



**GfG Instrumentation**  
Worldwide Manufacturer of Gas Detection Solutions

# CI 21

NH<sub>3</sub> Transmitter

## Operations Manual



**GfG Instrumentation**

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## For Your Safety

As with any piece of complex equipment, the GfG CI 21 transmitter will do the job it is designed to do only if it is used and serviced in accordance with the manufacturer's instructions. Please protect yourself and your employees by following the instructions in this manual. All individuals who have or will have the responsibility for using and servicing this product must carefully read this manual. The warranties made by GfG with respect to the product are voided if functions or parameters are changed without the permission of GfG. They are also voided if the product is not used and serviced in accordance with the instructions in this manual. Failures or false alarms caused by interfering gases or electrical signals are not part of the warranty obligation. The above does not alter any statements by GfG regarding warranties, conditions of sale and/or delivery.

## General Description

A fixed gas monitoring system consists of the transmitter (MWG) and a controller (GMA), which are connected by a cable. The transmitter converts the unit of the gas concentration into an electrical signal and transmits it to the controller.

### Fixed Gas Detection System

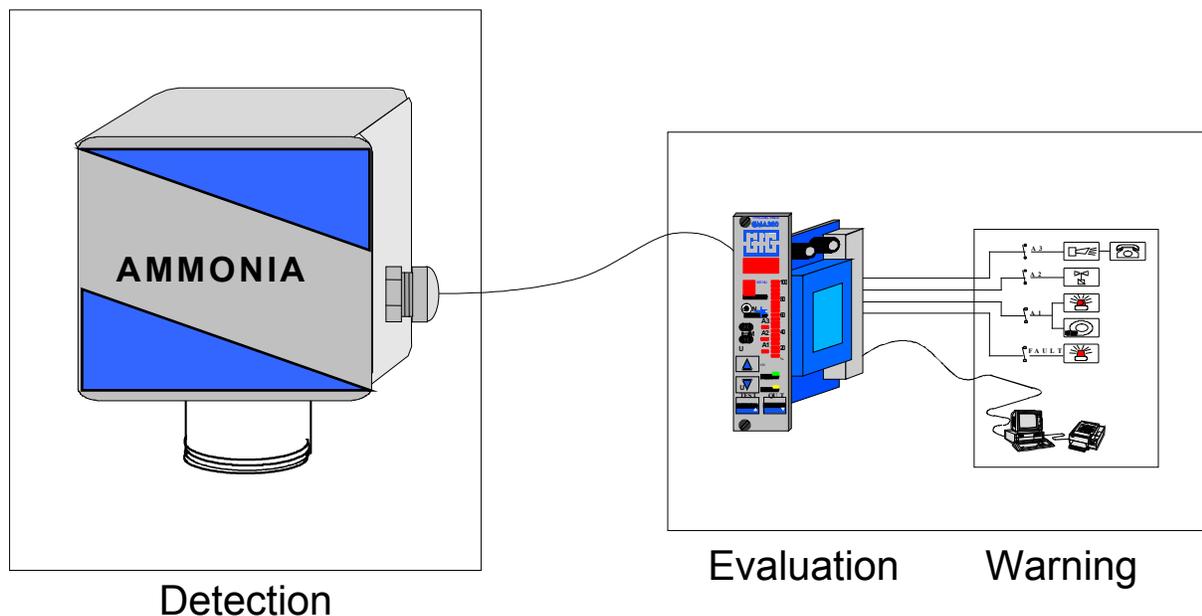


Figure 1

The CI 21 is an "intelligent" transmitter. The comprehensive electronics allow easy operation and maintenance and also increase operational safety and accuracy. The following features characterize the CI 21:

- Easy on-site calibration
- Compensation for temperature fluctuations
- Long sensor life

## Detection Principle

The CI 21 has a Charge Carrier Injection sensor. As long as there is no gas in the ambient air, the internal resistance of the sensor is high.  $\text{NH}_3$  (ammonia) is adsorbed at the sensor surface, reducing the internal resistance. The change in resistance is equivalent to the measurement of the gas concentration and is converted into a standardized current signal (0.2–1 mA or 4–20 mA) by the integrated electronics. The Charge Carrier Injection sensor has proven long-term stability.

