

CDO Sensor (Carbon dioxide) – for the detection of CO₂

Features

- High selectivity to CO₂
- Long-term stability
- Low dependency on humidity & temperature

Applications

- Air quality control
- Agriculture & fermentation process control
- Ventilator



< Package >



< Pack Module >

General

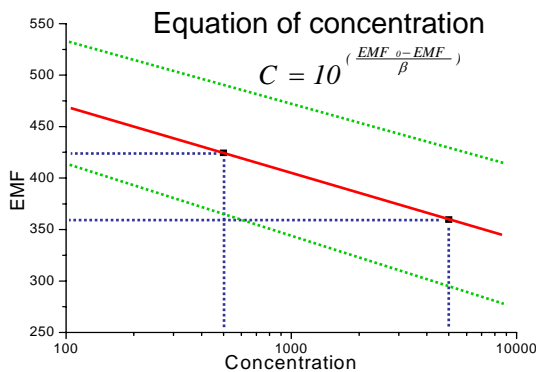
* Operation Range

- Working Temperature : -10 ~ 60
- Working Humidity : below saturation point
- Storage Temperature : -20 ~ 70

Product code	Characteristics
Package GHFS41	Output data : 0.55 ~ 0.05Volt Analogue signal
Pack Module GHFS41 - P1XX	Output data : 5 ~ 0Volt Analogue signal

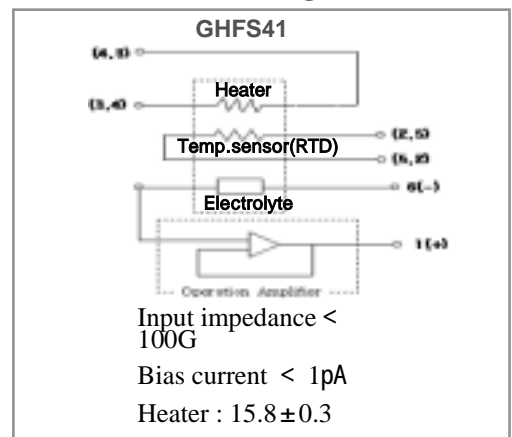
1. Sensitivity characteristic slope for Sensor

1.1 Sensitivity slope



$$EMF = (EMF_0) - \beta \cdot \text{Log}(\text{Concentration})$$

1.2 Basic Measuring Circuit



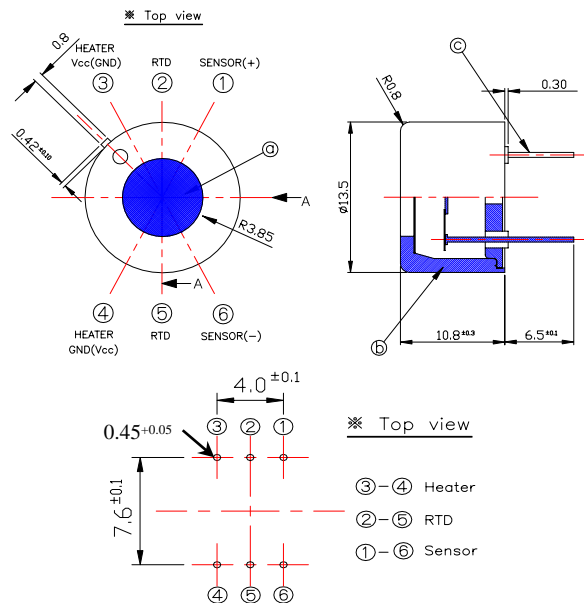
1.3 Environmental Condition

- * Standard test condition (balance gas : clean air, or special gas)
 - Temp. : 20 ±2 , • Humidity : RH65%±5%, • Pressure : 1atm
 - Test chamber : more than 50 , • Pre-heating time : more than 48hr
- * Storage temp. & Relative humidity : -20 to 70 , less then dew point
- * Oxygen concentration : 21% ± 50%(The sensitivity characteristics are independent by variation in oxygen concentration)

