Intelligent Gas Distribution System

User manual

V1.0

厦门海恩迈科技有限公司

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High-End MEMS

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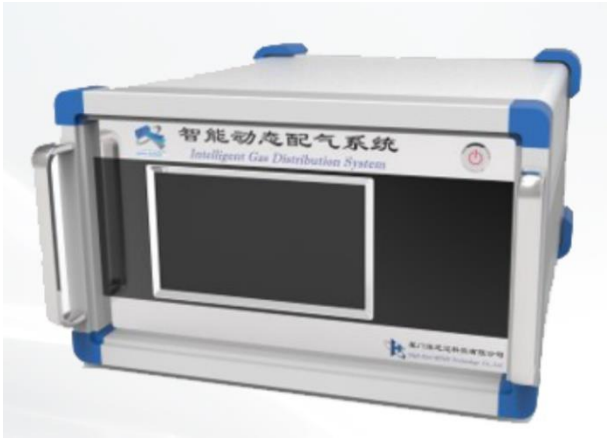
Intellingent Gas Distribution System

Instrument Overview

Intellingent Gas Distribution System is an intelligent multi-channel dynamic gas distribution device that uses the principle of mass flow control to mix Standard Gas and Carrier Gas in a certain proportion, and output the gas with a set concentration. It has a gas path switching function that allows the output gas to be switched freely between mixed gas and background gas.

The device has built-in conversion coefficients for more than a hundred common gases, which can automatically calculate the accurate volumetric flow rate of different types of single or mixed gases.



The instrument is small in size, powerful in function, and easy to operate. In addition to touch screen operation, it can also be controlled by a computer, and has programmable test functions such as flow rate change and gas path switching. It can be widely used in quantitative gas distribution in fields such as gas-sensitive sensing, environmental protection, and industrial hygiene.

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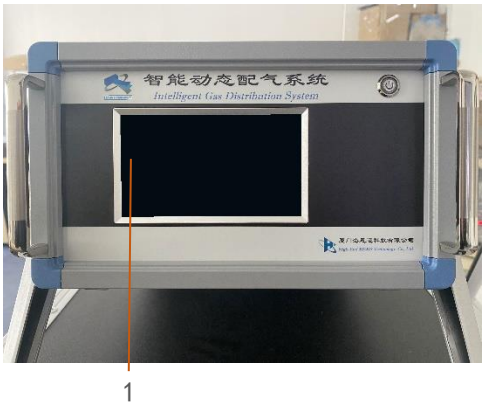
Table of Contents

Chapter 1 Instrument Introduction

1.1 Product and Accessories

Package Contents	
Instrument	TGA on Gantilever
Accessories	A to A USB cable x 1; 220V three-prong power cable x 1; 5M PTFE 1/8 tubing x 1
Related files	User Manual x 1; PC Control Software

1.2 Instrument Appearance and Interface Introduction



1. 5-inch capacitive touch screen
2. PTFE 1/8 tube connector
3. 220V Power Socket + Switch
4. USB Data Interface

1.2.1 5-Inch Capacitive Touch Screen: It features a simple and intuitive UI that allows for quick instrument configuration and operation.

1.2.2 Standard gas, carrier gas, and balance gas have three inlets, while sample gas and exhaust gas have two outlets.

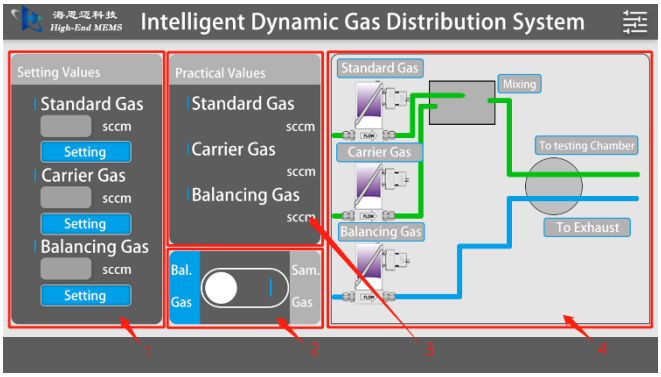
1.2.3 220V Power Outlet + Switch

1.2.4 USB-A Data Cable: The data cable connects to a PC for data and control transmission.

1.3 Instrument UI Operation Introduction

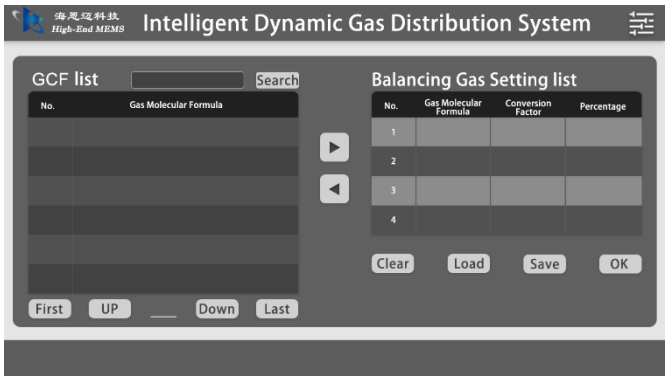
1.3.1 Gas distribution control interface

