

# ***Toxic and Combustible Gas Detection***



***Model D12***

**Digital Gas Transmitter**

# There's A D12 Transmitter That's Right For You.

Gas detection systems come in all shapes and sizes. Some require simple 4-20 mA transmission. Some are better suited to local alarm relay functions. Some really require both. And increasingly, digital communication directly to the transmitter is desirable. Not to mention the fact that self-testing sensor capability adds to the reliability of any system.

We couldn't come up with a catchy name that would convey all the capabilities of the D12, so we'll just explain everything our transmitter can provide — starting with our four different configurations.

## **Loop Powered Transmitter**

For measurement and data transmission to remote display and alarm equipment, the D12 will operate in 2-wire mode (except for combustible gas). Integral LCD indicates gas concentration as well as alarm conditions.

## **Loop Powered with HART™**

For plants operating with Hart protocol communications systems, the D12 can be supplied with this option. Our HART™ output supports both 4-20 mA and constant-current mode of operation.

## **Transmitter with Integral Relays**

For systems requiring local alarm functions, or systems where discrete outputs are desired, the D12 can provide 3 relay outputs. Relays are assignable to any alarm setpoint or fault condition and are fully programmable for setpoint, hysteresis, and time delay.

## **Transmitter with Modbus™**

When RS-485 communication is desirable, D12 transmitters with alarm relays can be supplied with a Modbus(tm) interface. Software supports up to 247 unique addresses for large system use.



*D12 with Combustible Gas Sensor*

## **Typical Applications**

- Chemical Processing
- Pulp & Paper
- R&D Labs
- Semiconductor Plants
- Refineries
- Pharmaceuticals
- Food Processing
- Aluminum Refining
- Breweries
- Metals Processing
- Water Treatment
- Wastewater Treatment
- Electric Utilities
- Agricultural Chemicals
- Plastics Manufacturing

# Features For Every Application

D12 transmitters provide useful features that simplify installation, operation, and maintenance. From clear menu-driven setup pages to large numerical display of gas values, you simply can't find a more versatile transmitter.

- **LCD Graphics Display:** Gas concentrations are displayed in large, easy to read numbers. The display also provides alarm indication and complete menus for setting up operating parameters. A backlight is available when operating in 3-wire mode.

- **Internal Data Logger:** Measured gas values are stored at user definable intervals and can be recalled when needed on the LCD display. Data can be downloaded using the MODBUS™ interface.



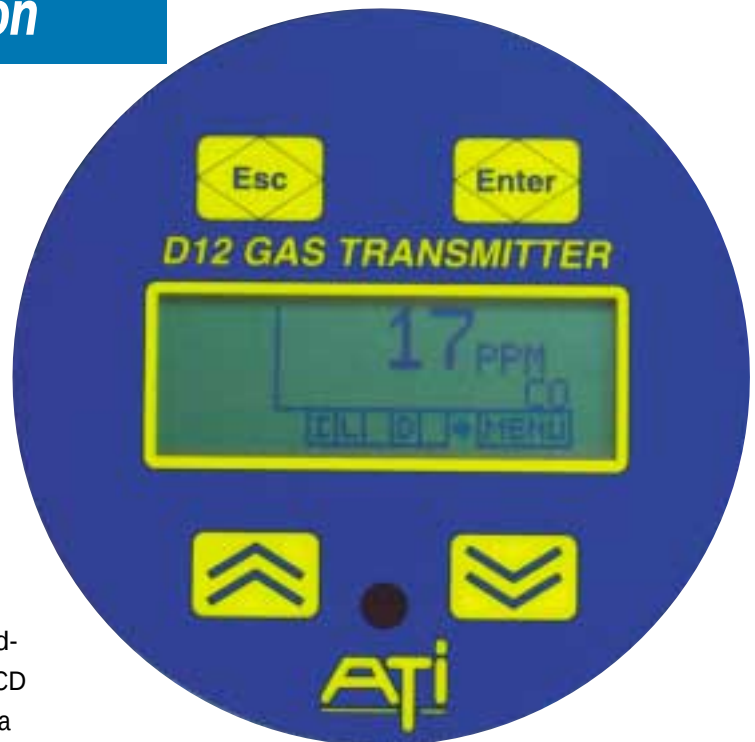
- **Non-Intrusive Operation:** Operating functions such as calibration, alarm setup, alarm reset, data view, and setup options are all available using a magnetic tool. It is not necessary to open the enclosure when making adjustments.

- **Password Protection:** Program settings stored in the transmitter may be protected by a user selectable 4-digit password. Operators may still review all functions, but changes may only be made by authorized personnel.

- **Modular Electronics:** The D12 electronic assembly plugs easily into the power supply board in the base of the enclosure. Transmitters can be removed for wiring and quickly replaced in the event of a fault condition.

- **Explosion Proof Enclosure:** Transmitters are designed for operation in hazardous areas. The cast aluminum housing for the D12 transmitter is rated for Class 1, Division 1, Group B, C, D locations and is UL, FM, and CSA certified.

