

Self Checking Gas Sensors

GasSens is a flexible component system providing a variety of options to meet individual gas detection and alarm requirements. From chemical and petrochemical plants to food processors, the GasSens system can be applied to the simplest or most complex gas detection application. Economical and low maintenance, this system is your best choice for reliable leak detection.

GasSens detection systems consist of individual modules that can be located where required. Sensor/transmitters, located in the area where gas leakage or buildup might occur, provide the basic measurement for the system. Sensor transmitters are available in either NEMA 4X or explosion-proof versions and can be supplied with ATI's exclusive Auto-Test automatic sensor testing system, greatly reducing operator testing requirements.

Receiver modules provide the electronic brains for the detection and alarm system. Each compact module includes a digital display of gas concentration, isolated analog output, and 4 relay outputs. Receivers may be located up to 1000 feet from sensor/transmitters for remote indication, or can provide local control functions such as valve shutoff while transmitting a 4-20 mA signal to remote displays or data loggers.

Universal power supply modules provide DC power to receivers. The power supply is housed in a compact module similar to the receiver, and will accept inputs from 85 to 265 volts, AC or DC, without adjustment. The power supply also provides a power failure relay and charging for an optional battery back-up unit.

Applications include: Chemical plants; pulp & paper mills; semiconductor fabrication; food processing; water treatment; mineral processing; wastewater treatment; parking facilities; gas processing; and petroleum refining.



Gas & Range Availability

Gas	Minimum Range	Maximum Range
Acid Gases	0-10 PPM	0-100%
Alcohol	0-500 PPM	0-2000 PPM
Ammonia	0-50 PPM	0-500 PPM
Arsine	0-1000 PPB	0-10 PPM
Bromine	0-1 PPM	0-100 PPM
Carbon Monoxide	0-50 PPM	0-500 PPM
Chlorine	0-1 PPM	0-100 PPM
Chlorine Dioxide	0-1 PPM	0-100 PPM
Combustible Gas	0-50% LEL	0-100% LEL
Diborane	0-1000 PPB	0-10 PPM
Ethylene Oxide	0-20 PPM	0-200 PPM
Fluorine	0-1 PPM	0-100 PPM
Formaldehyde	0-20 PPM	0-200 PPM
Germane	0-1000 PPB	0-10 PPM
Hydrogen	0-2000 PPM	0-10%
Hydrogen Chloride	0-10 PPM	0-100 PPM
Hydrogen Cyanide	0-10 PPM	0-100 PPM
Hydrogen Fluoride	0-10 PPM	0-100 PPM
Hydrogen Sulfide	0-10 PPM	0-100 PPM
Hydrogen Peroxide	0-10 PPM	0-100 PPM
Hydrogen Selenide	0-1000 PPB	0-10 PPM
Iodine	0-1 PPM	0-100 PPM
Nitric Oxide	0-20 PPM	0-250 PPM
Nitrogen Dioxide	0-10 PPM	0-100 PPM
Oxygen	0-5%	0-35%
Ozone	0-1 PPM	0-100 PPM
Phosgene	0-2 PPM	0-100 PPM
Phosphine	0-1000 PPB	0-10 PPM
Silane	0-10 PPM	0-50 PPM
Sulfur Dioxide	0-10 PPM	0-100 PPM

Receiver Module

Receiver modules provide an interface between the detection system and external alarming and data logging requirements. One module is used with each sensor/transmitter and includes a variety of features:

- **LED Display:** Indicates gas concentration directly in PPM, PPB, or %. The display may be operated in high intensity (sunlight readable) mode for outdoor use or in normal mode for indoor applications.
- **Analog Output:** An isolated 4-20 mA output is standard. The output will drive loads up to 1000 ohms for use in recording, data logging, or computer input.
- **Two Alarm Setpoints:** Alarm setpoints are factory adjusted to standard values but may be set to any value from 5% to 100% of range. Front panel LED's marked "Warning" and "Alarm" indicate the status of each alarm setpoint. A standard alarm delay of 2 seconds or a longer delay of 10 seconds may be selected. In addition, alarms may be switch programmed to activate either above or below the setpoint.
- **Three Alarm Relays:** Output relays are SPDT with unpowered contacts for use in activating external signaling devices, control elements, or for input to telemetry or annunciator systems. Each relay may be assigned to either alarm setpoint for application flexibility. Relays are factory set to energize on alarm, but may be switch programmed for fail safe operation. Relays may also be set for either

latching or non-latching operation.

