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Fixed Gas Detector

Operator's Manual

GTQ-AF110/GTQ-AF111/
GT-AF112-R/AG310/AG311

Version: 1.3.2002

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-General Manager

Nanjing AIYI Technologies Co., Ltd.

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AIYI Technologies shall not be responsible for the personal injury or property damage of you or a third person for the following reasons: The equipment is not properly installed or used in strict accordance with the requirements; it is not regularly maintained as required; force majeure ; your own or third-party reasons (including but not limited to access to third-party products, components, etc.).

The right to interpret and modify this disclaimer belongs to Nanjing AIYI Technologies Co., Ltd.

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.



Attention: please read the manual carefully before connecting and operating your device.

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Chapter 1: Product Introduction

1.1. Brief introduction

AIYI Technologies GTQ-AF110, GTQ-AF111, GT-AF112-R, AG310, AG311 gas detection transmitters 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 can be applied to all kinds of bad occasions.

Model Description:	GTQ-AF110	4-20mA signal catalytic combustible gas detector
	GTQ-AF111	RS485 signal catalytic combustible gas detector
	GT-AF112-R	4-20mA & HART signal infrared combustible gas detector
	AG310	4-20mA signal toxic gas detector
	AG311	RS485 signal toxic gas detector

GTQ-AF110, GTQ-AF111 and GT-AF112-R are point-type combustible gas detectors for industrial and commercial purposes, and AG310 and AG311 are toxic gas detectors.

Features:

- Use high-performance sensors, quick response, safer and more reliable.
 - Integrated design of large aperture sound and light alarm and numerical display.
 - Modular design, plug-in replacement of each component, simple and convenient maintenance.
 - Stainless steel + aluminum alloy material, the protection level of the whole table reaches IP66, which is suitable for harsh working conditions.
 - High-brightness OLED display, LED status indicator, display rich information.
 - Built-in low-report, high-report, and fault three switches, which can realize multi-level interlocking.
- Full English menu, infrared remote control operation, no need to open the cover on site.

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"

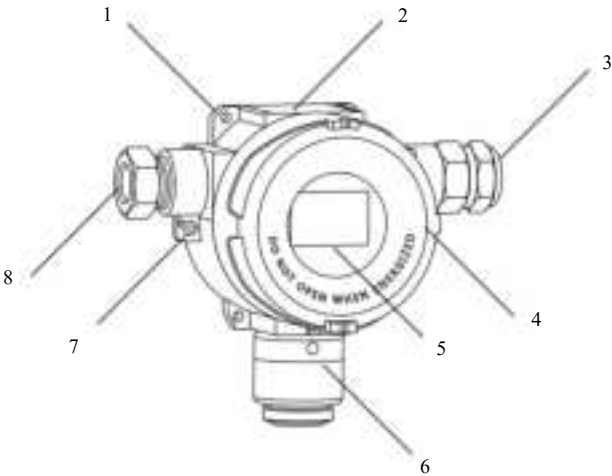
■ JJG 693-2011 "Combustible gas detection alarm"

■ JJG 915-2008 "Carbon Monoxide Detection Alarm"

■ JJG 695-2003 "Hydrogen Sulfide Gas Detector"

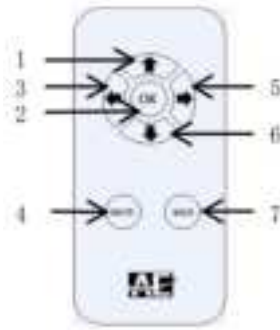
■ JJG 551-2003 "Sulfur Dioxide Gas Detector"

1.2 Description



- | | | |
|-------------------|-------------------|------------------|
| 1 mounting hole | 2 nameplate | 3 buzzer |
| 4 light Alarm | 5 OLED display | 6 sensor housing |
| 7 grounding screw | 8 Explosion-proof | |

Remote control



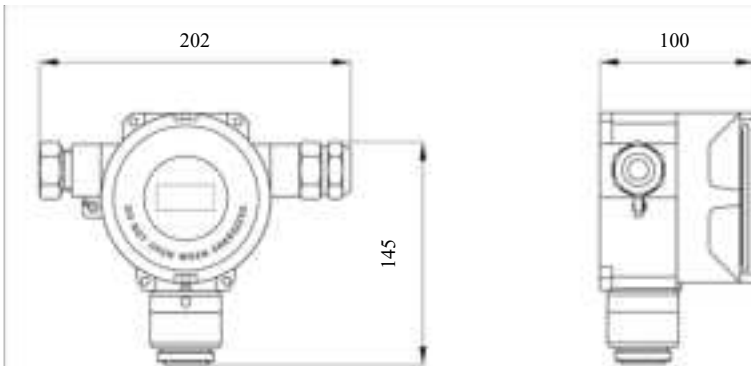
↑	Move up or number plus
↓	Move down or decrease the number
←	Left
→	Right
OK	Confirm or enter the menu
MUTE	mute
BACK	Exit

display



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

Gas detector size(mm)





