SENSIDYNE®
Industrial Health & Safety Instrumentation

Listed Gas Detection for Sewage Collection and Treatment Facilities

In Compliance with NFPA 820

WWTP is Big Business

SENSIDYNE®
Industrial Health & Safety Instrumentation

- 16,000 Municipal Waste Treatment Systems In US
- With Exceptional Regulatory, Environmental And Safety Requirements to Preserve Quality of Life
- Process Hazards Such as O_2 Deficiency, Toxic Gasses And The Risk Of Fire or Explosion Are Monitored for Safety

Many Gas Hazards

SENSIDYNE®
Industrial Health & Safety Instrumentation

Gas	Formula	Density	TLV/LEL	Span	Type	Source - Use
Ammonia*	NH_3	0.6	25 ppm/15%	300 ppm	LI, EC, D	Storage
Carbon Dioxide	CO_2	1.5	0.5%, 3% IDLH	5% vol	Infrared	Sewage
Carbon Monoxide*	CO	1	50 ppm	100 ppm	EC, ND	Cogen, Various
Bleach (Use Cl_2)	$NaClO_2$	2.5	0.5 ppm	5 ppm	LI, EC	Disinfection
Chlorine*	Cl_2	2.5	0.5 ppm	5 ppm	LI, EC	Disinfection
Gasoline	HC Mix	2 to 4	1.2% vol	100% LEL	Infrared	Leaks
Hydrogen Chloride*	HCl	1.3	2.0 ppm	20 ppm	EC, ND	Cleaning
Hydrogen Sulfide*	H_2S	1.2	1.0 ppm	100 ppm	EC, ND	Sewage

*** More Ranges Available**

LI: Low Interference; EC: Electrochemical; D: Depleting with Gas Exposure; ND: Non-depleting with Exposure

TLVs from ACGIH or OSHA, IDLH from NIOSH, STEL from ACGIH, LELs from NFPA 325 and NFPA 820

More Gas Hazards

SENSIDYNE®
Industrial Health & Safety Instrumentation

Gas	Formula	Density	TLV/LEL	Span	Type	Source - Use
Methanol	CH_3OH	1.1	200 ppm/250 ppm STEL	500 ppm	EC, ND	Denitrification
Methanol	CH_3OH	1.1	6.0% vol	100% LEL	Infrared	Denitrification
Natural Gas	CH_4	0.63	3.8-6.5% vol	100% LEL	Infrared	Heating
Nitrogen	N_2	Monitor Oxygen		- -	- -	
Oxygen	O_2	~1.0	19.5%, 18.0% IDLH	25% vol	EC, D	
Sewer Gas	CO_2, CH_4	~1.0	5.3% vol	100% LEL	Infrared	Collection
Sludge Gas	CH_4, CO_2	~0.8	5.0% vol	100% LFL	Infrared	Digesters
Sulfur Dioxide*	SO_2	2.3	2.0 ppm	10 ppm	EC, ND	Dechlorination

* More Ranges Available

LI: Low Interference; EC: Electrochemical; D: Depleting with Gas Exposure; ND: Non-depleting with Exposure

TLVs from ACGIH or OSHA, IDLH from NIOSH, STEL from ACGIH, LELs from NFPA 325 and NFPA 820

A Word About Compliance

SENSIDYNE®
Industrial Health & Safety Instrumentation

- Compliance
  - The Act or Process of *Complying* With or *Following* a Demand, Code, Regulation, Standard or Law
- Municipalities, Cities and States Adopt Codes and Regulations Into Law as Well as Write Their Own Laws
  - All Entities Must Comply With Federal Laws
- Non-compliance, Resulting in Injury or Death Is Extremely **Costly** to The Owner (Taxpayers)

Major Laws Governing WWTP

SENSIDYNE
Industrial Health & Safety Instrumentation

- 40 CFR, The EPA
- Consensus Codes
  - Mechanical, Electrical, Plumbing, Building and Others
- OSHA, 29 CFR, Department of Labor, Part 1910
  - 1910 Subpart Z - Toxic and Hazardous Substances
  - 1910.1000 - Air Contaminants, Tables Z1, Z2, and Z3
- NFPA Standards 1, 37, 70, 82, 85, 497, 820 – Others

NFPA 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities

SENSIDYNE
Industrial Health & Safety Instrumentation

- Direct Citation from Chapter 7
- 7.4 Combustible Gas Detection
  - Located As Specified in Tables 4.2, 5.2, 6.2(a), 6.2(b)
  - Listed LEL, Toxic and Oxygen Detectors
  - 7.4.5.1 Low Alarms Set at 10% LEL
- Similar for Fire Detection and Ventilation

Discussion?

