A Comparison of the Properties of Selected Commercially Available, Low-cost Carbon Dioxide and Methane Gas Concentration Sensors: *Supplementary Material*

Table S1 lists the selected carbon dioxide sensors with important properties obtained from the manufacturer. Table S2 lists the methane or hydrocarbon sensors and respective properties. The K-30, COZIR, Dynament, and Telaire sensors are all NDIR sensors. These sensors were chosen as low-cost, lightweight sensors with satisfactory detection parameters of carbon dioxide. Dynament also provides a dual gas NDIR sensor (MSH-DP/HC/CO2/) designed to measure both carbon dioxide and methane concentrations. This ability was attractive given low-cost and portability requirements. The carbon dioxide and methane Gascard sensors sold by GHG Analytical were an order of magnitude more expensive than the other chosen NDIR sensors, which have a cost between that of the lowest cost sensors on our list and that of the bench-top analyzers. Their specifications combined with the included pressure and temperatures compensation make them attractive enough to make up for the expense. In addition to the Gascard sensor, the Dynament hydrocarbon sensors (MSH-P/HC and MSH-DP/HC/CO2/) were chosen as inexpensive candidates for methane detection. Chemoresistive sensors include the MQ-4 from Hanwei Electronics and TGS-2600, TGS-2610, and TGS-2611 manufactured by Figaro Engineering Inc. sensors. The TGS sensors are used in commercial methane and air quality detectors. There are several different MQ versions optimized for hydrocarbon sensing. The MQ-4 sensor was chosen as this variant was specifically tuned for methane.

[Table 1 about here.]

[Table 2 about here.]

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Table 1: Manufacturer listed properties of evaluated carbon dioxide sensors

Sensor	Supplier	Type	Sampling Method	Cal. Range	Op. Range
K-30 SE-0018	CO_2Meter	NDIR	flow or diffusion	0-5000 ppm	0-10000 ppm
COZIR AMB GC-020	CO_2Meter	NDIR	flow or diffusion	0-5000 ppm	0-10000 ppm
Gascard CO_2	GHG Analytical	NDIR	flow	0-50000 ppm	0-50000 ppm
MSH-P/CO2/NC/5/V/P/F	Dynament	NDIR	diffusion	0-2491 ppm	0-5000 ppm
MSH-DP/HC/CO2/NC/P/F	Dynament	NDIR	diffusion	100-2500 ppm	0-5000 ppm
Telaire T6615	General Electric	NDIR	flow or diffusion	0-2000 ppm	0-2000 ppm

Sensor	Warm Up	T	Humidity	Auto-cal	V Input	Avg. I
K-30 SE-0018	<1 min	0-50°C	0-95%	Yes	4.5-14 VDC	40 mA
COZIR AMB GC-020	<3 s	0-50°C	0-95%	Yes	3.25-5.5 VDC	1.5 mA
Gascard CO_2	30 s	0-45°C	0-95%	Yes	7-30 VDC	250 mA
MSH-P/CO2/NC/5/V/P/F	45 s	-20-50°C	0-95%	No	3.0-5.0 VDC	75-85 mA
MSH-DP/HC/CO2/NC/P/F	45 s	-20-50°C	0-95%	No	3.0-5.0 VDC	75-85 mA
Telaire T6615	10 min	0-50°C	0-95%	Yes	0-5 VDC	33 mA

Table 2: Manufacturer listed properties of evaluated methane sensors

Sensor	Supplier	Type	Sampling Method	Cal. Range	Op. Range
MQ-4	Futurelec	chemiresistive	diffusion		200-10000 ppm
Gascard CH_4	GHG Analytical	NDIR	flow	0-50000 ppm	0-50000 ppm
MSH-P/HC/NC/5/V/P/F	Dynament	NDIR	diffusion	0-5000 ppm	0-10000 ppm
MSH-DP/HC/CO2/NC/P/F	Dynament	NDIR	diffusion	5000-11000 ppm	0-10000 ppm
TGS-2600	Figaro Engineering	chemiresistive	diffusion		1-30 ppm
TGS-2610	Figaro Engineering	chemiresistive	diffusion		1000-25000 ppm
TGS-2611	Figaro Engineering	chemiresistive	diffusion		500-10000 ppm

Sensor	Warm Up	T	Humidity	Auto-cal	V Input	Avg. I
MQ-4				No	5 VDC	<150 mA
Gascard CH_4	30 s	0-45°C	0-95%	Yes	7-30 VDC	250 mA
MSH-P/HC/NC/5/V/P/F	30 s	-20-50°C	0-95%	No	3.0-5.0 VDC	75-85 mA
MSH-DP/HC/CO2/NC/P/F	30 s	-20-50°C	0-95%	No	3.0-5.0 VDC	75-85 mA
TGS-2600				No	5.0±0.2 VDC	4.2±4 mA
TGS-2610				No	5.0±0.2 VDC	5.6±5 mA
TGS-2611				No	5.0±0.2 VDC	5.6±5 mA

Sensors with no listed warm-up time required 7-day burn-in time