Description	Specifications	GTQ-AF110	GTQ-AF111	GT-AF112-R	AG310	AG311
Detected gas						
Combustible gas	Catalytic combustion, infrared	☑	☑	☑	-	-
Toxic gas	Electrochemical, infrared, PID	-	-	-	☑	☑
performance						
Measuring range	0-100%LEL	☑	☑	☑	-	-
	See the gas selection table for details	-	-	-	☑	☑
Typical response time*	T90≤30S	☑	☑	☑	-	-
	T90≤30/60/180S	-	-	-	☑	☑
Linear accuracy*	±1%FS	☑	☑	☑	☑	☑
Repeatability*	±1%FS	☑	☑	☑	☑	☑
Electrical characteristics						
Power supply	18-28VDC	☑	☑	☑	☑	☑
power consumption	≤3.5W	☑	☑	☑	-	-
	≤2W	-	-	-	☑	☑
output signal	4-20mA	☑	-	☑HART	☑	-
	RS485	-	☑	-	-	☑
Wiring	Three-wire	☑	-	☑	☑	-
	Four-wire	-	☑	-	-	☑
Use cable	RVVP3*1.0mm ²	☑	-	☑	☑	-
	RVVP4*1.0mm ²	-	☑	-	-	☑
Relay output	3relays 250VAC/5A 30VDC/5A)	☑	☑	☑	☑	☑
display	OLED display	☑	☑	☑	☑	☑
Indicator light	Power,fault,alarm-1, 2,IR	☑	☑	☑	☑	☑
Operation	remote control	☑	☑	☑	☑	☑
Ingress Protection	IP66	☑	☑	☑	☑	☑
Ambient Temp.	-40°C~70°C	☑	☑	☑	-	-
	-20°C~60°C	-	-	-	☑	☑
Humidity	10~95%RH Non-condensing	☑	☑	☑	☑	☑
Work pressure	80-120kPa	☑	☑	☑	☑	☑



Description	Specifications	GTQ-AF110	GTQ-AF111	GT-AF112-R	AG310	AG311
Structural characteristics						
Body material	ADC12 aluminum alloy + 316L stainless steel	●	●	●	●	●
Thread interface	NPT1/2	●	●	●	●	●
Weight	About2kg	●	●	●	●	●
Size	145*202*100mm(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 vary, 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:



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

2.2. Cautions

- 1 Check if the Ex-mark is consistent with the site condition and if any appearance of obvious cracks and other defects, to ensure the perfect explosion-proof performance.
- 1 The detector shall connect to the corresponding controller, and it is forbidden to connect with other brands or models' controller; The controller must be installed in a non-hazardous area.
- 1 Keep the power off during installation, and ensure that the ambient temperature and humidity are in accordance with the detector's operating requirements.
- 1 The detector is design for gas leak detection. Without permission of manufacturer, it is forbidden to use for other purposes such as internal of pipelines.
- 1 The ingress protection grade of detector is IP66 there is no need for rain cover; keep the sensor downward and no painting and block on it.
- 1 Keep the detector far away from the high-power equipment.
- 1 Catalytic combustion sensor require oxygen in air, the absence of oxygen may cause the readings lower than the actual. The detector will not work properly in the oxygen below 10%VOL.
- 1 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, and regular inspection or calibration is required.
Be careful not to touch the internal circuit when wiring, and the case of the meter must be grounded reliably.

■ The installation, use and maintenance of the product should also comply with the instruction manual, "Electrical Equipment for Explosive Gas Atmospheres" (GB3836.13-2013) Part 13: Overhaul of Electrical Equipment for Explosive Gas Atmospheres, "Electrical Equipment for Explosive Gas Atmospheres" (GB3836.15-

2017) Part 15: "Electrical Installation in Hazardous Locations (Except Coal Mines), "Electrical Equipment for Explosive Gas Environments" (GB3836.16-2017) Part 16: Inspection and Maintenance of Electrical Installations (Except Coal Mines) and "Electrical Equipment Installation "Code for Construction and Acceptance of Electrical Installations in Engineering Explosion and Fire Hazardous Environments" (GB50257-2017) and other relevant regulations.

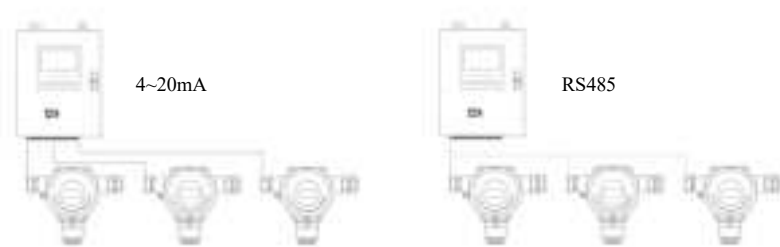
2.3. Installation Preparation

■ Complete gas detection transmitter components and installation accessories

■ Screwdriver, multimeter (if needed) and other installation tools

Power supply and cables

The standard working power supply of the transmitter is 24VDC. In view of the voltage drop caused by the cable resistance, it should be ensured that the supply voltage of the transmitter is not less than 18VDC. If it is directly connected to a DCS or PLC system, please ensure that the power supply of the transmitter and the resistance of the entire loop should be $\leq 600\Omega$. If the voltage cannot meet the minimum operating voltage of the transmitter, a repeater, explosion-proof box and other equipment should be installed.



