# EM7000 - Communication Board for Gas Sensor Evaluation Modules Instruction Manual

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## 1. About EM7000

The **EM7000** communication board is designed to transfer output from EM series sensor evaluation modules to an external computer for facilitating evaluation of the characteristics of various Figaro gas sensors. This communication board is equipped with a USB connector to transfer output data from the EM series evaluation modules to a PC via serial communication, an output terminal for gas concentration data in PWM format from the CDM series $CO_2$ sensor, as well as a terminal for voltage output that is converted from PWM output. It facilitates an easy start to evaluating the characteristics of Figaro gas sensors.

Once the PC application software is installed on an external PC, it allows for the transfer of measurement data in serial format to the PC and the graphic display of output data on the PC monitor. Measurement data can be imported and saved in CSV format on the computer using the PC application software, then after gas measurements, it can be utilized for manual data processing and analysis using other software, such as Microsoft Excel (Note 3).

The communication board includes a Mini-B USB cable. The PC application software can be downloaded from the Figaro website. Please note that Figaro gas sensors or EM series evaluation modules are not included, but they can be purchased separately depending on evaluation needs.

## 2. Part names and Specifications

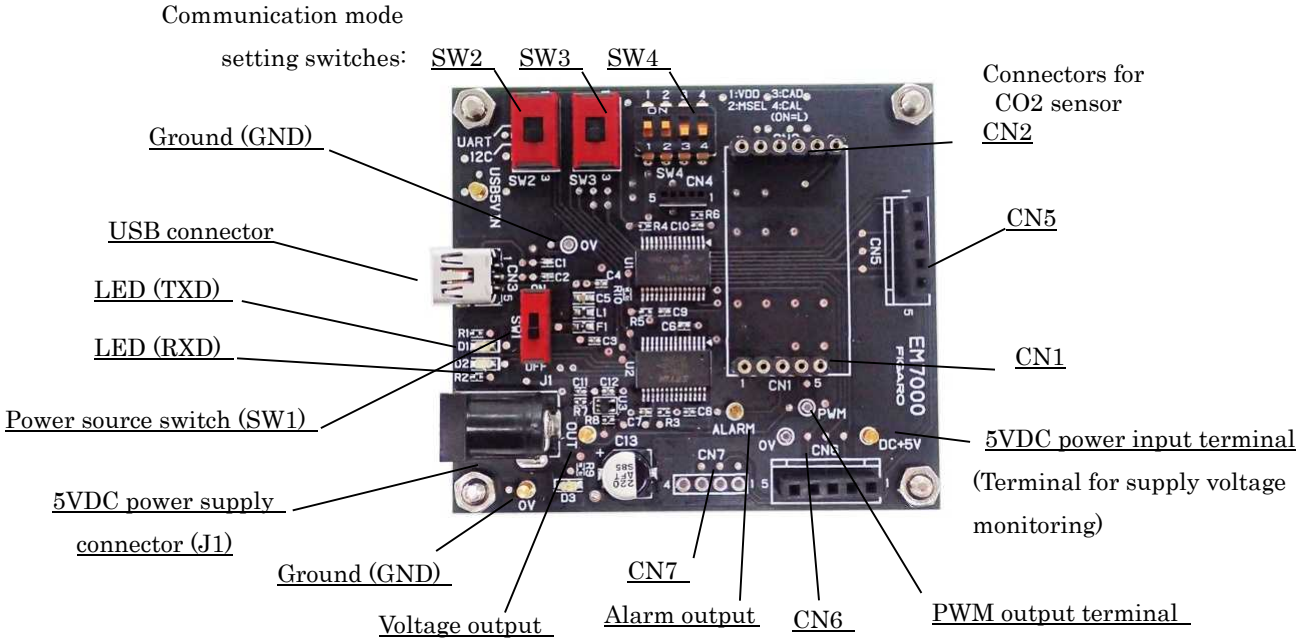



Figure 1 Part names

**Specifications**

| | |
|---|---|
| Model no. | EM7000 |
| Name | Communication board for gas sensor evaluation modules |
| Compatible products | EM series gas sensor evaluation modules and CDM716x $CO_2$ sensor |
| Power supply | via USB connector or 5.0VDC (Note 1) |
| USB output | 0 to 65,535ppm for Carbon dioxide ($CO_2$) sensor (Note 2)<br>According to the specifications of EM evaluation modules (Note 2) |
| PWM output (1kHz) | duty ratio of 0 to 100% (corresponding to 0 to 5,000 ppm $CO_2$)<br>for $CO_2$ sensor |
| Voltage output | 0 to 5V (corresponding to 0 to 5,000 ppm $CO_2$) for $CO_2$ sensor |
| Alarm output | CMOS output (High at 1,000ppm or higher, Low at less than 900ppm)<br>for $CO_2$ sensor |
| Operating temperature/<br>Humidity | 0˚C to 50˚C, 0 to 95%RH (without condensation) |