- **Scalable 4-20 mA:** The output range for a particular sensor is programmable within the range boundaries set in that sensor.



- **Three Internal Alarm Relays:** Optional relay outputs can be used for local alarm functions. All relays are programmable for setpoint, hysteresis, on-delay, off-delay, and other variables. Even a remote reset feature is provided for in the transmitter design.

- **Analog Output Simulation:** Transmitter analog output can be set to user definable values. This provides for complete loop testing without the need to apply gas to the sensor.

- **Relay Output Simulation:** Alarm relays may be activated on command to allow testing of local alarm devices. Any combination of relays may be activated based on operator selection. Output and alarms may also be inhibited for maintenance and calibration.

- **Serial Communication Interface:** The transmitter is available with either HART™ or MODBUS™ protocol. The HART™ protocol supports the HART™ Universal and Common Practice Commands at 1200 baud using the Bell 202 FSK modem standard. The MODBUS™ protocol supports 9600 baud access to concentration and status information, and supports alarm setup and many other functions on either RS485 or RS232 (software selectable). Comes with a register/tag database on a 3-1/2" diskette



## Available Gas List

| Symbol                          | Gas                | Min. Range | Max. Range | Symbol                        | Gas                 | Min. Range | Max. Range |
|---------------------------------|--------------------|------------|------------|-------------------------------|---------------------|------------|------------|
| C <sub>2</sub> H <sub>2</sub>   | Acetylene *        | 0-50 PPM   | 0-500 PPM  | HCl                           | Hydrogen Chloride * | 0-10 PPM   | 0-200 PPM  |
| HX                              | Acid Gases *       | 0-10 PPM   | 0-200 PPM  | HCN                           | Hydrogen Cyanide *  | 0-10 PPM   | 0-200 PPM  |
| C <sub>2</sub> H <sub>6</sub> O | Alcohol            | 0-50 PPM   | 0-2000 PPM | HF                            | Hydrogen Fluoride * | 0-10 PPM   | 0-200 PPM  |
| NH <sub>3</sub>                 | Ammonia *          | 0-50 PPM   | 0-2000 PPM | H <sub>2</sub> O <sub>2</sub> | Hydrogen Peroxide * | 0-10 PPM   | 0-1000 PPM |
| AsH <sub>3</sub>                | Arsine             | 0-500 PPB  | 0-200 PPM  | H <sub>2</sub> Se             | Hydrogen Selenide   | 0-500 PPB  | 0-200 PPM  |
| Br <sub>2</sub>                 | Bromine *          | 0-1 PPM    | 0-200 PPM  | H <sub>2</sub> S              | Hydrogen Sulfide *  | 0-10 PPM   | 0-200 PPM  |
| CO                              | Carbon Monoxide *  | 0-50 PPM   | 0-1000 PPM | I <sub>2</sub>                | Iodine *            | 0-1 PPM    | 0-200 PPM  |
| Cl <sub>2</sub>                 | Chlorine *         | 0-1 PPM    | 0-200 PPM  | NO                            | Nitric Oxide        | 0-50 PPM   | 0-200 PPM  |
| ClO <sub>2</sub>                | Chlorine Dioxide * | 0-1 PPM    | 0-200 PPM  | NO <sub>2</sub>               | Nitrogen Dioxide *  | 0-10 PPM   | 0-200 PPM  |
| CH <sub>4</sub>                 | Combustible Gas *  | 0-50% LEL  | 0-100% LEL | O <sub>2</sub>                | Oxygen              | 0-5%       | 0-25%      |
| B <sub>2</sub> H <sub>6</sub>   | Diborane           | 0-500 PPB  | 0-200 PPM  | O <sub>3</sub>                | Ozone *             | 0-1 PPM    | 0-200 PPM  |
| C <sub>2</sub> H <sub>4</sub> O | Ethylene Oxide *   | 0-20 PPM   | 0-200 PPM  | COCl <sub>2</sub>             | Phosgene            | 0-1 PPM    | 0-100 PPM  |
| F <sub>2</sub>                  | Fluorine *         | 0-1 PPM    | 0-200 PPM  | PH <sub>3</sub>               | Phosphine           | 0-500 PPB  | 0-200 PPM  |
| HCHO                            | Formaldehyde *     | 0-20 PPM   | 0-200 PPM  | SiH <sub>4</sub>              | Silane              | 0-10 PPM   | 0-200 PPM  |
| GeH <sub>4</sub>                | Germane            | 0-500 PPB  | 0-200 PPM  | SO <sub>2</sub>               | Sulfur Dioxide *    | 0-10 PPM   | 0-200 PPM  |
| H <sub>2</sub>                  | Hydrogen           | 0-500 PPM  | 0-10%      |                               |                     |            |            |

