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Fixed Gas Detector

Operator's Manual

GTQ-Anr-A/ GTQ-Anr-D/

AG210/ AG211

Version : 1.2.2001

Dear customer：

Glad to have your trust and support on AIYI Technologies, we will provide you best product and service in return.

As an ISO certified manufacturer. AIYI Technologies has been focus on safety and environment many years, we provide you gas & dust detector and systems. The design and manufacture of product is strictly follow the international standard and company regulations, and each product get a normative QC control to ensure the best quality for you.

Please read and understand this operator's manual before operating instrument. Improper use of the gas monitor could result in bodily harm or death. Please don't hesitate to contact us if you have any questions or suggestions. Thanks!

We are honored to have the opportunity to serve you.

Yours sincerely,

Dongxu Zhang

Vice-Gerneral Manager

Nanjing AIYI Technologies Co., Ltd.

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Introduction to the operation manual

This manual mainly introduces the hardware characteristics, installation methods and maintenance of the gas detection transmitters.

This manual is suitable for the following personnel: instrument maintenance engineers, field users.

Note: When installing the device, please carefully read the contents of this manual to avoid possible personal injury and equipment damage.

In addition to this manual, if you need to obtain the latest product information, you can go to www.aiyitec.com or call the hotline 0086-25-87756351 for consultation.



Note: To avoid possible personal injury and equipment damage before and during the installation of the equipment, please read the relevant contents of this manual carefully.

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Chapter 1: Product Introduction

1.1. Brief introduction

AE'S GTQ-Anr-A、GTQ-Anr-D、AG210、AG211 gas detector are suitable for detecting the content of combustible and toxic gases such as combustible gas, oxygen, and toxic gases in explosion hazard areas. The product adopts the integrated design of sound and light alarm, which can effectively warn of various gas leakage hazards; modular design, easy maintenance; with infrared remote control, can be achieved without open cover operation. IP66 protection class

Features:

▎Use high-performance sensors, quick response, safer and more reliable.

Model Description:	GTQ-Anr-A	4-20mA signal catalytic combustible gas detector
	GTQ-Anr-D	RS485 signal catalytic combustible gas detector
	AG210	4-20mA signal toxic gas detector
	AG211	RS485 signal toxic gas detector

GTQ-Anr-A、GTQ-Anr-D are combustible gas detector for industrial and commercial use. AG210、AG211 are gas detector which are collectively referred to as gas detectors .

▎Stainless steel + aluminum alloy material, the protection level of the whole table reaches IP66, which is suitable for harsh working conditions.

▎High-brightness display, LED status indicator, display rich information.

▎Built-in low-report, high-report, and fault three switches, which can realize multi-level interlocking.

▎Infrared remote control operation, no need to open the cover on site.

▎Standard electrical interface, support external sound and light alarm

A variety of signals are available to support the different needs of customers.

The design, manufacture and verification of this product follow or refer to the following national standards:

▎GB15322.1-2019 "Combustible Gas Detector Part 1: Point-type Combustible Gas Detector for Industrial and Commercial Use"

▎GB 3836.1-2010 "Explosive Atmosphere Part 1: General Requirements for Equipment"

▎GB 3836.2-2010 "Explosive Atmosphere Part 2: Equipment Protected by Flameproof Enclosure "d""

▎GB 3836.4-2010 "Explosive Atmosphere Part 4: Equipment Protected by Intrinsic Safety Type "i""

▎GB/T 50493-2019 Code for Design of Detection and Alarm of Combustible Gas and Toxic Gas in Petrochemical Industry"

▎GB 12358-2006 "General Technical Requirements for Gas Detector and Alarm in Working Environment"

▎GB 16838-2005 "Environmental Test Methods and Severity Levels of Fire Electronic Products"

▎GB/T 4208-2017 "Enclosure protection class (IP code)"

▌GBZ 2.1-2007 "Occupational Exposure Limits for Hazardous Factors in the Workplace Part 1: Chemical Hazardous Factors"

▌JJG365-2008 "Electrochemical Oxygen Analyzer"

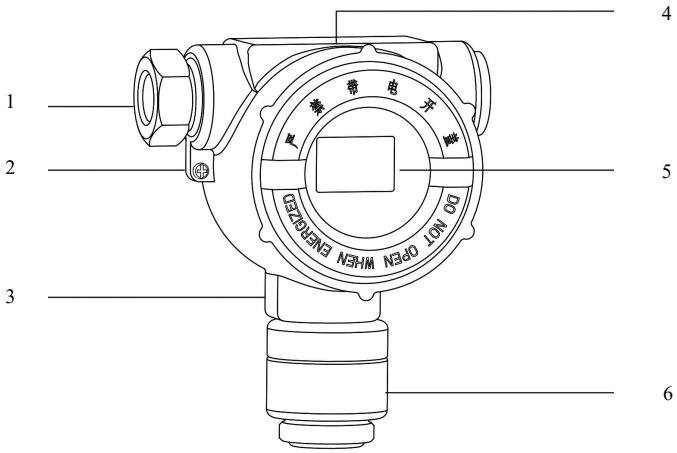
▌JJG 693-2011 "Combustible gas detection alarm"

▌JJG 915-2008 "Carbon Monoxide Detection Alarm"

▌JJG 695-2003 "Hydrogen Sulfide Gas Detector"

▌JJG 551-2003 "Sulfur Dioxide Gas Detector"