Common Applications

SENSIDYNE®
Industrial Health & Safety Instrumentation

- **Pumping Stations**
- Storm Water Wet Wells
- Primary Sedimentation
- Flow Equalization Tanks
- Bar Screen Area
- Oxygen Aeration Tanks
- Grit Removal
- Screening
- Co-Generation
- Clarifiers
- De Nitrification
- Headworks
- Odor Control Areas
- Methane Recovery
- Ammonia Stripping
- Sludge Treatment
- Digester Buildings
- Disinfection

Lift Station Gas Monitoring

SENSIDYNE®
Industrial Health & Safety Instrumentation

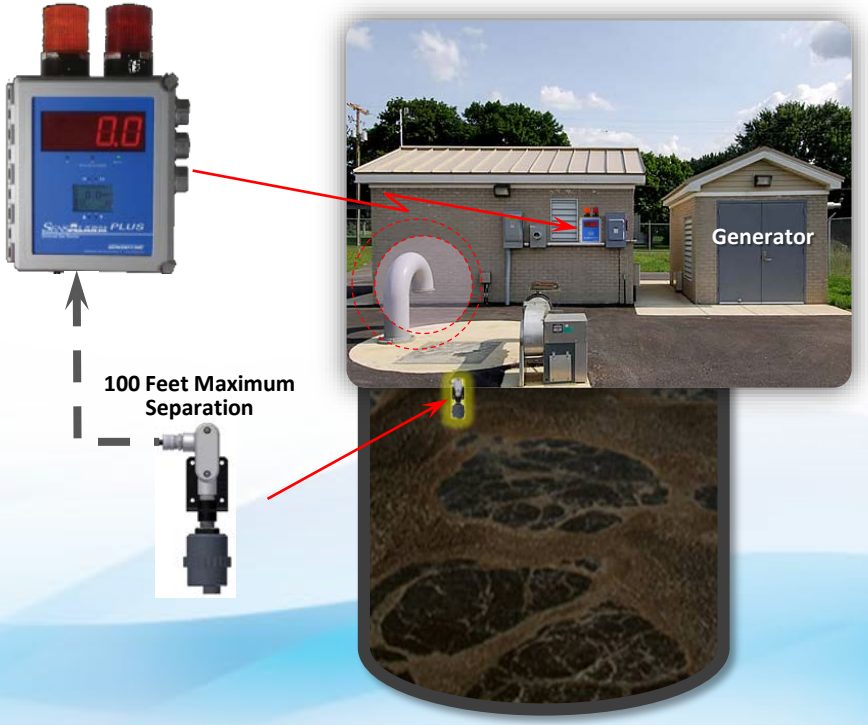
- Many Sizes, Shapes and Variables
  - Human Entry?
    - If No, LEL Only
    - If Yes, LEL, H2S and Oxygen
  - Storm, Sanitary or Combined?
  - Physical Size / Configuration
    - Wet Well, Vaults, Dry Well?
  - LEL Always Required
  - Continuous Ventilation?
  - Location and Surroundings
  - Potential Toxics or Asphyxiates
    - Larger Pumping Stations

Small Residential Lift Station

- No Provision for Entry
- Electrical Panels Outside
- Methane Is the Concern
  - Use I.S. Sensor
  - Transmitter In Panel
  - Remote Gassing Fixture
- No Active Ventilation
- Submersible Pumps
  - Pump Lift in Place

