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## Applications

The DigitalFlow GF868 flowmeter is a complete ultrasonic flow metering system for:

- Flare gas
  - Track down or prevent losses from leakage with positive material identification
  - Account for total plant throughput of material
  - Reduce cost of steam usage with proportional control
  - Conserve energy by eliminating unnecessary flaring
  - Comply with government regulations for pollution control
- Vent gas

## Features

- Measures velocity, volumetric and mass flow
- Measures instantaneous average molecular weight
- Measures hydrocarbon gases
- Minimal maintenance due to no moving parts, no holes or tubes, and tolerance to dirty or wet conditions
- Delivers accurate flow rate, independent of gas composition
- Measures very low to very high velocity
- Field-proven installation techniques
- Built-in totalizers
- Built-in power supply for pressure and temperature transmitters
- 2750 to 1 turndown ratio

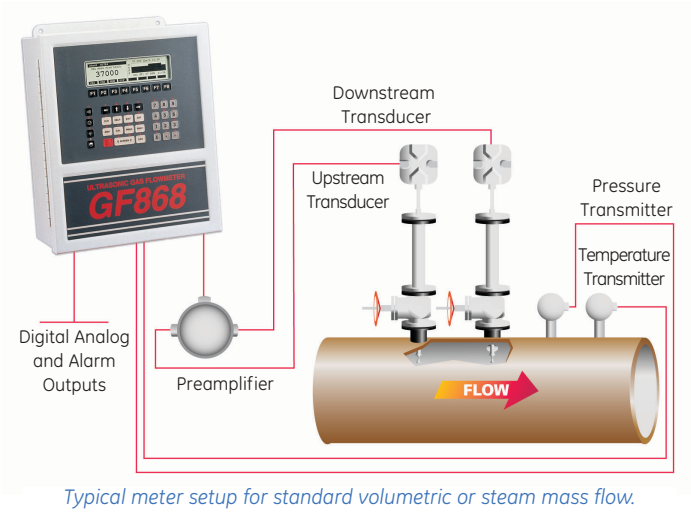
# DigitalFlow™ GF868

## Panametrics Flare Gas Mass Ultrasonic Flowmeter


DigitalFlow GF868 is a Panametrics product. Panametrics has joined other GE high-technology sensing businesses under a new name– GE Industrial, Sensing

## Flare Gas Mass Flowmeter

The DigitalFlow GF868 ultrasonic flowmeter uses the patented Correlation Transit-Time™ technique, digital signal processing, and an accurate method of calculating molecular weight. Add to these features the inherent advantages of ultrasonic flow measurement—reliability with no routine maintenance, high accuracy, fast response, wide rangeability—and the DigitalFlow GF868 flowmeter is the clear choice for flare gas applications.




*Typical meter setup for standard volumetric or steam mass flow.*

## Patented Molecular Weight Measurement Method

The DigitalFlow GF868 uses a patented method for calculating the average molecular weight of hydrocarbon mixtures. This proprietary algorithm extends the range for measuring average molecular weight, while improving accuracy and compensating for nonhydrocarbon gases better than ever before possible. Higher accuracy mass flow data and more precise knowledge of flare gas composition can improve the efficiency of plant operation, enabling correct metering of steam injection at the flare tip, rapid trouble-shooting of leaks into the flare stream, early detection of process control problems, and accurate plant balance.

## Best Technology for Flare Gas

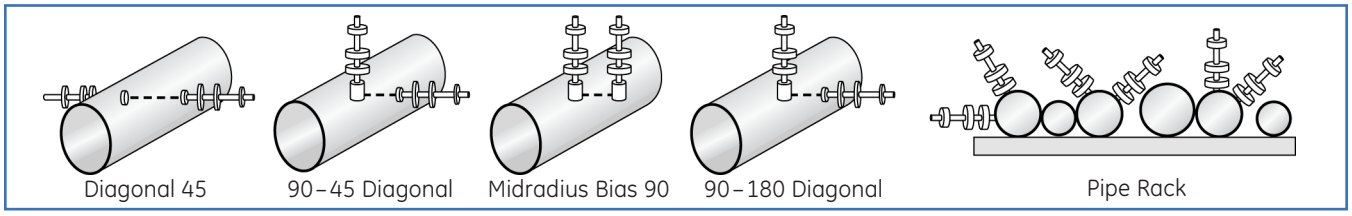
Ultrasonic flow measurement, the ideal technology for flare gas applications, is independent of gas properties, and does not interfere with the flow in any way. All-metal ultrasonic transducers installed in the pipe send sound pulses upstream and downstream through the gas. From the difference in these transit times between the transducers, with and against the flow, the DigitalFlow GF868's onboard computer uses advanced signal processing and correlation detection to calculate velocity, and volumetric and mass flow rate. Temperature and pressure inputs enable the meter to calculate standard volumetric flow. For maximum accuracy, use the two-channel version and measure along two different paths at the same location. The two-channel meter can also measure the flow in two separate pipes or at two different places on the same pipe.

