飞米科技
FEIMI Technology

CGMS

User Guide

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Customer Notice

The signals in the Contactless Capacitive Measurement System (CGMS) comply with all applicable requirements of GB21288-2022 (hereinafter referred to as the National Standard) regarding radiation safety.

During operation, users and nearby personnel must maintain a distance of at least 20 centimeters or more.

The product has been tested and complies with the national standard regulations for the limitations on digital devices. These limitations are designed to provide reasonable protection against harmful interference in installations. This product generates radiation and radio frequency signals, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. If this product does cause harmful interference to radio or signal reception, it can be determined by turning the sensor off and on, and the user should try to eliminate the interference by taking one or more of the following measures:

- Reposition or reorient the host computer's Bluetooth reception module.
- Increase the distance between the product and the host computer.
- Consult authorized distributor technical support personnel.

Note

Electrostatic discharge (ESD) may damage the CGMS. Handle the CGMS in an ESD-protected area. If such an area is not available, wear an anti-static wrist strap or touch a grounded surface before handling the CGMS.

Chapter 1

1.1 Introduction

The CGMS is an advanced distance measurement device utilizing capacitive sensing technology, capable of responding to the proximity of conductive electrodes and providing real-time gap measurements. Its advantages include high precision, wide measurement range, excellent reliability, and fast response speed. This product is primarily designed for applications in semiconductor processing, precision machining, and measurement equipment industries.

The CGMS consists of the following components:

- Measurement Sensor : The measurement sensor is designed with a wafer-like form factor, making it compatible with most wafer handling equipment. The sensor packaging is also vacuum-environment compatible.

- CGMS-software : CGMS-software Monitoring Measurement Sensor,and displays distance measurement values and other status information in real time。 CGMS-software runs on most personal computers using the Microsoft Windows operating system.

- Wireless Connection : CGMS-software Communicates with the measurement sensor via a Bluetooth wireless connection to the host computer's USB port.

• Battery Charger and Adapter Cable： The battery charger and adapter cable allow you to charge the battery of the distance measurement wafer.

• Carrying Case : The carrying case allows you to conveniently transport the complete CGMS system to the factory or on the road.

Chapter 2

2.1Installing The Software

This chapter describes the procedures you need to perform to install your CGMS and get it ready for use. For best results,perform the procedures in the order they are presented in this chapter:

1. Installing the software

2. Checking communication between the device and the sensor

Caution

Dropping the gapping wafer or hitting it against a hard object can bend,break,or chip the housing ; damage the internal components ; or knock the gapping wafer out of calibration. While it is not as fragile as an actual silicon wafer;handle the gapping wafer with care, as you would any precision instrument .If the gapping wafer is damaged or in need of calibration, see Chapter 4, “Maintaining Your CGMS.”

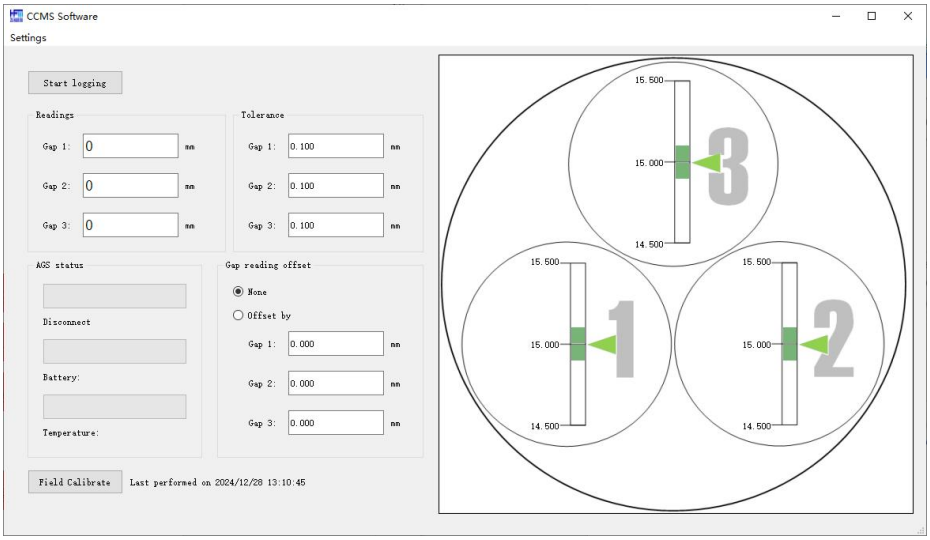
- To run the WaferSense CGMS software, your computer must have the following:
- Windows 10 or Windows 11 operating system

2.1.1 Installing Your CGMS

• Log in using an account with administrator privileges.