\* Auto-Test gas generator available

## Specifications

|                |                                                                                                                                                                                                       |                   |                                                                                                            |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------------------------------------------------------------------------------------------|
| Gas Type:      | Customer selected from available sensor list.                                                                                                                                                         | Analog Output:    | Loop-powered 4-20 mA, 675 ohms maximum at 24 VDC                                                           |
| Sensor Type:   | Electrochemical for toxic gases and oxygen. Catalytic bead for combustible gas                                                                                                                        | Serial Interface: | HART™ (1200 baud modem interface)<br>MODBUS™ (1200-9600 – RS232 or RS485, software selectable)             |
| Range:         | User adjustable within limits of selected sensor.                                                                                                                                                     | Power:            | 12 - 30 VDC, 25 mA maximum in loop-powered mode<br>12 – 30 VDC, 200 mA maximum in 3-wire mode.             |
| Response Time: | Sensor dependent                                                                                                                                                                                      | Alarm Relays:     | Three SPDT, 5 A @ 230 VAC resistive                                                                        |
| Accuracy:      | Generally ±10% of value (limited by available calibration gas)                                                                                                                                        | Relay Coil:       | Programmable either normally energized or normally de-energized.                                           |
| Repeatability: | ±1% (Electronic)                                                                                                                                                                                      | Enclosure:        | Explosion-proof, Class 1, Div. 1, Groups B, C, & D.                                                        |
| Linearity:     | ±0.5% (Electronic)                                                                                                                                                                                    | Sensor Auto-Test: | Optional gas generator dependent on sensor.                                                                |
| Zero Drift:    | Less than 2% full scale per month, non-cumulative                                                                                                                                                     | Controls:         | 4 magnetic switches on front of transmitter                                                                |
| Span Drift:    | Dependent on environment but generally less than 3% per month                                                                                                                                         | Operating Temp.:  | -30° to +60° C for toxics<br>(-10° C minimum for O <sub>2</sub> sensor)<br>-40° to +70° C for combustibles |
| Alarms:        | Three concentrations alarms (Caution, Warning, Alarm) programmable for setpoint, hysteresis, alarm delay, and manual or automatic reset. One fault alarm with programmable output and relay response. | Weight:           | 4 Lbs (1.8 Kg.)                                                                                            |

## Sensor Flexibility

No matter which style of transmitter you choose, your D12 transmitters come with features that enhance performance and provide operational flexibility, starting with our own advanced electrochemical sensors.

- **Interchangeable Sensors:** Every toxic gas transmitter will accept up to 46 different sensors, greatly reducing the need for multiple transmitter models. The self-aligning sensor holder simply plugs in, with automatic sensor recognition and verification when contact is made.

- **Smart Sensors:** Plug-in sensors store calibration data, allowing sensors to be calibrated separately from the transmitter. This allows bench calibration (or factory calibration) of sensors to reduce the necessity for carrying calibration gas around the plant. Sensors are even interchangeable with ATI's C16 portable gas leak detector.

- **Calibration History:** Each time a sensor is zeroed or calibrated, the data is stored in sensor memory. Calibration history can be recalled and sensor condition reviewed by operating personnel whenever necessary.

## Sensor Response Verification

For many toxic and combustible gases, ATI offers a unique sensor response testing system unmatched by any competitive transmitter. Even outdoors in high wind conditions, the Auto-Test system provides reliable response checks to insure system integrity.

- **Electrochemical Gas Generator:** Sensor response is verified with an actual gas sample, generated on demand. Electronic sensor and circuit tests just can't provide the same level of confidence.

- **Plug-in Smart Generator:** Auto-Test gas generators are easily installed and removed when necessary. Generators store run time information accessible to operators, and are automatically tested for compatibility with the installed sensor.

- **Auto-Test Log:** Systems using Auto-Test generators store a testing log indicating the number of tests performed as well as test results. This data is stored in individual sensor memory for later review.



*Plug-In Sensor*



*Self-aligning Sensor/Generator Holder*



*Auto-Test Generator*

## Order Information: Model D12-E-F-G

For transmitters to be used with electrochemical sensors, sensors must be selected separately from the list shown below. Note that the sensor part number will vary in some cases depending on the range of operation. If an Auto-Test generator is to be used, this item must also be specified separately. Combustible gas sensors are part of the sensor holder specified under Suffix F

### Suffix E – Transmitter Type

- 1 – Electrochemical without alarms
- 2 – Electrochemical with alarms
- 3 – Combustible gas without alarms
- 4 – Combustible gas with alarms

### Suffix F – Sensor Holder Style

- 1 – Integral holder for sensor and generator
- 2 – Remote Sensor System for toxic sensors
- 3 – Integral combustible gas sensor
- 4 – Integral combustible sensor with generator
- 5 – Remote Sensor System for combustible gas sensor
- 6 – Remote Sensor System for combustible sensor with generator

### Suffix G – Digital Output

- 1 – None
- 2 – MODBUS™ interface (requires alarm option in Suffix E)
- 3 – HART™ interface

## Accessories

- 00-1056 Calibration adapter
- 00-1251 Flowcell assembly
- 00-0981 Sensing module keeper for 4 sensors