- **Trouble Alarm & Relay:** Should the sensor/transmitter input be lost, a trouble light (LED) on the front panel will flash and an associated relay will activate. For those systems equipped with the sensor Auto-Test feature, this alarm will also activate if the sensor does not respond to the automated gas test.
- **Front Panel Reset Switch:** A single front panel switch marked A/R (Acknowledge/Reset) serves a number of functions. When an alarm occurs, the switch will silence an audible horn wired to the module and will change the alarm lights from flash to steady on. After the alarm condition has cleared, the switch may be used to reset any latching alarms. The switch will also activate an electronic module test, inhibit alarm contacts, and activate the Auto-Test.
- **Remote Reset Input:** Terminals are provided for connection of a remote reset switch so that alarms can be acknowledged from a remote location or through a telemetry system.
- **Pluggable Terminal Blocks:** External electrical connections are made to plug-in terminal blocks. Should module service ever be needed, modules can be replaced in minutes.



Receiver module



Power supply & receiver



DIN rail mounting



Standard sensor/transmitter



Explosion-proof sensor/transmitter



Transmitter with auto-test



Electrochemical sensor

Sensor/Transmitter

GasSens gas detection systems employ electrochemical sensors developed and manufactured by ATI. Expertise in electrochemistry and sensor design provides the foundation for leak detection systems that perform continuously with minimal maintenance. Sensors are rated for ambient temperatures from -25° to $+50^{\circ}\text{C}$, allowing both indoor and outdoor applications. Excellent zero stability and high sensitivity and selectivity combine to make ATI sensors the best available on the market today.

Gas sensors are closely coupled to a digital transmitter for excellent noise immunity and the ability to transmit long distances using unshielded cable. The transmitter is powered from the

receiver module and uses a unique current pulse position technique to send information to the receiver over a two wire connection. The receiver connection is not polarity sensitive, virtually eliminating the possibility of incorrect transmitter wiring. Sensor/transmitters can be located up to 1000 feet from receiver modules.

Sensor/transmitters are housed in shielded NEMA 4X enclosures for use in almost any industrial environment and are designed to meet intrinsic safety standards. An explosion-proof version of the transmitter is also available for applications where this type of protection is preferred. Combustible gas transmitters are always explosion-proof.

Sensor Auto-Test

A major expense in gas detection systems is the cost of regular testing to ensure that sensors are responding. This requires a technician to inspect sensors weekly and apply a small amount of gas manually to check response. ATI has developed a unique system to reduce this maintenance requirement.

Available on most ATI digital sensor/transmitters is an option called "Auto-Test." This option consists of an electrochemical gas generator closely coupled to the sensor. Every 24 hours, the receiver automatically activates the generator, producing a small amount of gas that diffuses into the sensor, just as it would if a gas leak occurred. The microcomputer in the receiver analyzes the output of the

transmitter to determine that the sensor is responding normally. When proper sensor response is detected, the generator is turned off and the system goes back to normal operation. If no sensor response is detected, the TROUBLE light on the receiver will flash and the trouble relay will activate. During testing, alarm relays are inhibited so that external alarms are not activated.

The Auto-Test feature ensures that each sensor is regularly tested with gas. Premature sensor failure or blockage of the sensor membrane is quickly detected. In addition, self-testing will alert maintenance personnel when a sensor has reached the end of its useful life. Since sensors normally last anywhere from 12 months to over 3 years, this feature allows users to determine when sensor replacement is needed.

Power Supply Module

To meet the needs of users throughout the world, ATI has developed a compact universal power supply in a DIN rail module similar to the receiver. The power supply will accept any AC or DC input from 85 to 265 volts, without adjustment. No jumper changes or selection switches are required, and large variations in input voltage do not affect power supply operation. This power supply is suitable for operation of one or two receiver modules.

The power supply provides three 12 VDC output connections, two of

which are designated for receiver module connection. A third connection is provided to automatically charge the optional external battery back-up system. The power supply module is protected by a fuse conveniently located in a removable holder accessible from outside the module. For external power failure indication, the power supply contains a SPDT relay. The relay is normally energized, and de-energizes on power failure.



Battery Back-Up

Battery back-up systems are used in gas detection applications to ensure that detectors remain operable, even when AC power fails. ATI offers a separate battery back-up unit that maintains power to detection equipment in the event of a power interruption. The battery back-up system consists of a rechargeable sealed lead acid battery housed in a NEMA 4X enclosure. An electronic circuit attached to the battery controls the charging rate and will disconnect the battery from the system if the battery voltage drops to a level

where battery damage might occur. Charging is provided by the power supply module.

Battery back-up units will operate a single point detector for a minimum of 12 hours and an average of 24 hours. Two point systems will be maintained for 6 hours minimum and an average of 12 hours. The actual battery back-up time depends on whether the LED display is operated in high intensity mode and whether relays are in fail-safe mode (normally energized).