| Dimensions | Approx. 60 x 68 x 23 mm (excluding protruding portion)<br>The height includes spacers. |
| Standard accessories | Mini B USB cable x 1 |

**Specifications of PC Application Software:**

| | |
|---|---|
| Supported OS: | Windows®10, 64bit version / Windows®11 (Japanese and English versions)<br>(Note 3, Note 4) |
| Display on monitor: | Graph chart of 0 to 5V, 0 to 65,535ppm $CO_2$ (Note 2) |
| Data file format: | CSV format |
| Data saving interval: | 2 sec, 4 sec, 10 sec, 20 sec, 30 sec, 60 sec, or<br>5 min, 10 min, 30 min, or 60 minutes |
| Data capacity: | Measurement data for about 24 hours max. in a single file |

Note 1) When connecting the EM series gas sensor evaluation modules with the EM7000, please connect a 5.0 VDC power supply with 2A or higher current and compatible with a φ5.5 × 2.1 mm (center-positive) power input connector in addition to the USB power supply.

Note 2) For specification details, please refer to the Product Information of each EM series evaluation modules and CDM716x $CO_2$ sensor.

Note 3) Windows and Excel are registered trademarks of Microsoft Corporation.

Note 4) The operation of the PC application software has been tested and verified on the above operating systems. However, proper operation of this software is not guaranteed.

## 3. Setting Sensors and Serial Communication Mode

RS232-USB conversion is used for serial data transmissions between this communication board and an external computer.

**Only the I2C bus mode can be used for serial communication between the CDM716X $CO_2$ sensor and this communication board, as factory preset as follows.**

### 3-1) Switch settings for I2C bus mode

Default settings of switches SW2, SW3, and SW4 (1 to 4) are as follows.

SW2, SW3: Set to the position for I2C (lower position as seen in Figure 2).
SW4-1, SW4-2: Set to ON position (upper position as seen in Figure 2).
SW4-3, SW4-4: Set to OFF position (lower position as seen in Figure 2).

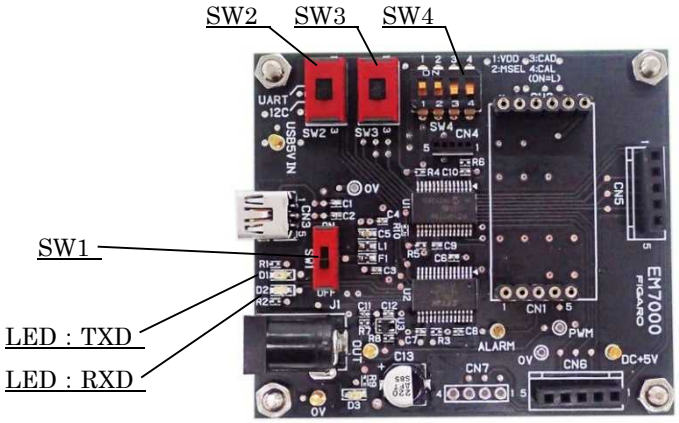



Figure 2 - I2C Communication Settings

**Caution!! Change of the default settings of switches SW2, SW3, or SW4 may cause damage of CDM716x sensors.**

### 3-2) Attaching $CO_2$ Sensor

The CDM716x series $CO_2$ sensor module is not included with shipment from the factory. When mounting a CDM716x, match the pin # of connectors CN1 and CN2 on EM7000 with the corresponding pin # of the CDM716x (Figure 3).