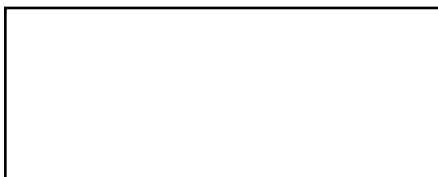
## Auto-Test Generator

- 00-1239 C18-11 Chlorine gas generator
- 00-1240 C18-15 Ammonia gas generator
- 00-1241 C18-16 Carbon Monoxide gas generator
- 00-1243 C18-24 Hydrogen Sulfide gas generator
- 00-1244 C18-27 Sulfur Dioxide gas generator

## Toxic Gas Sensors

| Part No. | Gas & Range                                           |
|----------|-------------------------------------------------------|
| 00-1000  | Bromine, 0-1/5 PPM (2 PPM Standard)                   |
| 00-1001  | Bromine, 0-5/200 (20 PPM Standard)                    |
| 00-1002  | Chlorine, 0-1/5 PPM (2 PPM Standard)                  |
| 00-1003  | Chlorine, 0-5/200 (20 PPM Standard)                   |
| 00-1004  | Chlorine Dioxide, 0-1/5 PPM (2 PPM Standard)          |
| 00-1005  | Chlorine Dioxide, 0-5/200 (20 PPM Standard)           |
| 00-1006  | Fluorine, 0-1/5 PPM (2 PPM Standard)                  |
| 00-1007  | Fluorine, 0-5/200 (20 PPM Standard)                   |
| 00-1008  | Ozone, 0-1/5 PPM (2 PPM Standard)                     |
| 00-1009  | Ozone, 0-5/200 PPM (20 PPM Standard)                  |
| 00-1010  | Ammonia, 0-50/500 PPM (200 PPM Standard)              |
| 00-1011  | Ammonia, 0-500/2000 PPM (1000 PPM Standard)           |
| 00-1012  | Carbon Monoxide, 0-50/1000 PPM (200 PPM Standard)     |
| 00-1013  | Hydrogen, 0-1/10% (4% Standard)                       |
| 00-1014  | Oxygen, 0-5/25% (25% Standard)                        |
| 00-1015  | Phosgene, 0-1/5 PPM (2 PPM Standard)                  |
| 00-1016  | Phosgene, 0-5/100 PPM (100 PPM Standard)              |
| 00-1017  | Hydrogen Chloride, 0-10/200 PPM (20 PPM Standard)     |
| 00-1018  | Hydrogen Cyanide, 0-10/200 PPM (20 PPM Standard)      |
| 00-1019  | Hydrogen Fluoride, 0-10/200 PPM (20 PPM Standard)     |
| 00-1020  | Hydrogen Sulfide, 0-10/200 PPM (50 PPM Standard)      |
| 00-1021  | Nitric Oxide, 0-50/500 PPM (200 PPM Standard)         |
| 00-1022  | Nitrogen Dioxide, 0-10/200 PPM (20 PPM Standard)      |
| 00-1023  | Sulfur Dioxide, 0-10/500 PPM (20 PPM Standard)        |
| 00-1024  | Arsine, 0-500/2000 PPB (1000 PPB Standard)            |
| 00-1025  | Arsine, 0-10/200 PPM (10 PPM Standard)                |
| 00-1026  | Diborane, 0-500/2000 PPB (1000 PPB Standard)          |
| 00-1027  | Diborane, 0-10/200 PPM (10 PPM Standard)              |
| 00-1028  | Germane, 0-500/2000 PPB (1000 PPB Standard)           |
| 00-1029  | Germane, 0-10/200 PPM (10 PPM Standard)               |
| 00-1030  | Hydrogen Selenide, 0-500/2000 PPB (1000 PPB Standard) |
| 00-1031  | Hydrogen Selenide, 0-10/200 PPM (10 PPM Standard)     |
| 00-1032  | Phosphine, 0-500/2000 PPB (1000 PPB Standard)         |
| 00-1033  | Phosphine, 0-10/200 PPM (10 PPM Standard)             |
| 00-1034  | Phosphine, 0-200/2000 PPM (1000 PPM Standard)         |
| 00-1035  | Silane, 0-10/200 PPM (10 PPM Standard)                |
| 00-1036  | Iodine, 0-1/5 PPM (2 PPM Standard)                    |
| 00-1037  | Iodine, 0-5/200 PPM (20 PPM Standard)                 |
| 00-1038  | Acid Gases, 0-10/200 PPM (20 PPM Standard)            |
| 00-1039  | Ethylene Oxide, 0-20/200 PPM (20 PPM Standard)        |
| 00-1040  | Formaldehyde, 0-20/200 PPM (20 PPM Standard)          |
| 00-1041  | Hydrogen, 0-500/2000 PPM (2000 PPM Standard)          |
| 00-1042  | Hydrogen Peroxide, 0-10/100 PPM (20 PPM Standard)     |
| 00-1043  | Alcohol, 0-50/500 PPM (200 PPM Standard)              |
| 00-1044  | Alcohol, 0-500/2000 PPM (2000 PPM Standard)           |
| 00-1057  | Acetylene, 0-500/2000 PPM (0-500 PPM Standard)        |

Represented By:

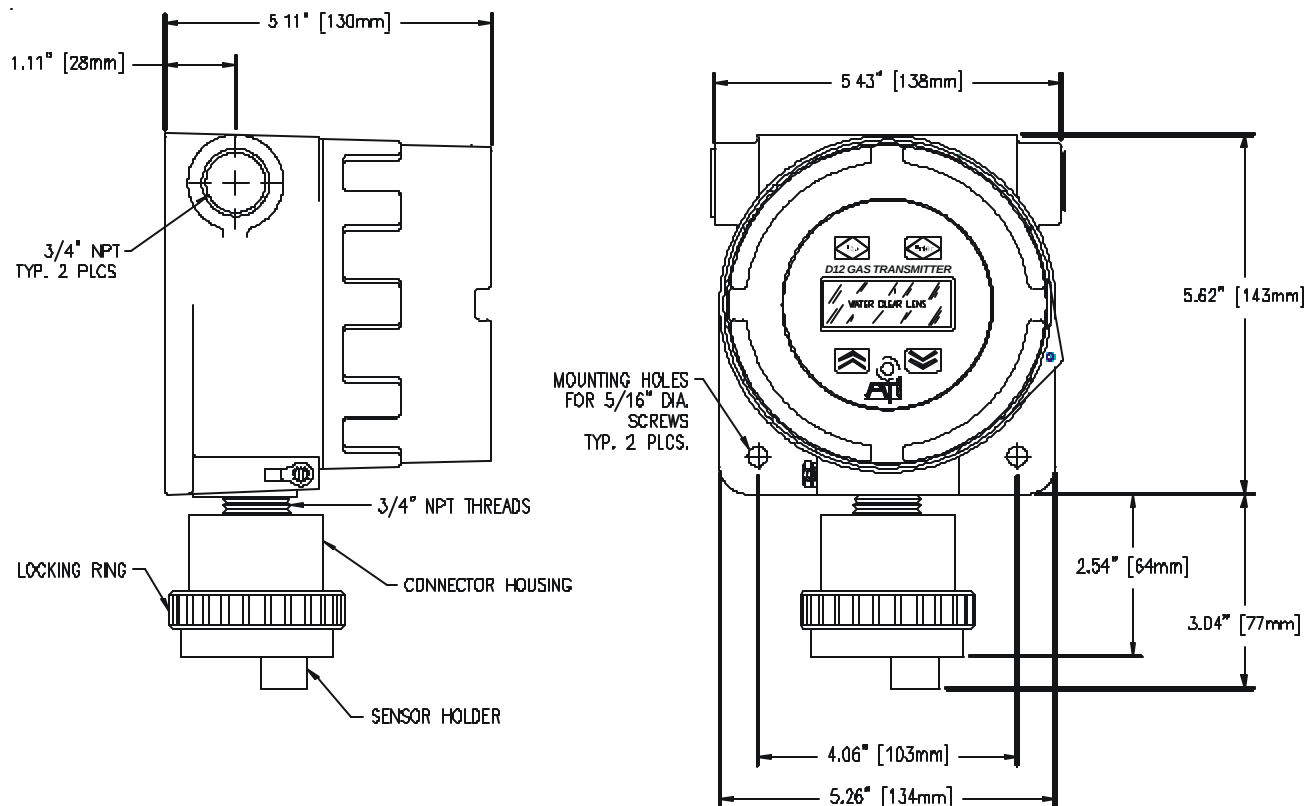


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### ENCLOSURE DIMENSIONS

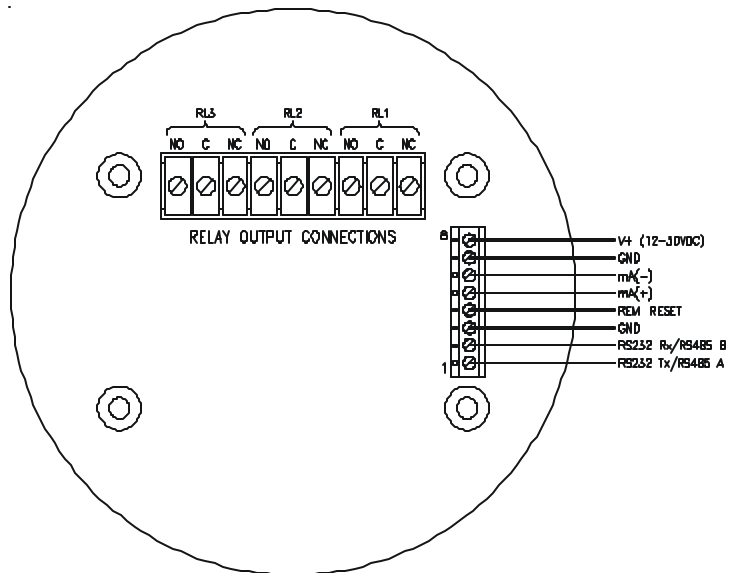


#### NOTES:

- 1) **Enclosure Matl:** Sand Cast copper-free aluminum  
O-Brien yellow in color.  
**Cover:** Sand Cast copper-free aluminum O-Brien yellow in color,  
with 3-5/16" dia. tempered glass window.
- 2) **Certifications:**  
FM standard 3615  
CSA standard C22.2 No.30  
UL Standard 1203  
KEMA CENELAC standard EN50014, 50018
- 3) **Ratings:**  
UL Class I, Groups B,C,D  
Class II, Groups E,F,G  
CENELAC: EExd IIC, IP66  
Nema 4X, 78CD, 9EFG

