FDU Series
Mass flow sensors for gases

FEATURES

- **Ranges 0...±200 sccm[1] or 0...±2 "H_2O (0...±5 mbar)**
- **Bidirectional sensing**
- **Actual mass flow sensing**
- **Low differential pressure sensing**
- **Sensortechnics PRO services**

MEDIA COMPATIBILITY

To be used with dry gases only

The FDU series is NOT designed for liquid flow and will be damaged by liquid flow through the sensor

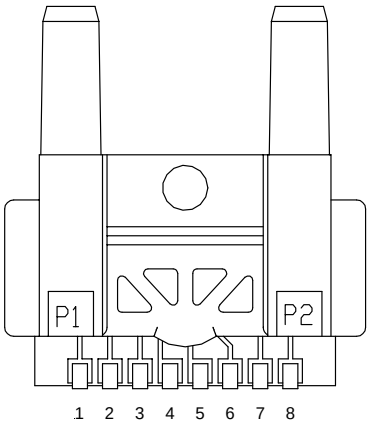
SPECIFICATIONS

Maximum ratings

Supply voltage[2]	8 to 15 V typ. 10 ±0.01 V
Power consumption	50 mW
Temperature limits	
Operating	-25 to 85°C
Storage	-40 to 90°C
Mechanical shock	100 g (5 drops, 6 axes)

Note:
[1] sccm denotes standard cubic centimeters per minute
[2] Output voltage is ratiometric to supply voltage

ELECTRICAL CONNECTION



FLOW SENSOR CHARACTERISTICS[3]

(V_S = 10 ±0.01 V, T_A = 25°C)

Part no.	Flow range (full scale)	Pressure range	Max. flow change[4]	Output voltage @ trim point
FDUM200DB	±200 sccm		5.0 l/sec	77 mV @ 200 sccm
FDUH002DB		±2 "H_2O	5.0 l/sec	38 mV @ 2 "H_2O

PERFORMANCE CHARACTERISTICS

(V_S = 10 ±0.01 V, T_A = 25°C)

Characteristics				Min.	Typ.	Max.	Unit
Zero offset				-15	0	15	mV
Repeatability and hysteresis (combined)			FDUM200DB			±0.35	%FSO
			FDUH002DB		±0.1		% reading
Ratiometricity error[2]					±0.30		
Temperature effects[5]	Offset	-25 to 85 °C[6]			±2.0[7]		mV
	Span	-25 to 25 °C	FDUM200DB		-3.0[8]		%FSO
			FDUH002DB		25[5]		% reading
		25 to 85 °C	FDUM200DB		±1.0[8]		%FSO
			FDUH002DB		-30[5]		% reading
Sensor resistance (pin 1 - pin 2, pin 1 - pin 8)				1.5	1.75	2.2	kOhm
Sensor current						0.6	mA
Response time					1.0	3.0	ms
Common mode pressure						25	psi

Notes:
[2] Output voltage is ratiometric to supply voltage
[3] A 5 micron filter is recommended for all devices.
[4] Maximum allowable rate of flow change to prevent damage.
[5] Temperature shifts in differential pressure devices are mostly due to the density change of the gas over temperature.
[6] Shift is relative to 25 °C.
[7] Assumes low TCR bridge resistance used (pins 2 and 8).
[8] Requires recommended Rc value of 1K Ohm is used (pins 3 to 7) and typ. heater control circuit. Maximum current Rh.

FLOW SPECIFICATIONS

(V_S = 10 ±0.01 V, T_A = 25°C)

FDUM200DB

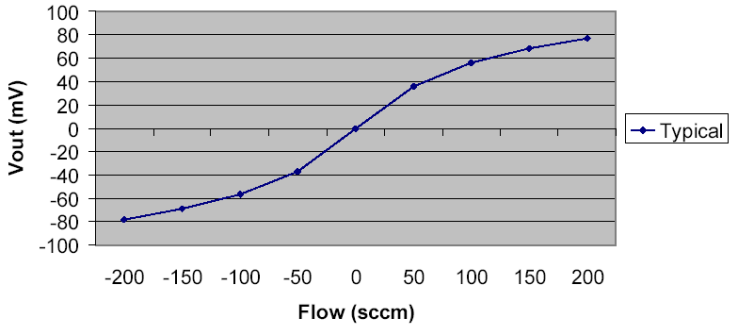
Flow (sccm)	Nominal (mV Typical)	± Tolerance (mV Typical)
200	77	32
150	68	29
100	56	25
50	36	17
0	0	20
-50	-37	18
-100	-57	26
-150	-69	30
-200	-78	33

