## WATCHGAS SENSOR MODULES

UNI and POLI sensors are smart sensors that carry with them calibration data. The connecting adapters depend on the type of instrument: 7-pin connectors for UNI, black wedge-shaped connection modules for POLI, and raw sensors for MUNI.

**POLI Sensor Modules**

**UNI Sensor Module**

## TEMPERATURE, PRESSURE AND HUMIDITY

All electrochemical sensors can be used in the temperature range -40 to 50°C (except $ClO_2$, which has a range of -20 to 40°C) and pressures deviating by up to ±20% from atmospheric pressure.

## HUMIDITY REQUIREMENTS

All electrochemical sensors operate in the humidity range of 15 to 95% RH (non-condensing). Some humidity is required for long-term use to prevent drying out of the internal electrolyte. Humidity is not required for NDIR, PID, or LEL sensors, which thus have a range of 0 to 95% RH (non-condensing). Humidity above 50% RH can reduce PID response and may need correction for highly accurate work.

## OXYGEN REQUIREMENTS

At least 10% by volume oxygen is required in the sampled gas for pellistor-type LEL sensors to sustain catalytic oxidation, but not for IR-type LEL sensors. A small amount of oxygen (≥1%) is needed for nearly all electrochemical sensors except those that measure strong oxidants, i.e., O3, Cl2, and ClO2. Thus, most electrochemical sensors cannot be used to measure in dry, inert gases (such as nitrogen or argon) for long periods. However accurate measurements can be made in dry, inert gases for up to several minutes because the sensor electrolyte retains enough moisture and oxygen for this short time after moving from typical ambient air. Standard gases, which are often supplied in a dry nitrogen matrix, can be used for calibration because the exposure time is short enough. LEL measurements in inert gases can be made using an IR-type LEL sensor or a PID, neither of which require oxygen, as opposed to a pellistor-type LEL sensor, which needs oxygen for combustion.

### DISCLAIMER

**Due to our continuous improvement efforts these specifications may change without notice.**

## LIFETIME & STORAGE

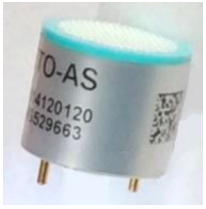
Most electrochemical sensors should be stored at 0 to 20°C in their sealed container for up to 6 months without shorten much their operating life. The CO, $H_2S$, LEL, $O_2$ & IR sensors typically have warranties of 24 months in ambient air and expected operating lives of 36 months or more, depending on which instrument they are used in. All other electrochemical & PID sensors have a standard warranty of 12 months from the date of shipment, although the typical operating life is usually longer.

## BIASED SENSORS (ETO, HCL, NO, THT & LEAD-FREE $O_2$)

Electrochemical sensors that use a bias voltage (e.g., HCl, ETO and lead-free oxygen) require an equilibration time of up to 12 hours after installing into an instrument (powered on or off), before zeroing and calibrating. Most other sensors are ready for use within several minutes of installation.

## INSTRUMENT LIMITATIONS

The data listed below are from the supplier specification sheets and apply to the raw, 3-pin sensors without attached circuitry. In some cases the instrument limits the specifications further. For example, the temperature range for most sensors is -40 to 50°C, whereas most WatchGas instruments have an operating range of -20 to 50°C. In a few instances the measuring range is narrower in the instrument than for the raw sensor, and in some cases the instrument can extend the range to lower values. POLI monitors can accept at most two high-power sensors, which include PID, NDIR and LEL.




**3-Pin Raw Sensor (MUNI)**

SuAS

## AMMONIA ($NH_3$)

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | CO | 50 ppm | 0 ppm |
| Range | 0-100 ppm | $CO_2$ | 1000 ppm | 0 ppm |
| Extended Linear Range | 200 ppm | $H_2$ | 1000 ppm | 0 ppm |
| Resolution | 1 ppm | HCN | 10 ppm | 0 ppm |
| Deadband (UNI/POLI) | 4 ppm | NO | 25 ppm | 0 ppm |
| $t_{90}$ Response Time | ≤90 s | $H_2S$ | 25 ppm | 65 ppm |
| Bias | 0 mV | $SO_2$ | 4 ppm | ≤2 ppm |
| Temp. Range | -40 to 50°C | $PH_3$ | 5 ppm | 0 ppm |
| T Effect on Zero (-20 to 50°C) | -0.5 to 5 ppm | $SiH_4$ | 20 ppm | Neg |
| T Effect on Signal (-20 to 50°C) | ±40% | HF | 8.4 ppm | -11 ppm |
| Warranty | 1 year | Isobutylene | 100 ppm | 0 ppm |
| Default Alarms TWA/STEL | 25 / 35 ppm | Methyl Mercaptan | 20 ppm | 10 ppm |
| Calibration Gas/Bal. Gas | 50 ppm $NH_3$/Air* | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
***** Nitrogen balance gas can also be used if exposure is <5 minutes**

SuVS

## AMMONIA ($NH_3$)

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | CO | 50 ppm | 0 ppm |
| Range | 0-500 ppm | $CO_2$ | 1000 ppm | 0 ppm |
| Extended Linear Range | 1000 ppm | $H_2$ | 1000 ppm | 0 ppm |
| Resolution | 3 ppm | $H_2S$ | 25 ppm | 35 ppm |
| Deadband (UNI/POLI) | 5 / 4 ppm | $SO_2$ | 1000 ppm | 0 ppm |
| $t_{90}$ Response Time | ≤90 s | Isobutylene | 100 ppm | 0 ppm |
| Bias | 0 mV | | | |
| Temp. Range | -40 to 50°C | | | |
| T Effect on Zero (-20 to 50°C) | -0.5 to 5 ppm | | | |
| T Effect on Signal (-20 to 50°C) | ±40% | | | |
| Warranty | 1 year | | | |
| Default Alarms TWA/STEL | 25 / 35 ppm | | | |
| Calibration Gas/Bal. Gas | 50 ppm $NH_3$/Air | | | |

***** Nitrogen balance gas can also be used if exposure is <5 minutes**
**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**

SuSS

## ARSINE ($AsH_3$)

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | $H_2S$ | 25 ppm | 31 ppm |
| Range | 0-1 ppm | $PH_3$ | 20 ppm | 17 ppm |
| Extended Linear Range | 10 ppm | $SiH_4$ | 10 ppm | 5.5 ppm |
| Resolution | 0.01 ppm | $SO_2$ | 20 ppm | 3.2 ppm |
| Deadband (UNI) | 0.05 ppm | $NH_3$ | 30 ppm | 0.02 ppm |
| $t_{90}$ Response Time | ≤30 s | $H_2$ | 500 ppm | 0 ppm |
| Bias | 0 mV | CO | 300 ppm | 0 ppm |
| Temp. Range | -40 to 50°C | Ethylene | 10 ppm | 0.01 ppm |
| T Effect on Zero (-20 to 50°C) | ±0.03 to +0.1 ppm | | | |
| T Effect on Signal (-20 to 50°C) | ±15% | | | |
| Warranty | 1 year | | | |
| Default Alarms TWA/STEL | 0.1 / 0.3 ppm | | | |
| Calibration Gas/Bal. Gas | 5 ppm $SO_2$/Air* | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet. * Set span to 0.8 ppm. Nitrogen balance gas can also be used if exposure is <5 minutes. See TA Note 6 for other calibration gas options**