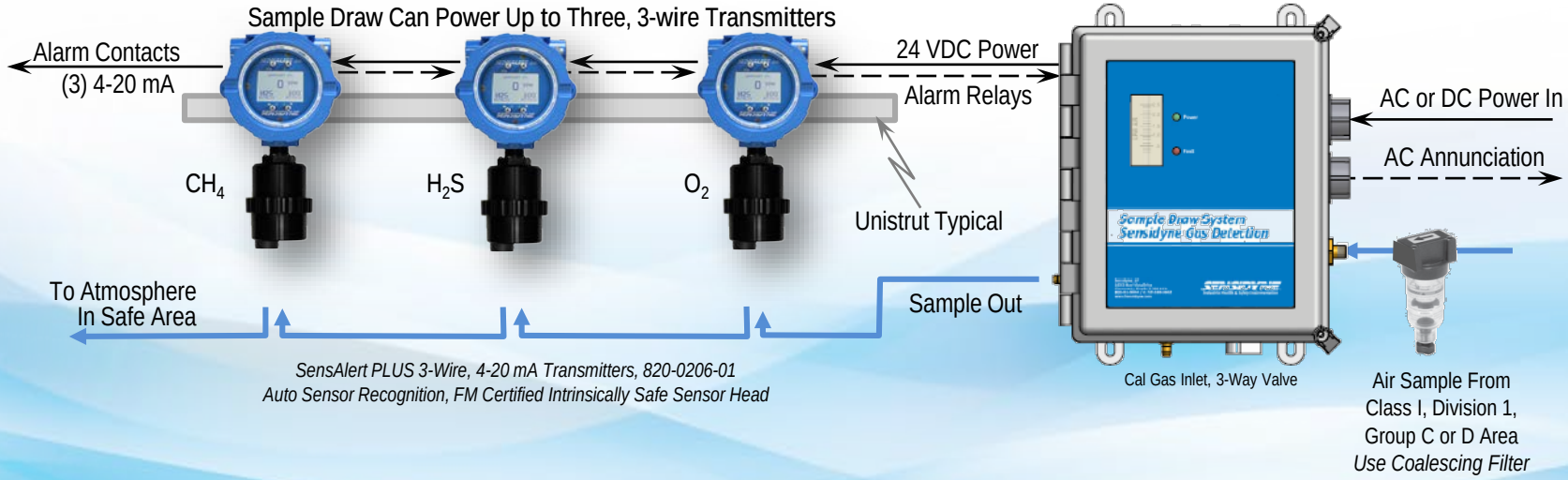
Larger Pumping Stations

- No Provision for Entry?
- Outside Motor Controls?
- Methane Is The Concern
  - Use I.S. Sensor
  - Sensor in Top of Wet Well
  - Use Remote Gassing Fixture
- No Active Ventilation?
- Monitor The Larger Structures with Potential Exposure to the Wet Well Atmosphere



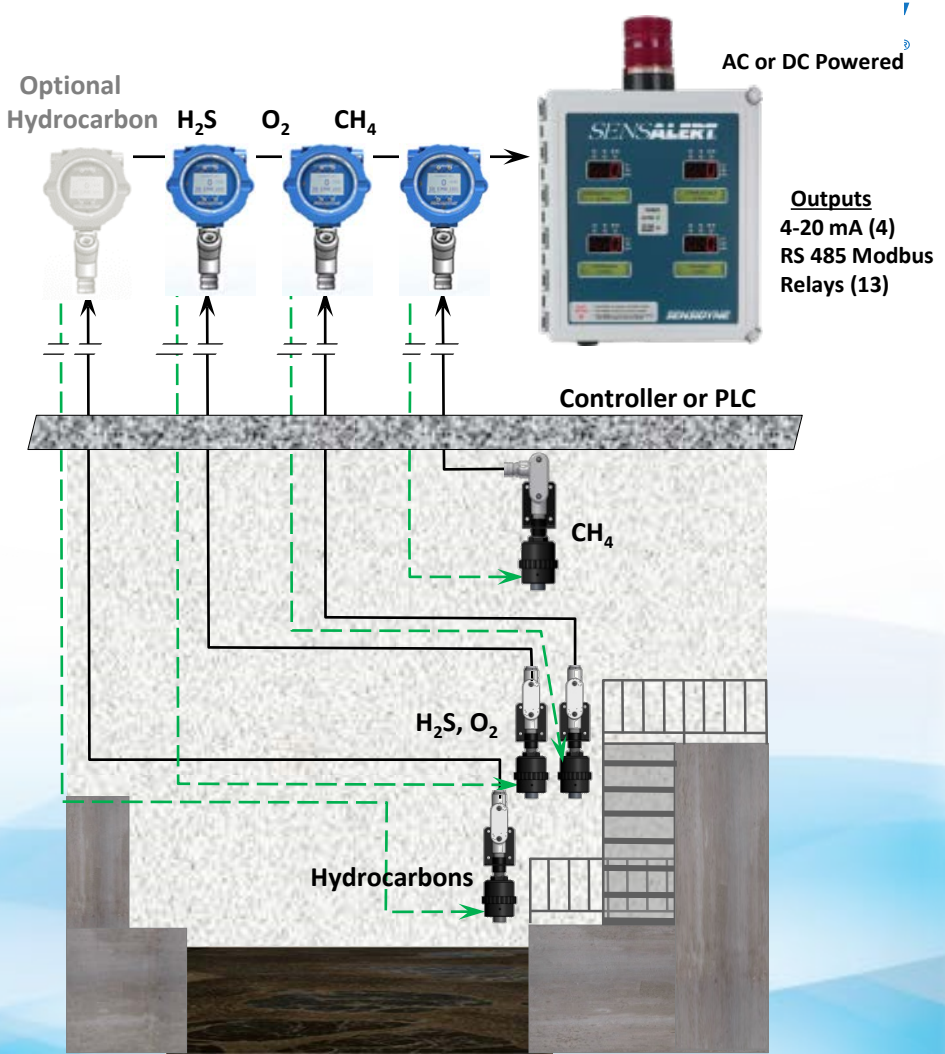
Large Wet Wells

- Sample Draw
  - An Integral Power Supply Can Be Used to Power Up to Three (3) Gas Detection Transmitters With Internal Relays