The transmitter and the controller are connected by shielded cables. Different cables should be selected according to different operating conditions. The 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 industry specifications such as the "Electrical Safety Regulations for Explosive Hazardous Locations of the People's Republic of China"; the wiring should not be parallel to the power cables and interfere with the communication. Cables are recommended. as follows:

Model	AG310	AG311	GT-AF112-R	GTQ-AF110	GTQ-AF111
Output signal	4~20mA	RS485	4~20mA	4~20mA	RS485
Recommended cable	RVVP 3×1.0mm ²	RVVP 4×1.0mm ²	RVVP 3×1.0mm ²	RVVP 3×1.0mm ²	RVVP 4×1.0mm ²
Wiring	Three-wire	Four-wire	Three-wire	Three-wire	Four-wire

For long-distance transmission, cables or repeaters should be replaced according to actual conditions.

2.4. Location selection

The installation position of the gas transmitter is crucial to achieve the best detection effect. When determining the location, it is recommended to consider the following factors:

The requirements of the design drawings and the Design Code for the Detection and Alarm of Combustible Gas and Toxic Gas in Petrochemical Enterprises (GB50493-2019) shall be followed.

The transmitter should be installed at the location where the gas flow rate is the maximum concentration or as close as possible to the gas leakage source. When installing indoors, if the source of leakage is outdoors, the instrument should be installed at the air inlet. The gas leakage source lighter than air is in a closed or semi-enclosed factory building. A transmitter should be installed above the leakage source, and a transmitter should be installed at the highest point in the factory building where gas can easily



accumulate.
Installation height selection: when heavier than air: the transmitter installation height should be 0.3-0.6m higher than the floor (floor surface); when it is lighter than air; the transmitter installation height should be 0.5-2m higher than the leakage source; and the specific gravity of the air When similar: the installation height of the transmitter is within 1m above and below the leakage source. The transmitter should be installed as far as possible in a place where there is no wind, dust, water, impact, vibration, corrosion, and electromagnetic interference.

2.5. Installation

please refer to 2.2. Installation precautions.

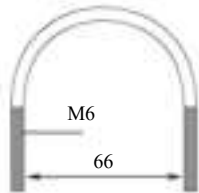
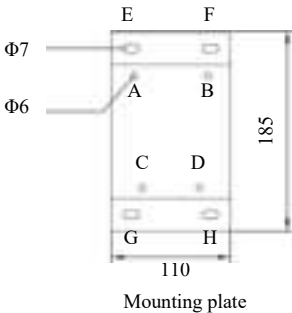
Use M5 screws (included in the accessories) to connect the transmitter to the mounting base ABCD.

This product can be installed in wall-mounted or stand-pipe type.

■ Wall-mounted installation: Use 4 6mm expansion tubes and self-tapping screws (included in the accessories) to fix the transmitter to the wall through the EFGH holes on the mounting base plate.

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

Installation accessories size



Installation diagram



2.6. Wiring

1 | unscrew the detector cover counterclockwise.

1 | with your fingers buckle the recess around the panel part, slowly pull out the circuit module up. Note that do not operate with violence. Because there are cable links between circuit module and the sensor.

1 | Tighten the cable to the desired size, and then unscrew the compression nut, metal gasket and rubber seal of the detector connector. After passing through the parts, the cable is inserted into the detector cavity, and the cable is tightened with the tightening nut.

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

1 | Unplug the wiring terminal, select the corresponding terminal port to connect with the cable, plug it back into the wiring terminal after the wiring is firm, and restore the circuit module to its original position after pressing the wire. For wiring terminals, please refer to 1.2 Appearance and Structure.

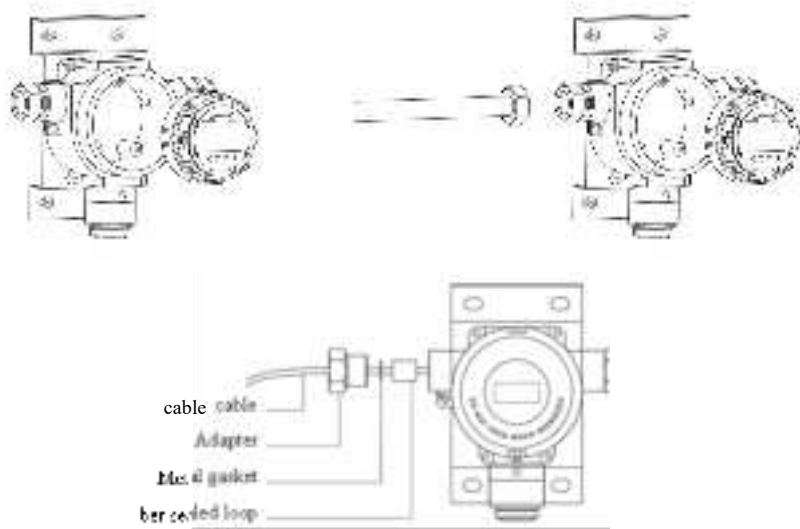
1 | Ground the grounding screw of the enclosure in accordance with the regulations, and the grounding point should be prepared for corrosion protection.