DyMSHia

# CARBON DIOXIDE ($CO_2$)

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | NDIR | | | |
| Range | 0-5% Vol | | | |
| Extended Linear Range | 0-10% Vol | | | |
| Resolution | 0.025% Vol | | | |
| Deadband (POLI) | 0.02% Vol | | | |
| $t_{90}$ Response Time | ≤30 s | | | |
| Bias | NA | | | |
| Temp. Range | -20 to 50°C | | | |
| T Effect on Zero (-20 to 50°C) | ±0.055% Vol | | | |
| T Effect on Signal (-20 to 50°C) | ±15% | | | |
| Warranty | 2 years | | | |
| Default Alarms TWA/STEL | 0.5 / 3 % | | | |
| Calibration Gas/Bal. Gas | 0.5% Vol $CO_2$/Air (equals 5000 ppm) | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**

SuSF

# CARBON MONOXIDE (CO) ALL RANGES

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | $Cl_2$ | 10 ppm | 0.5 ppm |
| Range | 0-1000 ppm | $H_2$ | 50 ppm | 8 ppm |
| Extended Linear Range | 2000 ppm | NO | 50 ppm | 10 ppm |
| Resolution | 1 ppm | $NO_2$ | 30 ppm | 1 ppm |
| Deadband (UNI/POLI) | 5.5 / 3 ppm | $SO_2$ | 20 ppm | 0 ppm |
| $t_{90}$ Response Time | ≤15 s | $H_2S$ | 100 ppm | 0 ppm |
| Bias | 0 mV | Ethylene Oxide* | 10 ppm | 0 ppm |
| Temp. Range | -40 to 50°C | VOC* | | |
| T Effect on Zero (-20 to 50°C) | -1 to 10 ppm | | | |
| T Effect on Signal (-20 to 50°C) | ±40% | | | |
| Warranty | 2 years | | | |
| Default Alarms TWA/STEL | 35 / 100 ppm | Breath test | | No response |
| Calibration Gas/Bal. Gas | 60 ppm CO/Air (0-500 ppm range)<br>100 ppm CO/Air (0-1000 or 1999 ppm range) | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
***** An internal carbon/oxidant filter reduces response to VOCs. The filter effectiveness is reduced over the life of the sensor by an amount that depends on the VOC exposure level.**

AlCOAX

# CARBON MONOXIDE (CO) – LOW HYDROGEN INTERFERENCE

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY* | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | $H_2$ (@10°C) | 900 ppm | 18 ppm |
| Range | 0-2000 ppm | $H_2$ (@20°C) | 900 ppm | 36 ppm |
| Maximum Overload | 4000 ppm | $H_2$ (@30°C) | 900 ppm | 54 ppm |
| Resolution | 1 ppm | $Cl_2$ | 10 ppm | 0 ppm |
| $t_{90}$ Response Time | ≤30 s | NO* | 500 ppm | ≤10 ppm |
| Bias | 0 mV | $NO_2$* | 10 ppm | ≤0.1 ppm |
| Temp. Range | -30 to 50°C | $NH_3$ | 20 ppm | 0 ppm |
| T Effect on Zero (-20 to 50°C) | +4 to -6 ppm | $SO_2$* | 20 ppm | 0 ppm |
| T Effect on Signal (-20 to 50°C) | ±35% | $C_2H_4$ (ethylene) | 400 ppm | ≤20 ppm |
| Warranty | 1 year | | | |
| Default Alarms TWA/STEL | 35 / 100 ppm | | | |
| Calibration Gas/Bal. Gas | 60 ppm CO/Air (0-500 ppm range)<br>100 ppm CO/Air (0-1000 or 1999 ppm range) | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
***** Internal filter capacities: H2S: 250,000 ppm-hours, SO2: 250,000 ppm-hours, NO: 20,000 ppm-hours, NO2: 500,000 ppm-hours Filter effectiveness is reduced over the life of the sensor by an amount that depends on the exposure level.**

## CARBON MONOXIDE/ HYDROGEN SULFIDE ($CO/H_2S$) DUAL SENSOR

DDGS+4DT

| PARAMETER | CO SPECIFICATION** | $H_2S$ SPECIFICATION** |
|---|---|---|
| Sensor Type | Electrochemical | Electrochemical |
| Range | 0-1000 ppm | 0-200 ppm |
| Extended Linear Range | NA | NA |
| Resolution | 1 ppm | 0.5 ppm |
| $t_{90}$ Response Time | ≤30 s | ≤30 s |
| Bias | 0 mV | 0 mV |
| Temp. Range | -30 to 50°C | -30 to 50°C |
| T Effect on Signal (-20 to 50°C) | ±60% | ±15% |
| Warranty | 1 year | 1 year |
| Default Alarms TWA/STEL | 35 / 100 ppm | 10 / 15 ppm |
| Calibration Gas/Bal. Gas | 100 ppm CO/Air | 25 ppm $H_2S$/Air |

| CROSS-SENSITIVITY | TEST CONC. | CO RESPONSE | $H_2S$ RESPONSE |
|---|---|---|---|
| CO | 300 ppm | 300 ppm | <5 ppm |
| $H_2S$ | 25 ppm | <5 ppm | 25 ppm |
| $H_2S$ | 5 ppm | 0 ppm | <1 ppm |
| NO | 35 ppm | <0.1 ppm | <1 ppm |
| $NO_2$ | 5 ppm | <0.1 ppm | 0 ppm |
| $Cl_2$ | 15 ppm | 0 ppm | 0 ppm |
| VOC* | | * | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
*** An internal carbon/oxidant filter reduces CO sensor response to VOCs, with a filter lifetime of >20,000 ppm-hours**

## CHLORINE ($CL_2$)

SuDS

| PARAMETER | SPECIFICATION | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | $ClO_2$ | 5.0 ppm | 3.9 ppm |
| Range | 0-10 ppm | $O_3$ | 0.5 ppm | 0 ppm |
| Extended Linear Range | 50 ppm | CO | 100 ppm | 0 ppm |
| Resolution | 0.1 ppm | $H_2$ | 1000 ppm | 0 ppm |
| Deadband (UNI / POLI) | 0.4 / 0.2 ppm | NO | 50 ppm | 0 ppm |
| $t_{90}$ Response Time | ≤60 s | $NO_2$ | 10 ppm | 10 ppm |
| Bias | 0 mV | $SO_2$ | 20 ppm | 0 ppm |
| Temp. Range | -40 to 50°C | $H_2S$ | 25 ppm | -3 ppm |
| T Effect on Zero (-20 to 50°C) | 0.2 to -0.4 ppm | Isobutylene | 100 ppm | 0 ppm |
| T Effect on Signal (-20 to 50°C) | ±20% | | | |
| Warranty | 1 year | | | |
| Default Alarms TWA/STEL | 0.5 / 1.0 ppm | | | |
| Calibration Gas/Bal. Gas | 10 ppm $Cl_2$ / $N_2$ | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**

## CHLORINE DIOXIDE ($CLO_2$)

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | $Cl_2$ | 1 ppm | 1.1 ppm |
| Range | 0-1 ppm | $O_3$ | 0.6 ppm | 0.1 ppm |
| Extended Linear Range | 0-1 ppm | $NO_2$ | 10 ppm | 6 ppm |
| Resolution | 0.03 ppm | CO | 100 | 0 ppm |
| Deadband (UNI/POLI) | 0.03 ppm | $CO_2$ | 5000 ppm | 0 ppm |
| $t_{90}$ Response Time | ≤60 s | $H_2$ | 1000 ppm | 0 ppm |
| Bias | 0 mV | $H_2S$ | 20 ppm | -15 ppm |
| Temp. Range | -20 to 40°C | $SO_2$ | 5 ppm | 0 ppm |
| T Effect on Zero (-20 to 50°C) | 0 to 0.06 ppm | HF | 5.3 ppm | 0 ppm |
| T Effect on Signal (-20 to 50°C) | ±20% | Isobutylene | 100 ppm | 0 ppm |
| Warranty | 1 year | | | |
| Default Alarms TWA/STEL | 0.1 / 0.3 ppm | Breath test | | positive |
| Calibration Gas/Bal. Gas | 0.6 ppm $ClO_2/N_2$ (Requires generator)<br>or 1 ppm $Cl_2$/ $N_2$ (Available in gas cylinder)<br>See TA Note 6 for generator options and procedures. | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**