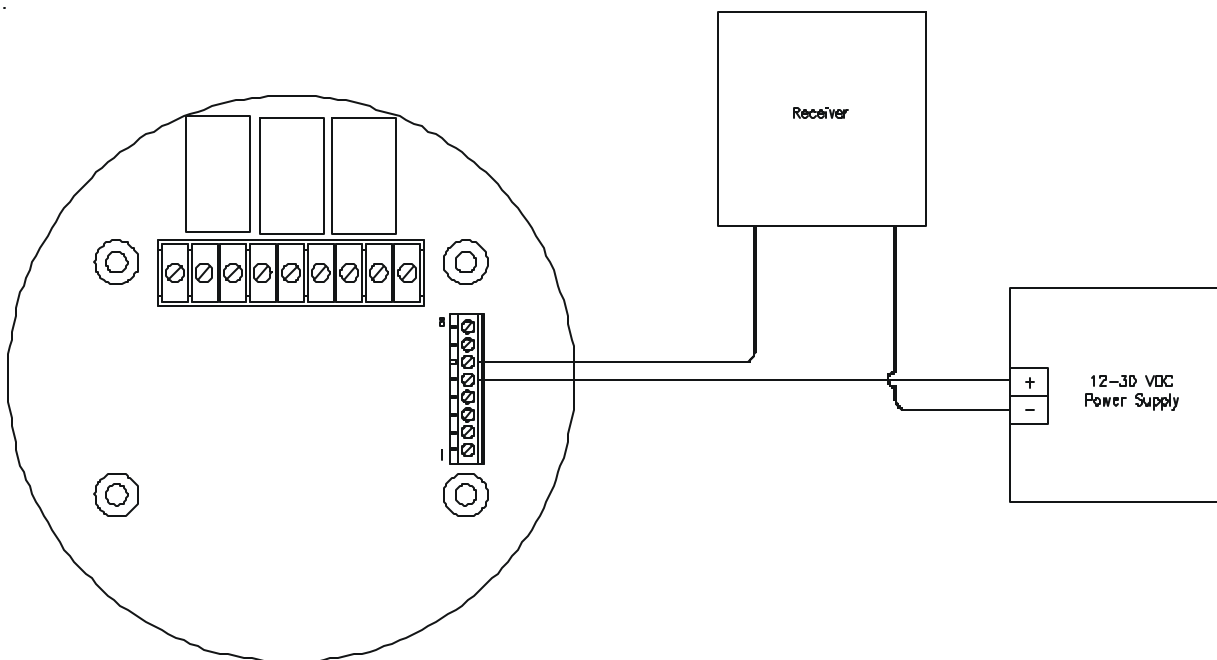
ATI-0532

**POWER SUPPLY PCB GENERAL LAYOUT**



ATI-0526

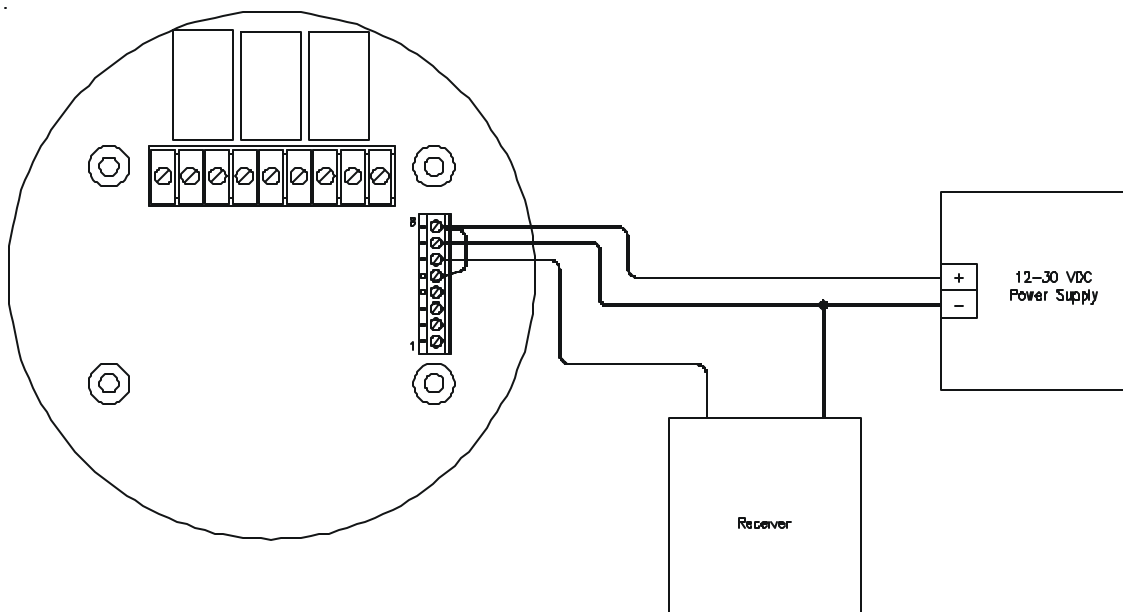
**2-WIRE LOOP POWER WIRING**



ATI-0527

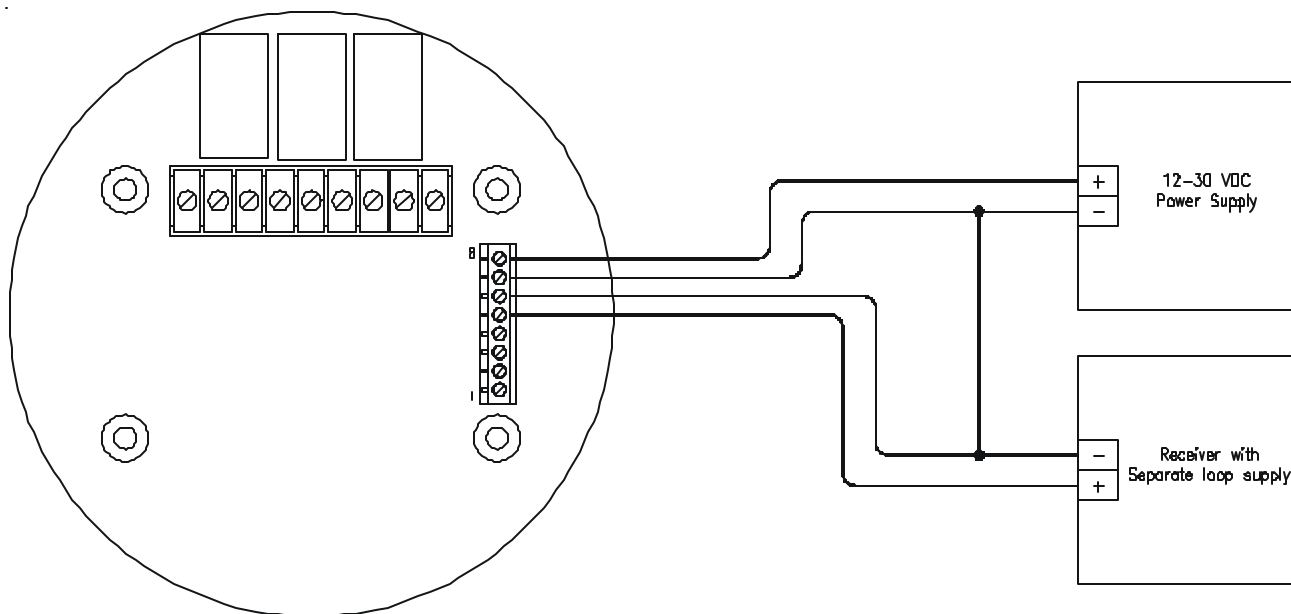


**3-WIRE WIRING DIAGRAM**



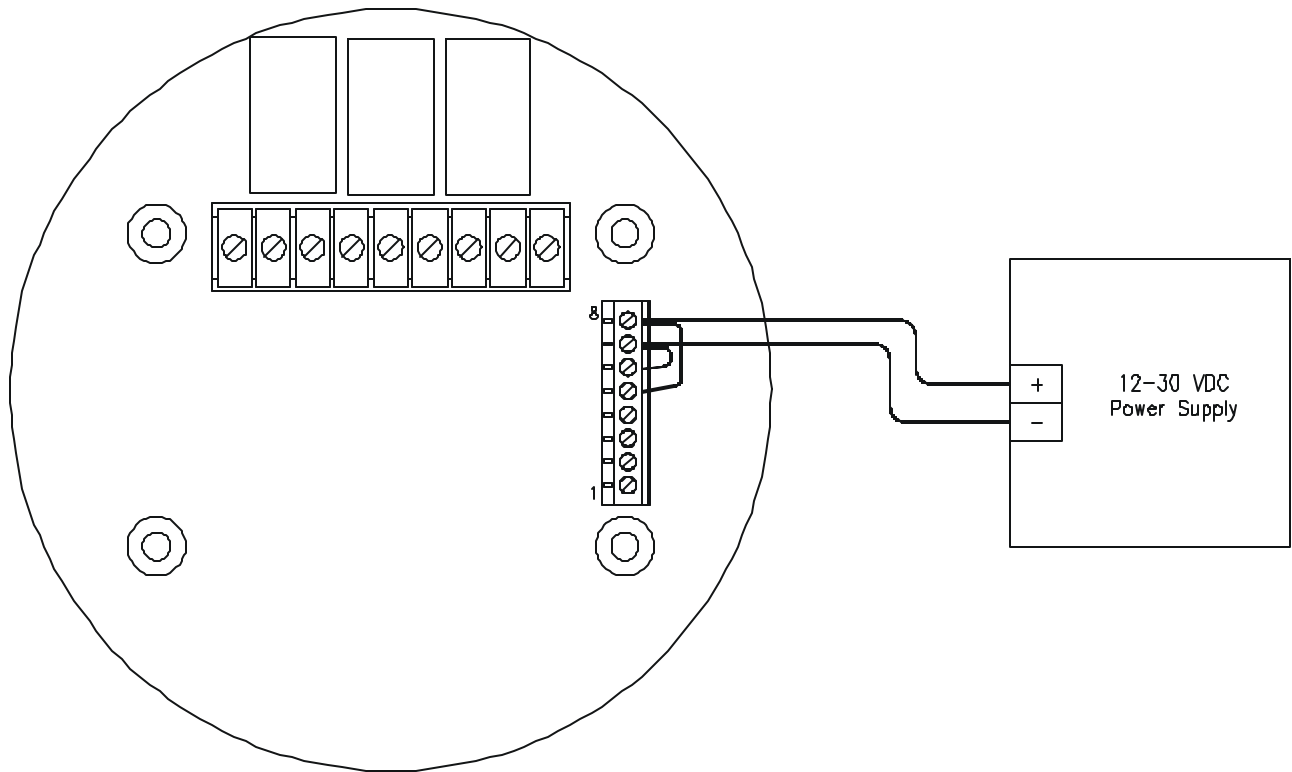