• Insert the CGMS installation USB drive into the computer.

After opening the folder, run the "CGMS-software.exe" program.



2.1.2 Check Communication Between the Computer and the Sensor

To complete the installation, verify that the gapping wafer and link can communicate as follows:

1. The capacitive sensor is powered by an internal rechargeable battery. Before using the capacitive sensor for the first time, charge it for two hours ;

2. Unplug the charger, and then remove the sensor from the box ;

3. Toggle the switch button to turn on the capacitive sensor. The power indicator light on the capacitive sensor will illuminate ;

4. After turning on the switch, the connection status light on the sensor will blink slowly. After a few seconds, the sensor and device will connect, and both lights will remain steadily illuminated without blinking.

That completes the installation your CGMS.

2.2 Perform Calibration Service

To maintain optimal performance, you should calibrate the capacitive sensor and replace its battery every twelve months. These services can be performed either at the factory or by yourself. (If you purchased the calibrator）。

2.3 Technical Support

The after-sales service center of Harbin Feimi Intelligent Technology Co., Ltd. (hereinafter referred to as "Feimi Technology") provides free technical support. If any malfunction occurs with the CGMS hardware or CGMS-software, please contact us. We will be glad to assist you.

When contacting us, please ensure you provide the following information:

• A detailed description of the issue, including the exact text of any error messages and a list of steps to reproduce the problem.

• Information about your computer, including the manufacturer, CPU type, Windows version, and memory size.

• CGMS-Software Application version。

- Technical support is available from Monday to Friday, 8:00 AM to 5:00 PM (UTC+8)。
- Contact Information : +86-13009802897

Chapter 3

3.1 Using Your CGMS

This chapter gives you instructions for performing the following tasks with the CGMS :

• Using the CGMS Buttons and Status Lights

• Performing basic gap measurements

• Applying offset to gap readings

• Logging your readings

• Monitoring operating temperature

3.2 CGMS Buttons and Status Lights

CGMS has two buttons:

• ON / OFF： Turn on or Turn off CGMS。If the CGMS-software application is not running, the CGMS will automatically turn off after 30 minutes.

• Pairing : Change the pairing between the CGMS and the connection.

CGMS also has the following status lights:

• Power status light：CGMS lights up when turned on.

• Charging status light：Lights up when the CGMS is charging.

• Charging complete status ligh：Lights up when the battery reaches

at least 90% charge.

• Pairing status light：Lights up when the CGMS is paired with the connection.

• Connection status light：Lights up when the sensor has established communication with the host computer. Blinks slowly when the sensor is attempting to establish a connection with the host computer.

