GfG Instrumentation, Inc.

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GfG Instrumentation
World-wide manufacturer of gas detection solutions
One of the World's Leading Manufacturers of Gas Detection Products

GfG Instrumentation mbH

- Worldwide headquarters in Dortmund, Germany
- An industry leader in development and production of gas measurement technology for over 50 years
- Founded in 1961
- Over 300 employees worldwide in 2012
GFG Instrumentation, Inc.

- Headquarters in Ann Arbor, Michigan, USA
- Responsible for manufacturing, design, and sales support for North and South America
- Originally founded in 1963 as Dynamation, Inc.

GfG Instrumentation
Exceptional designs with best cost of ownership in the gas detection industry
GiG Product Applications

- Confined space
- Fire Service
- Emergency response
- Oil industry
- Chemical industry
- Steel industry
- Water / waste water
- Sewer entry
- Telecommunications
- Municipal departments
- Refrigeration systems
- Power generation
- Pulp and paper

Portable gas detectors

Micro IV single-gas detector
G450 4-gas detector
G460 1 - 6 gas detector
MICRO IV Single Sensor Gas Detector

- Compact and affordable single gas detector
- Available for wide range of toxic gases, hydrogen or oxygen
- Stores long-term and short-term average values (TWA, STEL)
- Event logger standard
- Data logger standard
- Display backlight standard
- Vibrator alarm standard
- IR Communication Interface

MICRO IV Single Sensor Gas Detector

- Small and lightweight
- Extremely robust
- Very loud buzzer 95 dB(A)
- Bright alarm
- Easy and fast sensor replacement
- Up to 6 month continuous operation with one battery
- Leave turned on, or turn off when not in use to extend battery life
- 3 alarm thresholds per gas
- Certification: c-UL-us Intrinsically Safe for use in Class I, Div. 1, Groups A, B, C, and D Hazardous Locations
MICRO IV Single Sensor Gas Detector

- Display shows in large letters alternating:
  - Current gas and gas concentration
  - Detection range
- Confidence beep adjustable
- Keys for Switching ON/OFF
- Custom setup with configuration software

Unique attachable Micro IV motorized pump

- Simple slide on design
- Add to any Micro IV whenever needed
- Pump powered by its own alkaline battery
**Data-logging standard!**

- Logging of all event data
  - Date and time of alarm
  - Type of alarm
  - Gas concentration which triggered alarm
- Consistent storage of data
- Infrared interface for data transfer via DI 220 data transfer station

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**DI-220 Single Unit Docking / Data Transfer Station**

- Use for:
  - Calibration and bump testing
  - Instrument setup and programming
  - Download monitoring results to PC
### Automatically records exposure events

#### Event Data Device 1

<table>
<thead>
<tr>
<th>No</th>
<th>Date Time</th>
<th>Type</th>
<th>Value</th>
<th>STEL(15min)</th>
<th>TWA(8h)</th>
<th>Gas</th>
<th>BAT</th>
<th>MK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>28.08.2006 16:05</td>
<td>Dev-OFF</td>
<td>33</td>
<td>0</td>
<td>0 ppm CO</td>
<td>85%</td>
<td>343-05 48563</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>28.08.2006 16:08</td>
<td>Dev-ON</td>
<td>73</td>
<td>0</td>
<td>0 ppm CO</td>
<td>90%</td>
<td>343-05 48563</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>28.08.2006 16:13</td>
<td>A1 ON</td>
<td>29</td>
<td>1</td>
<td>0 ppm CO</td>
<td>75%</td>
<td>343-05 48563</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>28.08.2006 16:13</td>
<td>A2 ON</td>
<td>0</td>
<td>1</td>
<td>0 ppm CO</td>
<td>85%</td>
<td>343-05 48563</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>28.08.2006 16:14</td>
<td>A1 OFF</td>
<td>1</td>
<td>0</td>
<td>0 ppm CO</td>
<td>80%</td>
<td>343-05 48563</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>28.08.2006 16:14</td>
<td>A2 OFF</td>
<td>29</td>
<td>1</td>
<td>0 ppm CO</td>
<td>90%</td>
<td>343-05 48563</td>
<td></td>
</tr>
</tbody>
</table>