## One Meter, Wide Range of Flow Conditions

The DigitalFlow GF868 meter achieves rangeability of 2750 to 1. It measures velocities from 0.1 to 275 ft/s (0.03 to 85 m/s) in both directions, in steady or rapidly changing flow, in pipes from 3 in to 120 in (76 mm to 3 m) in diameter. With this range of operation, one DigitalFlow GF868 flowmeter performs measurements under most of the conditions that may occur in a flare line.

## Simple Installation

The flowmeter system consists of a pair of transducers for each channel, preamplifiers, and an electronics console. The transducers can be installed as part of a flowcell, or directly into the pipe with a hot- or cold-tapping procedure. The electronics console of the DigitalFlow GF868 meter can be located up to 1,000 ft (300 m) from the transducers.




*Standard transducer mounting configurations*

## Identify Leak Sources, Reduce Steam Usage and Improve Plant Material Balance

Leaks and excess steam delivery are two major causes of loss of product and energy. Reducing them immediately improves the overall efficiency in refinery and chemical plant operation. Payback for the entire DigitalFlow GF868 installation usually occurs within a matter of months. In the long term, the DigitalFlow GF868 can help save millions of dollars in reduced losses.

Once the sound speed of the gas has been determined by the DigitalFlow GF868, its on-board computer uses temperature and pressure inputs in conjunction with the sound speed to calculate instantaneous average molecular weight and mass flow rate of the gas. These parameters are used to help identify sources of leaks into the flare system. Detection of even a small increase in flow rate into the flare system may indicate a leak source such as partially unseated relief valve. An accompanying change in the average molecular weight of the flare gas may be used to help locate the leak source. Quick identification and elimination of leak sources into the flare system saves significant amounts of potentially lost energy and product.

Mass flow rate may be used to perform a mass balance calculation and to control flare tip steam injection. By knowing the exact amount of gas flow and average molecular weight in the flare stack, delivery of the correct amount of steam required at the flare tip can be accurately controlled. Steam usage can be reduced while maintaining compliance with pollution control regulations.

## Correlation Transit-Time Technology Is Ideal for Flare Gas Flow Measurement

The DigitalFlow GF868 uses the patented Correlation Transit-Time technique that has distinct advantages over other methods of flare gas flow measurement, and it is used to solve a variety of difficult problems. Typically, gas in flare stacks, headers or laterals, is a mixture of components from different sources. Flow rate in flare systems may be unsteady or even bidirectional. Pulsating pressure, varying composition and temperature, harsh environment, and wide flow range further complicate the measurement. The GF868 is designed for superior performance under these conditions.

## Designed for Flare Gas Environment

The DigitalFlow GF868 flowmeter has no moving parts to clog or wear out. Its patented ultrasonic transducers are constructed of titanium or other metals that withstand the corrosive environment usually found in flare gas applications. The transducers are designed for use in hazardous locations. Wide rangeability allows measurement of flow rate from 0.1 up to 275 ft/s (0.03 to 85 m/s). In contrast to thermal flowmeters, the ultrasonic transit-time technique does not depend on the heat transfer coefficient of the flare gas and does not require regular maintenance. These and other features make the DigitalFlow GF868 unique among flare gas flowmeters.

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# GF868 Specifications

## Operation and Performance

**Fluid Types**
Flare and vent gases

**Pipe Sizes**
2 in to 120 in NB (50 mm to 3,000 mm) and larger

**Pipe Materials**
All metals. Consult GE for other materials.

**Flow Accuracy (Velocity)**
- One-path measurement: ±2% to 5% of reading at ±1 to 275 ft/s (±0.3 to 85 m/s)
- Two-path measurement: ±1.4% to 3.5% of reading at ±1 to 275 ft/s (±0.3 to 85 m/s)

**Molecular Weight Accuracy (Hydrocarbon Mixtures)**
MW 2 to 120 gr/gr mole/±1.8%, optimizable for other gas compositions

**Mass Flow Accuracy (Hydrocarbon Mixtures)**
- One-path: 3% to 7%
- Two-path: 2.4% to 5%

*Dependent on accuracy of temperature and pressure inputs.*

*Accuracy depends on pipe size and whether measurement is one-path or two-path. Accuracy to ±0.5% of reading may be achievable with process calibration.*