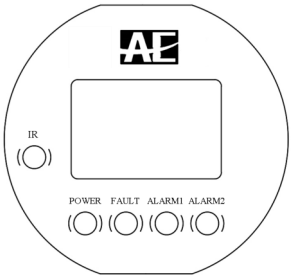
1.2. Appearance structure



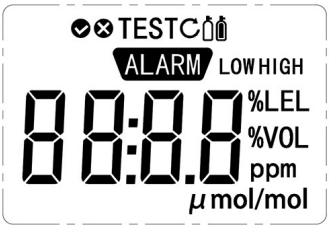
1 Ex-proof adapter 2 Ground screw 3 Base mounting hole

4 Nameplate 5 Screen 6 Sensor housing

Screen and indicator



Infrared	Receive infrared remote signal
Power	Normal on, the green light is off
Fault	Normally off, yellow light is
Alarm1	Normally off, and the red light is always on when the alarm-1
Alarm2	Normally off, the red light is always on when the alarm-2



2、Status



ALARM	Alarm indication
LOW	Alarm-1
HIGH	Alarm-2

3、Display



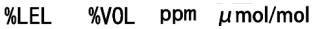
Readings

1、Task



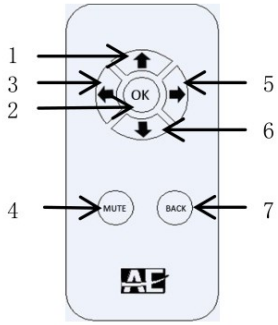
	Success
	Fault
TEST	Self-inspection
	RS485 signal
	Zero calibration indication
	Range calibration indication

4、Unit



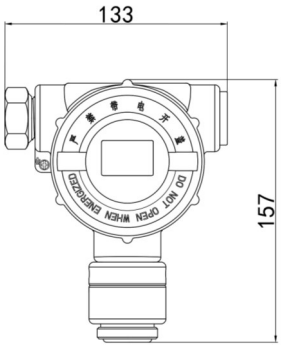
%LEL	Percentage of lower explosive limit
%VOL	Volume percentage
μmol/mol	Volume ratio per million
ppm	Volume ratio per million

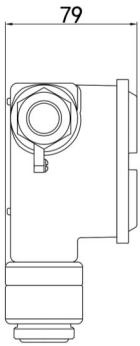
Remote control



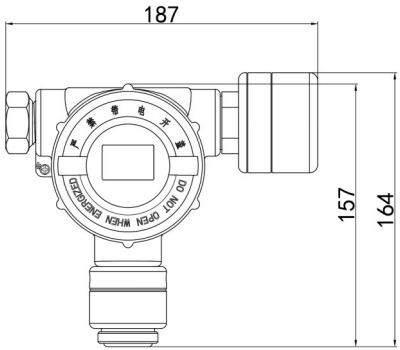
↑	Move up or number plus
↓	Move down or decrease the number
←	Left
→	Right
OK	Confirm or enter the menu
MUTE	mute
BACK	Exit

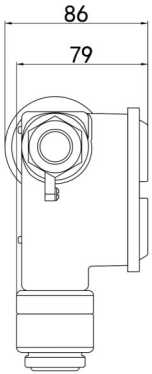
Gas detector dimensions(mm)





Dimensions of gas detector with GARY sound-light alarm (mm)





Description	Specifications	GTQ-Anr-A	GTQ-Anr-D	AG210	AG211
Gas detected					
Combustible gas	Combustion catalytic	●	●	-	-
Toxic gas	Electrochemical, PID, Infrared	-	-	●	●
Detection					
Measure range	0-100%LEL	●	●	-	-
	See Appendix	-	-	●	●
See Appendix *	T90≤30S	●	●	-	-
	T90≤30/60/180S	-	-	●	●
Accuracy*	≤±3%FS	●	●	●	●
Repeatability*	≤3%FS	●	●	●	●
Electric					
Power supply	18-28VDC(Standard24VDC)	●	●	●	●
Power consumption	≤2.5W	●	●	-	-
	≤2W	-	-	●	●
Single output	4-20mA	●	-	●	-
	RS485	-	●	-	●
Wiring	Three wiring	●	-	●	-
	Four wiring	-	●	-	●
Cable	RVVP3*1.0mm^2	●	-	●	-
	RVVP4*1.0mm^2	-	●	-	●
Relay output	Three relay output(250VAC/5A 30VDC/5A)	●	●	●	●
Display &Operation					
Display	LCD Display	●	●	●	●
Indicator light	Power, fault,alarm1, alarm2	●	●	●	●
Operation method	IR remote control operation	●	●	●	●
Operation Environment					
Ingress protection	IP66	●	●	●	●
Temperature	-40℃～+70℃	●	●	-	-
	-20℃～+60℃	-	-	●	●
Humidity	10～95%(No condensation)	●	●	●	●
Pressure	80-120kPa	●	●	●	●

Description	Specifications	GTQ-Anr-A	GTQ-Anr-D	AG210	AG211
Structure					
Body Material	ADC12Aluminum alloy + 304L stainless steel	●	●	●	●
Conduit Port	NPT1/2	●	●	●	●
Weight	About 1.45kg	●	●	●	●
Dimensions	157*133*79mm(H*W*D)	●	●	●	●

Note:

● means it has this function,-means it does not have this function.
*Refer to attached table 1 for detailed detection gas.
*Different gases will be different, and their response time, error, and repeatability are different. The data in the above table is for reference only. Please consult the manufacturer for details.

Chapter 2: Installation

2.1. Packing list

Please check and count the goods before installation to confirm that the appearance of the packing box is complete. After unpacking, check the installation accessories and check whether they are complete. If there is any loss, please contact our company as soon as possible. Items not included in the packing list may be used during the installation process, please purchase by yourself.

Under normal circumstances, the gas detection transmitter contains the following products and accessories:



Gas detector



Remote*(optional)



manual



certificate/calibration report



accessories

Note: Remote is universal. For eco-friendly, each order equip one remote only.