## Operation

The CI 21 passes function and performance tests before shipment and is calibrated with suitable test gases. **This does not preempt the user's obligation to perform a function test after putting the transmitter into operation.**

## Design

The design of the CI 21 is shown in figure 2. The sensor is mounted in the sensor support (pos. 5). Gas enters the sensor chamber through the diffusion inlet (pos. 6). The electronics convert the measurement signal into the output of 0.2–1 mA or 4–20 mA, which is then transferred to the controller by a cable.

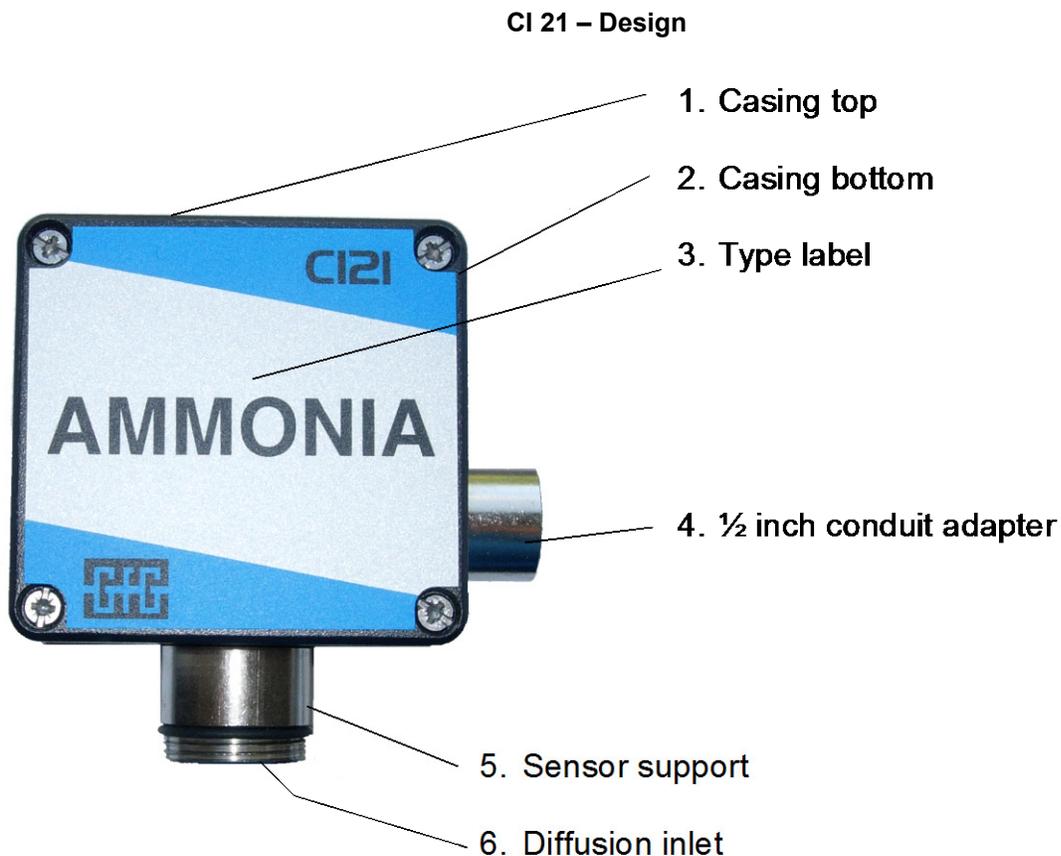


Figure 2

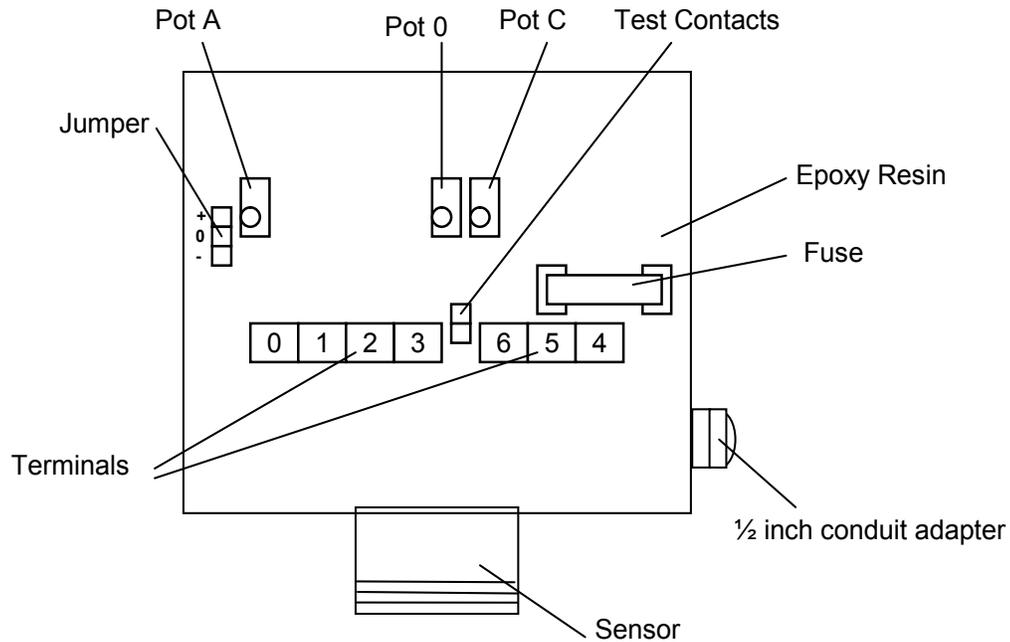


Figure 3 / Schematic

## Mounting

It is essential to know the ambient conditions before deciding on the mounting position. To achieve representative measurement results, check the:

- **Room ventilation**
- **Gas density**

Install the CI 21 in a place where gases will pass the sensor even in case of bad ventilation. If necessary, use a smoke cartridge to check air flow.

Take the following into consideration as well:

- **Ambient temperature**
- **Rain water, hose water, dripping water or condensation**
- **Dust** in the atmosphere
- **Avoid** installation near silicones, anti-seize, lubricants
- Other possible contaminants

The CI 21 is protected to a great extent against water and dust (IP 54). Special accessories are available to provide additional protection for very harsh conditions. Please contact GfG for detailed information.



The warranty may be voided if the transmitter is exposed to ambient conditions that were unknown to GfG during planning, production or delivery. Substitution of components may compromise the safety of this device. Only use components approved by GfG Instrumentation, Inc.

When deciding on the transmitter position, make sure that it is always accessible for service and maintenance. Mounting the CI 21 with the sensor facing the floor is recommended. A different mounting position, however, does not affect the sensor's accuracy.

For connecting the CI 21 refer to the connection diagram (also refer to the terminal diagram of your GMA controller). To mount the transmitter, remove the four lock screws and lift the casing top off. Attach the casing by putting two screws through the appropriate borings.



**The CI 21 comes equipped with a protective cap over the sensor. Do not remove this cap until just before you apply power to the transmitter.**

**The protective cap must be replaced whenever power is not applied to the CI 21.**



**In order for the CI 21 to detect NH<sub>3</sub>, the protective cap must be removed. Once the CI 21 is properly installed, a heater helps to keep the sensor protected from most contaminants in the environment.**