2. Package (Sensor) Characteristics

2.1. Characteristics

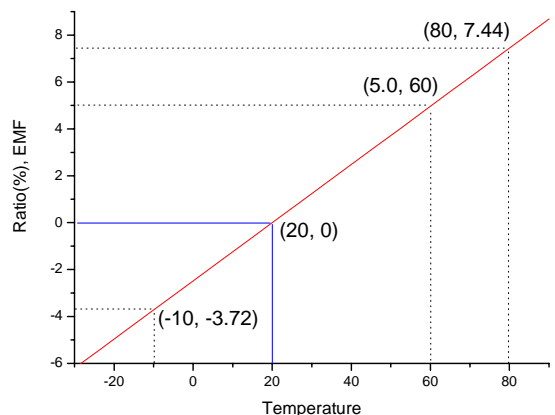
Model number	11		GHFS41	Remark
Sensing element type	Solid electrolyte			
Target gas, Measuring range	CO2(Carbon dioxide) (200 ~ 30,000ppm)			
Electrical characteristics under standard test Conditions	RH	Heater resistance 15.8 ±0.3		
	VH	Heater Voltage 5.0V±0.05V		
	PH	Power consumption Less than 680mW		
	EMF	Electromotive force 200~300mV in 200ppmCO2		Rank
	Amp	Amplifying Upper 100G		
Sensor characteristics (After gas saturation)	Response time(T90)	Reaction : less than 10sec Recovery : less than 30sec		
	Warm up time(T90)	Less then 60minute		
	Sensitivity slope ()	40 ~60		Rank
	Accuracy	±15% at the concentration		
	Resolution	1%		
	Response time	1min to 95% of step change		
Temp. sensor (Platinum RTD)	Sensor resistance	25~35 (at 20)		
	Measuring current	Less than 1mA		
	TCR (Resistance slope)	3,840ppm/·k		



Dependency of humidity

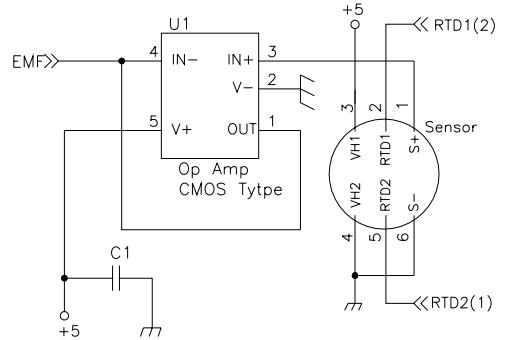
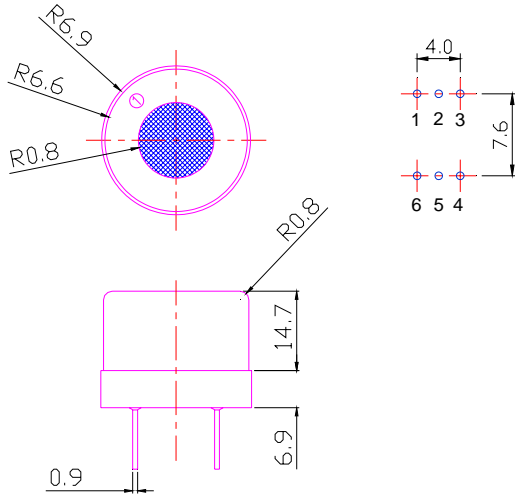
$$\text{Ratio} (\%) = -2.481 + 0.124 \times (t), \quad t = \text{Temp.}$$

$$\text{Real EMF} = (\text{Out EMF}) \times \{1 - (\text{Ratio}/100)\}$$



2.2. Dimension & Connection

2.2.1 Dimensions



Term. No	Heater	RTD+	EMF+
	3	2	1
Term. No	+5V		Output
	4	5	6
Term. No	GND		GND

2.2.2 Standard Slope

Rank No.	SP(EMF ₀) Table	
A	270	300
B	300	330
C	330	360
D	360	390
E	390	420
F	420	450
G	450	480
H	480	520

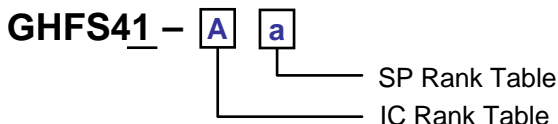
Equation of concentration (C)

EMF : Electric Motive Force (Volt, EMF⁺ Output)

$$C = 10^{\left(\frac{EMF_0 - EMF}{\beta}\right)}$$

Rank No.	IC() Table	
a	-60	-55
b	-55	-50
c	-50	-45
d	-45	-40
e	-40	-35

2.2.3. Product Code [GHFS41-XX]



A EMF₀ Rank No.

a IC Rank No.

