He	4% H2 in N2	25% SiHCl3 in N2	
2.7% C2H4 in He	50% SiH4 in He	5% H2 in N2	5% Xe in Ne	
3% C2H4 in He	0.7% AsH3 in N2	9.4% H2 in N2	15% Xe in Ne	

If other gas configurations are required, please contact your sales representative

The Future of Flow Control is Now.

Pivotal Systems | 47900 Fremont Blvd | Fremont CA USA | info@pivotalsys.com |