**If maintenance is being performed in the area, the protective cap must be used.**

**Failure to follow these instructions may cause damage to the sensor and will void the warranty.**

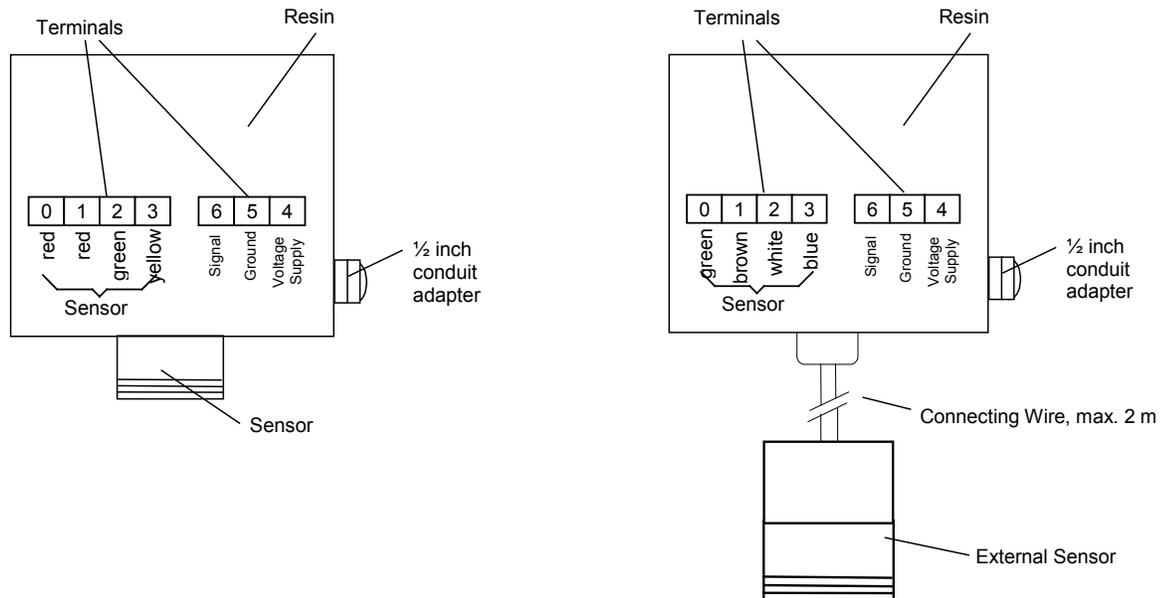


**The CI 21 is not certified for use in hazardous areas.**

### Electrical Connections

An electrician following the applicable regulations should install cable and electrical connections. A shielded 18/3 cable should be used (Belden #8770 or equivalent) for distances less than 500 yards.

**NOTE:** There is shielding over the EMC cable screwing.



**Figure 4**

The supply voltage for the transmitter (terminal 4) is 10–30 VDC.

Once the installation is completed, close the casing top and secure it with the screws.

## Start-up

Once the CI 21 is installed, the user can put it into operation. Before shipment, the CI 21 is calibrated and tested after a specific warm-up time. When connecting the transmitter to a controller (power supply) you should allow approximately 60 minutes to warm-up the Charge Carrier Injection sensor before checking the sensitivity. Should you notice that a re-calibration is required, allow an extended warm up period of about 4 hours. **If you replace the sensor, adjust the jumper of the transmitter according to the specifications on the new sensor (sensor replacement requires adjusting the dead band for the new sensor).**

The CI 21 is calibrated and tested before shipment. Certain deviations, however, are possible due to transport, mounting, and ambient conditions. Inside the CI 21 there are two test contacts to check the electrical output signal (fig. 3). The voltage at the test contacts can be measured with a voltmeter. Warm-up time is approximately 60 minutes.

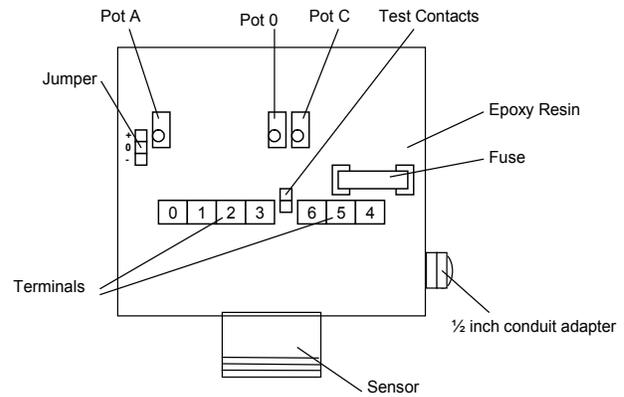
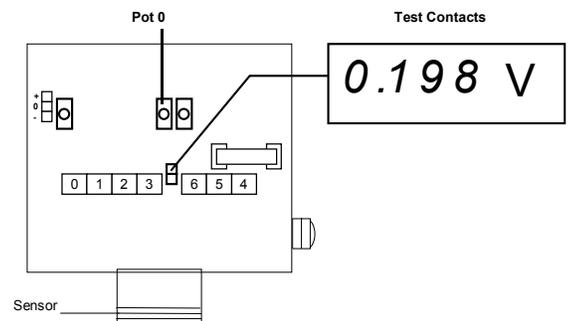