## COMBUSTIBLES (LEL – LOWER EXPLOSIVE LIMIT)

SuLEL

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Catalytic Oxidation | Responds to most combustible gases including $H_2$ and VOCs up to $C_8$* | | |
| Range | 0-100% LEL | | | |
| Extended Linear Range | 100% LEL | | | |
| Resolution | 1% LEL | | | |
| Deadband (POLI) | 6% LEL | | | |
| $t_{90}$ Response Time | ≤15 s | | | |
| Temp. Range | -20 to 55°C | | | |
| T Effect on Zero (-20 to 60°C) | ±3% LEL | | | |
| T Effect on Signal (-20 to 60°C) | ±10% | | | |
| Warranty | 2 years | | | |
| Default Alarms LOW/HIGH | 10 / 20% LEL | | | |
| Calibration Gas/Bal. Gas | 50% LEL $CH_4$/Air, 50% LEL Propane/Air or 20% LEL Pentane/Air | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
*** CAUTION: Poison-removing carbon fiber filters (PN M082-0903-010) placed on the sensor inlet should only be used for measuring methane or hydrogen because they greatly slow the response of propane and absorb heavier hydrocarbons like pentane or gasoline.**

## ETHYLENE OXIDE & ACETALDEHYDE (ETO, $C_2H_4O$)

SuAS

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY† | CF* |
|---|---|---|---|
| Sensor Type | Electrochemical | CO | 2.3 |
| Range (ETO / $C_2H_4O$) | 0-100, 0-20 ppm | $NO_2$ | 6.1 |
| Extended Linear Range | 200 ppm | HCN | 2.8 |
| Resolution | 0.1 ppm | Formaldehyde | 0.4 |
| Deadband (ETO UNI/POLI)<br>Deadband ($C_2H_4O$ UNI/POLI) | 0.5 / 4.5 ppm<br>- / 2.5 ppm | Formic Acid | 1.4 |
| | | Methanol | 0.9 |
| $t_{90}$ Response Time | ≤120 s | Ethanol | 1.5 |
| Bias | 300 mV | Ethylene Oxide | 1.0 |
| Temp. Range | -40 to 50°C | 1,3-Butadiene | 0.8 |
| T Effect on Zero (-20 to 50°C) | -1 to 10 ppm | Isobutylene | 1.7 |
| T Effect on Signal (-20 to 50°C) | ±25% | Vinyl Chloride | 1.4 |
| RH Effect on Signal (@45%RH) | ≤10% | Acetone | NR |
| Warranty | 1 year | Ethyl Acetate | NR |
| Default Alarms TWA/STEL | 1 / 2 ppm | Benzene | NR |
| Calibration Gas/Bal. Gas | 10 ppm ETO/Air<br>100 ppm CO‡ | n-Hexane | NR |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
**† For more cross-sensitivity data, see TA-Note 9.**
**‡ Set ETO span value to 43 ppm.**
*** CF = Correction Factor = Response(ETO) / Response(Test Gas). After calibration to ETO, the true concentration of these gases is calculated as Reading x CF.**

## HYDROGEN ($H_2$)

SuNT

| PARAMETER | SPECIFICATION | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | CO | 50 ppm | 150 ppm |
| Range | 0-1000 ppm | $Cl_2$ | 10 ppm | 0.5 ppm |
| Extended Linear Range | 2000 ppm | NO | 50 ppm | 10 ppm |
| Resolution | 10 ppm | $NO_2$ | 30 ppm | 1 ppm |
| Deadband (UNI/POLI) | 12 ppm | $SO_2$ | 20 ppm | 0 ppm |
| $t_{90}$ Response Time | ≤70 s | $H_2S$ | 100 ppm | 0 ppm |
| Bias | 0 mV | | | |
| Temp. Range | -40 to 50°C | | | |
| T Effect on Zero (-20 to 50°C) | -1 to 10 ppm | | | |
| T Effect on Signal (-20 to 50°C) | ±300% | | | |
| Warranty | 1 year | | | |
| Default Alarms LOW/HIGH | 100 / 400 ppm | | | |
| Calibration Gas/Bal. Gas | 700 ppm $H_2$/Air | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**

# HYDROGEN CHLORIDE (HCl)

SuLS

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | HF | 6 ppm | 1 ppm |
| Range | 0-50 ppm | $CL_2$ | 10 ppm | variable |
| Extended Linear Range | 100 ppm | CO | 100 ppm | 0 ppm |
| Resolution | 0.1 ppm | $CO_2$ | 500 ppm | 0 ppm |
| Deadband (UNI/POLI) | 0.8 ppm | NO | 20 ppm | 50 ppm |
| $t_{90}$ Response Time | ≤70 s | $NO_2$ | 5 ppm | ~15 ppm |
| Bias | 200 mV | $H_2S$ | 25 ppm | 110 ppm |
| Temp. Range | -40 to 50°C | $SO_2$ | 20 ppm | 30 ppm |
| T Effect on Zero (-20 to 50°C) | -1 to 15 ppm | | | |
| T Effect on Signal (-20 to 50°C) | ±20% | | | |
| Warranty | 1 year | | | |
| Default Alarms TWA/STEL | 1 / 5 ppm | | | |
| Calibration Gas/Bal. Gas | 10 ppm HCl/Air* | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
*** N2 balance gas can also be used as this sensor does not require oxygen. Use stainless steel regulator and allow ≥3 min. gas flow prior to start of calibration. See TA Note 6 for detailed procedures.**

# HYDROGEN CYANIDE (HCN)

SuLS

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | CO | 100 ppm | 0 ppm |
| Range | 0-50 ppm | $Cl_2$ | 16 ppm | 0 ppm |
| Extended Linear Range | 100 ppm | NO | 18 ppm | 0 ppm |
| Resolution | 0.2 ppm | $NO_2$ | 23 ppm | -1 ppm |
| Deadband (UNI/POLI) | 0.9 ppm | $H_2S$ | 26 ppm | 52 ppm |
| $t_{90}$ Response Time | ≤120 s | $SO_2$ | 23 ppm | 8 ppm |
| Bias | 0 mV | $SiH_4$ | 20 ppm | 0 ppm |
| Temp. Range | -40 to 50°C | | | |
| T Effect on Zero (-20 to 50°C) | -1 to 1 ppm | | | |
| T Effect on Signal (-20 to 50°C) | ±25% | | | |
| Warranty | 2 years | | | |
| Default Alarms TWA/STEL | 4.7 / 4.7 ppm | | | |
| Calibration Gas/Bal. Gas | 10 ppm HCN/Air* | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
*** Nitrogen balance gas can also be used if exposure is <5 minutes**