3.3 Performing Basic Gap Measurements

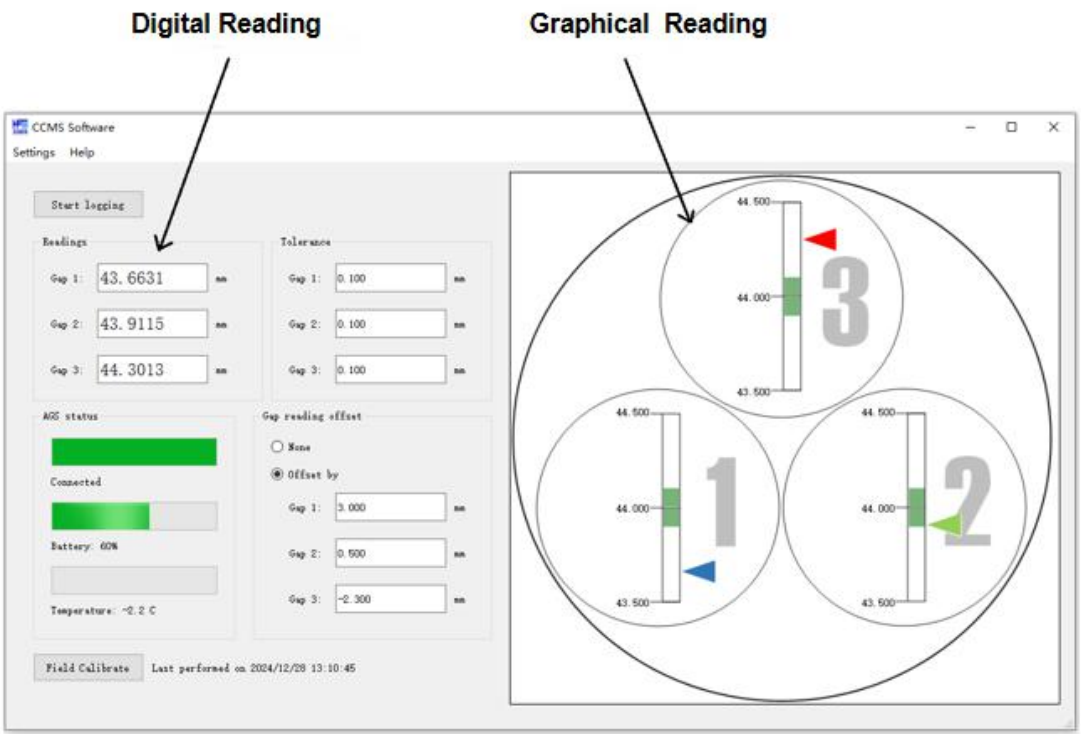
cGMS Using three sensors，These sensors respond to the proximity of conductive surfaces. Using these sensors, the CGMS measures the gap at three points, which is the distance between the bottom of the CGMS and the surface of the device above it. You can use these three gap measurements to adjust the equipment, making the CGMS parallel to the measured side or other surface within your specified tolerance range.

CGMS-softwareThese gap measurement results are displayed using two types of readings:

• Graphical reading

• Digital reading

CGMS-software Real-time updated readings， So you can see any changes in real time.



Perform basic gap measurement ：

1. Place the CGMS on the device you want to inspect. By rotating the CGMS, align the numbers on it with the numbers on the CGMS-software display.

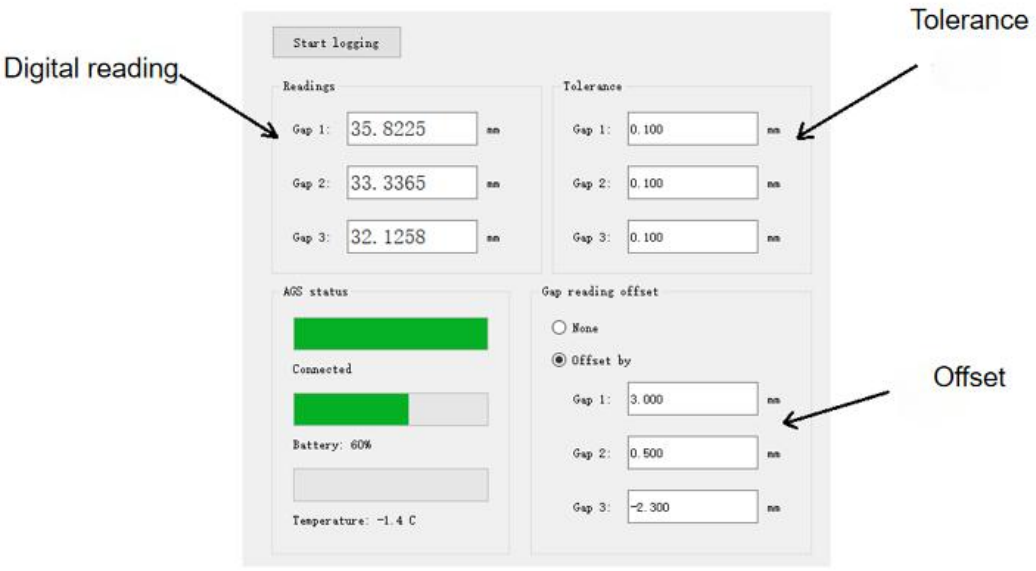
There is also a notch on one side of the capacitive sensor. When you align the capacitive sensor as described above, facing the wafer, the notch will be at the ten o'clock position.