Figure 3

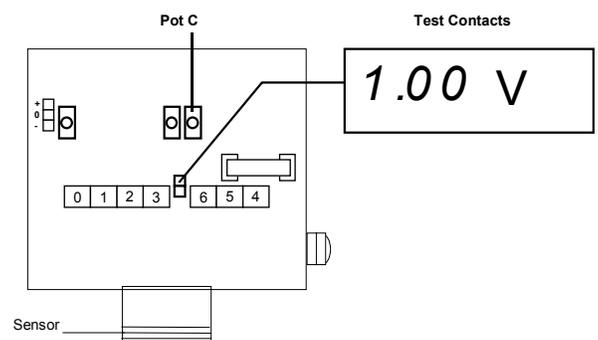
## Check Electrical Zero Point

- 1) Use a multimeter to check the output signal by measuring the voltage at the test contacts.
- 2) The reading should be in the range of: 0.198 – 0.200 V
- 3) If there is a deviation from this range it is possible to adjust the value by turning pot 0.



## Check Sensitivity (Calibration) / Bump Test

- 1) Use a multimeter to check the output signal by measuring the voltage at the test contacts.
- 2) Attach the calibration adapter to the diffusion inlet of the transmitter. Moisten and wring out the humidifier sponge, install the sponge in the humidifier and attach to the calibration adapter.
- 3) Select a suitable test gas (200, 1,000, or 10,000 ppm NH<sub>3</sub> depending on the detection range) and allow a flow of 0.5 lpm or 1 CFH for 3–5 minutes before reading and making adjustments.
- 4) The reading should be in the 1.00 V +/- 10% range.
- 5) In case of a deviation you can correct the value by turning potentiometer C.



When using a GMA controller, signal checks and adjustments may be done at the GMA (please refer to the GMA manual).

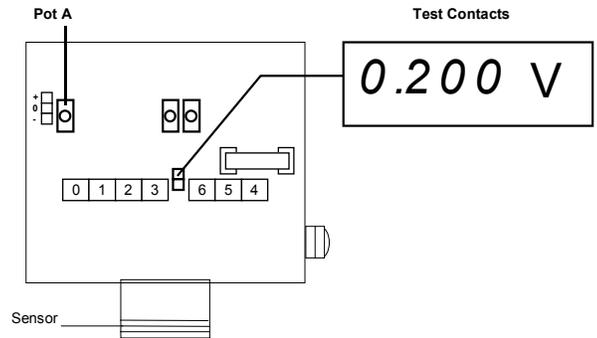


**Do not use test gas with a balance of nitrogen. Calibration gas must be GfG approved.**

## Check Zero Point (Dead Band)

**Adjustments to the zero point (Pot A) should not be done without direct instruction from GfG.**

- 1) Use a multimeter to check the output signal by measuring the voltage at the test contacts.
- 2) Attach the calibration adapter to the diffusion inlet of the transmitter. Moisten and wring out the humidifier sponge, install the sponge in the humidifier and attach to the calibration adapter.
- 3) Select a suitable test gas (20 or 30 ppm NH<sub>3</sub>, depending on the detection range) and allow a flow of 0.5 lpm or 1 CFH for 3 to 5 minutes before reading and making adjustments.
- 4) The signal should be approximately 0.200 V.
- 5) In case of a deviation it is possible to adjust the value by turning potentiometer **A**.