FDUH002DB

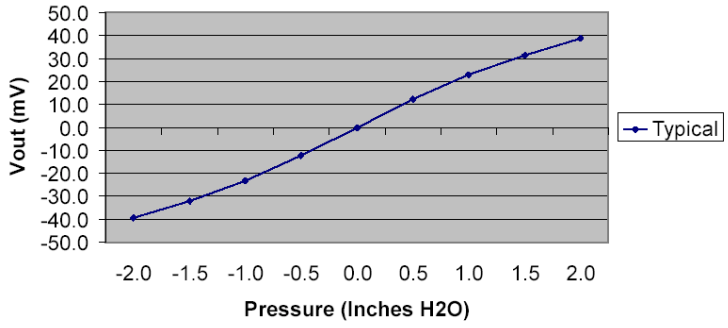
Pressure (inch H2O)	Nominal (mV) Typical	Typical Min. (mV)	Typical Max. (mV)
2.0	38	22	77
1.5	32	18	66
1.0	23	12	49
.5	12	7	29
0	0	-20	20
-.5	-12	-7	-30
-1.0	-23	-12	-51
-1.5	-32	-18	-68
-2.0	-39	-22	-79

OUTPUT VS. FLOW CURVES

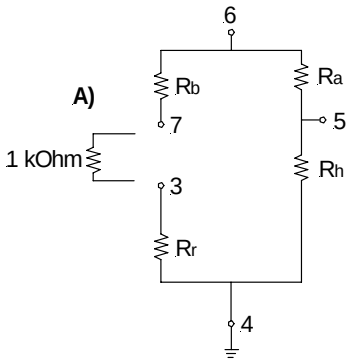
FDUM200DB



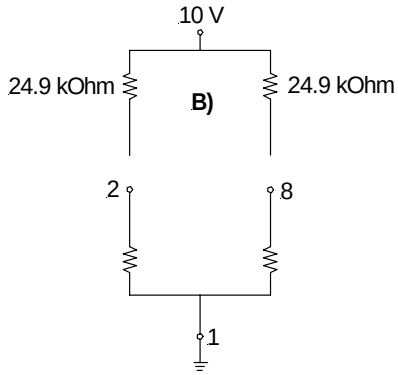
FDUH002DB



HEATER CONTROL CIRCUIT

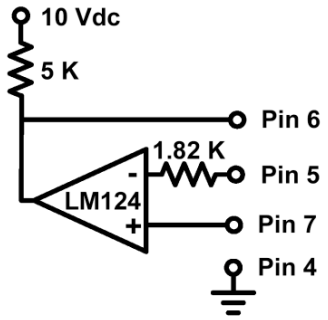


SENSING BRIDGE SUPPLY CIRCUIT

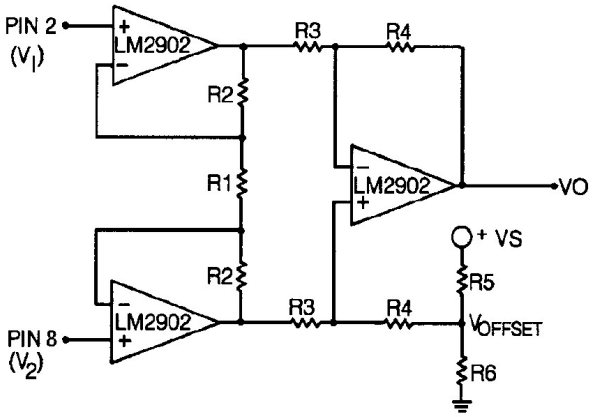


Note:
Circuits required for operation per specifications. Circuits are not on board the sensor.
A) Customer supplied 1 kOhm resistor (affects temperature compensation and span voltage).
B) Customer supplied 24.9 kOhm matched bridge resistors (affects null output voltage).
Output is measured differentially from pins 8 to 2.

HEATER CONTROL CIRCUIT (suggested)