### Event Data Device 2

<table>
<thead>
<tr>
<th>No</th>
<th>Date Time</th>
<th>Type</th>
<th>Value</th>
<th>STEL(15min)</th>
<th>TWA(8h)</th>
<th>Gas</th>
<th>BAT</th>
<th>MK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>28.08.2006 16:05</td>
<td>Dev-OFF</td>
<td>54</td>
<td>0</td>
<td>0 ppm CO</td>
<td>65%</td>
<td>343-05 48568</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>28.08.2006 16:08</td>
<td>Dev-ON</td>
<td>90</td>
<td>0</td>
<td>0 ppm CO</td>
<td>70%</td>
<td>343-05 48568</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>28.08.2006 16:13</td>
<td>A1 ON</td>
<td>25</td>
<td>0</td>
<td>0 ppm CO</td>
<td>70%</td>
<td>343-05 48568</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>28.08.2006 16:13</td>
<td>A1 OFF</td>
<td>54</td>
<td>0</td>
<td>0 ppm CO</td>
<td>55%</td>
<td>343-05 48568</td>
<td></td>
</tr>
</tbody>
</table>

### Automatically records time stamped monitoring results

#### DS220 Data

<table>
<thead>
<tr>
<th>DV-SN</th>
<th>DV-ID</th>
<th>Sensor</th>
<th>BAT</th>
<th>Ver</th>
<th>Conf. Blip</th>
<th>DS-SN</th>
<th>DS-Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>GfG</td>
<td>MK343-05/48568</td>
<td>70</td>
<td>2.14</td>
<td>OFF</td>
<td>6070887</td>
<td>2.06</td>
</tr>
<tr>
<td>4</td>
<td>GfG</td>
<td>MK343-05/48563</td>
<td>90</td>
<td>2.14</td>
<td>OFF</td>
<td>6070887</td>
<td>2.06</td>
</tr>
<tr>
<td>6</td>
<td>GfG</td>
<td>MK343-05/48567</td>
<td>95</td>
<td>2.14</td>
<td>OFF</td>
<td>6070887</td>
<td>2.06</td>
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<tr>
<td>5</td>
<td>GfG</td>
<td>MK343-05/48570</td>
<td>45</td>
<td>2.14</td>
<td>OFF</td>
<td>6070887</td>
<td>2.06</td>
</tr>
<tr>
<td>2</td>
<td>GfG</td>
<td>MK343-05/48568</td>
<td>70</td>
<td>2.14</td>
<td>OFF</td>
<td>6070887</td>
<td>2.06</td>
</tr>
<tr>
<td>6</td>
<td>GfG</td>
<td>MK343-05/48567</td>
<td>95</td>
<td>2.14</td>
<td>OFF</td>
<td>6070887</td>
<td>2.06</td>
</tr>
<tr>
<td>4</td>
<td>GfG</td>
<td>MK343-05/48563</td>
<td>90</td>
<td>2.14</td>
<td>OFF</td>
<td>6070887</td>
<td>2.06</td>
</tr>
</tbody>
</table>

#### Test parameter

<table>
<thead>
<tr>
<th>Test Gas Gas Bottle</th>
<th>Test Date Time</th>
<th>Mode</th>
<th>Test Ready</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 ppm CO</td>
<td>IC-39MNRC 28.08.2006 15:52</td>
<td>Bump</td>
<td>Yes</td>
</tr>
<tr>
<td>200 ppm CO</td>
<td>IC-39MNRC 28.08.2006 15:52</td>
<td>Bump</td>
<td>Yes</td>
</tr>
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<td>Bump</td>
<td>Yes</td>
</tr>
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<td>Bump</td>
<td>Yes</td>
</tr>
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<td>Bump</td>
<td>Yes</td>
</tr>
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<td>200 ppm CO</td>
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<td>Bump</td>
<td>Yes</td>
</tr>
<tr>
<td>200 ppm CO</td>
<td>IC-39MNRC 28.08.2006 15:52</td>
<td>Bump</td>
<td>Yes</td>
</tr>
<tr>
<td>200 ppm CO</td>
<td>IC-39MNRC 28.08.2006 15:52</td>
<td>Bump</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Setup choices

Docking Station Micro IV DS-220

- Automatic Teast Station for Micro IV
- Auto Bump test
- Auto Calibration
- Bump or calibrate up to six instruments at the same time
- Test results automatically results stored on MMC flash memory card
**DS 220 Docking “Station”**

- Complete device management system:
  - Automatic bump test
  - Automatic calibration adjustment
  - Programming interface
  - Data transfer

- Easy operation
  - Push green button for “Bump Test”
  - Push red button for “Auto Calibration” adjustment

- Test up to 6 detectors simultaneously
- No PC required!