**Caution!! Before mounting or removing CDM716x, be sure to turn off the power switch (SW1) by setting it to the lower position as shown in Fig. 3.**

**Note)** The standard CDM716x $CO_2$ sensor module is not equipped with pin terminals for connection.
If you purchase a CDM716x sensor module, solder commercially available pin terminals to the CDM716x and mount onto the communication board.

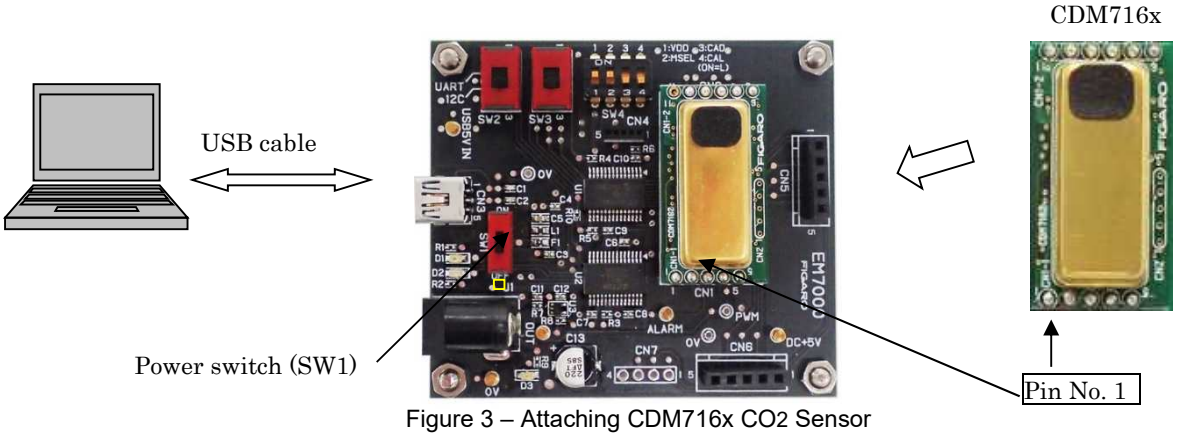



Figure 3 – Attaching CDM716x $CO_2$ Sensor

### 3-3）Attaching EM series Evaluation Modules

The EM series evaluation module or TGS series gas sensor is not included with shipment from the factory. When mounting EM series evaluation modules, match the pin # of connectors CN5 or CN6 on EM7000 with the corresponding pin # of the EM evaluation module (Figure 4).

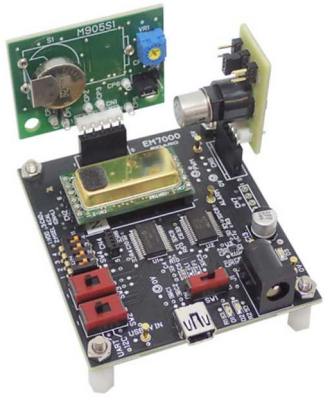


Figure 4 – Attaching EM series evaluation modules (Example)

## 4．Installing the PC Application Software and USB Driver

Before installing the USB driver, check the version of Windows OS on your computer by following the description on the Microsoft website.

### 4-1) Downloading the PC Application Software

Download the PC Application Software from the following Figaro website:

(Japanese version) https://www.figaro.co.jp/product/entry/em7000.html
(English version) https://www.figaro.co.jp/en/product/entry/em7000.html
(Chinese version) https://www.figaro.co.jp/cn/product/entry/em7000.html

When clicking the [Download PC Application Software] button on the Figaro website, a customer registration form will appear. Enter required information on the registration form and click the [Send] button. Then an email message containing a link to download the PC Application Software will be sent to the email address provided in the registration form. Click the link in the email message to download the PC Application Software to the desired location on the computer (e.g. desktop). After downloading the compressed ZIP file, decompress it and proceed with the installation of the PC Application Software and the USB driver.