Sensors In Wet Well

- I.S. Sensor Head (FM)
- Remote Gassing as Needed
  - 0.25 Inch O.D. Tubing
- Hydrocarbon LEL Optional
- O_2 & H_2S “Knee to Face Level”
- Methane Sensor High
- 4-20 mA or RS 485 Modbus RTU to Controller or PLC
- Controller Alarm Outputs



NFPA 820: Tunnels

- Underground Tunnels Containing Natural Gas or Sludge Gas Piping
- Ventilation 0 to <6 Air Changes Per Hour Is Class I, Division 2
- Class I, Division 1 Within 3 m (10 ft) of Valves and Appurtenances
- CGD and FD Are Required

Co-Generation

- Biogas Gas (CH_4) Recovery and Gas Conditioning Area Monitors
- Generator Area Monitors for Methane and Ambient CO
- Some Have SCR Units And Will Require Ammonia Monitoring

Screening or Grit Removal

SENSIDYNE®
Industrial Health & Safety Instrumentation

- Grit Removal And Screening Building or Lift Station Screening
- Monitor For O_2, H_2S And LEL
  - O_2 and H_2S in Breathing Zone
  - CH_4 High, Remote Kit and Gassing

Digester Areas

SENSIDYNE®
Industrial Health & Safety Instrumentation

- Digesters In Buildings
- Digester Gas Processing
- Digester Gas Storage
- Methane Mounted High
- H_2S if it is an Issue
- Oxygen When Indoor Area

Enhanced Denitrification

SENSIDYNE®
Industrial Health & Safety Instrumentation

- Wastewater Contains High Levels Ammonia
  - This Is Converted Into Nitrates By Bacterial Degradation
- The EPA Has Mandated Reduced Nutrient Discharges
- Methanol Is Carbon Source
- Enhanced Denitrification Is Used By More Than 200 WWTPs

Methanol Characteristics

SENSIDYNE®
Industrial Health & Safety Instrumentation

- Methanol Is Toxic & Flammable
  - Toxicity
    - 200 PPM, 8 Hour TWA, ACGIH
  - Flammability
    - 6% Volume LEL
- Preferred Detection Methods
  - 0-500 PPM Electro-chemical Sensor
  - 0-100% LEL Infrared LEL Sensor
- Sensidyne Sensors Are FM Performance Certified

FM C US APPROVED

Dry Wells

SENSIDYNE®
Industrial Health & Safety Instrumentation

- Pumping Stations
  - Wet Well
  - Dry Well With Piping, Valves
- Below Grade, Same Hazards
- Supposed to be Positive Pressure (0.1 Inch wc)
- Monitoring Sometimes Desired

Disinfection

- Chemical Storage & Metering
- Chlorine or Bleach
  - Monitor Storage and Fluid Handling Equipment
- SO_2 May be Used for De-Chlorination
  - Monitor Storage and Fluid Handling Equipment

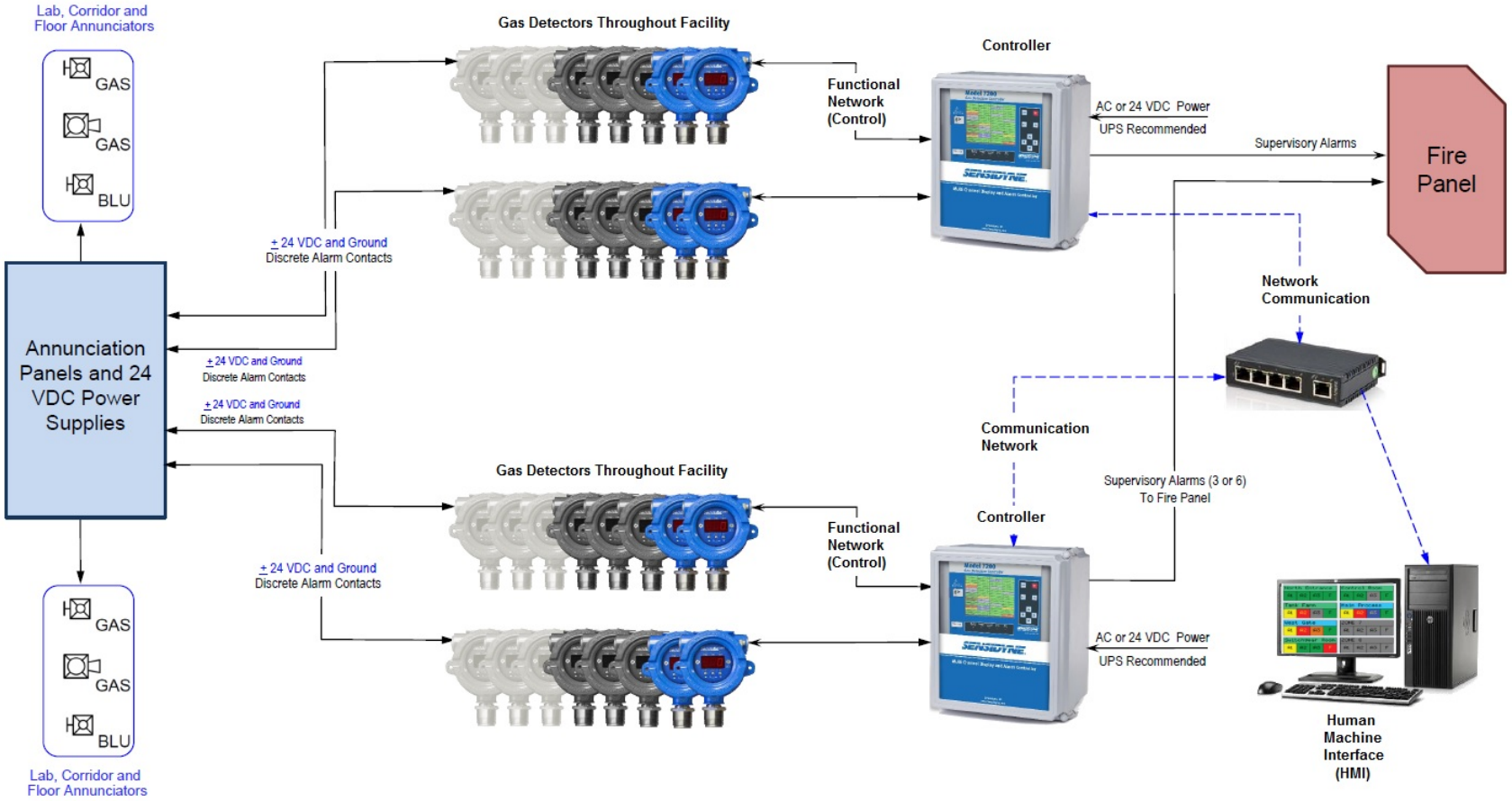
Discussion?