1. The flow control of the three inlets has an upper limit of 100 SCCM and a minimum accuracy of 2 SCCM. Click the "setting" button to enter the gas type setting interface and set the gas type.
2. The four-way valve switch allows you to choose whether the gas at the Chamber outlet is balance gas or a mixture of standard gas and carrier gas.
3. The actual gas flow rate display window.
4. The internal working condition of the device.



1.3.2 Setting interface

Before using the programmable temperature control interface, device parameters need to be set. Click "Enter Settings" in the upper right corner to access stage temperature control settings, and click the temperature control switch button to start. The current stage and settings are displayed during the process.



Chapter 2 PC Software Introduction

2.1 TGA Software

2.1.1 The TGA software can also be used to control the gas delivery system on a PC.

2.1.2 Upon opening the software, the menu bar is located at the top, and the status bar is at the bottom, as shown in the image below:

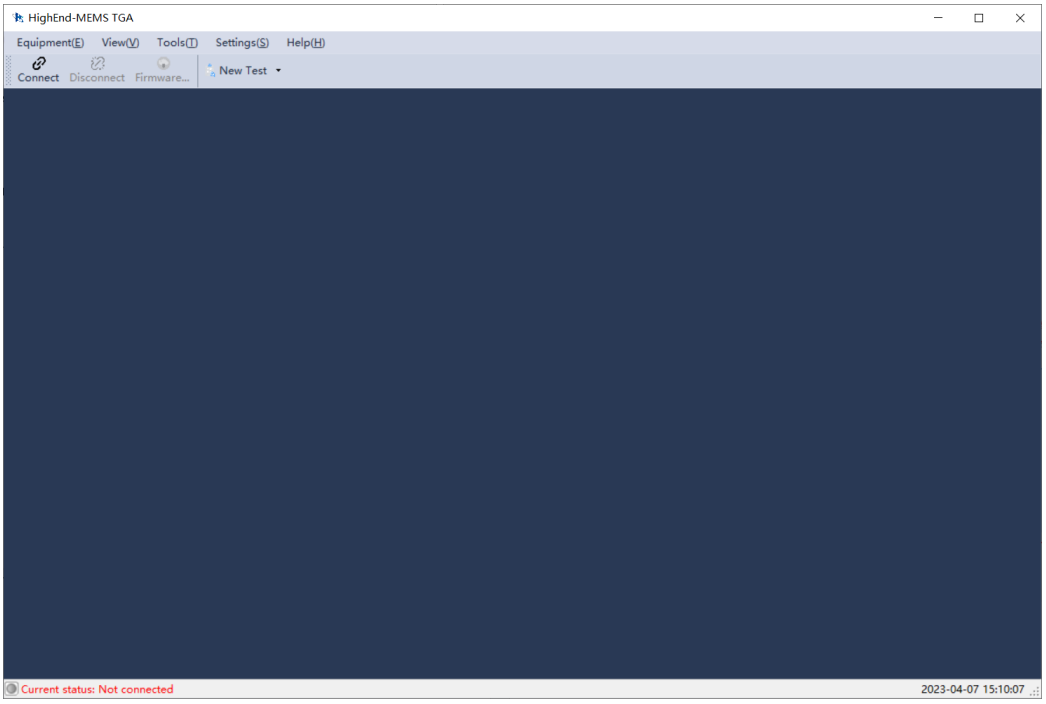


Figure 3.2.1 TGA Initial Interface

2.1.3 Under the "Equipment" dropdown menu, you can choose "Connect" to connect the device, "Disconnect" to disconnect the device, and "Firmware Update" to upgrade the device.

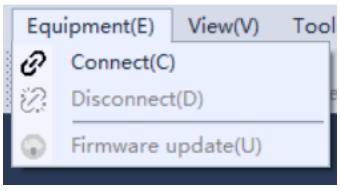


Figure 3.2.2 TGA Initial Interface

2.1.4 Under the "Tool" dropdown menu, you can choose to display the "Toolbar" and "Status Bar".

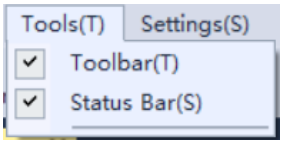


Figure 3.2.3 The drop-down menu under the Tools tab.