2.2. Installation cautions

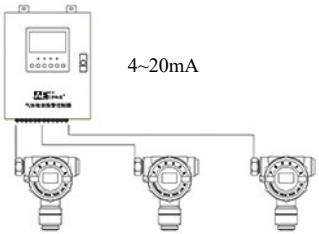
- Before the detector is installed, it should be inspected in detail whether the explosion-proof mark conforms to the environment of the explosive gas mixture and whether there is obvious crack in the appearance to ensure the explosion-proof performance of the product.
- When applied to the field of fire type approval, the gas detector should be connected to the corresponding controller, and it is forbidden to connect with other brands and models. The controller must be installed in a non-hazardous area.
- Please keep the power off state during the installation and wiring process to ensure that there is no flammable gas in the environment, and ensure that the temperature and humidity of the use environment meet the working requirements of the detector.
- The detector is designed for gas detection in the environment and should not be used on pipelines or other purposes.
- The detector must be installed so that the sensor is down and the sensor cover must not be blocked or painted.
- The installation and wiring of the detector should be as far away as possible from high-power equipment.
- In an oxygen-deficient atmosphere, the catalytic combustion type sensor may be lower than the actual reading. When the oxygen concentration is lower than 10%vol, the instrument will not work properly.
- Long-term presence of H2S, halogen elements (fluorine, chlorine, bromine, iodine), heavy metals, organic solvents, and acid gases in the environment may cause distortion of the test results, need periodic inspection or calibration.
- Be careful not to touch the internal circuit when wiring, and the instrument case should be grounded.

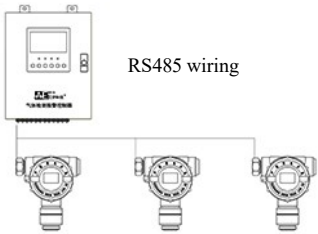
The installation, use and maintenance of the product shall comply with the instruction manual and the "Electrical Equipment for Explosive Gas Atmosphere" (GB3836.13-2013) Part 13: Inspection and Repair of Electrical Equipment for Explosive Gas Environment, "Electrical Equipment for Explosive Gas Environment" (GB3836.15-2017) Part 15: "Electrical installation in hazardous areas (except for coal mines), "Electrical equipment for explosive gas atmospheres" (GB3836.16-2017) Part 16: Inspection and maintenance of electrical installations (excluding coal mines) and Relevant regulations on "Construction and Acceptance Specifications for Electrical Equipment Installation Engineering Explosion and Fire Hazardous Environment Electrical Installations" (GB50257-2017).

2.3 Installation preparation

- Complete gas detector assembly, mounting accessories
- Screwdriver, multi-meter (if needed), etc.
- Power and cable

The standard working power supply of the detector is 24VDC. In view of the voltage drop caused by the cable resistance, ensure that the detector supply voltage is not less than 18VDC. If directly connected to the DCS or PLC system, please ensure that the power supply of the detector and its entire loop resistance should be ≤300Ω. For the case that the voltage cannot meet the minimum working voltage of the detector, it is necessary to install equipment such as repeater and explosion-proof box.





The detector and the controller are connected by shielded cables, and different cables should be selected depending on the operating conditions. Cable laying should pay attention to the different wiring methods of the bus system and the branching system; it should comply with the national and industrial specifications of the "Electrical Safety Regulations for Explosive Hazardous Locations of the People's Republic of China"; the wiring should be avoided in parallel with the power cable, and the interference affects the communication. The recommended cable is as follows:

For long-distance transmission, replace the cable or install a repeater or other device according to the actual situation.

Model	AG210	AG211	GTQ-Anr-A	GTQ-Anr-D
Single output	4~20mA	RS485	4~20mA	RS485
Recommended cable	RVVP 3×1.0mm^2	RVVP 4×1.0mm^2	RVVP 3×1.0mm^2	RVVP 4×1.0mm^2
Wiring	4~20mA	RS485	4~20mA	RS485

2.4. Location selection

The location of the gas transmitter is critical to achieving the best results. When determining the location, it is recommended to consider the following factors:

- The design drawings and the "Code for Design of Detection and Alarm of Combustible Gas and Toxic Gases in Petrochemical Enterprises" (GB50493-2009) shall be followed.
- The detector should be installed at a position where the gas flow is at the maximum concentration or as close as possible to the source of the gas leak.
- When installing indoors, if the leak source is outdoors, the detector should be installed at the air inlet.
- The source of gas leakage that is lighter than air is in a closed or semi-enclosed plant. The detector should be placed above

the source of the leak and at the highest point in the plant where it is prone to build up.

- Installation height selection:

When it is heavier than air: the height of the detector should be higher than the floor (floor surface) 0.3-0.6m; when it is lighter than air; the height of the detector should be 0.5-2m higher than the leakage source; when it is close to the air specific gravity: change The height of the detector installation is within 1 m of the source of the leak.

- The detector should be installed in a place where there is no wind, no dust, no water, no impact, no vibration, no corrosion, and no electromagnetic interference.

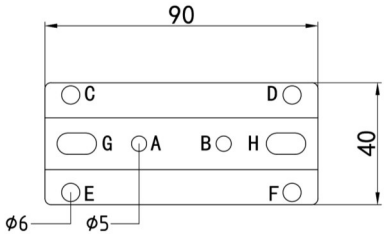
2.5 Installation

- Please refer to 2.2 Installation Precautions for product installation.
- Connect the detector to the mounting base AB hole with the M5 screw (included in the kit).
- This product can be installed on wall or riser.
- Wall Mounting: Secure the detector to the wall with four 6mm expansion tubes and self-tapping screws (included in the kit) by mounting the base CEEF hole.