**Pot A is factory set and should not be adjusted without direct instruction or training from GfG.**

## Troubleshooting

Symptom	Reason/s	Solution
0 mA output current	<ul style="list-style-type: none"> <li>• Incorrect wiring</li> <li>• Defective fuse</li> <li>• Cut cable/wire</li> <li>• DC voltage too high</li> <li>• Defective electronics</li> </ul>	<ul style="list-style-type: none"> <li>• Verify wiring to CI 21 diagram</li> <li>• Replace fuse (use approved type only)</li> <li>• Reconnect wiring</li> <li>• Correct voltage to 10–30 VDC</li> <li>• Contact GfG for instructions</li> </ul>
No reaction to test gas	<ul style="list-style-type: none"> <li>• Improper gas</li> <li>• Faulty sensor</li> </ul>	<ul style="list-style-type: none"> <li>• Use GfG approved test gas</li> <li>• Replace sensor</li> </ul>
Controller shows incorrect reading with test gas applied.	<ul style="list-style-type: none"> <li>• Controller not calibrated</li> <li>• CI 21 out of calibration</li> </ul>	<ul style="list-style-type: none"> <li>• Calibrate controller</li> <li>• Calibrate CI 21</li> </ul>
High output current with no gas present	<ul style="list-style-type: none"> <li>• Open ground wire</li> <li>• Possible interfering background gas</li> </ul>	<ul style="list-style-type: none"> <li>• Reconnect ground wire</li> <li>• Identify background gas and eliminate</li> </ul>
Slow sensor response	<ul style="list-style-type: none"> <li>• Incorrect test gas</li> <li>• Humidifier sponge too wet</li> <li>• Humidifier sponge too dry</li> <li>• Sensor defective</li> </ul>	<ul style="list-style-type: none"> <li>• Use GfG approved test gas</li> <li>• Wring out sponge</li> <li>• Moisten sponge</li> <li>• Replace sensor</li> </ul>

## Service

Service includes maintenance, inspection, and repair of gas warning equipment and function tests of the equipment.

A function test checks the:

- Alarm with gas concentration
- Zero point and sensitivity (calibration)
- Response time
- Gas sampling and gas processing system (if any)
- Alarm signal activation
- Failure alarm

The function check should be done before putting the system into operation, and it should be repeated at least once a year.

For service, please contact:

GfG Instrumentation, Inc.  
1194 Oak Valley Drive  
Suite 20  
Ann Arbor, MI 48108

Phone: (734) 769-0573  
Fax: (734) 769-1888  
E-mail: info@gfg-inc.com  
Website: www.goodforgas.com

### Maintenance and Inspection

With maintenance and inspection you can ensure the proper working status of the gas detection system. The CI 21 does not require special maintenance. Depending on the ambient conditions, gas detection systems may change their behavior. Therefore, it is important to perform a visual check every day, particularly during the first few days after starting up the device:

- Check pump assembly and gas processing system (if any).
- Check gas supply for blockage (for correct measurement the gas supply to the sensor must not be blocked).
- Sensors are subject to ageing and exhausting. Depending on their type and on their exposure to gas they can be used up. A sensitivity check can only be done with a suitable test gas after certain periods of time. The sensitivity calibration is an expert calibration and is usually performed by GfG service or by authorized technicians.