Introduction to Sensidyne

- Established in 1983 - acquired by Schauenburg GmbH in April 2008
  - A multinational company with 37 locations worldwide
  - Sensidyne is the instrumentation hub for the Americas
- Expanded to new manufacturing and corporate headquarters in January, 2013
- Certified to ISO9001:2008
- Ongoing investment in product development and sustaining engineering

How Are They Used

SENSIDYNE®
Industrial Health & Safety Instrumentation



Sensidyne Gas Detectors

SENSIDYNE
Industrial Health & Safety Instrumentation

SensAlert ASI

SensAir

SensFlex

SensCast

SensAlert

SensAlarm Plus

SensAlert Plus

SensAlert ASI

SENSIDYNE®
Industrial Health & Safety Instrumentation

- Preferred transmitter for all new applications (SIL-2, FM Approved)
- Replacing SensAlert Plus (170% runrate YoY)
- Certifications Include:
  - Explosion Proof - NEC and CEC Class I Div 1, Groups A, B, C, D; Class II Groups E, F, G; Class III T4
  - Flame Proof - ATEX Ex d [ia Ga] IIC T4 Gb
  - Non-Incendive - NEC and CEC Class I Div 2, Groups A, B, C, D; Class II Groups E, F, G; Class III T4
    ATEX Ex nC [ia Ga] IIC T4 Gc
  - Intrinsic Safety - NEC and CEC Class I Div 1, Groups A, B, C, D; Class II Groups E, F, G; Class III T4
    ATEX Ex ia IIC T4 Ga
  - CE Mark - ATEX Directive 2014/34/EU
  - IECEx - Zone 0: Ex ia IIC T4 Ga
    Sensor Ex ia IIC T4 Ga;
    Zone 1: Ex d [ai Ga] IIC T4 Gb
    Zone 2: EX nC [ia Ga] IIC T4 Gc
  - FM U.S - FM 3600:1998, FM 3610:2010, FM 3611:2004, FM 3615:2006, FM 3810:2005
  - FM Europe - EN 60079-0:2012, EN 60079-1:2007, EN 60079-11:2012, EN 60079-15:2010, EN 60529:2000, EN 50270:2006
    EN 60079-29-1:2007
  - SIL-2 Compliant - EN 61508 SIL-2 Parts 1,2, & 3 Hardware & Software. Fit for use in SIL-2 applications.