Be sure to tighten the upper cover after wiring.



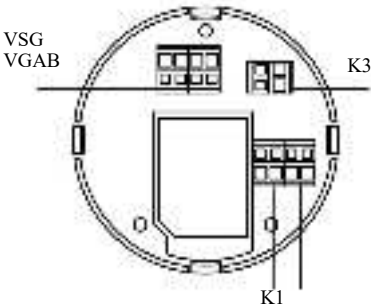
Note: Since the wiring can only be carried out after the upper cover is unscrewed, the explosion-proof safety performance of the transmitter after unscrewing will not be guaranteed. If the transmitter is installed in an explosive hazardous area, please take safety measures before wiring, including but not limited to: hot work permit; continuous detection of portable combustible gas detector; use intrinsically safe multimeter; minimize operation time.

Wiring



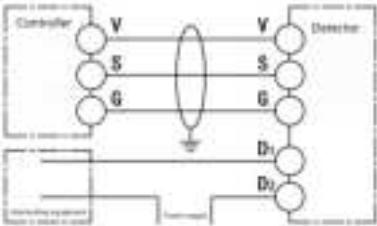
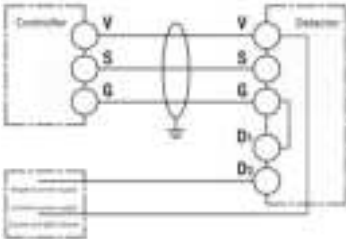
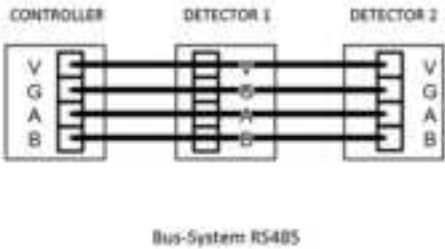
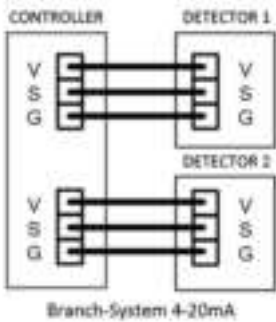


Terminals



- V 24V power supply positive
- S 4~20mA signal output
- G 24V power supply negative
- A B RS485 signal output
- K1 Alarm-1 relay contact output
- K2 Alarm-2 relay contact output
- K3 Fault relay contact output

Note: can only use one of the two in 4~20mA and RS485 output, pay attention to distinguish the actual



Ground connection



2.7 Power-on test

After power on, the screen displays the software version number, screen detection, and 30s countdown after sensor detection to enter the main interface.

Keep at least 20 minutes power on at first time. And take it as normal phenomenon if any alarm happen because the initialization. After the detector work in normal status, it will continuously display the gas concentration and output signal of 4-20mA or RS485.

Before powering on the system, verify that the wiring and installation are correct, and then power on after confirmation.

Gas	principle	Time	Gas	principle	Time
Combustible gas	catalytic combustion	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					

Due to the characteristics of the sensor, the transmitter needs to be warmed up/polarized for a period of time after it is energized before it can work normally. Sensors of different principles have different warm-up times. Generally speaking:

Before the transmitter works normally, there may be inaccurate values, false alarms, etc. Please wait patiently. During this period, do not perform any operations such as calibration or parameter changes.

If the transmitter still does not work normally after the warm-up/polarization time, please refer to the attached table 5 to troubleshoot or directly consult the manufacturer.

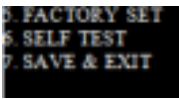
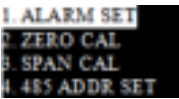


Chapter 3: Operation and Maintenance

3 1. Operation

1 The transmitter can use infrared remote control to realize live operation without opening the cover, which is safe and reliable. For remote control operation, please refer to 1.2 Appearance and Structure.

1 Point the remote control at the infrared window of the transmitter and press the "OK" button, and the transmitter will pop up a password input box. Enter the password (6 "OK" keys) to enter the menu. The detailed functions of the menu are as follows:

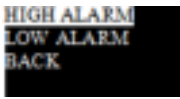
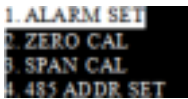


1. Alarm setting	Set the upper limit alarm and lower limit alarm of the transmitter
2. Zero calibration	Carry out transmitter zero point calibration
3. Span calibration	Carry out transmitter range calibration
4. 485 address setting	Set the RS485 address
5. Factory settings	Factory settings such as temperature coefficient, display unit, etc.
6. Self-check	Alarm self-check, check system version
7. Save and exit	Save and return to the main interface

3 2. Alarm setting

1 Enter the alarm setting, you can select the lower limit alarm setting or the upper limit alarm setting through the "up" and "down" keys. After selection, press the "OK" key to enter the alarm value setting state.