You can change the orientation of the capacitive sensor in the CGMS-software display.

2. Ensure that the computer running the CGMS-software application is within the range of the CGMS, approximately 10 meters.

3.The digital and graphical readings indicate the three gap measurements

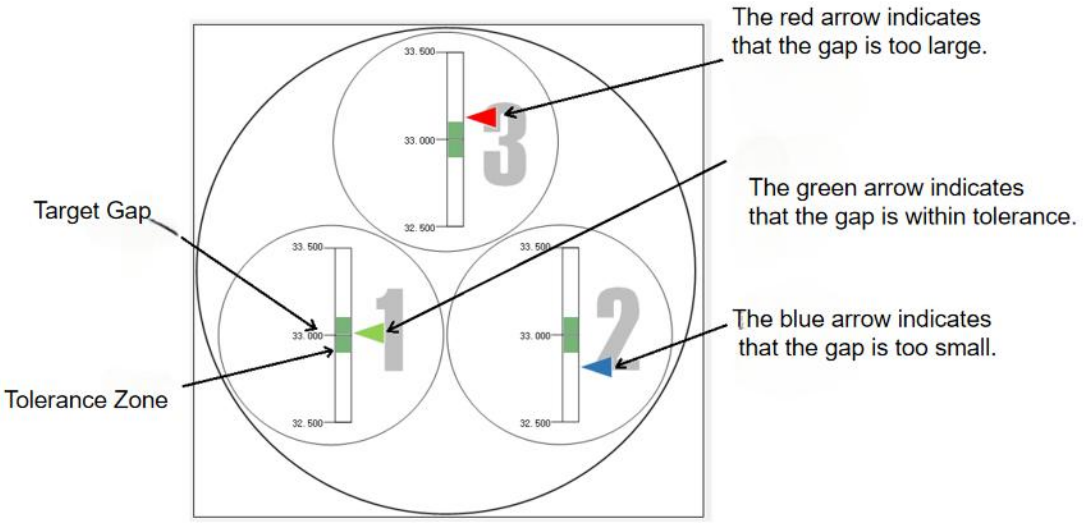
• The digital readings display gap measurements in real time, accurate to 0.0001 mm. The CGMS-software also shows the current settings of the target gap tolerance.



If you change the size of the CGMS-software window, the size of the digital readings will not change.

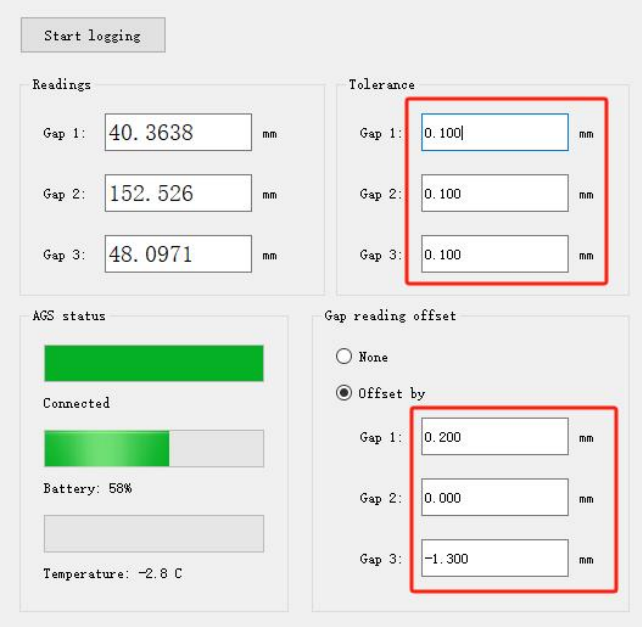
• The graphical data display shows the gap measurements in real time. Each circle (1, 2, and 3) displays a ruler with the target gap distance marked at its center. The green band at the center of the ruler corresponds to the tolerance of the gap measurement. You can set the target gap distance and tolerance for the three gap measurements.

Each ruler has an arrow next to it pointing to the current gap measurement. The color of the arrow indicates whether the current gap measurement is within tolerance (green), too small (blue), or too large (red).