**DS 220 Docking Station**

- Automatically stores results:
  - Battery capacity
  - Alarm thresholds
  - Visual alarm
  - Audible alarm
  - Serial number (detector)
  - Sensor serial number
  - Software version
  - Detector identification
  - Faults
  - Alarm list
  - “Event record” with gas concentration and alarm status
  - Response time for alarm 1 and alarm 2
Test Results

- **LED indicators signal test results:**
  - **Green** = Detector OK
  - **Yellow** = Test in process
  - **Red** = Test failed

Calibration adjustment

- **Press red key to start automatic calibration**
- **Up to 6 instruments can be adjusted simultaneously**
- **No mishandling possible**
- **Shorter waiting time, faster completion!**
Test result

<table>
<thead>
<tr>
<th>Test</th>
<th>BUMP test</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Horn Error T-A1 T-A2 T-50%</td>
<td>ZPT-before</td>
</tr>
<tr>
<td>Ok</td>
<td>3,2</td>
<td>4,2</td>
</tr>
<tr>
<td>Ok</td>
<td>2,7</td>
<td>3,7</td>
</tr>
<tr>
<td>Ok</td>
<td>2,4</td>
<td>3,4</td>
</tr>
<tr>
<td>Ok</td>
<td>1,4</td>
<td>3,4</td>
</tr>
</tbody>
</table>

Ok 3,2 4,2 7,2
Ok 2,7 3,7 5,7
Ok 2,4 3,4 6,4
Ok 1,4 3,4 5,4

- T-A1
- T-A2
- T-50%
- ZPT-before
- SPAN-before
- ZPT-akt
- SPAN-akt

MICRO IV Single Sensor Gas Detector

- Available for use with a wide range of dependable, substance specific electrochemical sensors
- O₂, CO and H₂S sensors warranted for 3-full years
- Optional range and resolution available for many sensors
- Plug-and-play sensor design makes changing or replacing sensors a snap
Substance-specific electrochemical sensors

- Gas diffusing into sensor reacts at surface of the sensing electrode
- Sensing electrode made to catalyze a specific reaction
- Use of selective external filters further limits cross sensitivity

Available electrochemical sensors, standard ranges and resolution

- More types of EC sensors available every year, both for individual toxic gases as well as sensors designed to detect a range of toxic or combustible gases
Additional gases detectable by means of relative response

- Electrochemical sensors are designed with specific usage requirements in mind
- The same manufacturer may offer multiple models of sensor for the detection of the same gas, but that are optimized for different sets of interferents and operating conditions
- Thus, cross sensitivities may vary widely between different models and brands of sensors!
- In addition, response values may differ at concentrations other than the ones listed in product documentation
- Discuss with manufacturer BEFORE attempting to use relative response values to measure additional gases

<table>
<thead>
<tr>
<th>Name</th>
<th>Formula</th>
<th>Sensitivity (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaldehyde</td>
<td>C₂H₅O</td>
<td></td>
</tr>
<tr>
<td>Acetic acid</td>
<td>CH₃CO₂H</td>
<td></td>
</tr>
<tr>
<td>Acrylic acid</td>
<td>C₅H₉O₇</td>
<td></td>
</tr>
<tr>
<td>Acrylonitrile</td>
<td>C₅H₈N₂</td>
<td></td>
</tr>
<tr>
<td>Acrylic acid</td>
<td>C₅H₈N₂</td>
<td></td>
</tr>
<tr>
<td>Acrolein</td>
<td>C₅H₈O</td>
<td></td>
</tr>
<tr>
<td>Acrylonitrile</td>
<td>C₅H₈N₂</td>
<td></td>
</tr>
<tr>
<td>Acrylic acid</td>
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</tr>
<tr>
<td>Acrolein</td>
<td>C₅H₈O</td>
<td></td>
</tr>
</tbody>
</table>