# HYDROGEN FLUORIDE (HF) (BEFORE 1 DEC 2022)

SuCS

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | HCl† | 10 ppm | 6.5 ppm |
| Range | 0-20 ppm | $Cl_2$ | 5 ppm | >20 ppm |
| Extended Linear Range | 50 ppm | $CO_2$ | 5000 ppm | ~1 ppm |
| Resolution | 0.1 ppm | CO | 500 ppm | 0 ppm |
| Deadband (UNI/POLI) | 0.5 ppm | HCN | 10 ppm | 0 ppm |
| $t_{90}$ Response Time | ≤120 s | NO | 5 ppm | >20 ppm |
| Bias | 0 mV | $NO_2$ | 20 ppm | 180 ppm |
| Temp. Range | -40 to 50°C | $NH_3$ | 50 ppm | 0 ppm |
| T Effect on Zero (-20 to 50°C) | 0.4 to -1 ppm | $H_2S$ | 25 ppm | 0 ppm |
| T Effect on Signal (-20 to 50°C) | ±20% | $SO_2$ | 5 ppm | 0 ppm |
| Warranty | 1 year | Isobutylene | 100 ppm | 0 ppm |
| Default Alarms TWA/STEL | 3 / 6 ppm | Burnt paper fumes | | ++ |
| Calibration Gas/Bal. Gas | 10 ppm HF/Air*<br>10 ppm HCl/Air*† | | | |

**** Specifications from sensor manufacturer; mPower monitor values may be different unless noted. See monitor data sheet.**
*** N2 balance gas can also be used; no O2 required. Use stainless steel regulator and allow ≥2 min. of gas flow prior to start calibration.**
**† Set HF span value to 6.5 ppm when calibrating with 10 ppm HCl. See TA Note 6 for detailed procedures.**
**++ Unquantified moderate positive response.**

# HYDROGEN FLUORIDE (HF) (AFTER 1 DEC 2022)

SxHF10

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | HCl† | 10 ppm | 9 ppm |
| Range | 0-10 ppm** | HBr | 10 ppm | 9 ppm |
| Extended Linear Range | 20 ppm | $Cl_2$ | 5 ppm | 8 ppm |
| Resolution | 0.1 ppm | Acetic Acid | 10 ppm | ~10 ppm |
| Deadband (UNI/POLI) | 0.5 ppm | NO | 25 ppm | 3 ppm |
| $t_{90}$ Response Time | ≤90 s | $NO_2$‡ | 10 ppm | 8 ppm |
| Bias | 0 mV | $NH_3$ | 100 ppm | 0 ppm |
| Temp. Range | -20 to 40°C | $H_2S$ | 20 ppm | -7.5 ppm |
| T Effect on Zero (-20 to 50°C) | 0.05 to +0.2 ppm | $SO_2$ | 18 ppm | 14 ppm |
| T Effect on Signal (-20 to 50°C) | -40 to +10 % | CO | 100 ppm | 0 ppm |
| Warranty | 1 year | $H_2$ | 3000 ppm | 0 ppm |
| Default Alarms TWA/STEL | 3 / 6 ppm | $H_2$ | 50% | <0.5 ppm |
| Calibration Gas/Bal. Gas | 10 ppm HF/Air*<br>10 ppm HCl/Air*†<br>10 ppm NO2/Air*‡ | Isobutylene<br>Dry air or nitrogen | 10 ppm<br>0 ppm | 0 ppm<br>Transient rise, then drop to 0 |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
*** N2 balance gas can also be used; no O2 required. Use stainless steel regulator and allow ≥2 min. of gas flow prior to start calibration.**
**† Set HF span value to 9 ppm when using 10 ppm HCl.**
**‡Set HF Span to 8 ppm when using 10 ppm NO2. See TA Note 6 for details.**

## HYDROGEN SULFIDE ($H_2S$) 0-50 PPM, 0-100 PPM & 0-200 PPM RANGES

SuAS

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | Methyl Mercaptan | 20 ppm | 7 ppm |
| Range | 0-100 ppm | CO | 300 ppm | 0 ppm |
| Extended Linear Range | 500 ppm | $H_2$ | 1000 ppm | 0 ppm |
| Resolution | 0.1 ppm | HCN | 10 ppm | 0 ppm |
| Deadband (UNI/POLI) | 2.5 / 1.5 ppm | $NH_3$ | 50 ppm | 0 ppm |
| $t_{90}$ Response Time | ≤15 s | NO | 18 ppm | 1 ppm |
| Bias | 0 mV | $NO_2$ | 23 ppm | 0 ppm |
| Temp. Range | -40 to 50°C | $PH_3$ | 5 ppm | 2 ppm |
| T Effect on Zero (-20 to 50°C) | -0.2 to 1 ppm | $SO_2$ | 5 ppm | 1 ppm |
| T Effect on Signal (-20 to 50°C) | ±20% | $SiH_4$ | 20 ppm | 3 ppm |
| Warranty | 2 years | Isobutylene | 100 ppm | 0 ppm |
| Default Alarms TWA/STEL | 10 / 15 ppm | | | |
| Calibration Gas/Bal. Gas | 25 ppm $H_2S$/Air* | Breath test | | No response |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
** Nitrogen balance gas can also be used if exposure is <5 minutes. 15 ppm $H_2S$ is used in 4-gas mixtures used to calibrate MUNI & POLI when pellistor LEL sensors are present to limit LEL inhibition by $H_2S$.**

## HYDROGEN SULFIDE ($H_2S$) 0-1000 PPM RANGE

SuNS

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | CO | 300 ppm | 0 ppm |
| Range | 0-1000 ppm | $H_2$ | 1000 ppm | 0 ppm |
| Extended Linear Range | 2000 ppm | HCN | 10 ppm | 0 ppm |
| Resolution | 0.1 ppm | $NH_3$ | 50 ppm | 0 ppm |
| Deadband (UNI/POLI) | 5.5 / 1.5 ppm | NO | 18 ppm | 1 ppm |
| $t_{90}$ Response Time | ≤45 s | $NO_2$ | 23 ppm | 0 ppm |
| Bias | 0 mV | $SO_2$ | 5 ppm | 1 ppm |
| Temp. Range | -40 to 50°C | | | |
| T Effect on Zero (-20 to 50°C) | 0 to 10 ppm | | | |
| T Effect on Signal (-20 to 50°C) | ±20% | | | |
| Warranty | 2 years | | | |
| Default Alarms TWA/STEL | 10 / 15 ppm | | | |
| Calibration Gas/Bal. Gas | ≥25 ppm $H_2S$/Air* | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
** Nitrogen balance gas can also be used if exposure is <5 minutes**

# METHYL MERCAPTAN ($CH_3SH$)

SuDS

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | t-Butyl Mercaptan | 7.3 ppm | 7.6 ppm |
| Range | 0-10 ppm | $H_2S$ | 2.5 ppm | 5.5 ppm |
| Extended Linear Range | 20 ppm | $SO_2$ | 5 ppm | 3 ppm |
| Resolution | 0.1 ppm | CO | 300 ppm | 0 ppm |
| Deadband (UNI/POLI) | 0.5 ppm | $H_2$ | 10,000 ppm | 25 ppm |
| $t_{90}$ Response Time | ≤20 s | NO | 35 ppm | 1 ppm |
| Bias | 0 mV | $NO_2$ | 5 ppm | -1 ppm |
| Temp. Range | -40 to 50°C | HCN | 10 ppm | 0 ppm |
| T Effect on Zero (-20 to 50°C) | -0.1 to 0.6 ppm | $NH_3$ | 50 ppm | 0 ppm |
| T Effect on Signal (-20 to 50°C) | ±20% | Isobutylene | 1000 ppm | 1.1 ppm |
| Warranty | 1 year | Isobutylene † | 10000 ppm | 5.6 ppm |
| Default Alarms TWA/STEL | 0.5 / 2.0 ppm | Methane++ | 2.5 Vol% | 0.0 ppm |
| Calibration Gas/Bal. Gas | 4 ppm $CH_3SH$/Air* | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
*** Nitrogen balance gas can also be used if exposure is <5 minutes.**
**++ 2% Vol Methane does not affect methyl mercaptan readings significantly.**
**† Could cause interference when measuring mercaptans in liquified petroleum gas (LPG)**

