Honeywell Zephyr HAF Series High Accuracy Mass Flow Meters

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Digital Sensors

- Sensors provide digital interface for reading gas flow
  - Temperature compensated
- Uses heat transfer principle to measure mass flow
  - Uses MEMS, Microelectronic and Microelectromechanical System, sensor to provide repeatable response to flow
- Available ranges
  - ±50 sccm, ± 100 sccm, ± 200 sccm, ± 400 sccm, ± 750 sccm
  - 10 slm, 15 slm, 20 slm, 50 slm, 100 slm, 200 slm, 300 slm

Specifications

Series	Honeywell Zephyr™ HAF Series-High Accuracy ±50 SCCM to ±750 SCCM	Honeywell Zephyr™ HAF Series-High Accuracy 10 SLPM to 300 SLPM
Signal conditioning	amplified, compensated	amplified, compensated
Technology	silicon die with thermally isolated heater	silicon die with thermally isolated heater
Flow/pressure range	±50 SCCM to ±750 SCCM	10, 15, 20, 50, 100, 200, 300 SLPM
Output	analog (Vdc), digital (I^2C)	digital (I^2C)
Power consumption	**3.3 Vdc:** 40 mW typ. (no load) (analog); 23 mW typ. (no load) (digital) **5.0 Vdc:** 55 mW typ. (no load) (analog); 38 mW typ. (no load) (digital)	**3 Vdc:** 60 mW max. **10 Vdc**: 200 mW max.
Port style	long port, short port	manifold mount, 22 mm OD tapered male fitting, G 3/8 female threaded fitting
Media compatibility	dry non-corrosive gases	dry non-corrosive gases
Temperature range	**operating:** -20°C to 70°C [-4°F to 158°F] **compensated:** 0°C to 50°C [32°F to 122°F]	**operating:** -20°C to 70°C [-4°F to 158°F] **compensated:** 0°C to 50°C [32°F to 122°F]
Dimensions (H x W x D)	**long port:** 20 mm x 36 mm x 19,9 mm [0.79 in x 1.42 in x 0.78 in]; **short port:** 17,6 mm x 28,8 mm x 19,9 mm [0.69 in x 1.13 in x 0.78 in]	110 mm x 54,4 mm x 54 mm [4.3 in x 2.14 in x 2.1 in] (22 mm OD, tapered male fitting - largest)
Features	high accuracy, high sensitivity at very low flows, high stability, low pressure, linear outpu,; customizable, full calibration and temperature compensation	built-in bypass provides high performance, easy integration and custom calibration