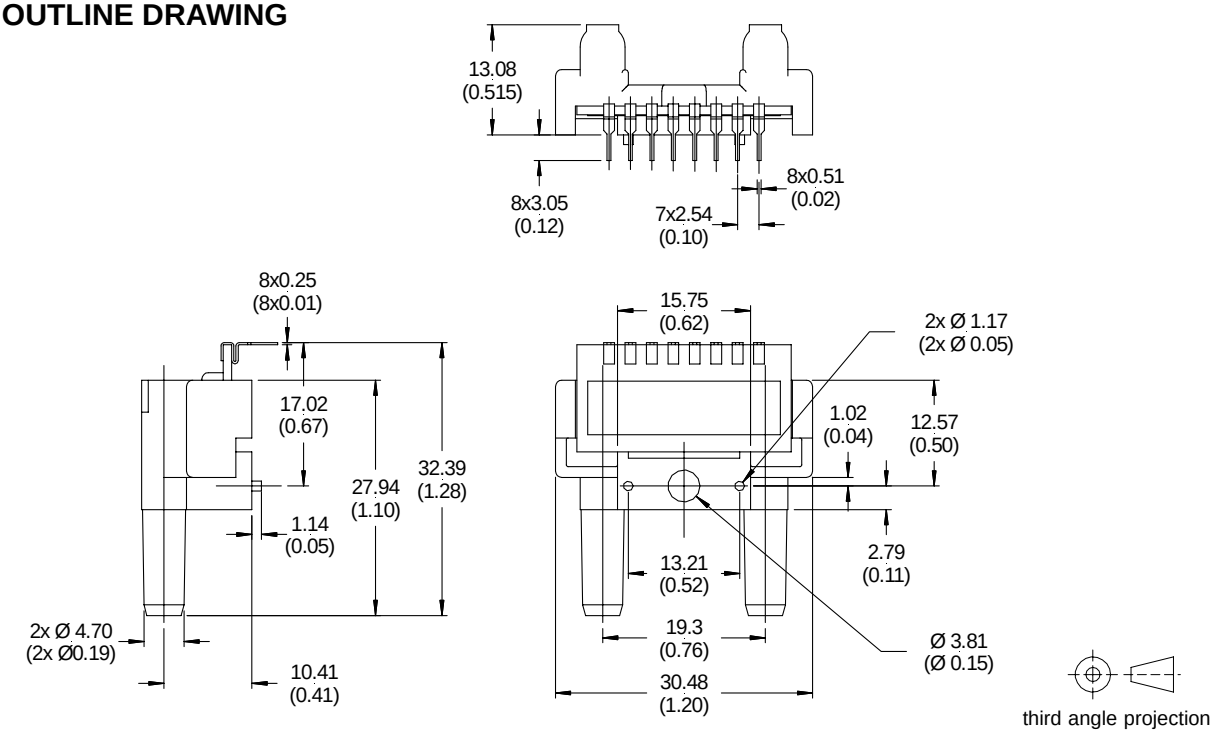
DIFFERENTIAL INSTRUMENTATION AMPLIFIER CIRCUIT (optional)



$$V_O = \left(\frac{2R_2 + R_1}{R_1}\right)\left(\frac{R_4}{R_3}\right)(V_2 - V_1) + V_{Offset}$$

where $V_{Offset} = V_S\left(\frac{R_6}{R_6 + R_5}\right)$

OUTLINE DRAWING



mass: approx. 5.6 g

dimensions in mm (inches)

GAS CORRECTION FACTORS[9]

Gas type	Correction factor (approx.)
Helium (He)	0.5[10]
Hydrogen (H_2)	0.7[10,11]
Argon (Ar)	0.95
Nitrogen (N_2)	1.0
Oxygen (O_2)	1.0
Air	1.0
Nitric oxide (NO)	1.0
Carbon monoxide (CO)	1.0
Methane (CH_4)	1.1
Ammonia (NH_3)	1.1
Nitrous oxide (N_2O)	1.35
Nitrogen dioxide (NO_2)	1.35
Carbon dioxide (CO_2)	1.35

Notes:

[9] Gas correction factors are referenced to nitrogen (N_2) as calibration gas type. Approximate gas correction factors are provided as guidelines only. Individual gas types may perform differently at temperature extremes and varying flow rates.

[10] When sensing Hydrogen (H_2) or Helium (He) it may be necessary to power the mass flow sensor using increased supply voltage: Hydrogen typ. 12 V, Helium typ. 15 V

[11] Hydrogen (H_2) flow measurement requires the use of a special sensor. These devices provide normal operation when sensing hydrogen flow and are designated with an "H" at the end of the order number.

ORDERING INFORMATION - AVAILABLE LISTINGS

Note: Preferred listings are highlighted in grey

Flow range	Dry gas
±200 sccm	FDUM200DB

Pressure range	Dry gas
±2 "H_2O (±5 mbar)	FDUH002DB

Sensortechnics PRO services:

- Extended guarantee period of 2 years
- Improved performance characteristics
- Custom product modifications and adaptations even for small quantities
- Advanced logistics models for supply inventory and short delivery times
- Technical support through application engineers on the phone or at your site
- Fastest possible technical response for design and QA engineers

... plus other services on request