### Spare Parts

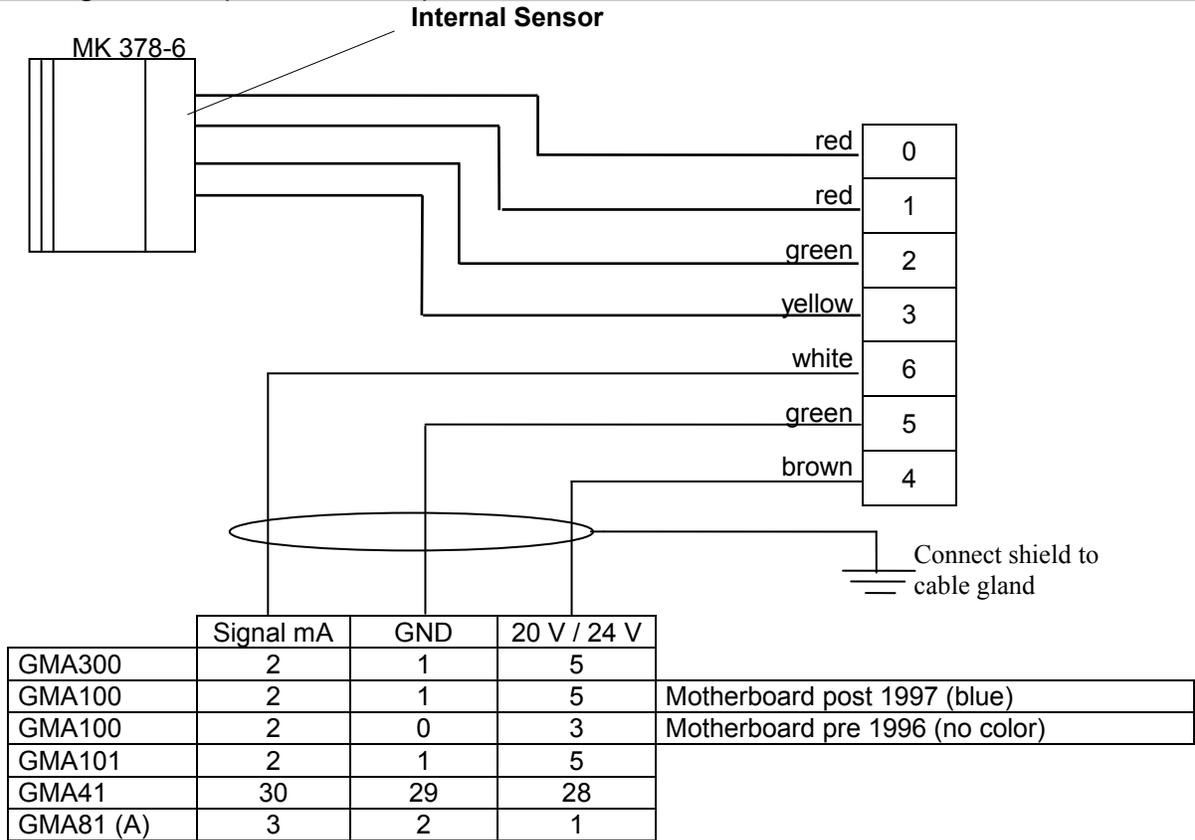
	<b>Part Number</b>
Spare sensor/internal	737806
Spare sensor/external	737805

**If you replace the sensor, adjust the jumper inside the transmitter according to the specifications on the new sensor (sensor replacement requires adjusting the dead band for the new sensor).**