### 4-2) Installing the USB driver

Before starting the dedicated application, perform the following three installations:

(1) USB Driver

Open the [USB Driver] folder in the dedicated application folder that was downloaded in the previous step and double-click either of the following executable file icons to install the USB driver:

- For 32-bit Windows OS: "CP210xVCPInstaller_x86.exe"

- For 64-bit Windows OS: "CP210xVCPInstaller_x64.exe"

(2) .Net Framework 3.5

Download and install Microsoft .Net Framework 3.5 software from Microsoft website:

(Japanese site): https://www.microsoft.com/ja-jp/download/details.aspx?id=22

(English site): http://www.microsoft.com/en-us/download/details.aspx?id=22

(Chinese site): https://www.microsoft.com/zh-CN/download/details.aspx?id=22

(3) MS Chart Controls

Download and install Microsoft Chart Controls from Microsoft website.

When downloading, make sure to check all boxes:

(Japanese site): http://www.microsoft.com/ja-jp/download/details.aspx?id=14422

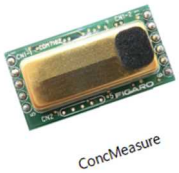
(English site): http://www.microsoft.com/en-us/download/details.aspx?id=14422

(Chinese site): http://www.microsoft.com/zn-CN/download/details.aspx?id=14422

### 4-3) Installing the PC Application Software

Open the "**EM7000_Conc Measure**" folder in the decompressed folder and confirm that the executable file of the PC Application Software, "**ConcMeasure.exe**" is properly installed.

Icon of executable PC Application Software:




ConcMeasure.exe

### 4-4) Uninstalling the PC Application Software

Delete the folder that contains the following file from the computer:

**- ConcMeasure.exe**

## 5. Using EM7000 with the PC Application Software

After installing the PC Application software and the USB driver (FT232R USB UART) on the computer, connect EM7000 to the computer using a mini B USB cable. This set-up allows the computer to acquire $CO_2$ concentration data from the CDM716x $CO_2$ sensor module and gas measurement data from the EM series evaluation modules.

### 5-1) Initial setting of the PC application software and gas measurement data acquisition

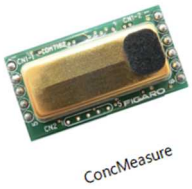
(1) Mount EM series evaluation modules and/or the CDM716x sensor module onto the EM7000 (*see Sec. 3*).

(2) Connect an external 5.0VDC power supply to DC socket on EM7000.

(3) Connect the EM7000 to the computer with a mini B-USB cable.

(4) Turn on the power switch (SW1) on EM7000 (see Fig. 7).

(5) Double-click the icon for the PC application software (ConcMeasure.exe) as installed on the computer to display the startup screen shown in Figure 8.