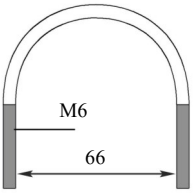
Standpipe installation: Use the U-shaped clamp in the accessories to fix it on the cylinder or pipe (suitable for DN30-65mm) through the G H hole of the installation base plate.

2.6. Wiring

Installation accessories size(mm)

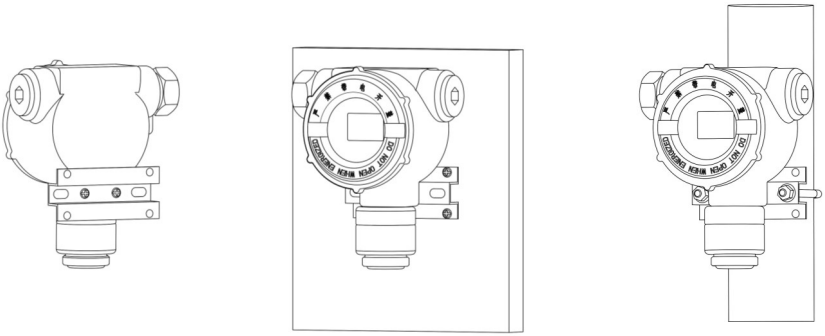


Mounting plate



U-shaped clamp

Installation Diagram



▌Unscrew the upper cover of the transmitter counterclockwise.

▌Unscrew the fixing screws on both sides of the display module, buckle the upper and lower recessed parts of the panel with your fingers, and slowly pull out the circuit module upwards. Note that there is a cable link between the circuit module and the sensor, and do not use violence to operate.

▌Strip the cable to the required size, and unscrew the adapter, metal gasket and rubber sealing ring of the transmitter wiring port in turn. The cable passes through the above parts one by one and then into the inside of the transmitter cavity. After adjusting the cable, tighten the compression nut to compress the cable tightly.

▌Use cold-pressed terminals for crimping at all wiring parts to avoid short circuits, bifurcation or falling off of wire ends.

▌Connect the cables firmly according to the markings of the wiring terminals.

▌Ground the grounding screw of the enclosure in accordance with the regulations, and the grounding point should be prepared for corrosion protection.

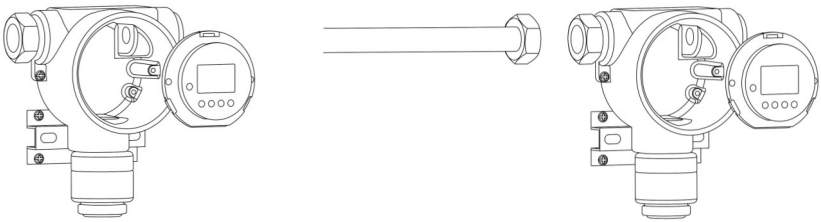
▌Be sure to tighten the upper cover after wiring is completed.

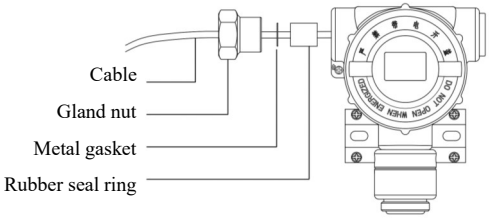


Note: Since the wiring can only be carried out after the top cover is unscrewed, the explosion-proof safety performance of the transmitter after unscrewing will not be guaranteed. If the transmitter is installed in an explosive hazardous area, take safety precautions before wiring, including but not limited to:

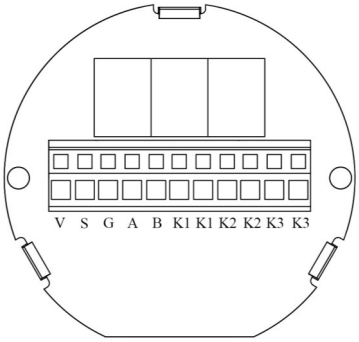
Hot work permit; continuous detection with portable flammable gas detectors; use of intrinsically safe multi-meters; minimize operating time.

Wiring





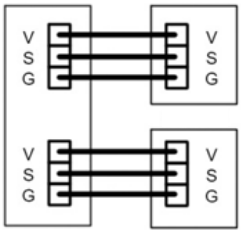
Terminals



V	24V power positive pole for detector
S	4~20mA signal output
G	24V power negative pole for detector
A B	RS485 signal (only for setting use)
K1	Low alarm relay contact output
K2	High alarm relay contact output
K3	Fault relay contact output

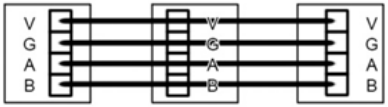
Note: 4~20mA signal output and RS485 output can only choose one, pay attention to distinguish the actual

Controller Detector

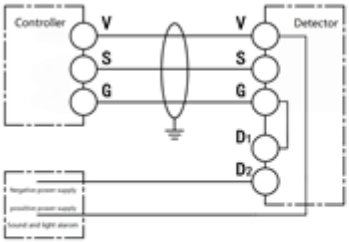


4-20mA wiring

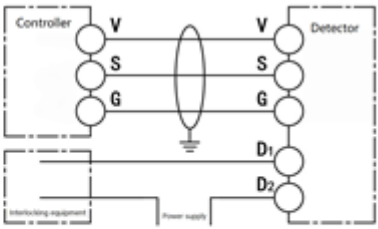
Controller Detector Detector



RS485 wiring

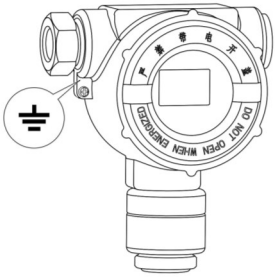


Detector connect alarm wiring diagram
24V power supply



Detector connect external device wiring diagram
non 24v power supply

Grounded



Gas	Principle	Time	Gas	Principle	Time
Combustible gas	Combustion catalytic	0.5h	O2	Electrochemical	0.5h
Toxic gas	Electrochemical	1h	ETO	Electrochemical	72h
CO2	Infrared	1h	VOC	PID	0.5h
The above time is for reference only, please consult the manufacturer for details.					

