LANDFILL GAS

This appendix contains multiple sources of information regarding landfill gas.

1. CEC Landtec GEM 2000 Portable Gas Analyzer Flysheet. This is a commonly used gas analyzer used at landfill facility gas extraction and detection wells.

2. Safe T Net 100 Single Point Gas Monitor Flysheet. This is commonly used for continuous monitoring of combustible gases, toxic gases or oxygen at one location for the protection of workers and property.
Landfill Gas Monitor

Landtec GEM™ 2000

The GEM™ 2000 is designed for analyzing LFG composition and calculating flow. The GEM™ 2000 combines the capabilities of the now discontinued GA-90 for monitoring gas migration probes and the GEM™ 500 for monitoring gas extraction systems. The GEM™ 2000 is certified intrinsically safe and offers improved speed and accuracy.

FEATURES

- **Diverse Field Applications** - Monitors migration control systems, gas extraction systems, flares, migration probes, and more.
- **Gas Extraction Monitor Mode** - Provides automatic sampling and analysis of gas composition by volume CH₄, CO₂, O₂ and balance gas, % LEL CH₄, temperature (with optional probe), static pressure, differential pressure, and barometric pressure. Calculates gas flow rates (SCFM) as well as BTU content.
- **Landfill Gas Analyzer Mode** - Provides automatic sampling and analysis of gas composition by volume CH₄, CO₂, O₂ and balance gas, % LEL CH₄, temperature (with optional probe), barometric pressure and relative pressure. Can be used for data logging, with user programmed intervals.
- **Easy to Read Display** - Extra large backlit LCD shows up to five gases, atmospheric and gas vacuum pressure, temperature, ID code - all at the same time.
- **Quick Analysis** - Completes sampling and displays gas analysis and flow results in less than one minute.
- **Infrared Gas Analyzer** - Provides accurate measurements of methane (CH₄), and carbon dioxide (CO₂).
- **Gas Temperature** - Read when using optional temperature probe or can be entered manually.
- **Durable Oxygen Sensor** - Provided by the galvanic cell principle, not influenced by other gases (i.e. CH₄, CO₂, CO, SO₂ or H₂S).
- **User Friendly On-Screen Menu** - In each mode the user performs most operations in just two screens.
- **PC Data Downloading** - Provided by RS232 interface with DataField CS software (Release 3.0 or later).
- **Data Storage/Retrieval** - Stores prior measurements taken for each monitoring point, 999 monitoring points total.
- **Date/Time Stamp** - Recorded for all stored data.
- **Prior Data Recall** - Allows user to view prior data for each monitoring point.
- **Methane Analysis** - Displayed as either % CH₄ by volume or LEL CH₄ (Landfill Gas Analyzer Mode only).
- **Durable Construction** - Built of strong, durable plastic material suitable for harsh landfill environments.
- **All Weather Use** - Designed to operate in extremes from 32°F to 104°F. Sealed, weather-tight case.
- **Built-in Adjustable Alarms** - Allows user to set alarm limits for CH₄ and O₂.
- **Rechargeable Batteries** - Internal, rechargeable nickel metal hydride batteries are standard.
- **Operating Time** - Approximately 8 hours with normal pump usage (approximately 10 hours without pump running).
- **Fast Recharge Time** - Approximately 3 hours from complete discharge.
- **Battery Check** - Battery life is continuously displayed.
- **Monitoring Point ID Codes** - Provides alphanumeric identification of monitoring points for data storage and recall.
- **ID Comments** - Allows user to answer up to 3 questions with a list of 9 potential answers each.
- **Imperial vs. SI Units** - Can display measurements in Imperial (USA) or SI (metric) units.
- **Interfaces to DataField Management Software** - Which provides statistical analysis and reporting of LFG data.

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Safe T Net 100
Single Point Gas Monitor
Continuous monitoring control system

Overview

Thermo Electron's Safe T Net 100 is the ideal instrument for continuous monitoring of combustible gases, toxic gases or oxygen at one location for the protection of workers and property. Microprocessor-controlled electronics provide simple operation and complete flexibility for selecting alarm logic and alarm thresholds. Thus, it is highly suitable for a wide variety of industrial and commercial applications.