ConcMeasure.exe

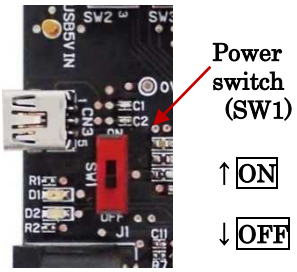



Figure 7 – Power Switch

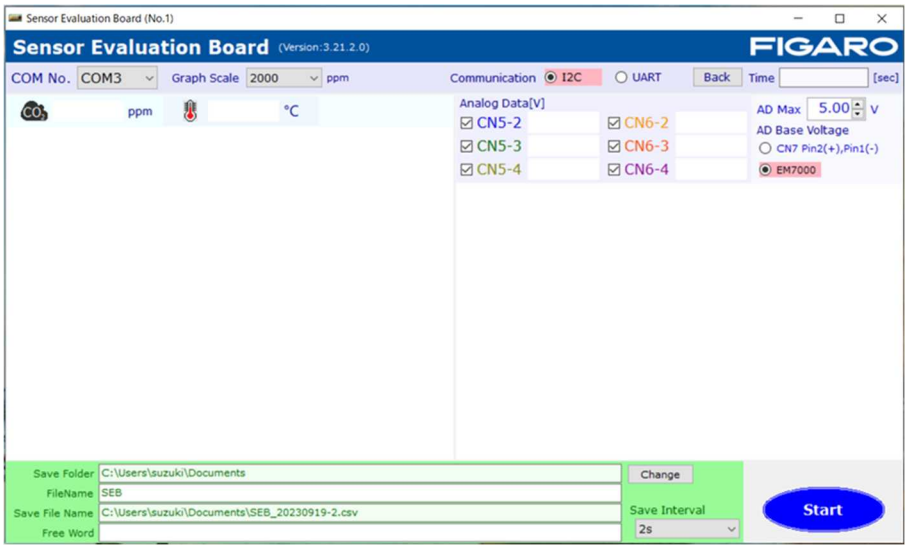



Figure 8 – Startup Screen

(6) Setting the COM port number **[COM No.]**

Select the COM port number that is automatically recognized by the PC application from the pull-down menu for "COM No." in the upper left corner of the screen.

(7) Setting the recording interval **[Save Interval]**

Select one of the following intervals from the Save Interval pull-down menu at the bottom right of the screen:

2 sec., 4 sec., 10 sec., 20 sec., 30 sec., 60 sec., 5 min., 10 min., 30 min., or 60 minutes.

This will specify the interval for recording measurement data in CSV format.

**Note)** *The measurement interval and the update interval of the measurement data chart display are fixed at 2 seconds.*

(8) Selecting the serial communication method **[Communication]**

Select I2C according to the serial communication mode setting on EM7000.

(9) Setting the storage destination **[Save Folder]**

The directory path for the default storage destination folder is displayed in the Save Folder field. The destination folder to save measurement data (CSV files) can be changed by clicking the [Change] button while gas measurement is not being performed.

(10) Setting the file name to save data **[Save File Name]**

Measurement data is automatically saved under the name consisting of the file name entered in the [File name] field (e.g. “SEB”), date (e.g. “20230919”), and serial number (e.g. “-1”) (example: “SEB_20230919-1.csv").

(11) Entering free-form text **[Free Word]**

Any information or remarks related to the measurement can be entered into the header section of the CSV file by entering it in the [Free Word] field.

(12) Starting measurement

- When you click the **[Start]** button, gas measurement begins, and the measurement data chart is displayed.
- The measurement data for the most recent 16 minutes will be displayed on the screen at the measurement interval of 2 seconds (see Figure 9).
- Measurement data is saved in CSV format on the computer at the recording interval specified in Step 7 above. (for how to change the storage destination or file name of saved data, see Sec. 5-2).


Figure 9 – Measurement Data Display Example

(13) Completion of measurement

Click the **[Stop]** button to terminate measurement.

When measurement is completed, measurement data is saved in the CSV format.

**Caution!!** Before attaching or removing the $CO_2$ sensor module or EM series evaluation modules, be sure to turn off the power switch (SW1).

**5-2) Saved data files**

(1) The storage destination can be changed while gas measurement is not being made through the following steps:

- Folder name: Click the **[Change]** button at the right of the Save Folder field.
- File name: Directly enter the new file name in the File Name field.
  (*The default file name is "SEB".*)

The actual saved file name and the directory path are displayed in the Save File Name field. "_YYYYMMDD-N.csv" is automatically added after the file name displayed in the File Name field.

Where,

- YYYY : The Western calendar year (four digits) on the computer clock.
- MM : Month (two digits) on the computer clock
- DD : Day (two digits) on the computer clock
- N : Serial number beginning with 1 is automatically added.

* Measurement data for about 24 hours will be stored in a single file. The data for the subsequent measurements for 24 hours is saved in a file with the same name and a new serial number N, that is incremented by one.

(2) Saved CSV files can be imported into a spreadsheet software such as Excel® for manual data processing and analysis after completion of measurements (Figure 10).

Figure 10 - Screen Example of a CSV File opened in Microsoft Excel®

The following information and measurement data are saved in a CSV file as shown in Figure 10:

・Rows 1 to 7 : Name of the PC Application Software and its version number
Date and start time of measurement (“Time”)
Recording interval (“Save Interval”)