Accuracy

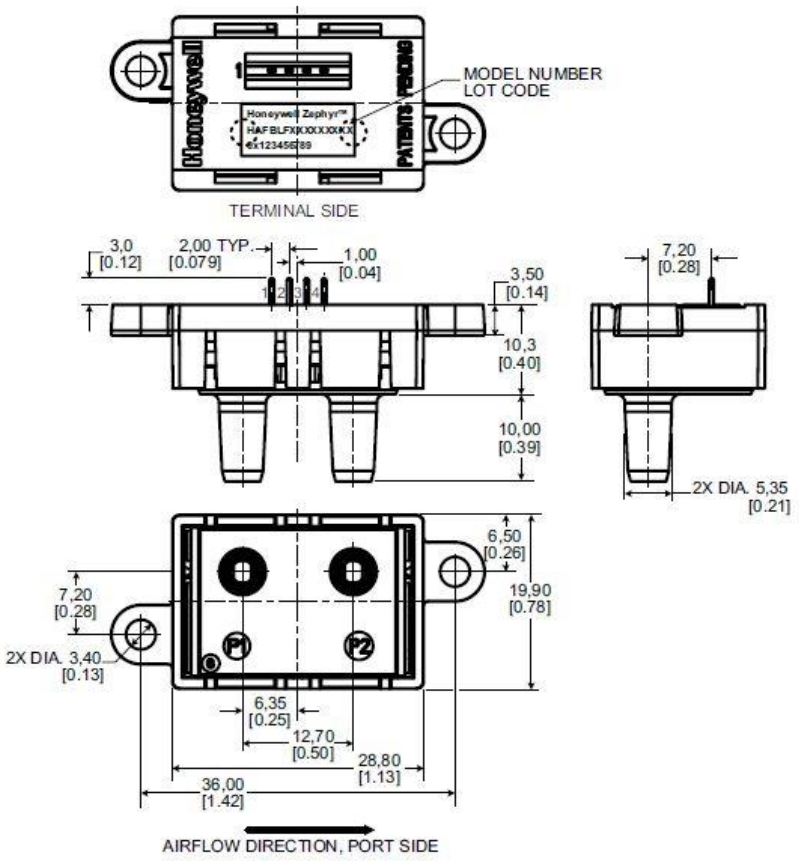
	Applied Flow (SCCM)	Accuracy Error (%FSS)	Applied Flow (SCCM)	TEB (%FSS)
±50	-50 to -16.7	±6% reading	-50 to -14.3	±7% reading
	-16.7 to 0	±1	-14.3 to 0	±1
	0	±0.16	0	±0.16
	0 to 20	±1	0 to 14.3	±1
	20 to 50	±5% reading	-14.3 to 50	±7% reading
±100	-100 to -14.3	±7% reading	-100 to -14.3	±7% reading
	-14.3 to 0	±0.5	-14.3 to 0	±0.5
	0	±0.12	0	±0.12
	20	±0.5	0 to 16.7	±0.5
	20 to 100	±5% reading	16.7 to 100	±6% reading
±200[1]	-200 to -11.1	±9% reading	-200 to -11.1	±9% reading)
	-11.1 to -0	±0.25	-11.1 to -0	±0.25
	0	±0.01	0	±0.1
	0 to 40	±0.25	0 to 22.2	±0.25
	40 to 200	±2.5% reading	22.2 to 200	±4.5% reading
±400	-400 to -26.7	±9% reading	-400 to -32	10% reading
	-26.7 to -0	±0.3	-32 to -0	±0.4
	0	±0.1	0	±0.1
	0 to 68.6	±0.3	0 to 71.1	±0.4
	68.6 to 400	±3.5% reading	71.1 to 400	±4.5% reading
±750	-750 to -31.3	±12% reading	-750 to -31.25	±12% reading
	-31.3 to -0	±0.25	-31.25 to -0	±0.25
	0	±0.1	0	±0.1
	0 to 68.2	±0.25	0 to 50	±0.25
	68.2 to 750	±5.5% reading	50 to 750	±7.5 reading

Dimensions

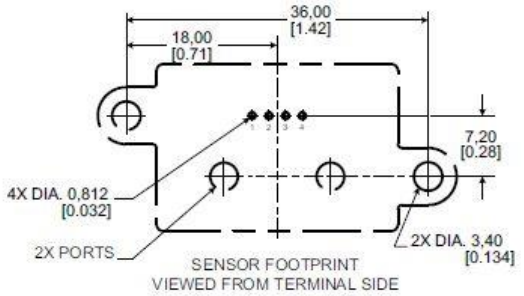
Honeywell Zephyr™ Digital Airflow Sensors
HAF Series–High Accuracy

Figure 10. Mounting Dimensions (For reference only: mm [in].)