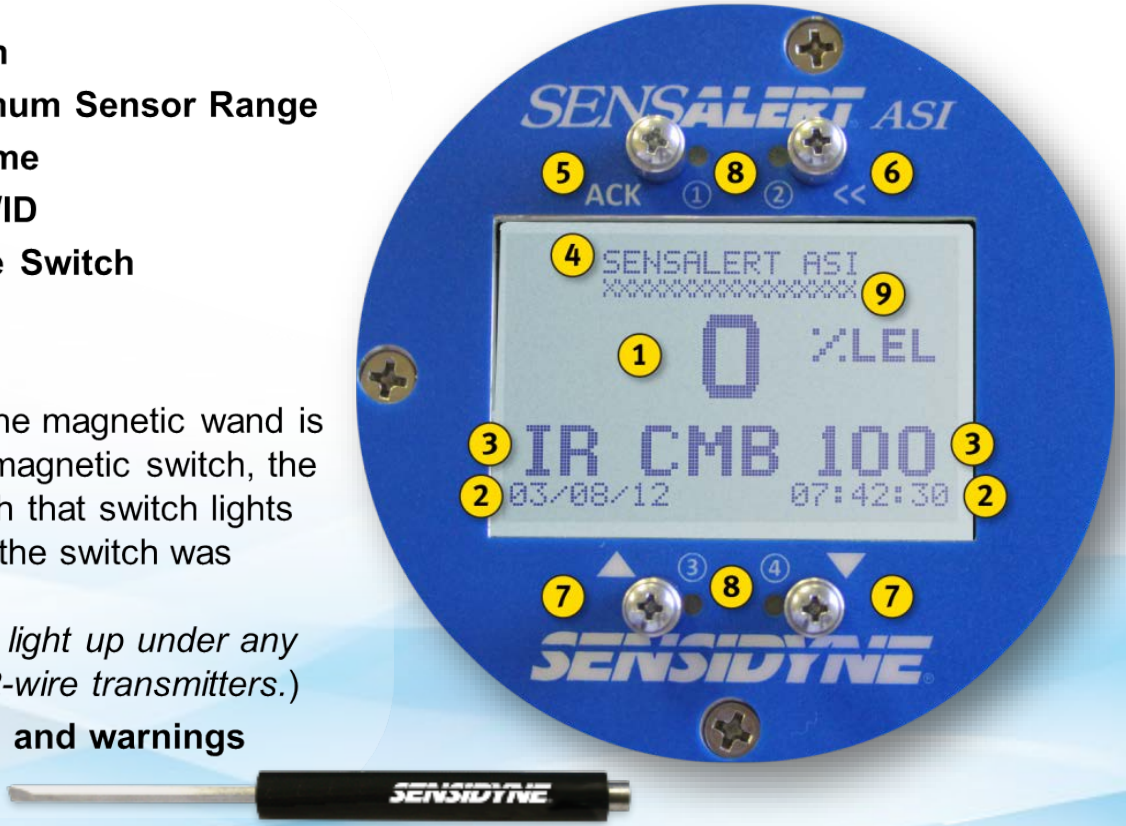
SensAlert ASI

(Options & Accessories)

- Remote Mountable
- Configurable Enclosure Orientation
- Basic Models Div-1, Div-2 & I.S.
  - No Options with I.S. or 2-Wire (e.g. Relays, Modbus, HART...)
- Different Enclosure Metals & Materials
- Premier Product with lots of features and benefits
- Many available Configurations to meet your specific application

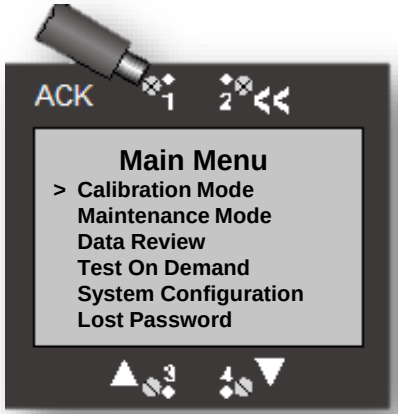
SensAlert ASI
Non-Intrusive User Interface

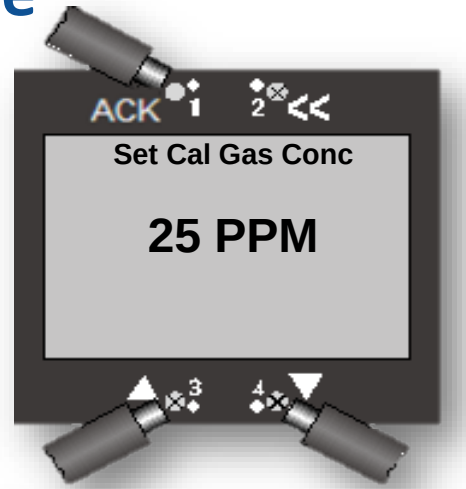
1) **Gas Concentration**
2) **Gas Type & Maximum Sensor Range**
3) **Local Date and Time**
4) **Transmitter Name/ID**
5) **ACK Acknowledge Switch**
6) **<< Go Back**
7) **▲ and ▼ Controls**
8) **LEDs 1-4** - When the magnetic wand is brought close to a magnetic switch, the LED associated with that switch lights up, confirming that the switch was actuated.
   (*Note: LEDs do not light up under any circumstances on 2-wire transmitters.*)
9) **System messages and warnings**