# NITRIC OXIDE (NO)

SuHS

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | CO | 100 ppm | 0 ppm |
| Range | 0-250 ppm | $H_2S$ | 26 ppm | 35 ppm |
| Extended Linear Range | 1000 ppm | $SO_2$ | 23 ppm | 2 ppm |
| Resolution | 0.5 ppm | $NO_2$ | 20 ppm | 10 ppm |
| Deadband (UNI/POLI) | 5 ppm | $NH_3$ | 50 ppm | 0 ppm |
| $t_{90}$ Response Time | ≤30 s | Cl2 | 18 ppm | 1.5 ppm |
| Bias | +300 mV | HF | 10 ppm | ≤1 ppm |
| Temp. Range | -40 to 50°C | Isobutylene | 100 ppm | 0 ppm |
| T Effect on Zero (-20 to 50°C) | -2 to 10 ppm | Benzene | 50 ppm | 0 ppm |
| T Effect on Signal (-20 to 50°C) | ±20% | Methanol | ~1000 ppm | 0 ppm |
| Warranty | 2 years | Isopropanol | 200 ppm | 0 ppm |
| Default Alarms TWA/STEL | 25 / 25 ppm | Acetone | 200 ppm | 0 ppm |
| Calibration Gas/Bal. Gas | 25 ppm NO/Air | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
*** Nitrogen balance gas can also be used if exposure is <5 minutes.**

# NITROGEN DIOXIDE ($NO_2$)

SuCT

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | CO | 400 ppm | 0 ppm |
| Range | 0-20 ppm | NO | 30 ppm | 0 ppm |
| Extended Linear Range | 200 ppm | $NH_3$ | 50 ppm | 0 ppm |
| Resolution | 0.1 ppm | $Cl_2$ | 11 ppm | -2 ppm |
| Deadband (UNI/POLI) | 0.5 ppm | $O_3$ | 0.6 ppm | 0 ppm |
| $t_{90}$ Response Time | ≤30 s | HF | 11 ppm | 0 ppm |
| Bias | 0 mV | $H_2$ | 1000 ppm | 0 ppm |
| Temp. Range | -40 to 50°C | $H_2S$ | 25 ppm | <1 ppm |
| T Effect on Zero (-20 to 50°C) | 0.3 to -1 ppm | $SO_2$ | 5 ppm | -7 ppm |
| T Effect on Signal (-20 to 50°C) | ±20% | $SiH_4$ | 20 ppm | Neg |
| Warranty | 2 years | Isobutylene | 100 ppm | 0 ppm |
| Default Alarms TWA/STEL | 1 / 1 ppm | Benzene | 50 pm | 0 ppm |
| Calibration Gas/Bal. Gas | 5 ppm $NO_2$/Air | Methanol* | ~1000 ppm | ~10 ppm |
| | | Isopropanol* | 200 ppm | ≤6 ppm |
| | | Acetone | 200 ppm | 0 ppm |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet. * 200 Methanol reads 0.0 ppm after 2 minutes but slowly drifts upwards to several ppm and after gas removal drifts slowly back to 0.0. Isopropanol exhibits similar drifting behavior. These solvents are not expected to interfere significantly below 100 ppm.**

# NITROUS OXIDE ($N_2O$)

DyMSHia-P/N2OP

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | NDIR | $CO_2$ | 1000 ppm | <100 ppm |
| Range | 0-1000 ppm | | | |
| Extended Linear Range | | | | |
| Resolution | 10 ppm | | | |
| Deadband (UNI/POLI) | 100 ppm | | | |
| $t_{90}$ Response Time | ≤30 s | | | |
| Bias | 0 mV | | | |
| Temp. Range | -20 to 50°C | | | |
| Warm-up Time | 45 s | | | |
| T Effect on Signal (-20 to 50°C) | ±15% | | | |
| Warranty | 2 years | | | |
| Default Alarms TWA/STEL | 35† / 100 ppm | | | |
| Calibration Gas/Bal. Gas | 1000 ppm $N_2O$/Air* | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
**** Nitrogen balance gas can also be used.**
**† Sensor cannot measure below 100 ppm but can calculate TWA as an average of 35 ppm if readings go above deadband of 100 ppm temporarily.**

# OXYGEN ($O_2$)

DDOx3

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | RESPONSE |
|---|---|---|---|
| Sensor Type | Galvanic Electrochemical | ppm levels of toxics including CO, $Cl_2$, $O_3$, $NO_2$, $H_2S$, $SO_2$, VOCs, etc. | No Effect |
| Range | 0-25% Vol | | |
| Extended Linear Range | 0-30% Vol | | |
| Resolution | 0.1 % Vol | | |
| Deadband (UNI/POLI) | 0.45 / 0.55% Vol | Vol% levels of $N_2$, Ar, He, etc. | No Effect* |
| $t_{90}$ Response Time | ≤10 s | | |
| Bias | 0 mV | Vol% levels of oxidizing gases, e.g $Cl_2$ & $O_3$ | Respond equal to their oxygen equivalence |
| Temp. Range | -30 to 50°C | | |
| T Effect on Zero (-20 to 50°C) | | | |
| T Effect on Signal (-20 to 50°C) | ±12% | Acid gases, e.g. $CO_2$ & $SO_2$ | 0.3% of signal per 1% Vol $CO_2$† |
| Warranty | 2 years | | |
| Default Alarms LOW/HIGH | 19.5 / 23.5 % | | |
| Calibration Gas | 18% Vol $O_2$ for span, pure $N_2$ for zeroing | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
*** Above ~1% Vol, non-nitrogen inert gases change the diffusion rate, causing high or low readings if calibrated in air. See TA-Note 14.**
**† Cannot be used to measure continuously in >25% Vol $CO_2$ due to reaction with electrolyte.**

# OXYGEN ($O_2$) LEAD-FREE

DDOxLF

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | RESPONSE |
|---|---|---|---|
| Sensor Type | Electrochemical | Vol% levels of $N_2$, Ar, He, etc. | No Effect* |
| Range | 0-25% Vol | | |
| Extended Linear Range | 0-30% Vol | | |
| Resolution | 0.1 % Vol | | |
| Deadband (UNI/POLI) | 0.65% Vol | Vol% levels of acid gases, $CO_2$ & $SO_2$ etc. | No Effect* |
| $t_{90}$ Response Time | ≤10 s | | |
| Bias | -600 mV | | |
| Temp. Range | -40 to 60°C | | |
| T Effect on Zero (-20 to 50°C) | | | |
| T Effect on Signal (-20 to 50°C) | ±11% | | |
| Warranty | 2 years | | |
| Default Alarms LOW/HIGH | 19.5 / 23.5 % | | |
| Calibration Gas | 10% Vol $O_2$ for span, pure $N_2$ for zeroing | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
*** Above ~1% Vol, non-nitrogen gases change the diffusion rate, causing high or low readings if calibrated in air. See TA-Note 14.**