3. Module

3.1 Characteristics

Model number	GHFS41 - Pxxx													
Sensing Method	Solid electrolyte													
Target gas	CO ₂ (Carbon dioxide)													
Measuring range	(200 ~ 30,000ppm)													
Resolution, Accuracy	Less then $\pm 1.0\%$, $\pm 10\%$													
Dimensions	25W X 35H													
Warm up time	Beginning stability time : 60min (90%)													
Response time	< 10sec to 95% of step change													
Temp. compensation	Built-in platinum RTD(25 ~ 35 , at 20)													
Circuit Voltage	VC	5.0V \pm 0.05V												
Power consumption	PH	Less than 700mW(1,000mw during from initial to 3min												
Output options	Concentration output	Analogue signal(0 ~ 4V)												
	EMF output	Analogue signal(100 ~ 550mV)												
	PCB Connection	None												
Accuracy	$\pm 15\%$ at the concentration (20)													
Resolution	1%													
Calibration interval	2 years recommended													
Operating range	Temp.: -10 ~ 60 , Humidity:5 ~ 95%RH, Non-condensing													
Storage	Temp. : -20 ~70 , Humidity : below saturation point													
<u>Range of Gas Concentration(ppm)</u>	<u>Environmental test condition</u> <ul style="list-style-type: none"> * Standard test condition (balance gas : clean air) <ul style="list-style-type: none"> • Temp. : 20 \pm2 , • Humidity : RH65%\pm5%, • Pressure : 1atm • Test chamber : more than 50 • Pre-heating time : more than 48hr * Operation temp. & Relative humidity -10 to 60 , less then dew point * storage temp. : -20 to 80 * Oxygen concentration : 21% \pm 5% The sensitivity characteristics are influenced by variation in oxygen concentration													
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Using Concentration</th> <th>Factory Cal. range</th> </tr> </thead> <tbody> <tr> <td>200 ~ 2,000</td> <td>100 ~ 3,000</td> </tr> <tr> <td>200 ~ 4,000</td> <td>100 ~ 6,000</td> </tr> <tr> <td>200 ~ 8,000</td> <td>100 ~ 12,000</td> </tr> <tr> <td>200 ~ 16,000</td> <td>100 ~ 24,000</td> </tr> <tr> <td>200 ~ 30,000</td> <td>100 ~ 48,000</td> </tr> </tbody> </table>	Using Concentration	Factory Cal. range	200 ~ 2,000	100 ~ 3,000	200 ~ 4,000	100 ~ 6,000	200 ~ 8,000	100 ~ 12,000	200 ~ 16,000	100 ~ 24,000	200 ~ 30,000	100 ~ 48,000		
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200 ~ 2,000	100 ~ 3,000													
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200 ~ 8,000	100 ~ 12,000													
200 ~ 16,000	100 ~ 24,000													
200 ~ 30,000	100 ~ 48,000													

3.2 Sensor Installation (refer to specification)

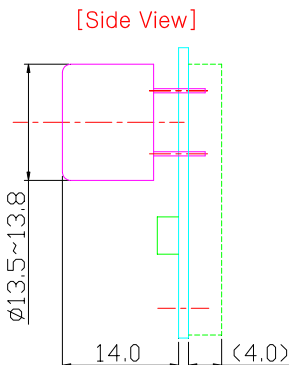
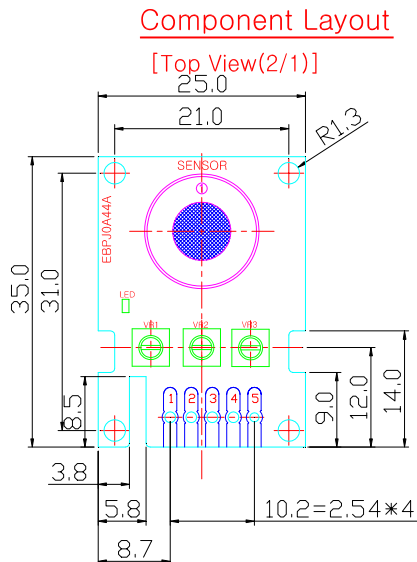
This will show you how to perform steps for installation

Select a mounting location with clean air environment, when you test.