1 The upper limit alarm value is higher than the set value alarm, and the lower limit alarm value is lower than the set value alarm. 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.



1 Press "Left" or "Right" to switch the digits, and the "Up" or "Down" keys to adjust the value. After the setting is completed, press the "OK" key to save and return to the previous menu.

Continue to press the "down" key to the save and exit option of the main menu, and press the "OK" key to save and return to the main interface.

3 3. Calibration Preparation:

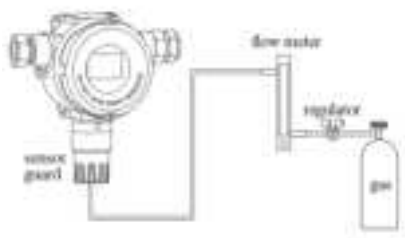
1 Before calibration, you need to prepare: zero point standard gas, span standard gas, calibration pressure reducing valve (including flowmeter), matching calibration cover, calibration hose.

1 Connect the calibration gas cylinder, calibration pressure reducing valve, hose, calibration cover, and transmitter tightly one by one, open the valves one by one to ventilate, and calibrate after the transmitter value is stable.

1 The calibration operation needs to unscrew the upper cover of the transmitter, and safety measures must be taken before calibration. If there is a remote control, there is no need to open the cover.

3 4. Zero calibration

1 Advice adopting pure N2 to do zero calibration.



Zero gas and span gas

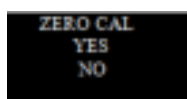
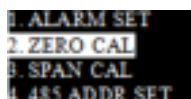
Calibration pressure reducing valve
(including flow meter)

Calibration hose (about 0.7m)

Calibration hood

Detector

1. Open the regulator slowly at 0.5L/min, prepare the zero calibration until a stable readings on detector.



1. Enter the zero calibration menu, press the "up" key or "down" key to select YES and then press the "OK" key to save and return to the previous menu.

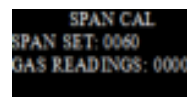
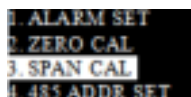
1. Continue to press the "down" key to the save and exit option of the main menu, and press the "OK" key to save and return to the main interface.

Continue to press the "down" key to the save and exit option of the main menu, and press the "OK" key to save and return to the main interface.

3.5. Span calibration

1. Select the specified concentration standard gas, see Attached Table 3 for details.

1. Slowly open the gas cylinder valve, adjust the flow meter knob to 0.5L/min, ventilate and wait for the value to stabilize, and start calibration.



1. Enter the range calibration menu, press the "left" key and "right" key to switch the digits, the "up" key or "down" key to adjust the value, after the setting is completed, press the "OK" key to save and return to the previous menu.

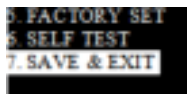
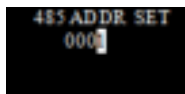
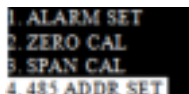
1. Continue to press the "down" key to the save and exit option of the main menu, and press the "OK" key to save and return to the main interface.

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



Note: After calibration, the valve of the calibration gas cylinder must be cut off in time to prevent explosion or poisoning caused by gas leakage.

3.6. 485 address setting



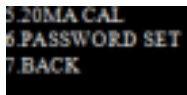
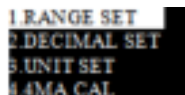
For RS485 signal transmitters, the address can be set in the 485 address setting menu.

1. Enter the 485 address setting menu, press "Left" and "Right" to switch the digits, and the "Up" or "Down" keys to adjust the value. After the setting is completed, press the "OK" key to save and return to the previous menu.

Continue to press the "down" key to the save and exit option of the main menu, and press the "OK" key to save and return to the main interface.

3.7 Factory setting

1. The factory setting menu can make advanced settings for the transmitter unit, range, temperature coefficient and other parameters. The password is 6 "up" keys.

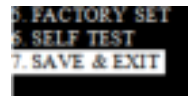
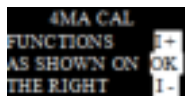


Change the transmitter parameters to professional parameter settings. Improper operation is very likely to cause the meter to fail to work normally. It is not recommended that the user modify it by himself. Please contact the manufacturer if you need to modify it.

3.8. 4mA/20mA current correction

For 4-20mA transmitters, when the transmitter output signal 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.

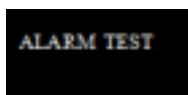
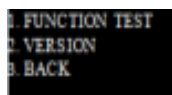


Enter the 4mA current calibration menu, check the current value on the multimeter, press the "up" key or "down" key to adjust the output current until the multimeter value is displayed as 4mA, after the setting is completed, press the "OK" key to save and return to the previous menu.