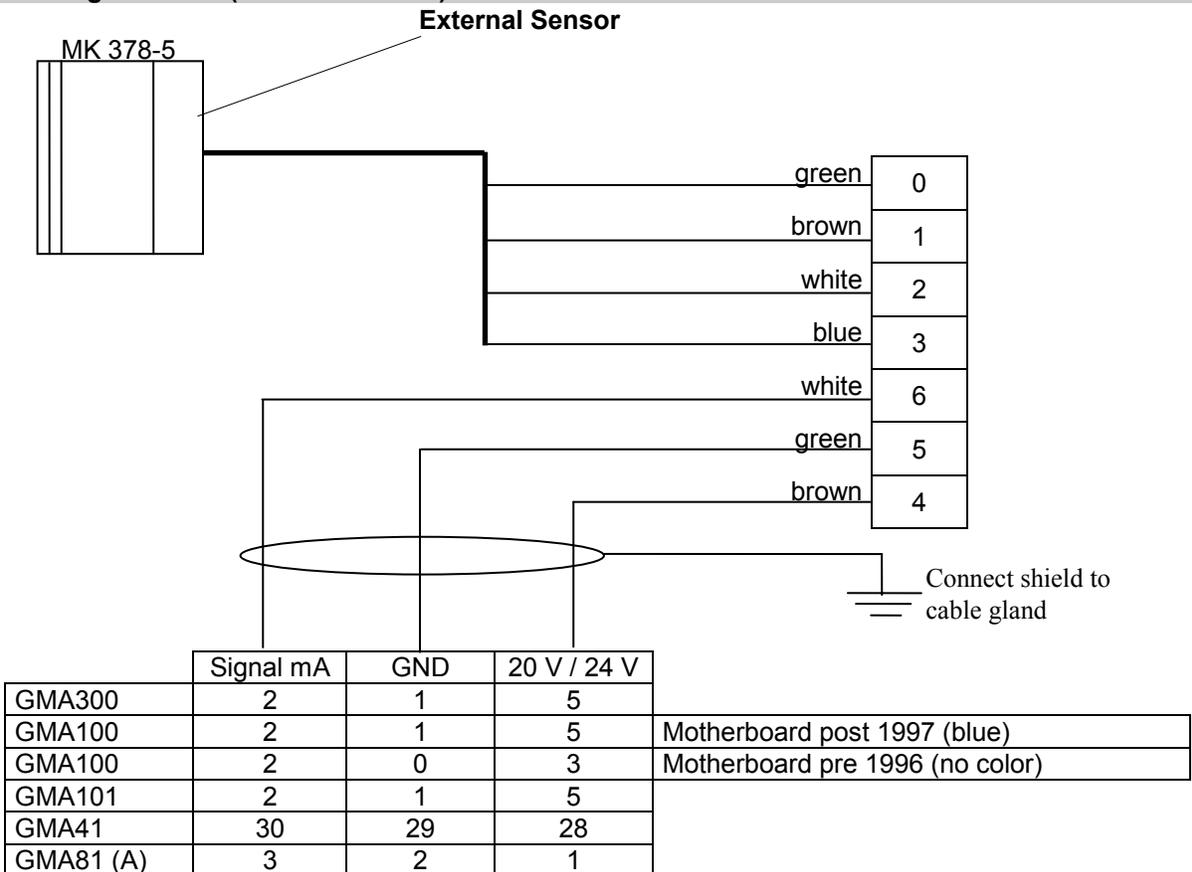
### Accessories

	<b>Part Number</b>
Calibration adapter	2000209
Calibration kit without gas (fixed flow regulator, tubing, inline humidifier and adapter)	7721-200
Calibration gas (200 ppm NH <sub>3</sub> balance air)	7803-002
Calibration gas (1000 ppm NH <sub>3</sub> balance air)	7803-010
Calibration gas (10,000 ppm NH <sub>3</sub> balance air)	7803-100
Calibration kit with gas (10,000 ppm)	7722-100
Calibration kit with gas (1,000 ppm)	7722-010
Calibration kit with gas (200 ppm)	7722-200

### Connection Diagram CI 21 (Internal Sensor)



### Connection Diagram CI 21 (External Sensor)



## Technical Data

<b>Transmitter CI 21</b>	
Type:	CI 21
Sensor Type:	MK 378-5 (external) or MK 378-6 (internal)
Gas:	Ammonia, NH <sub>3</sub>
Standard range:	200 ppm, 1,000 ppm or 10,000 ppm
Gas Supply:	Diffusion
Detection Principle:	Charge Carrier Injection (CI)
Fuse Rating:	315 mA, 250 V
Supply Voltage:	10 to 30 VDC
Output Current:	0.2 to 1 mA (4 k $\Omega$ ) or 4 to 20 mA (200 $\Omega$ )
Response Time t <sub>Δ</sub> :	< 8 seconds
Typical Sensor Life:	> 2 years
<b>Climate Conditions</b>	
Temperature:	-40 to 131°F (-40 to +55°C)
Humidity:	0 to 99% r. h., non condensing
Pressure:	920 to 1,100 hPa
<b>Casing</b>	
Material:	Aluminum
Protection:	IP 54
Cable Gland:	½ inch conduit
Transmitter Cable:	3 core shielded cable AWG 18 for runs less than 500 yards Belden #8770 or equivalent
Dimensions:	3.9x3.9x2.2 inches (100x100x57 mm) (HxWxD)
Weight:	13 oz. (370 g)
<b>Approvals</b>	
CSA:	c-CSA-us CSA C22.2 No. 205-M1983
UL:	UL 916

## Warranty

GfG Instrumentation warrants our products to be free from defects in material and workmanship when used for their intended purpose, and agrees to remedy any such defect or to furnish a new part (at the option of GfG Instrumentation) in exchange for any part of any product that we manufacture that under normal use is found to be defective; provided that the product is returned, by the purchaser, to GfG's factory, intact, for our examination, with all transportation costs prepaid, and provided that such examination reveals, in our judgment, that it is defective.

This warranty does not extend to any products that have been subjected to misuse, neglect, accident, or unauthorized modifications; nor does it extend to products used contrary to the instructions furnished by us or to products that have been repaired or altered outside of our factory. No agent or reseller of GfG Instrumentation may alter the above statements.

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