Keep away from ventilation inlets, doors and windows.

When you connect power, the out signal is displayed high concentration and then that is gradually getting stabilized within about 60minutes.

3.3. Dimensions



Output Terminal

1	2	3	4
+5V	GND	Vout	EMF

* EMF : Electric Motive Force
Factory used

Calibration (refer to specification)
[Front Side]

VR1 : Offset Calibration
VR2 : Gain Calibration

3.4 Output

Output Terminal

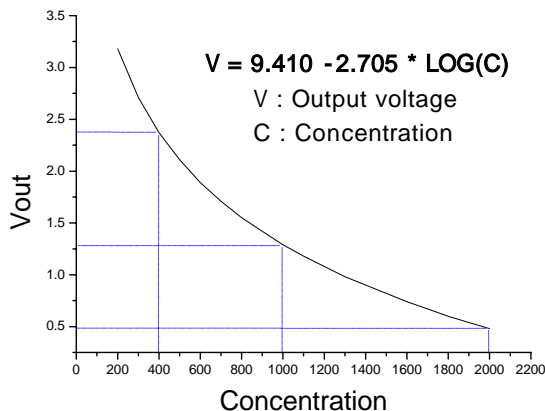
1	2	3	4
+5V	GND	Vout	EMF

Calibration (refer to specification)

[Front Side]

VR1 : Offset Calibration
VR2 : Gain Calibration

3.5 Standard Slope



3.6 Output Data (standard data at 20)

We will support datasheet according to customers.

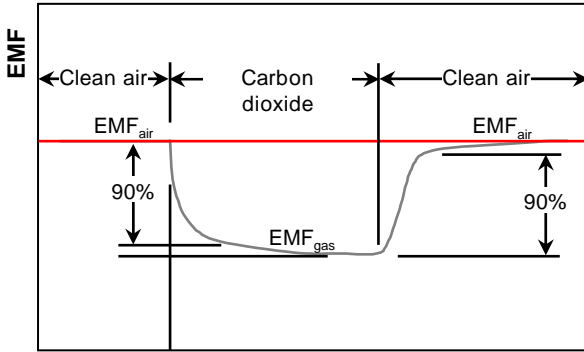
The table is part of datasheet in case of 2,000ppm.

Con. (ppm)	Vout (V)	EMF (mV)	Con. (ppm)	Vout (V)	EMF (mV)
100	4.00	(405.0)	1,100	1.18	(337.3)
200	3.18	(385.4)	1,200	1.08	(334.9)
300	2.71	(374.0)	1,300	0.98	(332.6)
400	2.37	(365.9)	1,400	0.90	(330.5)
500	2.11	(359.6)	1,500	0.82	(328.6)
600	1.89	(354.4)	1,600	0.74	(326.7)
700	1.71	(350.1)	1,700	0.67	(325.0)
800	1.55	(346.3)	1,800	0.60	(323.4)
900	1.42	(343.0)	1,900	0.54	(321.9)
1,000	1.29	(340.0)	2,000	0.48	(320.4)

$$C = 10 (3.47713 - 0.36929 * V)$$

C : Concentration, V : Voltage

4. Reaction time(T90)



EMF_{air} : Sensor EMF without gases
 EMF_{gas} : Sensor EMF after blowing gases

- * Reaction Time(T90) : Less then 5sec
[Between EMF_{air} & EMF_{gas}]
- * Recovering Time(T90) : Less then 10sec
[Between EMF_{gas} & EMF_{air}]
- * Beginning stability time(T95) : Less then 60 min.
- * Standard test conditions

Test gas condition : CO₂ in air
 at 20±2 , 65±5%RH

Circuit condition : V_H = 5.0±0.05V DC

Conditioning period before test : 2 days

5. Product Code [Standard; GHFS41 - P111]

GHFS41 - P1 3 4

Shape of terminal
Concentration range

5.5 Specification of customer

Using concentration Range
 Amplifying Rate

3 Sensing concentration

Code	1	2	3	4	5
(ppm)	Standard 200~2,000	200 ~4,000	200 ~8,000	200 ~16,000	200 ~30,000

4 Shape of terminal

Code	0	1	Others
Connection	None	In	

6. Others

In case of requirement for detail data, we will provide "specification"

* This Specifications are summary spec. and there is notify to can change without announcement for the development products.