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

3 9. Self-check

- The self-inspection menu can perform product self-inspection and query the system version.
- After entering the alarm self-test, the transmitter will check the indicator light and alarm light in turn



- The system version can display the current transmitter software version number.

3 10 Maintenance

- For keeping stable work of detector, advice do calibration every 90 days. Especially in the hard field condition.
- The operation of the detector, calibration and other maintenance work should be carried out by qualified professionals.
- Keep using the recommended calibration gas by the manufacturer.
- Do not open the cover when energized.
- Lighter and high-concentration gas is prohibited to use for testing the detector.
- Replace sensor in time once the sensor life is over.
- Using origin parts provided by manufacturer while the maintenance and the replacement of the parts. The non-company replacement parts may affect the performance and safety of the instrument itself. If the user repair themselves or replace parts themselves, the company will held no responsibility on any problems.
- Keep the instrument clean and if the gas sensor cover (part 6 on page 2) is blocked, it may affects the detection sensitivity and even damage the instrument.



Attached Table 1 Gas detector selection table

Gas		Measure range	principle	AG31X	GTQ-AF11X	GT-AF112-R
Combustibl	EX	0 ~ 100% L.E.L.	Catalytic	-	■	■
oxygen	O ₂	0-30%VOL 0-25%	Electrochemica	■	-	-
Carbon	CO	0-1000μmol/mol	Electrochemica	■	-	-
Hydrogen	H ₂ S	0-100μmol/mol	Electrochemica	■	-	-
Chlorine	CL ₂	0-10μmol/mol	Electrochemica	■	-	-
Sulfur	SO ₂	0-20μmol/mol	Electrochemica	■	-	-
Ammonia	NH ₃	0-100μmol/mol	Electrochemica	■	-	-
Nitric	NO	0-250μmol/mol	Electrochemica	■	-	-
Nitrogen	NO ₂	0-20μmol/mol	Electrochemica	■	-	-
Hydrogen	HCL	0-30μmol/mol	Electrochemica	■	-	-
ozone	O ₃	0-1μmol/mol	Electrochemica	■	-	-
Ethylene	C ₂ H ₄ O	0-20μmol/mol	Electrochemica	■	-	-
formaldehy	CH ₂ O	0-20μmol/mol	Electrochemica	■	-	-
Methanol	CH ₃ OH	0-20μmol/mol	Electrochemica	■	-	-
Phosphine	PH ₃	0-5μmol/mol	Electrochemica	■	-	-
hydrogen	H ₂	0-1000μmol/mol	Electrochemica	■	-	-
Fluorine	F ₂	0-1μmol/mol	Electrochemica	■	-	-
Hydrogen	HF	0-10μmol/mol	Electrochemica	■	-	-
Hydrogen	HCN	0-50μmol/mol	Electrochemica	■	-	-
Phosgene	COCL ₂	0-1μmol/mol	Electrochemica	■	-	-
Arsenide	AsH ₃	0-1/20μmol/mol	Electrochemica	■	-	-
Silane	SiH ₄	0-50μmol/mol	Electrochemica	■	-	-
Acrylonitril	C ₃ H ₃ N	0-20μmol/mol	Electrochemica	■	-	-
Carbon	CS ₂	0-20μmol/mol	Electrochemica	■	-	-
Ethanol	C ₂ H ₅ O	0-20μmol/mol	Electrochemica	■	-	-
Sulfur	SF ₆	0-1000μmol/mol	Infrared	■	-	-
carbon	CO ₂	0-5%/100%VOL	Infrared	■	-	-
Toluene	C ₇ H ₈	0-20μmol/mol	PID	■	-	-
Xylene	C ₈ H ₁₀	0-20μmol/mol	PID	■	-	-
benzene	C ₆ H ₆	0-20μmol/mol	PID	■	-	-
acetic acid	C ₂ H ₄ O ₂	0-1000μmol/mol	PID	■	-	-
Organic Volatile	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. Attached Table 2: VOC gas selection table