3.4 Applying Offsets to the Gap Readings

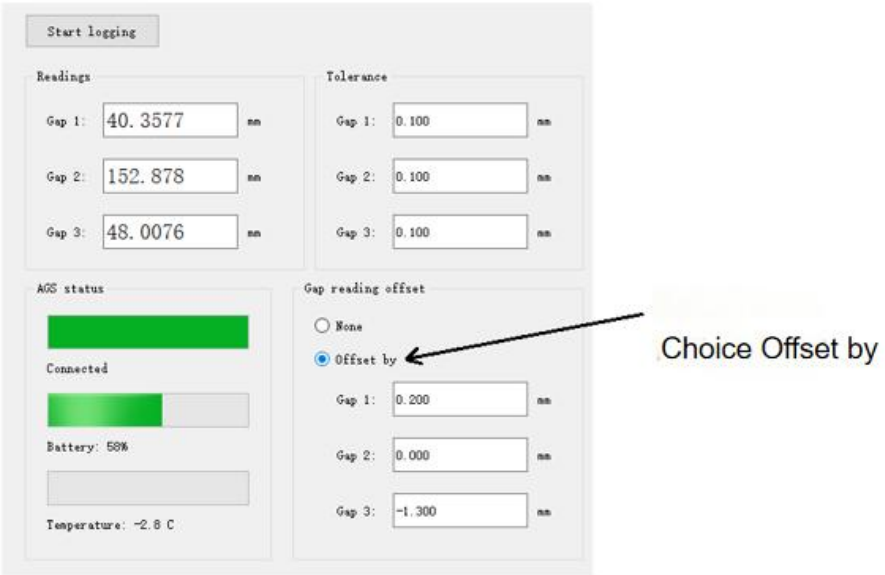
By default, CGMS-software displays the actual measurements from the gapping wafer's sensors. If you use other instruments to measure or set gaps, the measurements of those instruments might not agree with those of the CGMS because of differences in technology or calibration. If you want the CGMS readings to agree, you can use the offsets feature of CGMS-software to add an adjustment to the displayed measurements. You do this by having the AGS measure the gap and then telling CGMS-software what you want the displayed readings to be. CGMS-software calculates the difference between the actual CGMS measurements and your specified values and applies these offsets to the displayed readings.



3. In the adjustment box for each gap，Enter the value you want the CGMS-software to display for the current measured gap .

4. CGMS-softwareCalculate the difference between the adjusted settings and the current readings, and display this offset.

5. CGMS-softwaren the Read Offset section of the main window，select 'Offset by' application offset.



To stop CGMS-software from applying the gap offsets,in the Gap reading offset controls choose None .

3.5 Record Readings

CGMS-software It can record your activities when using the capacitive sensor to inspect various equipment gaps. CGMS-software Save the records in a data file. You can specify the file save path. The data file contains the following information :

Information for each entry:

• Date and Time : Date and time of the data file entry.

• Gap: Measured values of Capacitance 1, Capacitance 2, and Capacitance 3.

• Battery : Percentage of remaining battery power.

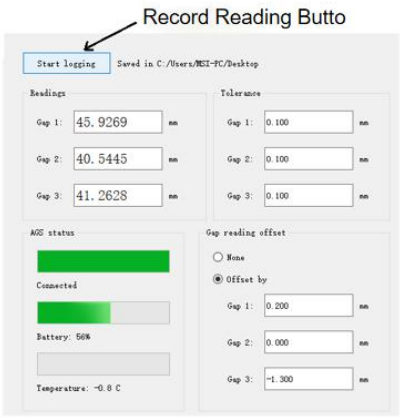
• Temperature: Current operating temperature of the capacitive sensor in degrees Celsius (°C) .

Record readings

CGMS-software Save entries to the data file according to your command.

Record in the data file

CGMS-software window， Click the Start loggingbutton to begin recording readings. Each time you click the button, the CGMS-software will start writing the readings to the data file.