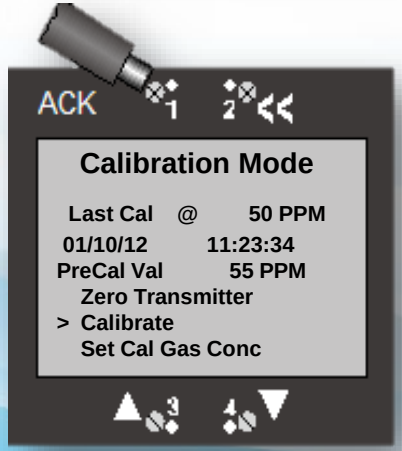


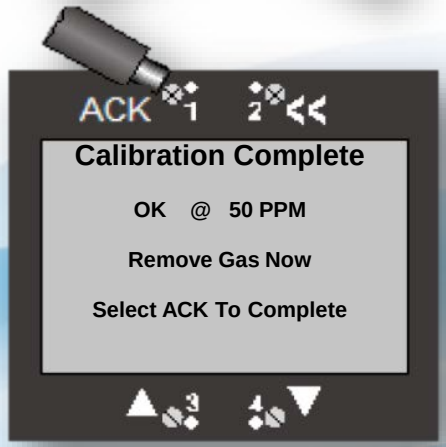
SensAlert ASI - Calibration Mode

SENSIDYNE®
Industrial Health & Safety Instrumentation



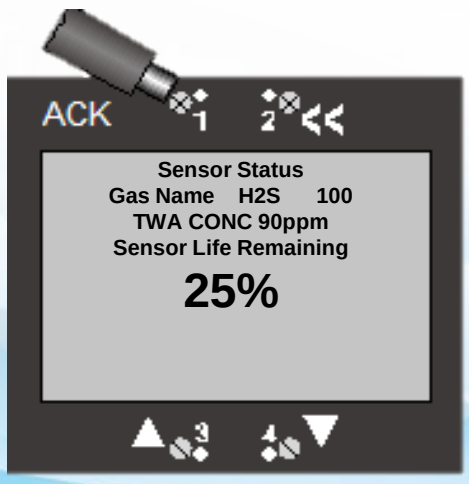


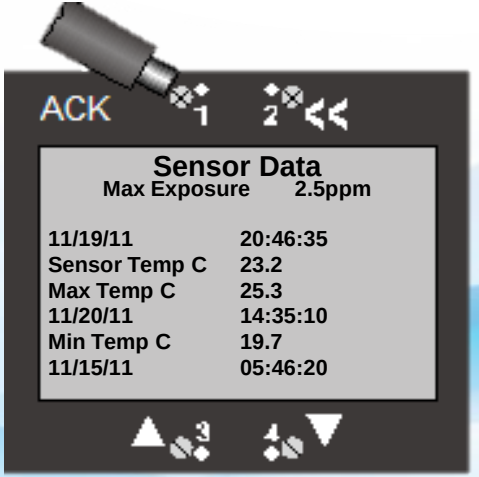




SensAlert ASI – Predictive Sensor Failure

- Alerts User Within 30 Days of Sensor Life Expiration
- Down Time Virtually Eliminated
- Enables Preventive Maintenance
- Sensor Data can be Recalled by the User Interface





Algorithm Factors:

- *Elapsed Time*
- *Accumulated Exposure*
- *Cal Gain Factor*
- *Power-On Hours*

SensAlarm *Plus*

SENSIDYNE®
Industrial Health & Safety Instrumentation

Advanced all-in-one gas monitoring system for local and remote gas detection.

- **Complete gas detection system**
  - Stand-alone single point AC or DC powered gas detection system
  - 1 or 2 double-flash strobes, horn and reset button
  - Optional battery back-up

- **Application-flexible installation and easy maintenance**
  - Non-intrusive configuration and maintenance interface
  - Remote sensor & gassing, duct mount, or sample draw
  - Mount sensor up to 100 ft./30 m. away using 4 conductor cable

Shown in Dual Strobe Configuration

SENSAIR CMB TOX O2

SENSIDYNE
Industrial Health & Safety Instrumentation

(Options & Accessories)

- Trying to break the “you get what you pay for mold”. Basic, but Robust!
- New Model Remote Mountable
- Configurable Enclosure Orientation
- Basic Models Div-1 & Div-2 (not I.S.)
  - Options include Relays, Modbus & BACnet
- Different Enclosure Metals & Materials
- Low Price with basic functions & features
- 3,249 Part Number Configurations (because the 28 sensors are part of the product)