Typical Electrochemical Detection Mechanism

H₂S Sensor:

Hydrogen sulfide is oxidized at the sensing electrode:

\[ \text{H}_2\text{S} + 4\text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4 + 8\text{H}^+ + 8\text{e}^- \]

The counter electrode acts to balance out the reaction at the sensing electrode by reducing oxygen present in the air to water:

\[ 2\text{O}_2 + 8\text{H}^+ + 8\text{e}^- \rightarrow 4\text{H}_2\text{O} \]

And the overall reaction is: \( \text{H}_2\text{S} + 2\text{O}_2 \rightarrow \text{H}_2\text{SO}_4 \)

4HS Signal Output: 0.7 \( \mu \) A / ppm H₂S
Notable recent gas and vapor TLV® updates

- Hydrogen sulfide (2010)
- Sulfur dioxide (2009)
- Nitrogen dioxide (2012)
Exposure limits for $\text{H}_2\text{S}$

- **Old TLV:**
  - $\text{TWA} = 10 \text{ ppm}$
  - $\text{STEL} = 15 \text{ ppm}$

- **New (2010) TLV:**
  - $\text{TWA} = 1.0 \text{ ppm}$
  - $\text{STEL} = 5.0 \text{ ppm}$

Are $\text{H}_2\text{S}$ sensors capable of measuring at the new TLV limits?

- The answer is “Yes” BUT with qualifications.....
  - Depends on the manufacturer!
  - Sensor must be capable of providing 0.1 or 0.2 ppm resolution
  - Instrument design must permit setting the alarms at the desired concentration
  - Micro IV designed for measurement at TLV concentration limits!
Where should you set the H₂S alarms?

- H₂S TLV® only includes STEL and TWA limits; does not include a Ceiling or “Peak” limit
- Instruments typically have four user settable alarms for each toxic sensor (Low, High, STEL and TWA)
- Suggested alarms:
  - NIOSH:
    - Low: 10.0 ppm
    - High: 15.0 ppm
    - STEL: 15.0 ppm
    - TWA: 10.0 ppm
  - TLV®:
    - Low: 3.0 ppm
    - High: 5.0 ppm
    - STEL: 5.0 ppm
    - TWA: 1.0 ppm

Exposure limits for SO₂

- OSHA PEL:
  - TWA = 5.0 ppm
- NIOSH REL:
  - TWA = 2.0 ppm
  - STEL = 5.0 ppm
- Old TLV:
  - TWA = 2 ppm
  - STEL = 5 ppm
- New (2009) TLV:
  - STEL = 0.25 ppm
**Suggested alarm settings for SO$_2$**

- **Suggested alarms:**
  - **NIOSH:**
    - Low: 2.0 ppm
    - High: 5.0 ppm
    - STEL: 5.0 ppm
    - TWA: 2.0 ppm
  - **TLV®:**
    - Low: 0.75 ppm
    - High: 1.25 ppm
    - STEL: 0.25 ppm
    - TWA: 0.25 ppm

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**Exposure limits for NO$_2$**

- **US OSHA PEL:**
  
  Ceiling = 5 ppm

- **US NIOSH REL:**
  
  15 min. STEL = 1 ppm

- **Old TLV:**
  
  8 hr. TWA = 3 ppm
  5 min. STEL = 5 ppm

- **New 2012 TLV**
  
  8 hr. TWA = 0.2 ppm
Suggested alarm settings for NO\textsubscript{2}

- **Suggested alarms:**
  - **NIOSH:**
    - Low: 3.0 ppm
    - High: 5.0 ppm
    - STEL: 1.0 ppm
    - TWA: 1.0 ppm
  - **TLV\textsuperscript{®}**:
    - Low: 0.6 ppm
    - High: 1.0 ppm
    - STEL: 0.2 ppm
    - TWA: 0.2 ppm

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**Sales Support:**

www.Goodforgas.com

- Data sheets
- Price lists
- Manuals
- Application Notes
- Product images
- Print ads ...and more!
Questions?