Change the data file save path

By default，CGMS-softwareWrite data entries to the root directory. CGMSReadings-（Date+Time）csv. If you prefer, you can specify a different save path for the data file.

change the data file save path:

1. Select the menu item Settings > Change Logging Save Address from the menu bar.

2. In the CGMS Data File dialog box, specify the save path for the data file, and then click the "Select Folder" button.

Display readings from the data file

The data file is saved in comma-separated values (CSV) text format. Files in CSV text format can be easily imported into spreadsheet and word processing programs.

3.6 Monitoring the Operating Temperature

To achieve the specified accuracy for gap readings, the operating

temperature range of the capacitive sensor is 20°C to 70°C. The temperature monitor in the CGMS-software window of the CGMS wafer status area displays the current operating temperature of the capacitive sensor with a numeric readout and a bar graph.

The thermometer indicates the upper and lower limits of the operating temperature range. The bar graph changes color as an additional indication of the current temperature relative to this range.

3.7 Accurate Operating Range

• Blue : Less than 20℃， CGMS is operating below the range where it can produce accurate readings.

• Green : 20℃ to 70℃， CGMS It operates within its normal temperature range, where the readings meet the specified accuracy.

• orange : Greater than 70℃ to 80℃， CGMS Operating above the range where it produces the most accurate readings, but the temperature is not high enough to damage the wafer.

• Red : Greater than 80℃， CGMS Operating at such high temperatures may cause damage.

3.8 Monitoring the Battery Level

Charging

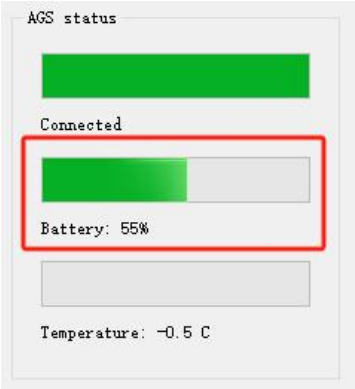
The CGMS is powered by a Type-C charging cable. When fully

charged, the battery provides approximately 8 hours of continuous operation. Before using the CGMS for the first time, charge it for two hours.

The battery can be charged approximately 500 times before its charging capacity significantly degrades. The battery cannot be replaced by the user. If the CGMS operating time noticeably decreases, please contact Feimi Technology After-sales Service Center.

Monitoring the Battery Level

The CGMS-software receives frequent updates from the CGMS regarding the battery status. The battery indicator in the CGMS status area of the CGMS-software window displays the approximate remaining battery dpepercentage before charging is required.



To charge the CGMS:

1.Use only the battery charger provided with the CGMS. Using a different charger may damage your capacitive sensor or create a safety

hazard.

2. Do not charge the capacitive sensor if its internal temperature exceeds 45°C. Charging the sensor at temperatures above 45°C may cause damage or create a safety hazard.

3. Insert the charger adapter cable into the socket labeled "CHARGER" on the capacitive sensor.

4. Insert the battery charger into a 220V power outlet, and connect the other end to the charger adapter cable. The charging indicator will illuminate while the CGMS is charging.

5. Charge the CGMS until the **Charging Done** light turns on or until you need to use the CGMS (you don’t need to wait until the CGMS is fully charged). Before using the CGMS remove the charger adapter cable. Fully charging the battery takes about two hours. Charging for one hour charges the battery to about 80% of its capacity. You can leave the CGMS plugged in when not in use; the battery won’t overcharge.

3.9 Monitoring the Wireless Connection to the CGMS

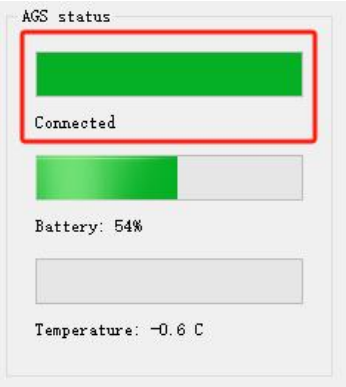
The CGMS-software application communicates with the CGMS by using a Bluetooth wireless link . The wireless link has a range of about 30ft(10m)

The Connection indicator in the CGMS status area of the CGMS-software window shows the quality of the wireless connection between the CGMS and the link module.The connection quality is

indicated by the color of the bar ang the wording below the bar.

• Green - Connected。The connection between the link and gapping wafer is good. With good connection ,the gapping wafer is sending readings to the link module at the maximum rate.