Controllers

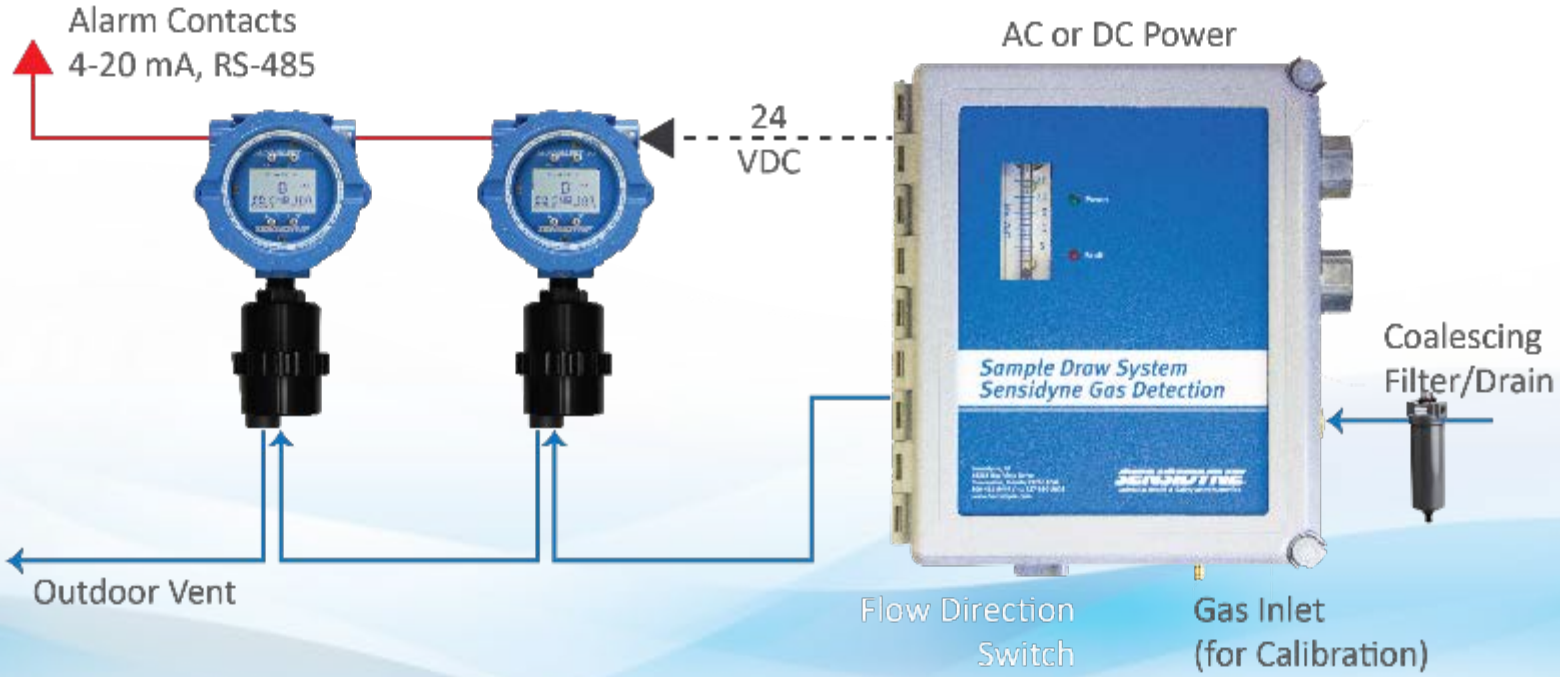
SENSIDYNE®
Industrial Health & Safety Instrumentation

Gas Detection Sample Draw

SENSIDYNE®
Industrial Health & Safety Instrumentation

- Class 1, Division 2 Rated for Sampling from a Class 1 Division 1 Area
- FM Listed for NFPA 820 Compliance
- Pumped or Air Aspirated Versions
- FM approved for Class 1, Division 2 Groups C & D Rated for Sampling from a Class 1 Division 1 Area Groups C & D
  - FM U.S. - FM 3600:2011, FM 3611: 2004, FM 3810:2005, ANSI/ISA 61010-1:2004
  - FM Canada - CSA C22.2 No. 0-M91, CSA C22.2 No. 142-M1987, CSA C22.2 No. 213-M1987, CSA C22.2 No. 1010.1 ANSI/UL 61010-1

Example Sample Draw Application



Factory Commissioning & Service

Ensure safety through expert start-up, repair, calibration, and maintenance.

- Start-up and Commissioning
  - On site start-up of equipment, functional testing, initial calibration, and training of local personnel
- Contract calibration-maintenance
  - Routine calibration and maintenance services by expert technicians
- Sensor Calibration Exchange Program
  - Scheduled delivery of factory calibrated sensors
  - Customer's second set of sensors stored at factory until next calibration interval
  - Sensors tested in Sensidyne's Factory Mutual (FM) approved lab
  - Sensors ship with calibration certificate

Discussion?