2.7. Power-on test

❙ The first power-on should be stable for not less than 20 minutes. After the power is turned on, the detector may have an alarm phenomenon. This is determined by the characteristics of the sensor itself. After waiting for the preheat/polarization, the detector will automatically return to normal value and working. In the normal working mode, the detector will display the measured gas concentration value in real time and transmit the corresponding 4~20mA or RS485 signal.

❙ Before the system is powered on, you should verify that the wiring and installation are correct.

❙ Due to the nature of the sensor, the detector needs to be warmed up/polarized for a period of time before it can work properly. Sensors with different principles have different warm-up times, usually:

Chapter 3 Operation and Maintenance

3.1. Power on



Self-check



Version No.



Countdown



Main interface

After power-on, the monitor light on the transmitter panel is always on, and the screen displays the self-check, version number, and countdown (warm-up) 45s before entering the main interface.

3.2. main menu



Password



Alarm-1



Alarm-2



Zero Calibration



Range calibration



485 address set



Factory set



Save and exit

The transmitter is equipped with an infrared remote control for operation. The operation should make the infrared transmitting end of the remote control aim at the infrared receiving window on the transmitter panel.

Press the "OK" key to enter, enter the password (four "OK" keys) and then enter the main menu (automatically return to the main interface if there is an operation error). The main menu includes 7 options including low alarm, high alarm, zero calibration, range calibration, 485 address setting, factory setting, and save and exit. Press the "Up" and "Down" keys to select, and press "Exit" to exit without saving.

3.3. Alarm setting



Alarm-1



Value setting



Back



Alarm-1



Value setting

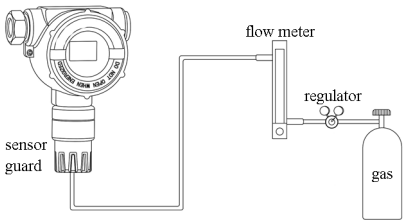


Back

❙ Enter the alarm setting menu. At this time, the screen displays the current alarm value. Press the "Up" and "Down" keys to adjust the value, and press the "Left" and "Right" keys to adjust the number of digits. After setting, press "OK" to save and return to the previous menu.

Note that oxygen is higher than the high alarm, lower than the low alarm, and other poisonous gas and combustible gas are higher than the alarm value.

3.4. Calibration preparation



Zero gas and span gas cylinder

Gas regulator

Calibration hose (about 0.7m)

Sensor guard

Gas detector



Note: After calibration, the regulator of the calibration gas cylinder must be shut off in time to prevent any danger caused by gas leakage.

❙ Prepare before calibration: zero standard gas, span standard gas, calibration regulator (including flow meter), matching calibration adaptor, calibration hose.

❙ Connect the calibration gas cylinder, calibration regulator, hose, calibration adaptor, and open the regulator and pass the gas to gas detector. Then do calibrate operation after the a stable readings.



Zero calibration



Zero adjust



Calibration OK



Calibration Fail

3.5. Zero calibration

❙ In order to ensure accuracy, it is recommended to use pure nitrogen for zero calibration.

❙ Slowly open the gas cylinder valve, adjust the flow meter knob to 0.5L/min, ventilate and wait for a stable readings, and start calibration.

❙ Enter the zero point calibration menu, press the "OK" key to calibrate, if the test is successful, it will display √ and then return to the previous menu with “SAVE”option; if it displays ×, it means the calibration failed.

❙ After entering the zero calibration menu, you can select “SAVE” to save the data and back to home menu. Or press the "BACK" key to exit without saving. At this time, the screen displays × and returns to the previous menu.

❙ The above operation is recommended to be repeated 3 times to ensure the stability of the instrument.



Span calibration



Calibration interface



Calibration Ok



Calibration Fail

3.6. Span calibration

❙ For different gases, the corresponding concentration standard gas should be selected. For details, please refer to appendix 3.

❙ Slowly open the gas cylinder valve, adjust the flow meter knob to 0.5L/min, ventilate and wait for a stable readings, and start calibration.

❙ Enter the span calibration menu, the current calibration value is displayed on the screen at this time, press the "up" and "down" keys to adjust the value, and press the "left" and "right" keys to adjust the number of digits. Set the value to the corresponding ventilation concentration and press the "OK" button to calibrate. If the test is successful, it will display √ and return to the previous menu; if it displays ×, it means the calibration has failed.

❙ After entering the zero calibration menu, you can select “SAVE” to save the data and back to home menu. Or press the "BACK" key to exit without saving. At this time, the screen displays × and returns to the previous menu.

❙ The above operation is recommended to be repeated 3 times to ensure the stability of the instrument.

3.7. 485 address setting

❙ Enter the 485 address setting menu. At this time, the screen displays the current transmitter's 485 address. Press the "up" and "down" keys to adjust the value, and press the "left" and "right" keys to adjust the number of digits. After setting, press "OK" to save and return to the previous menu.



485 address set



Address



485 address set

❙ This function item is only valid for the transmitter with RS485 signal output, please do not set the 4-20mA gas detector.