Gas Name	Formula	Factor	Gas Name	Formula	Factor
Ethane, n-	C ₂ H ₆	40.29	Amyl alcohol	C ₅ H ₁₂ O	1.2
Ethanol, 1-	C ₂ H ₆ O	4.01	Benzen-3-one	C ₆ H ₆ O	0.3
Propane	C ₃ H ₈	1.03	Benzen-3-one	C ₆ H ₆ O	0.79
Propanone	C ₃ H ₆ O	0	Benzen, n-	C ₆ H ₆	7.33
Propylene	C ₃ H ₆	0.45	Phenylene	C ₆ H ₆	0.33
Isobutane	C ₄ H ₁₀	1	Glutaraldehyde	C ₅ H ₈ O ₂	0.5
Isobutene	C ₄ H ₈	0	Carbon tetrabromide	CBr ₄	3
Isopropyl alcohol	C ₃ H ₈ O	1.5	Dibutene	C ₄ H ₈	1.2
Isopropanol	C ₃ H ₈ O	4.35	tert-butanol	C ₄ H ₁₀ O	1.33
D isopropylamine	C ₃ H ₉ N	0.7	Triethylamine	C ₃ H ₉ N	0.5
Hexane, 1-	C ₆ H ₁₄	0.9	Nitrogen trichloride	NO ₂	1
Hexan-3-one	C ₆ H ₁₂ O	0.3	Trimethylbenzene ambroxide	C ₉ H ₁₂	0.34
Hexane n-	C ₆ H ₁₄	3.33	Trimethylbenzene, 1,3,5-	C ₉ H ₁₂	0.34
Cyclohexanol, 2-	C ₆ H ₁₂ O	20.33	Nonane, n-	C ₉ H ₂₀	1.27
Cyclohexyl alcohol	C ₆ H ₁₂ O	20	Benzenethiol	C ₆ H ₆ S	0.7
Hexene	C ₆ H ₁₂	3	Guaiacol vapour		1.33
Vinyl bromide	C ₂ H ₃ Br	1	Guaiacol vapour		0.3
Vinyl chloride	C ₂ H ₃ Cl	1.1	Peridine	C ₆ H ₁₁ N	0.75
Cyclohex	C ₆ H ₁₂	0	Di(2,2-oxo-4-oxo-4-oxo)ethane	C ₂ H ₂ O ₃	3
Cyclohexane, n-	C ₆ H ₁₂	3.43	Bromoform	CHBr ₃	1.3
Isopropyl acetate	C ₇ H ₁₄ O ₂	1.5	Chlorobenzene	C ₆ H ₅ Cl	0.45
Isobutyl acetate	C ₈ H ₁₆ O ₂	1.25	Hydrogen sulfide	H ₂ S	4
Isopropyl acetate	C ₇ H ₁₄ O ₂	1.2	Benzenethiol	C ₆ H ₆ S	0.7
Ethyl acetate	C ₄ H ₈ O ₂	3.33	Chlorobenzene, o-	C ₆ H ₅ Cl	0.45
Methyl acetate	C ₃ H ₆ O ₂	5.33	Dibutyl	C ₁₂ H ₂₆	0.4
Propionaldehyde	C ₃ H ₆ O	1.33	Hydrazine	N ₂ H ₄	3
Cetyl mercaptan	C ₂ H ₅ S	0.23	Asphalt, petroleum fumes		1
Ethylamine	C ₂ H ₇ N	3	Mineral spirits		0.3
Ethanol	C ₂ H ₆ O	0.75	Cumene	C ₉ H ₁₂	0.33
Cyclohexanone	C ₆ H ₁₀ O	1.5	Formal	C ₂ H ₄ O	1.33
Chlorobenzene 2-	C ₆ H ₅ Cl	0	Formyl alcohol	C ₂ H ₄ O	2
Uniod (methylmer) 1,2-	C ₄ H ₁₀ N ₂	0.9	Camphene	C ₁₀ H ₁₆	0.45
Nitrobenzene	NO	0	Methyl mercaptan	C ₂ H ₅ S	0.7
Acrylic Acid	C ₃ H ₄ O ₂	1.74	Methyl bromide	C ₂ H ₅ Br	1.7
Bromobenzene	C ₆ H ₅ Br	0	Cresol, o-	C ₇ H ₈ O	1.33
Dibromochloromethane	C ₂ H ₂ BrCl	10	Cresol, o-	C ₇ H ₈ O	1.33
Bromobenzene	C ₆ H ₅ Br	0.7	Cresol, m-	C ₇ H ₈ O	1.33
Octane, n-	C ₈ H ₁₈	1.33	Methanol	C ₁ H ₄ O	100.37
Octane, 1-	C ₈ H ₁₈	0.33	Toluene	C ₇ H ₈	0.31
Nitrobenzene 4-	C ₆ H ₅ NO ₂	0.3	Methylamine	C ₁ H ₅ N	1.4
Nitrobenzene	C ₆ H ₅ NO ₂	1.7	Ethylformate	C ₃ H ₆ O ₂	20.33
Isoprene	C ₅ H ₈	0.33	Cyclohexane	C ₆ H ₁₂	0.75
Allyl alcohol	C ₃ H ₆ O	1.07	Cyclohexane	C ₆ H ₁₂	1.15
Allyl chloride	C ₃ H ₅ Cl	4.5	Cyclohexanone	C ₆ H ₁₀ O	1.33
Amyl acetate, n-	C ₇ H ₁₄ O ₂	1.3	Cyclohexanol	C ₆ H ₁₂ O	1.5

[illegible]