Key Features

- Low maintenance, simple operation
- Two user settable alarm points and relays for activating external devices
- Reliable, field-proven detectors (sample-draw or diffusion style available)
- Durable weather and corrosion proof. NEMA 4X enclosure
- Industry standard 4 to 20 mA output provides interface to recorders, data loggers and plant-wide control systems
- External amplifier models, with internal amplifier versions available for oxygen, LEL, carbon monoxide and hydrogen disulfide

A wide range of transmitters are available:

Optional Accessories

- Duct mounting adapter (combustibles)
- Explosion proof, air aspirated pump (combustibles)
- Line cord with cable bushing (9 ft.)
- DC power supply with backup battery
- Signal horn, 115 VAC (weatherproof, non-hazardous areas)
- Red beacon, 115 VAC (non-hazardous areas)
- Calibration kits
# T Net 100 Product Specifications

## Power
- **AC Input**: 100 to 130 VAC, 50/60 Hz or 200 to 260 VAC, 50/60 Hz (specify input when ordering)
- **DC Input**: 12 to 16 VDC (1A maximum)

## Output
- **Recorder**: 4 to 20 mA, 400 Ohm impedance maximum
- **Alarm Relays**: One set of SPDT (Form C) contacts for each alarm level (Warn/Alarm and Fail conditions)
- **Audible Alarm**: Case-mounted buzzer, 94 dB at 1 ft., pulsing for Warn and Alarm, continuous for Fail
- **Display**: Three digit, red LED
- **Status Indication**: Four color coded LED's
  - *Fail*: Yellow - Sensor malfunction, down scale reading, open sensor wiring
  - *Pilot*: Green - Instrument powered on
  - *Warn*: Orange - Low level threshold exceeded
  - *Alarm*: Red - High level threshold exceeded

## Controls
- **Potentiometer**: Zero, Span, Warn and Alarm levels. Alarm delay adjustment
- **Push Buttons**: Case-mounted external reset switch, resets latched alarms and acknowledges Warn alarms.
  - Internal calibration alarm disable (5 min.)
- **Logic**: Latching or auto-resetting (switch selected). Increasing or decreasing alarm (switch selected). Time delay 0-16 sec. (adjusted by potentiometer)
- **DIP Switches**: Alarm logic and relay operation

## Environmental
- **Operating Temp.**: -4°F to 113°F (-20°C to 45°C)
- **Relative Humidity**: 0 to 95% RH, non-condensing

## Physical
- **Dimensions**: 10.94" (L) x 8.5" (W) x 6.5" (H)
- **Weight**: 6.2 lbs. (2.3 kg)
- **Enclosure**: Rating NEMA 4X, gray fiberglass with blue panel overlay
- **Conduit**: 3/4 in. NPT, two hubs provided
- **Wire Terminations**: Screw type terminal blocks, 12-gauge wire maximum

## Area Classification
- General purpose (combustible gas detectors can be mounted remotely in hazardous areas)

## Approvals
- **Combustible gas sensor** (part# 61-0101) approved for Class I, Division 1, Groups A, B, C and D

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### Gas Limitations

<table>
<thead>
<tr>
<th>Gas</th>
<th>Formula</th>
<th>Standard Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>0 to 100 ppm</td>
</tr>
<tr>
<td>Arsine</td>
<td>AsH₃</td>
<td>0 to 1.00 ppm</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>CO</td>
<td>0 to 500 ppm</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>0 to 5.00 ppm</td>
</tr>
<tr>
<td>Chlorine Dioxide</td>
<td>Cl₂O₅</td>
<td>0 to 2.00 ppm</td>
</tr>
<tr>
<td>Combustibles</td>
<td></td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>Diborane</td>
<td>B₂H₆¿</td>
<td>0 to 1.00 ppm</td>
</tr>
<tr>
<td>Fluorine</td>
<td>F₂</td>
<td>0 to 10.0 ppm</td>
</tr>
<tr>
<td>Hydrogen Chloride</td>
<td>HCl</td>
<td>0 to 30.0 ppm</td>
</tr>
<tr>
<td>Hydrogen Cyanide</td>
<td>HCN</td>
<td>0 to 50.0 ppm</td>
</tr>
<tr>
<td>Hydrogen Fluoride</td>
<td>HF</td>
<td>0 to 15.0 ppm</td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>H₂S</td>
<td>0 to 100 ppm</td>
</tr>
<tr>
<td>Nitric Oxide</td>
<td>NO</td>
<td>0 to 100 ppm</td>
</tr>
<tr>
<td>Nitrogen Dioxide</td>
<td>NO₂</td>
<td>0 to 20.0 ppm</td>
</tr>
<tr>
<td>Oxygen</td>
<td>O₂</td>
<td>0 to 30.0% Vol.</td>
</tr>
<tr>
<td>Ozone</td>
<td>O₃</td>
<td>0 to 1.00 ppm</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>0 to 1.00 ppm</td>
</tr>
<tr>
<td>Silane</td>
<td>SiH₄</td>
<td>0 to 15.0 ppm</td>
</tr>
<tr>
<td>Sulfur Dioxide</td>
<td>SO₂</td>
<td>0 to 20.0 ppm</td>
</tr>
</tbody>
</table>

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