LF: Long port, fastener mount



Mounting Footprint

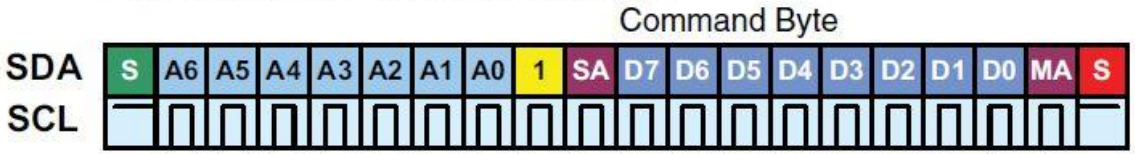


Digital Output

Figure 9. Sensor I²C Read and Write Sequences

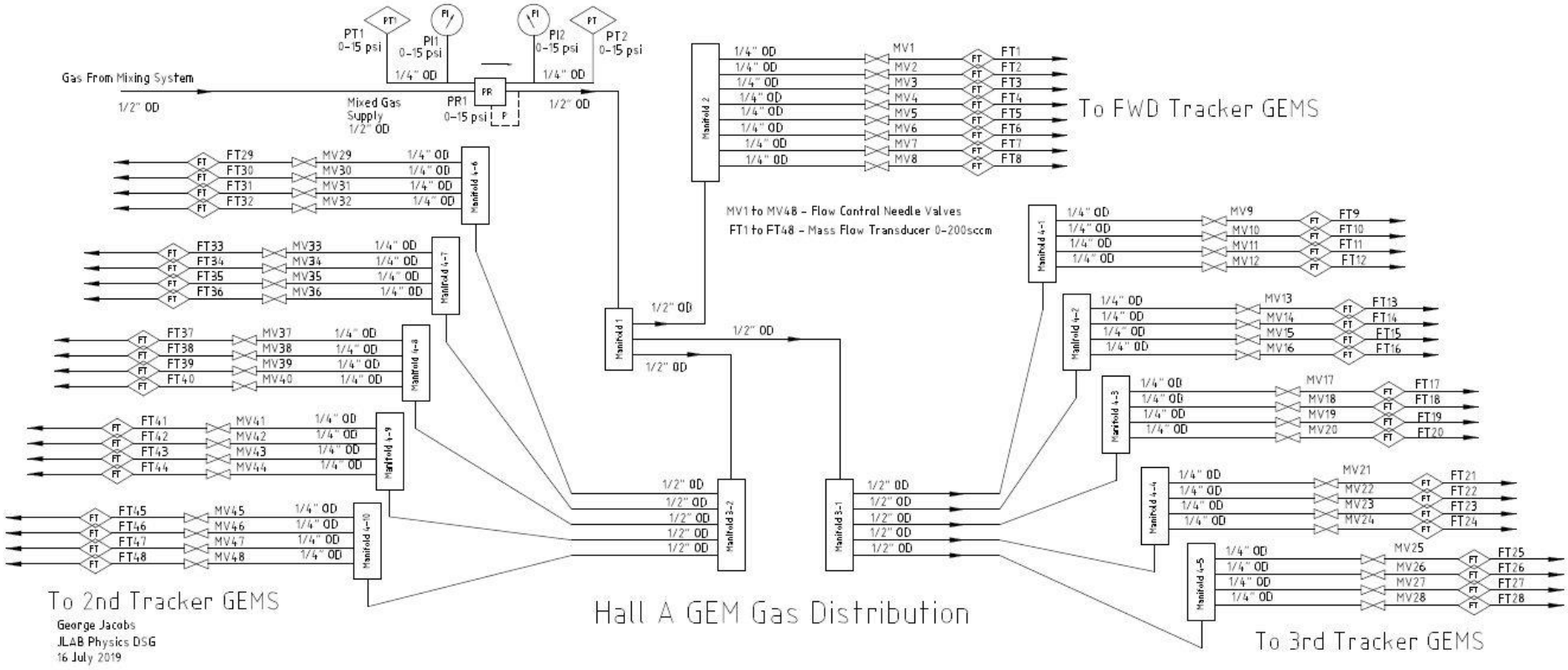
I²C Read: Slave responds to Master with data

I²C Read: Master sends data to Slave



Bit	Name	Description
S	Start condition	Master pulls SDA from high to low while SCL remains high
S	Stop condition	Master allows SDA to float from low to high while SCL remains high
A6	Address bit	I²C Slave Address is the 7 Most Significant Bits for the first transmitted byte
1	Read/write bit	Read = 1, Write = 0
D7	Data bit	
SA	Slave ACK	Slave pulls SDA low
MA	Master ACK	Master pulls SDA low
MN	Master NACK	Master allows SDA to float high

Hall A GEM Gas Distribution System



Conclusion

- Cost is ~$100 per unit for 50-750 sccm ranges
- Digital output sensor requires less hardware to implement than analog output types
- Accuracy is better than rotameter
- Cost is comparable to rotameter
- Permits remote monitoring of flow

Good choice for SBS GEM detectors