3.8. Factory setting



password



Decimal point



unit



Range



4mA correction



20mA correction



return

❙ Press the "OK" key to enter, enter the password (four "up" keys) and then enter the factory setting menu (automatically return to the main menu if an operation error occurs). The factory setting includes 6 options including decimal point, unit, range, 4mA correction, 20mA correction, and return. Press the "Up" and "Down" keys to select, and press "Exit" to exit without saving.

❙ Change the transmitter parameters to professional parameter settings. Improper operation is very likely to cause the meter to fail to work normally. It is not recommended that the user modify it by himself. Please contact the manufacturer if you need to modify it.

3.9. 4mA/20mA current correction



4mACorrection



Current



return



20mACorrection



Current



return

❙ When the output signal of the 4-20mA transmitter does not match the actual concentration, it can be adjusted in the current correction option.

❙ Connect the multimeter to the transmitter S and G terminals respectively.

❙ Enter the 4mA current calibration menu, check the current value on the multimeter, press the "up" key or "down" key to adjust the output current until the multimeter value is displayed as 4mA, after the setting is completed, press the "OK" key to save and return to the previous menu.

❙ 20mA current correction operation is the same as the 4mA current correction operation.

3.10.Save and Exit



Save



Main interface

- After all settings are completed, select save in the main menu and press "OK" to save and exit.

3.11. Maintenance

- In order to ensure the performance of the transmitter, calibration should be carried out regularly. The calibration frequency depends on the specific working conditions. It is recommended to calibrate the transmitter every 3 months. The calibration record should be filled in each calibration (refer to Schedule 5). For factors such as high concentration impact and corrosive gas, it is necessary to shorten the calibration period. In either case, the calibration period must not exceed one year.
- It is strictly forbidden to use high-concentration gas impact sensors (such as using a lighter) in daily use, otherwise the sensor will be seriously damaged.
- Care should be taken to maintain the transmitter clean during maintenance. If the sensor cover is clogged, the detection sensitivity may be degraded or even damaged.
- Maintenance of the operation, calibration, etc. of the transmitter should be performed by qualified personnel.
- When the sensor's service life arrives, it should be replaced in time. The replacement of the sensor should be carried out under the guidance of the manufacturer or returned to the factory for replacement. When replacing it yourself, be sure to remove the sensor module plug on the main board and replace it. Otherwise, the cable will be damaged easily.
- The maintenance of the instrument and the replacement of the components must use the accessories provided by the company. The use of non-company replacement parts may affect the performance and safety of the instrument itself.
- For faults encountered in routine maintenance, please refer to Table 4: Trouble Shooting. For those still unable to handle, please contact the manufacturer in time.

4.1. Appendix 1: Gas detector selection table

Gas		Measure range	principle	AG210	AG211	GTQ-Anr-A	GTQ-Anr-D
Combustible	EX	0～100%LEL	Catalytic combustion	-	-	●	●
Oxygen	O_2	0-30%VOL 0-25%VOL	Electrochemical	●	●	-	-
Carbon	CO	0-1000μmol/mol	Electrochemical	●	●	-	-
Hydrogen	H_2S	0-100μmol/mol	Electrochemical	●	●	-	-
Chlorine	CL_2	0-10μmol/mol	Electrochemical	●	●	-	-
Sulfur	SO_2	0-20μmol/mol	Electrochemical	●	●	-	-
Ammonia	NH_3	0-100μmol/mol	Electrochemical	●	●	-	-
Nitric oxide	NO	0-250μmol/mol	Electrochemical	●	●	-	-
Nitrogen	NO_2	0-20μmol/mol	Electrochemical	●	●	-	-
Hydrogen	HCL	0-30μmol/mol	Electrochemical	●	●	-	-
Ozone	O_3	0-1μmol/mol	Electrochemical	●	●	-	-
Ethylene	C_2H_4O	0-20μmol/mol	Electrochemical	●	●	-	-
Formaldehy	CH_2O	0-20μmol/mol	Electrochemical	●	●	-	-
Methanol	CH_3OH	0-20μmol/mol	Electrochemical	●	●	-	-
Phosphine	PH_3	0-5μmol/mol	Electrochemical	●	●	-	-
Hydrogen	H_2	0-1000μmol/mol	Electrochemical	●	●	-	-
Fluorine gas	F_2	0-1μmol/mol	Electrochemical	●	●	-	-
Hydrogen	HF	0-10μmol/mol	Electrochemical	●	●	-	-
Hydrogen	HCN	0-50μmol/mol	Electrochemical	●	●	-	-
Phosgene	$COCL_2$	0-1μmol/mol	Electrochemical	●	●	-	-
Arsenide	AsH_3	0-1/20μmol/mol	Electrochemical	●	●	-	-
Silane	SiH_4	0-50μmol/mol	Electrochemical	●	●	-	-
Acrylonitrile	C_3H_3N	0-20μmol/mol	Electrochemical	●	●	-	-
Carbon	CS_2	0-20μmol/mol	Electrochemical	●	●	-	-
Ethanol	C_2H_5OH	0-20μmol/mol	Electrochemical	●	●	-	-
Sulfur	SF_6	0-1000μmol/mol	Infrared	●	●	-	-
Carbon	CO_2	0-5%/100%VOL	Infrared	●	●	-	-
Toluene	C_7H_8	0-20μmol/mol	PID	●	●	-	-
Xylene	C_8H_{10}	0-20μmol/mol	PID	●	●	-	-
Benzene	C_6H6	0-20μmol/mol	PID	●	●	-	-
Acetic acid	$C_2H_4O_2$	0-1000μmol/mol	PID	●	●	-	-
Organic Volatile Gas	VOC	0-20μmol/mol 0-1000μmol/mol	PID	●	●	-	-

Note: 1. The above are only some common gases and ranges. For gases and special ranges not listed in the parameter table, please consult the manufacturer directly. 2. 1μmol/mol=1ppm, according to relevant regulations, all units are changed to μmol/mol.