2.1.5 Under the "Settings" dropdown menu, you can choose the language environment.

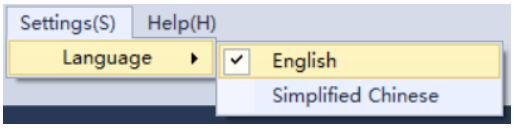


Figure 3.2.4 The drop-down menu under the Settings tab.

2.1.6 Under the "Help" dropdown menu, you can find the official website and software version information.

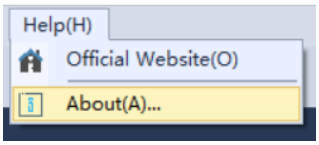


Figure 3.2.5 The drop-down menu under the Help tab

2.1.7 Connecting the device: Click on the "Connect" option in the menu and select the COM port of the device. Note: The device must be plugged in first in order to establish a successful connection.

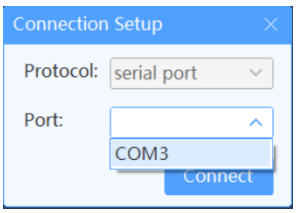


Figure 3.2.6 Selecting the COM Port

2.1.8 After clicking the "Connect" button and successfully connecting the device, the main interface will appear as shown in the image below:

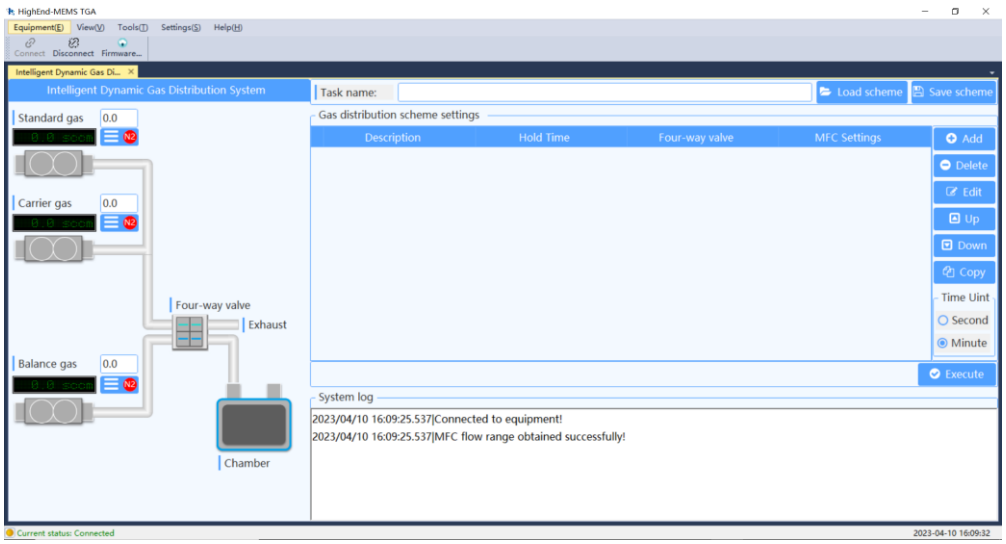


Figure 3.2.7 Main Interface after Successful Connection

2.1.9 The main interface is divided into: 1. Device Settings, 2. Scheme Selection, 3. Scheme Setting, 4. System Log.

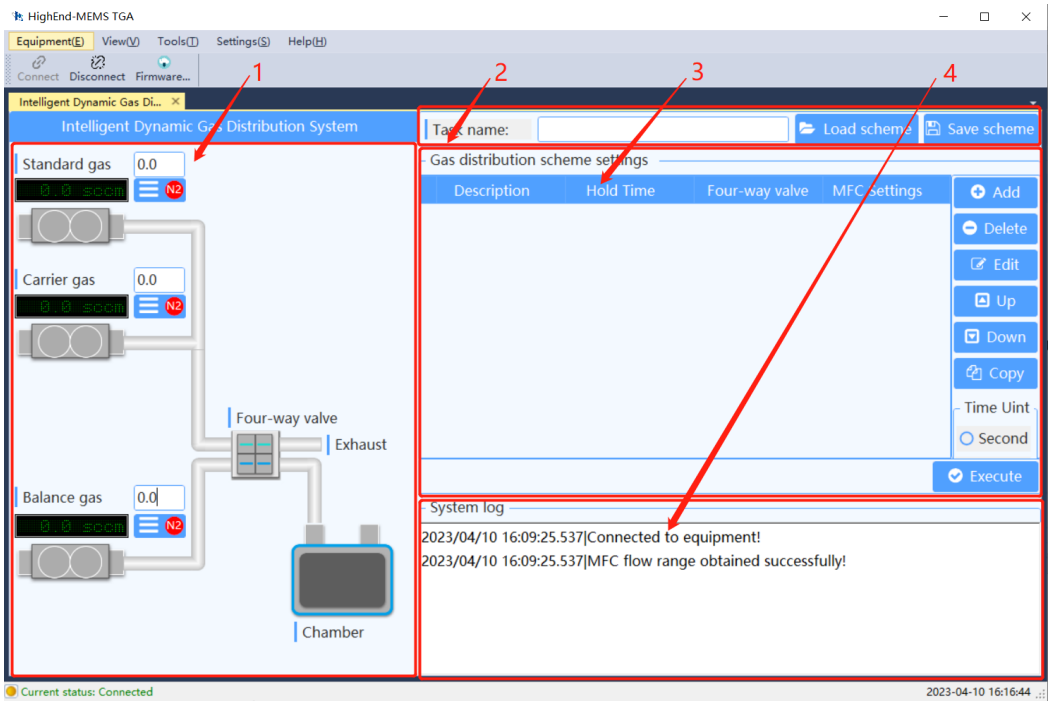


Figure 3.2.8 Main page functional division

2.1.10 Device settings：You can set the gas flow rate, type, and double-click the four-way valve to switch the four-way valve.

2.1.11 Scheme Selection: You can save the current program and also export saved programs.

2.1.12 Scheme Setting: You can click the "Add" button to add a single program, as well as delete, edit, copy, and other multiple operations to edit the program.

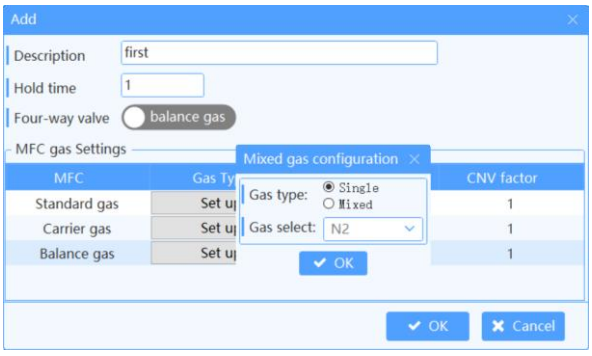


Figure 3.2.9 Add Program Window

2.1.13 System Log: Record system log.

Chapter 3 Testing Operation Instructions

3.1 The Operating Method for Gas Distribution Experiment.

3.1.1 Connect the gas lines. For a typical experiment, the balance gas and carrier gas are connected to the same inert gas, while the standard gas is connected to the experimental gas. The sample gas is connected to the exhaust gas from the reaction chamber for exhaust gas treatment, and the gas from the exhaust port is also treated as exhaust gas.

3.1.2 Open the gas cylinders and adjust the pressure regulator to maintain a pressure between 0.1 MPa and 0.3 MPa.

3.1.3 Adjust the flow rate ratio of the standard gas and carrier gas to dilute the standard gas and obtain the desired concentration.

