CGEO INTERNATIONAL LIMITED

CGEO-CM Signal Converter
VW to 4~20
Installation Manual

（REV A）

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1. INTRODUCTION

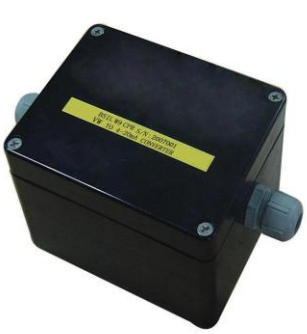
The CGEO-CM VW to 4-20mA Converter is a device that provides continuous excitation to the vibrating wire and converts the frequency signals of the VW sensor to 4-20mA signals. The CGEO-CM output is a current (4-20mA), which is directly proportional to the pressure exerted on the VW gage.

Operation of the CGEO-CM is simply a matter of connecting the VW gage to the CONVERTER connector on the enclosure, supplying DC power (12-16VDC), and setting the gage parameters to the CONVERTER via RS232 with Hyperterminal software. The system will begin normal operating as soon as these conditions are met.

The CGEO-CM is designed to be used in situations that the data collector system can't read the VW gage signals. This condition can be met usually when updating old monitoring system.

The CGEO-CM can also be used as an intelligent sensor with a VW gage. The results can be read by RS232 communication port.

2. SPECIFICATIONS



Power:

DC 12.5-16V, 50-80mA

Input:

Gage Type: VW sensors

Accuracy: 0.1Hz

Resolution: 0.01Hz

Output:

Signal Type: 4-20mA

Resolution: 16 bits

Nonlinearity: 0.012%(Max)

Offset Error: 0.05%(Max)

Total Output Error: 0.2% (MAX)

Total Output Error Drift: 20ppm/Centigrade(Type)

RS232

9600bps, no verify, 8 bits, 1 stop bit.

Refresh Rate:

Once every 10 seconds.

Physical

Size: 156mm(L) 84mm(W) 68mm(H)

Weight: 400g.

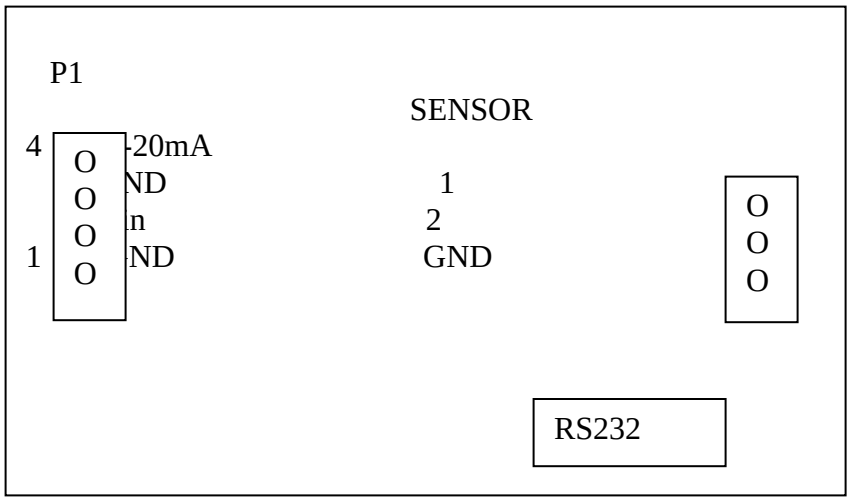
Operating temperature: 32-120 F (0-50 C)

Humidity: 99% (non-condensing)

3. Connector and Cable Wiring

The positions of connectors on PC board are shown as follows:

P1 is the connector of power supply input and 4-20mA output. The SENSOR connector should be



connected to the VW sensor.

(1). Power supply input and 4-20mA output (P1)

Pin No.	Name	Description
1	GND	Power Ground
2	Vin	12.5-16V DC Power Supply
3	GND	Analog Ground
4	4-20mA	4-20mA Output Signal

(2). Sensor connector

Pin No.	Pin Name	Description
1	Wire 1	First Wire of VW Sensor
2	Wire 2	Second Wire of VW Sensor
3	GND	Shield Ground

Attention: The Pins No.2 and No.3 are connected to System Ground internally on board. For most VW sensors, Pin 1 and Pin 2 can be connected without order. But, for some kinds of VW sensors, one wire of the sensor is connected to shield in the sensor, so the wire which is connected to shield should be connected to Pin No.2.

4. Settings and Readout By RS232 Port

To get better result, some parameters should be set to the converter, so the VW to 4-20mA Converter provides a RS232 serial port. By the RS232 port, the parameters can be set and the measurement result can be read out.

(4.1). Commands

(a). Setting High-Digits corresponding to 4mA

Command: Hxxxxx.xx (CR LF)

Response: H=xxxxx.xx(CR LF)

"(CR LF)" stands for a pair of carriage return(ASCII code: 0D hex) and line feed(ASCII code: 0A hex).

xxxxx.xx is the High-Digits number corresponding to 4mA(No pressure).

