GasSens

Modular Gas Detector

D12 Toxic and Combustible Gas Detector

OVERVIEW

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 and self–testing sensor capability adds to the reliability of any system.

D12 DETECTOR CONFIGURATIONS

Loop Powered Transmitter

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

Loop Powered with HART

For 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 three 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 RS485 communication is desirable, D12 transmitters with alarm relays can be supplied with a Modbus interface. Software supports up to 247 unique addresses for large system use.

FEATURES

D12 transmitters provide useful features that simplify installation, operation and maintenance.

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 can 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. A remote reset feature is provided 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 Comm Interface	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 in. diskette.

Badger Meter

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Product Data Sheet

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 accepts 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 our 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.



Figure 1: Self–aligning sensor/generator holder



Figure 2: Plug–in sensor



Figure 3: Auto–Test generator

Sensor Response Verification

For many toxic and combustible gases, we offer 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 secure 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.

AVAILABLE GAS LIST

Symbol	Gas	Min. Range	Max. Range
C_2H_2	Acetylene*	0–50 ppm	0–500 ppm
HX	Acid Gases*	0–10 ppm	0–200 ppm
C_2H_6O	Alcohol	0–50 ppm	0–2000 ppm
NH_3	Ammonia*	0–50 ppm	0–2000 ppm
AsH_3	Arsine	0–500 ppb	0–200 ppm
Br_2	Bromine*	0–1 ppm	0–200 ppm
CO	Carbon Monoxide*	0–50 ppm	0–1000 ppm
Cl_2	Chlorine*	0–1 ppm	0–200 ppm
ClO_2	Chlorine Dioxide*	0–1 ppm	0–200 ppm
CH_4	Combustible Gas*	0–50% LEL	0–100% LEL
B_2H_6	Diborane	0–500 ppb	0–200 ppm
C_2H_4O	Ethylene Oxide*	0–20 ppm	0–200 ppm
F_2	Fluorine*	0–1 ppm	0–200 ppm
HCHO	Formaldehyde*	0–20 ppm	0–200 ppm
GeH_4	Germane	0–500 ppb	0–200 ppm
H_2	Hydrogen	0–500 ppm	0–10%

Symbol	Gas	Min. Range	Max. Range
HCl	Hydrogen Chloride*	0–10 ppm	0–200 ppm
HCN	Hydrogen Cyanide*	0–10 ppm	0–200 ppm
HF	Hydrogen Fluoride*	0–10 ppm	0–200 ppm
H_2O_2	Hydrogen Peroxide*	0–10 ppm	0–1000 ppm
H_2Se	Hydrogen Selenide	0–500 ppb	0–200 ppm
H_2S	Hydrogen Sulfide*	0–10 ppm	0–200 ppm
I_2	Iodine*	0–1 ppm	0–200 ppm
NO	Nitric Oxide	0–50 ppm	0–200 ppm
NO_2	Nitrogen Dioxide*	0–10 ppm	0–200 ppm
O_2	Oxygen	0–5%	0–25%
O_3	Ozone*	0–1 ppm	0–200 ppm
$COCl_2$	Phosgene	0–1 ppm	0–100 ppm
PH_3	Phosphine	0–500 ppb	0–200 ppm
SiH_4	Silane	0–10 ppm	0–200 ppm
SO_2	Sulfur Dioxide*	0–10 ppm	0–200 ppm

* Auto–Test gas generator available

SPECIFICATIONS

Gas Type	Customer–selected from available sensor list
Sensor Type	Electrochemical for toxic gases and oxygen Catalytic bead for combustible gas
Range	User adjustable within limits of selected sensor
Response Time	Sensor dependent
Accuracy	Generally ±10% of value (limited by available calibration gas)
Repeatability	±1% (Electronic)
Linearity	±0.5% (Electronic)
Zero Drift	Less than 2% full scale per month, non-cumulative
Span Drift	Dependent on environment but generally less than 3% per month
Alarms	Three concentration alarms (Caution, Warning, Alarm) programmable for setpoint, hysteresis, alarm delay, and manual or automatic reset. One fault alarm with programmable output and relay response.

Analog Output	Loop-powered 4-20 mA, 675 Ohms max. at 24V DC
Weight	4 lb (1.8 kg)
Power	12–30V DC, 25 mA max. in loop–powered mode 12–30V DC, 200 mA max. in 3-wire mode
Alarm Relays	Three SPDT, 5 A @ 230V AC resistive
Relay Coil	Programmable either normally energized or normally de–energized
Enclosure	Powder coated copper–free aluminum, SS hardware, NEMA 4X/IP66
Sensor Auto–Test	Optional gas generator dependent on sensor
Controls	4 magnetic switches on front of transmitter
Operating Temp	–30 to 60 °C for toxics (–10 °C minimum for O_2 sensor) –40 to 70 °C for combustibles
Serial Interface	HART (1200 baud modem interface) Modbus (1200–9600 – RS232 or RS485 software selectable)

ORDERING 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 varies 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	Flow cell assembly
00-0981	Sensing module keeper for four (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 Number	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)

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