## OZONE ($O_3$)

SuCS

| PARAMETER | SPECIFICATION | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | $Cl_2$ | 5 ppm | ~5 ppm |
| Range | 0-5 ppm | $ClO_2$ | 0.5 ppm | 1.0 ppm |
| Extended Linear Range | 50 ppm | $NO_2$ | 1 ppm | 1.1 ppm |
| Resolution | 0.02 ppm | NO | 25 ppm | 3.1 ppm |
| Deadband (UNI/POLI) | 0.08 ppm | NO | 5 ppm | 0.54 ppm |
| $t_{90}$ Response Time | ≤60 s | $H_2S$ | 25 ppm | -6.4 ppm |
| Bias | 0 mV | $SO_2$ | 20 ppm | 0 ppm |
| Temp. Range | -40 to 50°C | CO | 400 ppm | 0 ppm |
| T Effect on Zero (-20 to 50°C) | 0 to -0.5 ppm | $H_2$ | 1000 ppm | 0 ppm |
| T Effect on Signal (-20 to 50°C) | ±20% | $CH_4$ | 25000 ppm | 0 ppm |
| Warranty | 1 year | | | |
| Default Alarms TWA/STEL | 0.1 / 0.1 ppm | Breath test | | Positive |
| Calibration Gas/Bal. Gas | 0.6 ppm $O_3$/Air ($O_3$ generator required)<br>2 ppm $Cl_2$ (available in gas cylinder)<br>2 ppm $NO_2$ or 5 ppm NO (in gas cylinder) | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
*** See TA Note 6 for generator options and procedures. An $O_3$ generator is preferred because response to surrogate gases can vary.**

## PHOSGENE ($COCl_2$)

SuVS

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | $Cl_2$ | 1 ppm | 0.5 ppm |
| Range | 0-1 ppm | $ClO_2$ | 1 ppm | negative |
| Extended Linear Range | 0-1 ppm | $SO_2$ | 5 ppm | 1 ppm |
| Resolution | 0.02 ppm | $H_2S$ | 5 ppm | 15 ppm |
| Deadband (UNI/POLI) | 0.03 / 0.1 ppm | CO | 100 | 0 ppm |
| $t_{90}$ Response Time | ≤120 s | NO | 18 ppm | 0 ppm |
| Bias | 0 mV | $NO_2$ | 23 ppm | -1 ppm |
| Temp. Range | -40 to 50°C | $O_3$ | 1 ppm | 0 ppm |
| T Effect on Zero (-20 to 50°C) | ±0.5 ppm | | | |
| T Effect on Signal (-20 to 50°C) | ±20% | | | |
| Warranty | 1 year | | | |
| Default Alarms TWA/STEL | 0.1 / 0.3 ppm | | | |
| Calibration Gas/Bal. Gas | 2.0 ppm $Cl_2/N_2$ (Available in gas cylinder)* or<br>1.0 ppm $Cl_2$/air (from gas generator) | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
*** This is 1 ppm phosgene equivalent. Set span value to 0.95 ppm to avoid over-range alarm at 1.00 ppm. See TA Note 6 for details.**

# PHOSPHINE ($PH_3$)

SuCS

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | $H_2S$ | 25 ppm | 20 ppm |
| Range | 0-20 ppm | $AsH_3$ | 10 ppm | 10 ppm |
| Extended Linear Range | 100 ppm | $SiH_4$ | 20.5 ppm | 6 ppm |
| Resolution | 0.05 ppm | CO | 300 ppm | 0 ppm |
| Deadband (UNI/POLI) | 0.2 / 0.5 ppm | $H_2$ | 1000 ppm | 0 ppm |
| $t_{90}$ Response Time | ≤60 s | HCN | 10 ppm | 0 ppm |
| Bias | 0 mV | $NH_3$ | 50 ppm | 0 ppm |
| Temp. Range | -40 to 50°C | NO | 18 ppm | 1 ppm |
| T Effect on Zero (-20 to 50°C) | 0 to 1 ppm | $NO_2$ | 23 ppm | 0 ppm |
| T Effect on Signal (-20 to 50°C) | ±20% | $SO_2$ | 5 ppm | 1 ppm |
| Warranty | 2 years | Isobutylene | 100 ppm | 0 ppm |
| Default Alarms TWA/STEL | 0.3 / 1 ppm | Methyl Mercaptan | 20 ppm | 1 ppm |
| Calibration Gas/Bal. Gas | 5 ppm $PH_3$/Air* | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
*** Nitrogen balance gas can also be used if exposure is <5 minutes.**

# PHOSPHINE ($PH_3$)

SuNS

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | CO | 500 ppm | 0 ppm |
| Range | 0-1000 ppm | $H_2$ | 1000 ppm | <1 ppm |
| Extended Linear Range | 2000 ppm | $NH_3$ | 40 ppm | 0 ppm |
| Resolution | 1 ppm | $SO_2$ | 5 ppm | <1 ppm |
| Deadband (POLI) | 4.5 ppm | $H_2S$ | 25 ppm | 20 ppm |
| $t_{90}$ Response Time | ≤60 s | Ethylene | 50 ppm | <1 ppm |
| Bias | 0 mV | | | |
| Temp. Range | -40 to 50°C | | | |
| T Effect on Zero (-20 to 50°C) | 0 to 10 ppm | | | |
| T Effect on Signal (-20 to 50°C) | ±20% | | | |
| Warranty | 1 year | | | |
| Default Alarms TWA/STEL | 0.3 / 1 ppm | | | |
| Calibration Gas/Bal. Gas | 100 ppm $PH_3$/Air*<br>500 ppm $H_2S$/Air* | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
*** Nitrogen balance gas can also be used if exposure is <5 minutes.**

## SULFUR DIOXIDE ($SO_2$) 0-20 AND 0-100 PPM RANGES

SuCT

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE |
|---|---|---|---|---|
| Sensor Type | Electrochemical | CO | 400 ppm | <3 ppm |
| Range | 0-20 & 0-100 ppm | $H_2$ | 2000 ppm | <8 ppm |
| Extended Linear Range | 150 ppm | NO | 20 ppm | 0 ppm |
| Resolution | 0.1 ppm | $NO_2$ | 20 ppm | <-24 ppm |
| Deadband (UNI/POLI) | 0.5 ppm | $NH_3$ | 50 ppm | 0 ppm |
| $t_{90}$ Response Time | ≤45 s | $H_2S$ | 25 ppm | 2.5 ppm** |
| Bias | 0 mV | $SiH_4$ | 20 ppm | 4 ppm |
| Temp. Range | -40 to 50°C | HF | 8 ppm | 0 ppm |
| T Effect on Zero (-20 to 50°C) | -0.1 to 1 ppm | Isobutylene | 100 ppm | 0 ppm |
| T Effect on Signal (-20 to 50°C) | ±15% | | | |
| Warranty | 2 years | | | |
| Default Alarms TWA/STEL | 2 / 5 ppm | | | |
| Calibration Gas/Bal. Gas | 5 ppm $SO_2$/Air* | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
*** Nitrogen balance gas can also be used if exposure is <5 minutes**
**** On-board filter material removes most $H_2S$ response, typically for years, but after long or high exposures, the filter may be used up.**

## TETRAHYDROTHIOPHENE (THT)

SuLS

| PARAMETER | SPECIFICATION** | CROSS-SENSITIVITY | TEST CONC. | RESPONSE ǂ |
|---|---|---|---|---|
| Sensor Type | Electrochemical | $H_2S$ | 25 ppm | 2 ppm (8 mg/m3) |
| Range | 0-40 ppm (0-147 mg/m³) | t-Butyl Mercaptan | 5 ppm | ~1.5 ppm |
| Extended Linear Range | None | CO | 500 ppm | -1 ppm (-3 mg/m3) |
| Resolution | 0.1 ppm | $NO_2$ | 23 ppm | 10 ppm (35 mg/m3) |
| Deadband (UNI/POLI) | 1.2 / 0.2 ppm | $CO_2$ | 1000 ppm | 0 |
| $t_{90}$ Response Time | ≤60 s† | $H_2$ | 1000 ppm | 0 |
| Bias | 300 mV | $N_2$ | 100% | 0 |
| Temp. Range | -40 to 50°C | | | |
| T Effect on Zero (-20 to 50°C) | 0 to 1.5 ppm | | | |
| T Effect on Signal (-20 to 50°C) | ±15% | | | |
| Warranty | 1 year | | | |
| Default Alarms TWA/STEL | 5 / 5 ppm | | | |
| Calibration Gas/Bal. Gas | 10 ppm THT/Air*<br>20 mg/m³ THT/Air* | | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**