4.2. Appendix 2: VOC gas selection table

Gas Name	Formula	Factor
Butane, n-	C4H10	46.29
Butanol, 1-	C4H10O	4.01
Isooctane	C8H18	1.08
Isopentane	C5H12	6
Terpinolene	C10H16	0.46
Isobutylene	C4H8	1
Isobutane	C4H10	8
Isooctyl alcohol	C8H18O	1.5
Isopropanol	C3H8O	4.35
Diisopropylamine	C6H15N	0.7
Hexene, 1-	C6H12	0.9
Hexan-2-one	C6H12O	0.8
Hexane n-	C6H14	3.28
Ethoxyethanol, 2-	C4H10O2	29.83
Ethylene glycol	C2H6O2	20
Ketene	C2H2O	3
Vinyl bromide	C2H3Br	1
Vinyl chloride	C2H3Cl	2.1
Ethylene	C2H4	8
Butyl acetate, n-	C6H12O2	2.42
Isoamyl acetate	C7H14O2	1.6
Isobutyl acetate	C6H12O2	2.25
Isopropyl acetate	C5H10O2	2.2
Ethyl acetate	C4H8O2	3.63
Methyl acetate	C3H6O2	5.18
Propionaldehyde	C3H6O	1.68
Ethyl mercaptan	C2H6S	0.69
Ethanolamine	C2H7NO	3
Ethanol	C2H6O	8.72
Ethylene oxide	C2H4O	15
Chloroethanol 2-	C2H5ClO	10
Iminodi(ethylamine) 2,2-	C4H13N3	0.9
Nitric oxide	NO	8
Acrylic Acid	C3H4O2	2.74
Bromoethane	C2H5Br	5
Dibromochloromethane	CHBr2Cl	10
Bromobenzene	C6H5Br	0.7
Octane, n-	C8H18	1.58
Octene, 1-	C8H16	0.69
Nitroaniline 4-	C6H6N2O2	0.8
Nitrobenzene	C6H5NO2	1.7
Isoprene	C5H8	0.69
Allyl alcohol	C3H6O	2.07
Allyl chloride	C3H5Cl	4.5
Amyl acetate, n-	C7H14O2	1.8
Amyl alcohol	C5H12O	3.2
Pentan-3-one	C5H10O	0.8
Pentan-2-one	C5H10O	0.79
Pentane, n-	C5H12	7.88
Piperylene	C5H8	0.66
Glutaraldehyde	C5H8O2	0.9
Carbon tetrabromide	CBr4	3
Diketene	C4H4O2	2.2
Tert-butanol	C4H10O	2.62
Triethylamine	C3H9N	0.5
Nitrogen trichloride	NCl3	1
Trimethylbenzene mixtures	C9H12	0.34
Trimethylbenzene, 1,3,5-	C9H12	0.34
Nonane, n-	C9H20	1.27
Benzonitrile	C7H5N	0.7
Gasoline vapors		1.05
Gasoline vapors		0.8
Pyridine	C5H5N	0.75
Bis(2,3-epoxypropyl) ether	C6H10O3	3
Bromoform	CHBr3	2.8
Chlorobenzene	C6H5Cl	0.45
Hydrogen sulfide	H2S	4
Benzenethiol	C6H5SH	0.7
Chlorotoluene, o-	C7H7Cl	0.45
Biphenyl	C12H10	0.4
Hydrazine	H4N2	3
Asphalt, petroleum fumes		1
Mineral spirits		0.8
Cumene	C9H12	0.58
Furfural	C5H4O2	1.38
Furfuryl alcohol	C5H6O2	2
Camphene	C10H16	0.45
Methyl mercaptan	CH4S	0.7
Methyl bromide	CH3Br	1.9
Cresol, p-	C7H8O	1.05
Cresol, o-	C7H8O	1.05
Cresol, m-	C7H8O	1.05
Methanol	CH4O	206.37
Toluene	C7H8	0.51
Methylamine	CH5N	1.4
Ethyl formate	C3H6O2	29.83
Cyclohexene	C6H10	0.75
Cyclohexane	C6H12	1.16
Cyclohexanone	C6H10O	1.03
Cyclohexanol	C6H12O	2.9

Gas Name	Formula	Factor
Cyclohexylamine	C6H13N	0.98
Acetaldehyde	C2H4O	4.86
Propylene oxide	C3H6O	7
Cyclopentane	C5H10	4
Chlorotrifluoroethylene	C2ClF3	1
Diisobutylene	C8H16	0.64
Diisopropyl ether	C6H14O	0.68
Divinylbenzene	C10H10	0.4
Diethyl ether	C4H10O	0.88
Diethylamine	C4H11N	1
Dioxane 1,4-	C4H8O2	1.5
Dioxane 1,2-	C4H8O2	1.5
Chlorine dioxide	ClO2	1
Dibromoethane 1,2-	C2H4Br2	2
Dichloroethylene 1,2-	C2H2Cl2	0.75
Dichloromethane	CH2Cl2	39
Dichlorobenzene o-	C6H4Cl2	0.5
Carbon disulfide	CS2	1.4
Dimethoxymethane	C3H8O2	1.4
Dimethyl ether	C2H6O	1.3
Dimethyl sulphide	C2H6S	0.5
Dimethylaniline, NN-	C8H11N	0.6
Xylene, m-	C8H10	0.44
Dimethylamine	C2H7N	1.4
Dicyclopentadiene	C10H12	0.81
Diphenyl ether	C12H10O	0.8
Chlorotoluene, p-	C7H7Cl	0.5
Hydroquinone	C6H6O2	0.8
Butene, 1-	C4H8	1
Ethyl butyrate	C6H12O2	0.95
Isobutyraldehyde	C4H8O	1.2
Butyl mercaptan	C4H10S	0.54
Butadiene diepoxide, 1,3-	C4H6O2	4
Butadiene	C4H6	0.83
Isobutanol	C4H10O	3.5
Butylamine, 2-	C4H11N	0.9
Butylamine, n-	C4H11N	1
Iodomethane	CH3I	0.4
Vinyl acetate	C4H6O2	1.1
Propyl acetate, n-	C5H10O2	2.5
Acetic Acid	C2H4O2	36.15
Diesel Fuel		0.75
Methyl acrylate	C4H6O2	3.4
Propene	C3H6	1.4
Propan-1-ol	C3H8O	4.8
Bromopropane, 1-	C3H7Br	1.3