3.1.4 Switch the four-way valve to proceed with the experiment.

3.2 Operating Procedure for Gas Sensing Experiment.

3.2.1 Test the sample gas concentration from low to high concentration during testing.

3.2.2 Open the gas cylinders and adjust the pressure regulator to maintain a pressure between 0.1 MPa and 0.3 MPa.

3.2.3 Set the balance gas to 100 sccm, the carrier gas to 80 sccm, and the standard gas to 20 sccm, which is equivalent to diluting the standard gas to 1/5 of the original.

3.2.4 Start the device and wait for the frequency to stabilize. Switch the four-way valve to allow the test gas to enter the reaction chamber.

3.2.5 At this point, the frequency curve responds downward, indicating an increase in material mass. The sample absorbs the test gas, waiting for the adsorption to be basically saturated, and the frequency curve is basically stable.

3.2.6 Switch the four-way valve to introduce the balance gas into the reaction chamber, and the frequency curve will rise, indicating the desorption of the previously adsorbed gas. Wait twice the amount of time required for the previous adsorption, and then test again at the same time interval, disregarding the data from the first test.

3.2.7 Adjust the concentration ratio of the carrier gas and the standard gas, for example, set both to 50 sccm, increase the concentration, and test at the same time interval.

3.2.8 After approximately 4 concentrations are tested, save the test curve.

Chapter 4 Shutdown Operation

4.1 Shutdown Operation Steps

4.1.1 After the experiment is completed, close the gas cylinders first and wait for the gas distribution system's flow rate to return to nearly zero.

4.1.2 Turn off the power

Chapter 5 Precautions

5.1 Detailed content of precautions

5.1.1 To ensure testing accuracy, the device should be turned on for 30 minutes before conducting the experiment.

5.1.2 You can use a T-connector to introduce the same gas into the balance gas and carrier gas lines. However, the T-connector should be placed far from the gas distribution system inlet to split the gas flow and prevent interference with the test results during gas path switching.

5.1.3 The exhaust gas from the device and the exhaust gas outlet of the reaction chamber need to be treated separately. It is forbidden to mix them into a single gas path for simultaneous exhaust gas treatment.