Horn/Strobe Options

A weatherproof piezoelectric audible horn is available for all gas detectors. The horn operates from 12 VDC supplied by the power supply module and can be activated from single or multiple receiver modules. The horn mounts easily in one of the enclosure knock-outs, and produces an 85 dB signal for

local alarming.

A 12 VDC strobe is available for enhanced visual alarm indication. The strobe uses a xenon lamp with a bright 1/2-million CP flash firing 70 times/minute. Strobe housing is weatherproof lexan with red lens, and mounts to 1/2" conduit.



Receiver & Power Supply Enclosures



A variety of NEMA 4X enclosures are available to house receiver and power supply modules. ATI offers standard enclosures to house up to 6 modules, and can supply large enclosures for systems requiring more points of detection. System integrators can use standard 35 mm DIN rail mounting modules in their own enclosure.

Single Module Enclosure: Houses a single receiver module for use in DC powered applications where the user supplies the DC power to the system.

Two Module Enclosure: Houses two receivers or one receiver and one power supply. Normally used for single point AC powered detectors.

Three Module Enclosure:

Accommodates two receivers and power supply or three receivers. Used mainly for two point detection systems.



Six Module Enclosure: Suitable for two power supplies and four receivers or six receivers. This enclosure is used primarily for four point gas detection systems.



Special Enclosure: Custom enclosures are available to handle systems of any size. Your ATI representative can assist with system designs for larger applications.





Receiver Module

Construction Display:	4 digit LED, sunlight readable
Input:	Digital signal, 2 wire connection to remote sensor/transmitter
Output:	Isolated 4-20 mA DC, 1000 ohms maximum load
Alarms:	Two adjustable concentration alarms, set points adjustable from 5-100% of range
Alarm Indicators:	High intensity LED bars for WARNING (low set-point) and ALARM (high setpoint)
Indicator Function:	WARNING indicator non-latching, ALARM latching
Alarm Relays:	Three assignable alarm relays, 10 A, 120 VAC (5 A, 250 VAC) resistive Alarm relays assignable to either alarm set point
Relay Function:	Configurable for normal/fail-safe, latching/non-latching, and fast/slow operation
Relay & Indicator Reset:	Activated from front panel switch or through remote reset
Trouble Alarm:	Front panel LED indicator and SPDT, 10 A, 120 VAC (5A, 250 VAC) resistive relay; Relay factory set to fail-safe operation
Trouble Function:	Indicates loss of sensor/transmitter input or failure of sensor Auto-Test (if in use)
Gas Indicator:	LED bar on front panel with gas symbol overlay
Mounting:	Module mounts to 35 x 7.5 mm DIN rail
Electrical Connection:	Quick disconnect plug-in terminal blocks
Module Enclosure:	Noryl
Size:	2.8"W x 3.6"L x 2.3"D (70 mm x 90 mm x 58 mm)
Operating Temperature:	-40° to +55°C
Humidity:	0-99% non-condensing
Power:	9-15 VDC, 300 mA maximum

Module Enclosures

Single Module Enclosure:	NEMA 4X polystyrene, 4.33"W x 7.09"H x 4.33"D (110 x 180 x 110 mm)
Two Module Enclosure:	NEMA 4X polystyrene, 7.17"W x 7.09"H x 4.33"D (182 x 180 x 110 mm)
Three Module Enclosure:	NEMA 4X polystyrene, 10.0"W x 7.09"H x 4.33"D (254 x 180 x 110 mm)
Six Module Enclosure:	NEMA 4X polystyrene, 10.0"W x 14.21"H x 4.33"D (254 x 361 x 110 mm)



Sensor/Transmitter

Measurement:	Gas type and range customer specified	Electrical Connection:	Quick disconnect terminal blocks (two wires without polarity)
Transmitter Type:	Two wire system, current pulse position signal	Connection Distance:	Up to 1000 feet (300 m) to receiver
Sensor:	Electrochemical gas diffusion type (manufactured by ATI)	Operating Temperature:	-25° to +55°C (-5° for oxygen)
Accuracy:	Generally ±5% of value, but limited by available calibration of gas accuracy.	Humidity:	0-95% non-condensing
Zero Drift:	Sensor dependent but normally less than 2% per month, non-cumulative	Option:	Sensor Auto-Test (available for most gases)
Enclosure:	NEMA 4X polystyrene	Size (Sensor Transmitter with Auto-Test):	3.7"L x 6.5"W x 2.2"D (94 mm x 163 mm x 57 mm)
Optional Enclosure:	Explosion-proof cast aluminum, Class I, Division I, Group B, C, & D	Power:	12 VDC from receiver module