Gas Name	Formula	Factor
Acetone	C3H6O	0.71
Ethyl acrylate	C5H8O2	2
Propane-1,2-diol, total	C3H8O2	10
Epichlorohydrin	C3H5ClO	8
Ethyl benzene	C8H10	0.54
Styrene	C8H8	0.44
Benzyl chloride	C7H7Cl	0.55
Benzaldehyde	C7H6O	0.86
Anisole	C7H8O	0.47
Benzyl formate	C8H8O2	0.77
Benzyl alcohol	C7H8O	1.25
Phenylenediamine, p-	C6H8N2	0.6
Aniline	C6H7N	0.5
Benzene	C6H6	0.5
Butene, 1-	C4H8O	1.15
Crotonaldehyde	C4H6O	1
Ethyl amine	C2H7N	1
WMD Methyl salicylate	C8H19O4	1
WMD N-Mustard Gas	C4H18SCl2	1.1
Dimethylhydrazine, 1,1-	C2H8N2	1
Tetrahydrofuran	C4H8O	1.55
Methylpropan-2-ol, 2-	C4H10O	3.5
Triethylamine	C6H15N	0.9
Toluene-2,4-diisocyanate	C9H6N2O2	1.6
Tetrafluoroethylene	C2F4	1
Trichloroethylene	C2HCl3	0.65
Turpentine	C10H16	0.6
Phenyl-2,3-epoxypropyl ether	C9H10O2	0.8
Tetrachloroethylene	C2Cl4	0.7
Ethyl hexyl acrylate, 2-	C11H20O2	1
Methylcyclohexanone 2-	C7H12O	0.95
Methylcyclohexanol, 4-	C7H14O	2.4
Methylcyclohexane	C7H14	1.1
Dimethylheptan-4-one, 2,6-	C9H18O	0.8
Isopropyl chloroformate	C4H7O2Cl	1.6
Epoxypropyl isopropyl ether, 2,	C6H12O2	1.1
Methylpentane-2,4-diol, 2-	C6H14O2	4
Ethyl chloroformate	C3H5O2Cl	83
Ethyl (S)-(-)-lactate	C5H10O3	3
Methyl sulphide	C2H6S	0.5
Dimethylformamide	C3H7NO	0.9
Dimethylethylamine, NN-	C4H11N	0.8
Dimethyl disulphide	C2H6S2	0.23
Diethylaminopropylamine, 3-	C7H18N2	1
Diethylaminoethanol, 2-	C6H15ON	2.7
Kerosene		0.83

Note: This table only lists some VOC gases, please consult the manufacturer for other unlisted gases.

4.3. Appendix 3: Recommended Calibration gas table

Gas	Measure Range	Standard gas	Concentration
CH4	100%LEL	CH4	60%LEL
O2	30%VOL	O2	20.9%VOL
CO2	5%VOL	CO2	3%VOL
CO	1000μmol/mol	CO	700μmol/mol
	500μmol/mol		300μmol/mol
VOC	1000μmol/mol	I-C4H8	700μmol/mol
	20μmol/mol		15μmol/mol
H2	1000μmol/mol	H2	700μmol/mol
H2S	100μmol/mol	H2S	80μmol/mol
NH3	100μmol/mol	NH3	60μmol/mol
HCL	30μmol/mol	SO2	60μmol/mol
CL2	10μmol/mol	CL2	10μmol/mol
SO2	20μmol/mol	SO2	15μmol/mol
NO2	20μmol/mol	CL2	10μmol/mol
C2H4O(ETO)	20μmol/mol	C2H4O	10μmol/mol
HF	10μmol/mol	CL2	10μmol/mol
PH3	5μmol/mol	H2S	5μmol/mol
COCL2	1μmol/mol	CL2	1μmol/mol

Note: Due to the inevitable error in the concentration of the standard gas, the above concentration values are for reference only. For gases and special ranges not listed in the parameter table, please consult the manufacturer directly.

4.4 Appendix 4: Trouble-shooting

FAULTS	REASONS	SOLUTIONS
No output signal	Wrong wiring	Re-wiring
	Wrong power supply	Check power supply
	Circuit fault	Return to factory
	The sensor cable is broken	Return to factory
Lower readings	Sensor failure	Replace sensor modular
	Need calibration	Re-calibration
	Reading drift	Re-calibration
Higher readings	Sensor failure	Replace sensor modular
	Need calibration	Re-calibration
	High-concentration gas shock	Return to factory
	Reading drift	Re-calibration
Unstable readings	Sensor failure	Replace sensor modular
	Interference	Check if it's grounded well
	On preheating	Wait a while after power-on
	Calibration failure	Re-calibration
	Circuit fault	Return to factory
Slow response	Sensor failure	Replace sensor modular
	Dust blocking the explosion-proof disc	Clean up the dust of the explosion-proof disc
	Circuit fault	Return to factory

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