*** Nitrogen balance gas can also be used if exposure is <5 minutes. ǂ 1 ppm THT = 3.66 mg/m3 @ 20°C**

**† 2-3 min calibration time is recommended because response rises sharply and then tails. $t_{90}$ is about 30 s for $H_2S$.**

# VOLATILE HYDROCARBONS (HCs) BY NDIR

DynMSHia

| PARAMETER | SPECIFICATION** | SPECIFICATION | CROSS-SENSITIVITY | CF** |
|---|---|---|---|---|
| Sensor Type | Infrared Absorption | Infrared Absorption | Methane | 3.3 |
| Range | 0-5% Vol $CH_4$ (0-100% LEL $CH_4$ or 0- 100% LEL VOC) | 0-100% Vol $CH_4$ ($CH_4$ only, no other VOCs for this range) | Ethane | 1.0 |
| | | | Propane | 1.0 |
| | | | Butane | 1.0 |
| Resolution | 0.025% Vol $CH_4$ (0.5% LEL CH4) | 0.5% Vol $CH_4$ | Pentane | 0.9 |
| | | | Hexane | 0.8 |
| Deadband (POLI) | 5% LEL $CH_4$ | 3% Vol | Ethylene | 3.4 |
| | | | Propylene | 1.7 |
| Accuracy | ±2% of full scale @ 20°C | | Cyclopentane | 1.6 |
| $t_{90}$ Response Time | ≤30 s @ 20°C | | Methanol | 2.2 |
| Warm-up Time | 1 min to ±2% of full scale | | Ethanol | 1.7 |
| Long Term Zero Drift | ±1% of full scale per month @ 20°C (max ±3% of full scale per year) | | Isopropanol | 1.4 |
| | | | Ethylene Oxide | 0.85 |
| Temp. Range | -20 to 50°C | | Acetone | 3.3 |
| T Effect on Signal (-20 to 50°C) | ±2% of full scale @ 0-20% full scale<br>±10% of reading @ 20-50% full scale<br>±15% of reading @ 50-100% full scale | | Methyl ethyl ketone | 1.9 |
| | | | Ethyl acetate | 1.7 |
| Sensor Life | Warranty 2 years; typical life >5 years | | Toluene | 1.2 |
| | | | Xylene | 1.5 |
| Calibration Gas/ Bal. Gas | 50% LEL $CH_4$ or Propane/Air or $N_2$* | 50% LEL CH4 or 3-pt cal with 50% LEL and 100% Vol CH4 balance Air or N2* | Chloromethane | 5.0 |
| | | | Dichloroethane | 8.6 |
| Compound Sensitivity | Responds to VOCs with C-H bonds | | Hydrogen | NR# |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
*** Cal gas type and concentration is preferably selected to be near the range of HCs to be measured. Single range 100%Vol CH4 sensor should be calibrated with 20% to 100%Vol CH4, while the Dual-Range LEL/VOL sensor is calibrated either with 2.5% Vol (50% LEL) CH4 for standard 2-pt calibration or for 3-pt calibration using 2.5% Vol (50% LEL) CH4 and 20-100%Vol CH4.**
**** CF = Vol% Correction Factor using propane calibration gas, tested up to 2.1% Vol (100% LEL) propane equivalent.**
**True Vol Concentration = Reading x CF.**
**# No response to H2.**

# VOLATILE ORGANIC COMPOUNDS (VOCs) BY PID (4-SERIES, 1/4" LAMP)

Base-MO

| PARAMETER | SPECIFICATION** | SPECIFICATION** | SPECIFICATION** |
|---|---|---|---|
| Sensor Type | Photo-ionization | Photo-ionization | Photo-ionization |
| Range | 0-200 ppm | 0-2000 ppm | 0-1000 ppm |
| Resolution | 0.01 ppm | 0.1 ppm | 0.5 ppm |
| $t_{90}$ Response Time | ≤5 s | ≤5 s | ≤5 s |
| Temp. Range | -20 to 60°C | | |
| RH Effect on Zero | ≤1% @ 90%RH | | |
| RH Effect on Signal | ≤15% @ 90%RH | | |
| Lamp Operating Life | >6000 hrs (3 yrs @ 40-hr work week) | | |
| Sensor Warranty | 1 year | | |
| Default Alarms TWA/STEL | 50 / 100 ppm | | |
| Calibration Gas/Bal. Gas | 10 ppm IBE*/Air | 100 ppm IBE*/Air | 100/1000 ppm IBE*/Air |
| Compounds Sensitivity | Responds to thousands of VOCs. See TA Note 2 for more information | | |

**** Specifications from sensor manufacturer; WatchGas monitor values may be different unless noted. See monitor data sheet.**
*** IBE = isobutylene. Calibration gas concentration is preferably selected to be near the concentration range of VOCs measured.**

# SENSOR SPECIFICATIONS AND DEFAULT CONFIGURATION SUMMARY

| SENSOR | RANGE (PPM) | RESOLUTION (PPM) | SPAN* (PPM) | LOW (PPM) | HIGH (PPM) | STEL (PPM) | TWA (PPM) | PANEL RING | RESPONSE TIME $T_{90}$(S) |
|---|---|---|---|---|---|---|---|---|---|
| CO | 0-500 | 1 | 100 | 35 | 200 | 100 | 35 | Red | 15 |
| | 0-1000 | 1 | 100 | 35 | 200 | 100 | 35 | | 15 |
| | 0-1999 | 1 | 100 | 35 | 200 | 100 | 35 | | 15 |
| $H_2S$ | 0-50 | 0.1 | 25 | 10 | 20 | 15 | 10 | Light Blue | 15 |
| | 0-100 | 0.1 | 25 | 10 | 20 | 15 | 10 | | 15 |
| | 0-200 | 0.1 | 25 | 10 | 20 | 15 | 10 | | 15 |
| | 0-1000 | 1 | 25 | 10 | 20 | 15 | 10 | | 45 |
| $NH_3$ | 0-100 | 1 | 50 | 25 | 50 | 35 | 25 | Orange | 90 |
| | 0-500 | 1 | 50 | 25 | 50 | 35 | 25 | | 90 |
| $Cl_2$ | 0-50 | 0.1 | 10 | 0.5 | 5 | 1 | 0.5 | Orange | 60 |
| $ClO_2$ | 0-1 | 0.01 | 0.5** | 0.2 | 0.5 | 0.3 | 0.1 | Orange | 120 |
| $COCl_2$ | 0-1 | 0.01 | 0.5** | 0.2 | 0.5 | 0.3 | 0.1 | Orange | 120 |
| $H_2$ | 0-1000 | 1 | 100 | 100 | 400 | 400 | 100 | Orange | 70 |
| | 0-2000 | 1 | 100 | 100 | 400 | 400 | 100 | | 70 |
| HCN | 0-100 | 0.1 | 10 | 4.7 | 5 | 4.7 | 4.7 | Orange | 120 |
| NO | 0-250 | 1 | 25 | 25 | 50 | 25 | 25 | Orange | 90 |
| $NO_2$ | 0-20 | 0.1 | 5 | 1 | 10 | 1 | 1 | Orange | 30 |
| $N_2O$ | 0-1000 | 100 | 400 | 35 | 200 | 100 | 35 | N/A | 30 |
| $PH_3$ | 0-20 | 0.01 | 5 | 1 | 2 | 1 | 0.3 | Orange | 60 |
| $PH_3$ | 0-1000 | 1 | 20/50 | 1 | 2 | 1 | 0.3 | Orange | 60 |
| $SO_2$ | 0-20 | 0.1 | 5 | 2 | 10 | 5 | 2 | Orange | 15 |
| $SO_2$ | 0-100 | 0.1 | 5 | 2 | 10 | 5 | 2 | Orange | 15 |
| ETO | 0-100 | 0.1 | 10 | 2 | 5 | 2 | 1 | Orange | 120 |
| | 0-200 | 0.1 | 10 | 2 | 5 | 2 | 1 | | 120 |
| $O_3$ | 0-5 | 0.01 | 1** | 0.2 | 0.3 | 0.1 | 0.1 | Orange | 60 |
| HF | 0-20 | 0.1 | 6** | 2 | 6 | 6 | 3 | Orange | 120 |
| HCl | 0-15 | 0.1 | 10** | 2 | 5 | 5 | 1 | Orange | 70 |
| $CH_3SH$ | 0-10 | 0.1 | 5 | 2 | 5 | 2 | 0.5 | Orange | 20 |
| $AsH_3$ | 0-1 | 0.01 | 5 ($SO_2$) | 0.2 | 0.5 | 0.3 | 0.1 | Orange | 30 |
| Acetaldehyde | 0-20 | 0.1 | 5 | 2 | 5 | 2 | 1 | Orange | 120 |
| THT | 0-40 | 0.1 | 10 | 5 | 10 | 5 | 5 | Orange | 60 |