Power Supply Module

Input Voltage:	85-265 VAC, 50/60 Hz, or 85-265 VDC, self regulating
Output Voltage:	Regulated 13.7 VDC, 1A
Output Connection:	3 separate connections, two for receiver modules, and one for external battery back-up
Alarm:	Loss of input power alarm relay, SPDT 10 A, 120 VAC (5A, 250 VAC) resistive
Operating Temperature:	-40° to +55°C
Humidity:	0-99% non-condensing
Module Enclosure:	Noryl
Size:	2.8"W x 3.6"L x 2.3"D (70 mm x 90 mm x 58 mm)
Electrical Connection:	Quick disconnect terminal blocks
Mounting:	Module mounts to 35 x 7.5 mm DIN rail

Battery Back-Up

Battery:	12 VDC, 4 Ampere hour
Charge Control:	Current limited to .75 A max.
Low Voltage Cutoff:	Relay disconnect at 10 VDC
Fault Protection:	Relay disconnect on shorted charger wiring
Enclosure:	NEMA 4X polystyrene
Size:	4.33"W x 7.09"L x 3.54"D (110 mm x 180 mm x 90 mm)

Ordering Information

Specify modules using the coding system below. Generate a part number for the receiver and sensor/transmitter. Then select power supply and enclosure options as required.

C
D
E
F

Model A14/A11-CC-DDDD-E-F Alarm Module: - - - Receiver Module + Sensor/Transmitter

Suffix CC - Gas Type - Standard range shown in parentheses

10 - Bromine (0-2 PPM)*	20 - Phosgene (0-2 PPM)	30 - Germane (0-1000 PPB)
11 - Chlorine (0-10 PPM)*	21 - Hydrogen Chloride (0-20 PPM)*	31 - Hydrogen Selenide (0-1000 PPB)
12 - Chlorine Dioxide (0-2 PPM)*	22 - Hydrogen Cyanide (0-20 PPM)*	32 - Phosphine (0-1000 PPB)
13 - Fluorine (0-2 PPM)*	23 - Hydrogen Fluoride (0-20 PPM)*	33 - Silane (0-10 PPM)
14 - Ozone (0-2 PPM)*	24 - Hydrogen Sulfide (0-50 PPM)*	34 - Hydrogen Peroxide (0-10 PPM)
15 - Ammonia (0-100 PPM)*	25 - Nitric Oxide (0-100 PPM)	35 - Iodine (0-2 PPM)*
16 - Carbon Monoxide (0-100 PPM)*	26 - Nitrogen Dioxide (0-20 PPM)*	36 - Acid Gases (0-10 PPM)*
17 - Combustible Gas (0-100% LEL)	27 - Sulfur Dioxide (0-20 PPM)*	37 - ETO (0-20 PPM)*
18 - Hydrogen (0-4%)	28 - Arsine (0-1000 PPB)	38 - Formaldehyde (0-20 PPM)*
19 - Oxygen (0-25%)	29 - Diborane (0-1000 PPB)	39 - Alcohol: Consult Factory

*Indicates Auto-Test option available for standard range or below.

Suffix DDDD - Range

Code the measurement range using a four digit number. The standard ranges are shown under Suffix C above. For 0-10 PPM chlorine, the code would be 0010. For 0-200 PPM ammonia, the code would be 0200.

Suffix E - Units of Measurement

- 1 - PPM
- 2 - PPB
- 3 - %
- 4 - % LEL

Suffix F - Auto-Test System

- 1 - Without sensor Auto-Test function
- 2 - With sensor self-test

Options and System Enclosures

80-0005	Single Module Enclosure	35-0002	Strobe with red lens, 12 VDC
80-0006	Two Module Enclosure	35-0005	Strobe with red lens, 120 VAC
80-0007	Three Module Enclosure		
80-0033	Large Three Module Enclosure	00-0118	Calibration adapter for A10 sensor
80-0008	Six Module Enclosure	00-0258	Calibration adapter for C10 explosion-proof sensors (combustibles)
80-0027	Large Six Module Enclosure	00-0261	Remote calibration adapter for combustible sensor
80-0024	Nine Module Enclosure	45-0046	Rain Shield for C10 explosion-proof sensors (combustibles)
80-0026	Twelve Module Enclosure	00-0253	Flowcell assembly for A10 sensor
00-0055	Power Supply Module	00-0298	Flowcell assembly for C10 explosion-proof sensors
28-0004	65 Watt Power Supply (for up to 12 Receivers)		
00-0057	Battery Backup Unit		
00-0058	Audible Horn		
35-0008	Horn, Industrial External 120 VAC		



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