• Gray - Disconnected. No connection exists between the CGMS device and the software.



The Bluetooth wireless link technology used in the CGMS is a low-power technology that operates in the 2.4GHz radio frequency band. This unlicensed band is also used by many other type of devices,such as Wifi and microwave ovens. Another 2.4GHzdevice operating in close proximity could interfere with the CGMS system.When this happens , Separating the devices by at least 5 meters usually resolves the issue.

Other factors can also affect the wireless link , such as the distance between the CGMS and the host computer ,as well as signal-blocking obstacles between them.if the CGMS-software indiccates a poor connection status, try moving the host computer closer to the CGMS device .

3.10 Saving Your Settings

Each time you exit the CGMS-software application, it saves your current settings to a configuration file, including parameters such as data file storage path, target gaps and tolerances, gap offsets, and other relevant information. The next time you start CGMS-software, it will restore these saved settings.

Chapter 4

4.1Maintaining Your CGMS

Caution

The edges of the CGMS gapping wafer are thin . It may be possible to sustain an injury from these edges if the gapping wafer is not handled with proper care.The CGMS device requires regular calibartion and battery replacement.

- Once a year, you should have your CGMS calibrated and the internal rechargeble battery replaced by returning the CGMS to the Femi Technology's .
- In addition to the annual factory calibration, you should calibrate your wafer using the field calibration procedure described in this chapter. Field calibration is not a substitute for the annual factory calibration.
- If cleaning is required, wipe the outside of the gapping wafer with IPA (isopropyl alcohol). If the gapping wafer is used in a clean environment, follow proper procedures for cleaning devices for this environment.

Warning

Do not immerse the gapping wafer or the link module in liquid . Do not spill liquids on the gapping wafer or on the link module.

4.2 Annual Factory Calibration and Battery Replacement

Every twelve months, you have return your capacitive sensor to Femi Technology's authorized seervice center.We will calibrate the capacitive sensor and replace its internal rechargeable battery .you can check the last factory calibration sensor through the main interface of the CGMS-software application.

If you accidentally drop the capacitive sensor or suspect its calibration may be compromised, please contact Femi Technology Authorized Service Center for technical support.

Battery Usage and Disposal

Your AGS gapping wafer contains a lithium-polymer battery. To avoid damage to the gapping wafer, use the supplied charger only. Do not charge the gapping wafer at temperatures outside the specified range (0 °C to 45 °C). Do not incinerate or dispose of the gapping wafer into fire. Do not immerse the gapping wafer when cleaning or spill liquids on the gapping wafer.

4.3 Field Calibrating Your CGMS

Over time, the CGMS gap measurement may drift. In addition to annual factory calibration, you may need to perform regular calibration of your CGMS system. The CGMS-software includes an on-site calibration

feature that simplifies the calibration process. For this calibration, you will also need a calibrator, which can be obtained from Femi Technology. For information about Femi Technology calibrators, please contact technical support.

To field calibrate your CGMS：

1. In CGMS-software, the last on-site calibration date of the CGMS device is displayed to the right of the "Field Calibration" button .

2. Place the CGMS device into the calibrator. In the gap field, enter the gap distance of the calibrator, which is displayed on the calibrator unit.

3. This dialog box displays the current calibration values (from the last factory or on-site calibration) along with the new values determined during this calibration session. Note that the new values have not yet been saved to the CGMS device at this point.

4. Click Save to store the new calibration values.

Chapter 5

5.1 Specifications System Requirements

To run the CGMS-software and link,you computer must have :

• Windows 10 or Windows 11

• BlueTooth,2.4GHz,USB2.0

• CGMS Hardware

Environment

Operating pressure range： $10^{-}6$~0.1MPa

Storage temperature range： -20°C - 45°C

Charging temperature range : 0 °C - 45 °C

Operating temperature range ： 20 °C - 70 °C

Power supply

Battery charger requires : 5Vdc

Battery usage on a full charge ： approximately 8 hours

Typical battery recharge cycles：approximately 500

Range and Accuracy

Measurement range： 9mm-21 mm

Parallelism accuracy ： ±0.020mm@15 mm。

Weight：305g、455g

Size：8、12