ATI-0528

**SEPARATE POWER & ANALOG LOOP SUPPLIES**



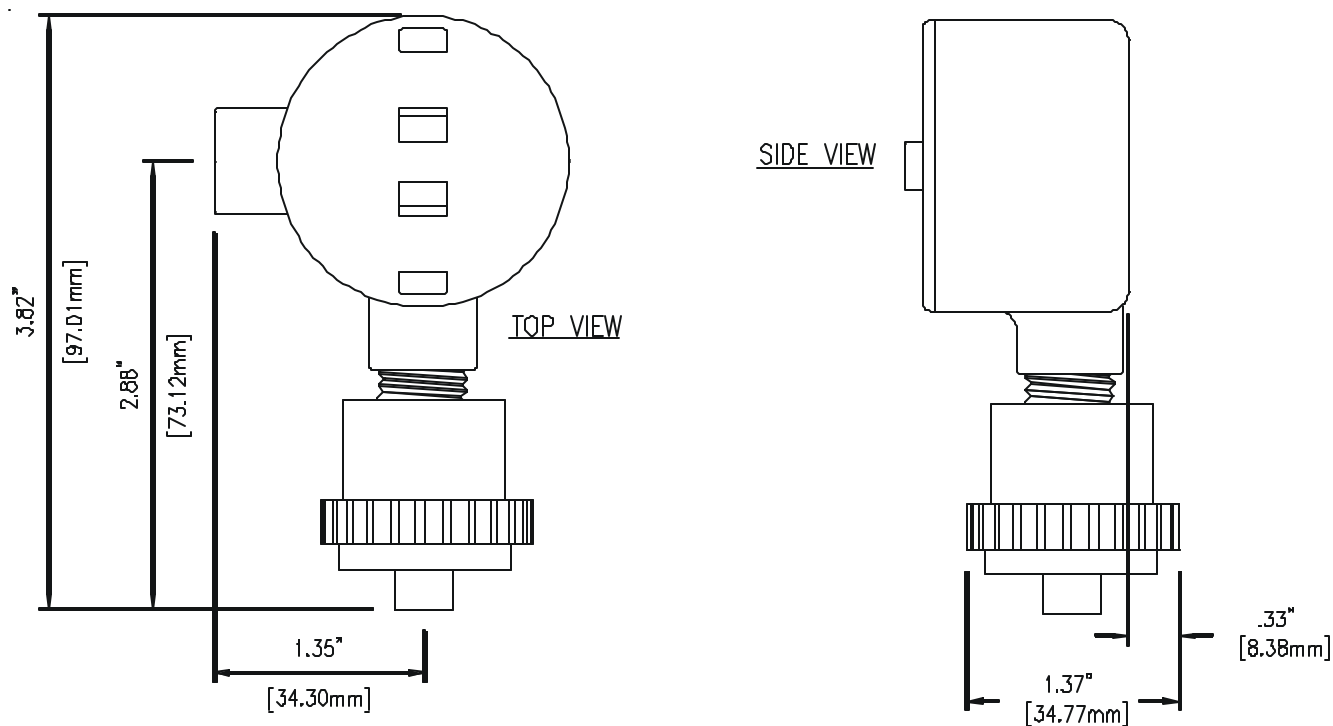
ATI-0529

**POWER OPERATION w/o ANALOG OUTPUT**



ATI-0530

**REMOTE SENSOR DIMENSIONAL DRAWING**



**ENCLOSURE RATINGS:**

CLASS I, GROUPS B,C,D  
 CLASS II, GROUPS E,F,G  
 CLASS III

Assembly is normally mounted directly to suitable explosion-proof conduit. To maintain the explosion-proof integrity of the transmitter, a suitable cable entry seal must be used in accordance with the applicable electrical code.

**REMOTE SENSOR WIRING DIAGRAMS**