**† Lower Detection Limit (deadband) for UNI/POLI (applies to both if only one value is given, and "-" if sensor unavailable).**
*** The default span setting equals the recommended span gas concentration.**
**** Calibration of these sensors requires a gas generator or other special precautions. See TA Note 6 for recommended procedures and gas sources. $COCl_2$ uses 1.0 ppm $Cl_2$ from a generator because this low level is unstable in cylinders.**

| SENSOR | RANGE (%) | RESOLUTION (%) | LDL† (%) | SPAN* (%) | LOW (%) | HIGH (%) | STEL (%) | TWA (%) | UNI RING COLOR | RESPONSE TIME $T_{90}$(S) |
|---|---|---|---|---|---|---|---|---|---|---|
| O2 | 0 - 25 | 0.1 | 0.45 / 0.55 | 0.0 | 19.5 | 23.5 | - | - | Dark Blue | 15 |
| | 0 - 30 | 0.1 | 0.45 / 0.55 | 0.0 | 19.5 | 23.5 | - | - | | 15 |
| O2 Lead-free | 0 - 30 | 0.1 | 0.65 | 0.0 | 19.5 | 23.5 | - | - | Dark Blue | 15 |

*** Oxygen sensors in UNI use pure nitrogen or other inert gas for both Span and Bump Test.**
**† Lower Detection Limit**

# CROSS-SENSITIVITIES AND NON-RECOMMENDED SENSOR COMBINATIONS

Most sensors respond to some extent to gases other than just the target gas. In most cases cross-sensitive gases result in high readings and therefore err in the safe direction, even if they result in a false positive alarm. A positive cross-sensitivity is sometimes useful, such as when using a $Cl_2$ gas cylinder to calibrate an $O_3$ sensor. Of more concern are gases that have a negative interference and thus give a false low response and prevent an alarm when there should be one. A common example is that of reducing gases like $NH_3$, $H_2S$ and $SO_2$ depressing the response of sensors for oxidizing gases like $Cl_2$, $ClO_2$ and $O_3$, and vice versa.

## CAUTION 1

We strongly urge users to contact WatchGas Technical Support before purchasing a unit with negatively interfering sensors.

## CAUTION 2

It is always most accurate to calibrate a sensor directly with the gas for which it is designed. Cross-sensitivities are not tested specifications when sensors are manufactured and thus may vary between individual sensors, sometimes by as much as a factor of 2.

Commonly-requested sensor combinations that require particular attention include:

- $H_2S$ and $Cl_2$ or $ClO_2$ sensors
- $NH_3$ and $Cl_2$ sensors
- $NO_2$ and $SO_2$ sensors

In addition, the following sensors have strong interferences and it is difficult to measure:

- HCN when $H_2S$ is present
- HF when HCl or $NO_2$ is present
- HCl when $H_2S$, NO, or $SO_2$ is present
- O3, $Cl_2$ $ClO_2$ and/or $NO_2$ in the presence of each other
- CO when $H_2$ is present (use the Low-$H_2$ version CO sensor to reduce interference to ~2%)

The table below provides typical percent response of non-target gases when the sensor is calibrated to its named gas.

SENSOR

| CHALLENGE GAS | $NH_3$ | CO | $Cl_2$ | $ClO_2$ | $H_2$ | HCl | HCN | HF | $H_2S$ | $CH_3SH$ | NO | $NO_2$ | $O_3$ | $PH_3$ | $SO_2$ | $CO_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $NH_3$ | +100 | | | | | | | | 0 | 0 | | | | | | |
| CO | 0 | +100 | 0 | 0 | +300 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | <1 | |
| $Cl_2$ | neg* | +5 | +100 | +60 | +5 | | 0 | pos* | | | +8 | -20 | +100 | | | |
| $ClO_2$ | | | +80 | +100 | | | | | | | | | +200 | | | |
| $H_2$ | 0 | +16 | 0 | 0 | +100 | | | | 0 | <1 | | 0 | 0 | 0 | <0.5 | |
| HCl | | | | | | +100 | | 160 | | | | | | | | |
| HCN | 0 | | | | | | +100 | 0 | 0 | 0 | | | | 0 | | |
| HF | | | | | | | | +100 | | | +10 | | | | | |
| $H_2S$ | +250 | 0 | -15 | -25 | 0 | +450 | +200 | +40 | +100 | +220 | +140 | <-4 | -25 | +80 | 0 | |
| $CH_3SH$ | +50 | | | | | | | | +35 | +100 | | | | +5 | | |
| NO | 0 | +20 | 0 | | +20 | +250 | 0 | pos* | +5 | <+2 | +100 | 0 | +10 | +5 | 0 | |
| $NO_2$ | | +3 | +100 | | +3 | | -4 | +900 | 0 | <-60 | +50 | +100 | +100 | 0 | -120 | |
| $O_3$ | | | | +300 | | | | | | | | | +100 | | | |
| $PH_3$ | 0 | | | | | | | | +40 | | | | | +100 | | |
| $SO_2$ | +120 | 0 | 0 | | 0 | +150 | +25 | 0 | +20 | <+50 | +10 | <+60 | 0 | +20 | +100 | |
| $CO_2$ | 0 | | | | | 0 | | | | | | | | | | |
| VOC | 0 | pos* | | 0 | | | | | 0 | 0.1 | | | 0 | 0 | | |

*** pos, neg = positive or negative response expected but not yet quantified**

# CALIBRATION OF CROSS-SENSITIVE SENSOR COMBINATIONS

If two cross-sensitive sensors are used in the same instrument, zero both sensors before starting any span calibration. After spanning the first sensor, be sure to allow at least a few minutes time in fresh air for the second sensor to stabilize before calibrating the latter. Then wait a few more minutes for all sensors to reach zero and then recheck the first sensor in a bump test to verify that it is still within acceptable calibration.