Digits=Frequency*Frequency/1000

(b). Setting Low-Digits corresponding to 20mA (Full range pressure).

Command: Lxxxxx.xx (CR LF)

Response: L=xxxxx.xx(CR LF)

(c). Query High-Digits Settings

Command: ?H (CR LF)

Response: H=xxxxx.xx(CR LF)

(d). Query Low-Digits Settings

Command: ?L (CR LF)

Response: L=xxxxx.xx(CR LF)

(e). Query the result of the measurement

Command: ? (CR LF)

Response: F=xxxx.xxHz, R=xxxxx.xx, I=xx.xxxxmA(CR LF)

where F is the frequency of VW sensor, R is the result of Digits (F*F/1000), and I is the theoretical value of the 4-20mA output.

I=4 + 16*(High_Digits - R) / (High_Digits - Low_Digits)

(4.2). Communication with Converter by Hyperterminal

Because the character linefeed(LF,0A hex) can't be input by keyboard, to communicate with the converter by *Hyperterminal* software, we should do the following settings before communicating.

Select "File"---->"Properties"---->"Settings"----> "ASCII Setup", enter into the "ASCII Setup" Form, check the following two checkboxes of "ASCII Sending"

Send line ends with line feeds

Echo typed characters locally

Checking the first checkbox orders the computer to send line feed (LF, 0A hex) after carriage return (CR, 0D hex) when we press Enter key.
Checking the 2nd checkbox makes the characters input displayed on screen. Because the converter doesn't echo the characters, the characters typed will not be displayed if we don't select this checkbox.

(4.3). Examples for the Converter settings

Assume that the table (shown in next page) is the calibration table of the sensor which is connected to the VW to 4-20mA Converter. According to the calibration table, neglect the influence of temperature, the following relationship can be get:
High-Digits = 9250
Low-Digits = 5456
Hence, the converter parameters can be set as follows:
Note, There is a CRLF pair (Enter key) after each command.
H9250 Command
H= 9250.00 Response
L5456 Command
L= 5456.00 Response
?H Query
H= 9250.00 Response
?L Query
L= 5456.00 Response
? Query results
F=3021.05Hz, R=9126.74, I=4.5198mA

where: R=F*F/1000
I=4 + 16 * (9250-R) / (9250-5456) = 4.5198(mA)

Vibrating Wire Pressure Transducer Calibration Report

Model Number: _____ Pressure Range: 150 psi

Serial Number: n/a Mfg. Number: 02-6226

Customer: _____ Temperature: 23.0 °C

Cust. I.D. #: n/a †Barometric Pressure: 1002.4 mbar

Job Number: 19757 Date of Calibration: November 19, 2002

Cal. Std. Control #(s): 407, 468, 500, 511, 524, 529, 403, 018 Technician:

Pressure (psi)	Reading 1st Cycle	Pressure (psi)	Reading 2nd Cycle	Average Pressure	Average Reading	Change	Linearity (%FS)	Polynomial Fit (%FS)
0	9250	0	9250	0	9250		0.15	-0.01
30	8499	30	8498	30	8499	752	-0.04	-0.01
60	7742	60	7742	60	7742	757	-0.10	0.03
90	6985	90	6985	90	6985	757	-0.14	-0.01
120	6223	120	6223	120	6223	762	-0.06	-0.02
150	5455	150	5456	150	5456	768	0.17	0.01

Linear Gage Factor (G): **0.03954** **(psi/ digit)** **Regression Zero:** **9256**

Polynomial Gage Factors: **A: -1.251E-07** **B: -0.03770** **C:* 359.41**

Thermal Factor (K): **-0.00244** **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

***Barometric compensation is not required with vented and differential pressure transducers.*

Factory Zero Reading: Readout Pos. B or $F(R_0)$: 9245 Temp(T_0): 23.7 °C †Baro(S_0): 998.8 mbar Date: November 25, 2002

† Barometric pressure is based upon Geokon factory elevation of 177m (580 ft.) above sea level. (appoximate correction for altitude = 0.5 psi / 1000 ft.)

**The user is advised to establish zero conditions in the field by recording the reading at a known temperature and barometric pressure.*

Wiring Code: Red and Black: Gage White and Green: Thermistor Bare: Shield

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

5. The Method of Calculating Results

Assume that the output is Iout (mA), we can get the Digits result as:
R=High_Digit - (Iout - 4) * (High_Digits - Low_Digits) /16
According to the above example, the Pressure can be calculated as:
$P=G(R_0-R)$ (1)
or
$P=AR^2+BR+C$ (2)

The above formula (1) can be simplified as follows:
$P=G_I (I - I_0)$
Where: $G_I = G*(High\_Digits - Low\_Digits)/16$
$I_0 =4 + 16*(High\_Digits - R_0)/(High\_Digits - Low\_Digits)$
If the High_Digits is set as $High\_Digits=R_0$, Then
$P = G_I (I-4)$ (3)
$G_I = G*(High\_Digits - Low\_Digits)/16$ (4)
High_Digits=R0 (5)