Chem Name	Formula	Molar
Acetone	C3H6O	0.71
Ethyl acetate	C4H8O2	1
Propan-1,2-diol, total	C3H8O2	10
Epichlorohydrin	C3H5ClO	0
Ethyl benzoate	C9H10O2	0.54
Benzene	C6H6	0.64
Benzyl chloride	C7H7Cl	0.55
Benzaldehyde	C7H6O	0.60
Anisole	C7H8O	0.47
Benzyl formate	C9H10O2	0.77
Benzyl alcohol	C7H8O	1.25
N-methyl-2-pyrrolidone, 2-	C5H9NO	0.6
Aniline	C6H7N	0.5
Benzene	C6H6	0.5
Benzene, 1-	C6H6	1.15
Crotonaldehyde	C4H6O	1
Ethylamine	C2H7N	1
WWD Methyl isobutylate	C10H20O4	1
WWD M-Water and Gas	C4H10N2O2	1.1
Dimethylhydrazine, 1,1-	C2H8N2	1
Tetrahydrofuran	C4H8O	1.55
Methyl propen-2-ol, 2-	C4H8O	0.5
Tricetylene	C6H12N	0.5
Toluene-2,4-diisocyanate	C10H6N2O2	1.6
Tetrafluoroethylene	C2F4	1
Trichloroethylene	C2HCl3	0.65
Turpentine	C10H16	0.6
Phenyl-2,2-bispropyl ether	C16H18O2	0.6
Tetraethoxyethane	C2O4	0.7
Ethyl hexyl acetate, 2-	C12H22O2	1
Methyl cyclohexanone, 2-	C7H12O	0.55
Methyl cyclohexanol, 4-	C7H14O	2.4
Methyl cyclohexane	C7H14	1.1
Dimethyl heptan-4-one, 2,6-	C9H18O	0.6
Isopropyl chloroformate	C4H7ClO	1.6
Isopropyl isopropyl ether, 2-	C6H12O2	1.1
Methyl pentan-2,4-di-ol, 2-	C6H14O2	4
Ethyl chloroformate	C3H5ClO	0.5
Ethyl 2-ethylhexanoate	C10H20O2	1
Methyl sulphide	C2H6S	0.5
Dimethyl formamide	C2H6NO	0.5
Dimethyl ethylamine, NH-	C4H11N	0.6
Dimethyl sulfolane	C2H6S2	0.15
Dicyclanilmethoxyamine, 2-	C10H18N2	1
Dicyclanilmethanol, 2-	C10H18ON	2.7
Sarcosine	C2H5NO2	0.6

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



4.3. Appendix 3: RS485 communications

Baud rate: 2400 Data bits: 8 bits Stop bit: 1 bit Parity: NONE

Host

:	0X55	0X03	0X01	0X01	0x00 0X00 0X00 0X00	CRCL CRCH
	Start code	Host ID	address code	function code	Four-byte data bits	Two check digits

Slave

:	0X55	0X01	0X01	0X01	0x00 0X00 0X00 0X00	CRCL CRCH
	Start code	Slave ID	address code	function code	Four-byte data bits	Two check digits

E.g:

The host queries the probe with address 1:

0X55 0X03 0X01 0X01 0X00 0X00 0X00 0X00 0X8A 0X19

The address defaults to 4 zeros Standard CRC check

Slave machine answer:

0X55 0X01 0X01 0X01 0X00 0X00 0X42 0X70 0X98 0X9D The actual analytical concentration is 60

float data

float data conversion:

typedef union

{

float sub_float;

struct

{

uchar b1,b0,b3,b2;

}sep_float;

}u_float;

float Uchar_to_Float()

{

float_styp.sep_float.b2 = float_sbuff[0];

float_styp.sep_float.b3 = float_sbuff[1];

float_styp.sep_float.b0 = float_sbuff[2];

float_styp.sep_float.b1 = float_sbuff[3];

return(float_styp.sub_float);

}



4.4. Appendix 4: Recommended calibration gas table

Gas	Measure Range	Span Gas	Concentration
CH ₄	100%LEL	CH ₄	60%LEL
O ₂	30%VOL	O ₂	20. 9%VOL
CO ₂	5%VOL	CO ₂	3%VOL
CO	1000μmol/mol	CO	700μmol/mol
	500μmol/mol		300μmol/mol
VOC	1000μmol/mol	I-C ₄ H ₈	700μmol/mol
	20μmol/mol		15μmol/mol
H ₂	1000μmol/mol	H ₂	700μmol/mol
H ₂ S	100μmol/mol	H ₂ S	80μmol/mol
NH ₃	100μmol/mol	NH ₃	60μmol/mol
HCL	30μmol/mol	SO ₂	60μmol/mol
CL ₂	10μmol/mol	CL ₂	10μmol/mol
SO ₂	20μmol/mol	SO ₂	15μmol/mol
NO ₂	20μmol/mol	CL ₂	10μmol/mol
C ₂ H ₄ O (ET0)	20μmol/mol	C ₂ H ₄ O	10μmol/mol
HF	10μmol/mol	CL ₂	10μmol/mol
PH ₃	5μmol/mol	H ₂ S	5μmol/mol
COCL ₂	1μmol/mol	CL ₂	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.

4.5. Appendix 5: 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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