**Repeatability**
±1% at 5 to 100 ft/s (15cm/s to 30 m/s)

**Range (Bidirectional)**
–275 to 275 ft/s (–84 to 84 m/s)

**Rangeability (Overall)**
2750:1

*Specifications assume a fully developed flow profile (typically 20 diameters upstream and 10 diameters downstream of straight pipe run) and flow velocity greater than 3 ft/s (1 m/s).*

**Measurement Parameters**
Mass flow, standard and actual volumetric flow, totalized flow, and flow velocity

## Electronics

**Flow Measurement**
Patented Correlation Transit-Time mode

**Enclosures**
- Standard: Epoxy-coated aluminum weatherproof Type 4X/IP66 Class I, Division 2, Groups A,B,C&D FM and CSA
- Optional: Stainless steel, fiberglass, explosion-proof, flameproof

**Dimensions**
- Weight 11 lb (5 kg)
- Size (h x w x d) 14.24 in x 11.4 in x 5.12 in (362 mm x 290 mm x 130 mm)


*DigitalFlow GF868 field installation on a typical flare system. Insert shows transducers installed on the flare header that leads to the flare stack.*

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# GF868 Specifications

### Channels
- Standard: One channel
- Optional: Two channels (for two pipes or two-path averaging)

### Display
Two independent software-configurable 64 x 128 pixel backlit LCD graphic displays

### Keypad
39-key tactile-feedback membrane

### Power Supplies
- Standard: 100 to 130 VAC, 50/60 Hz or 200 to 265 VAC, 50/60 Hz
- Optional: 12 to 28 VDC, ±5%

### Power Consumption
20W maximum

### Operating Temperature
–4°F to 131°F (–20°C to 55°C)

### Storage Temperature
–67°F to 167°F (–55°C to 75°C)

### Standard Inputs
Two isolated 0/4 to 20 mA inputs (121 Ω) with integral 24 VDC power supply

*For required temperature and pressure inputs*

### Standard Outputs
- Six 4 to 20 mA outputs, software assignable two outputs for 550 Ω maximum load
- Four outputs for 1000 Ω maximum load.

### Optional Inputs/Outputs
There are four additional slots available for any combination of the following I/O boards:

- Analog outputs: Select up to three additional output boards, each with four isolated 0/4 to 20 mA outputs, 1 kΩ maximum load
- Analog inputs: Select up to three boards of one of the following types:
  - Analog input board with two isolated 4 to 20 mA inputs and 24V loop power
  - RTD input board with two isolated, three-wire, RTD inputs; span –148°F to 662°F (–100°C to 350°C); 100 Ω Pt
- Totalizer/frequency outputs: Select up to three totalizer/frequency output boards, each with four outputs per board, 10-kHz maximum. All boards allow software-selectable functioning in two modes:
  - Totalizer mode: Pulse per defined unit of parameter (e.g., 1 pulse/$ft^3$)
  - Frequency mode: Pulse frequency proportional to magnitude of parameter (e.g., 10 Hz = 1 $ft^3$/h)
- Alarm relays: Select up to two boards of one of the following types:
  - General purpose: Relay board with three Form C relays; 120 VAC, 28 VDC maximum, 5A maximum; DC 30W maximum, AC 60 VA
  - Hermetically sealed: Relay board with three hermetically sealed Form C relays; 120 VAC, 28 VDC maximum, 2A maximum; DC 56W maximum, AC 60 VA

### Digital Interfaces
- Standard: RS232
- Optional: RS485 (multiuser)
- Optional: HART® protocol
- Optional: Modbus® protocol
- Optional: Ethernet TCP/IP

### Site Parameter Programming
Menu-driven operator interface using keypad and “soft” function keys

### Data Logging
Memory capacity (linear and/or circular type) to log more than 43,000 flow data points

### Display Functions
- Graphic display shows flow in numerical or graphic format
- Displays logged data and diagnostics

### European Compliance
Complies with EMC Directive 89/336/EEC, 73/23/EEC LVD (Installation Category II, Pollution Degree 2) and PED 97/23/EC for DN<25

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# GF868 Specifications

## Wetted Flow Ultrasonic Transducers

**Transducer Type**
- Standard: T5
- Optional: Other types available upon request

**Temperature Ranges**
- Standard: –94°F to 300°F (–70°C to 150°C)
- Optional
  - High temperature: –94°F to 536°F (-70°C to 280°C)
  - Low temperature: -364°F to 248°F (-220°C to 120°C)

**Pressure Range**
0 to 1500 psig (1 to 105 bar)

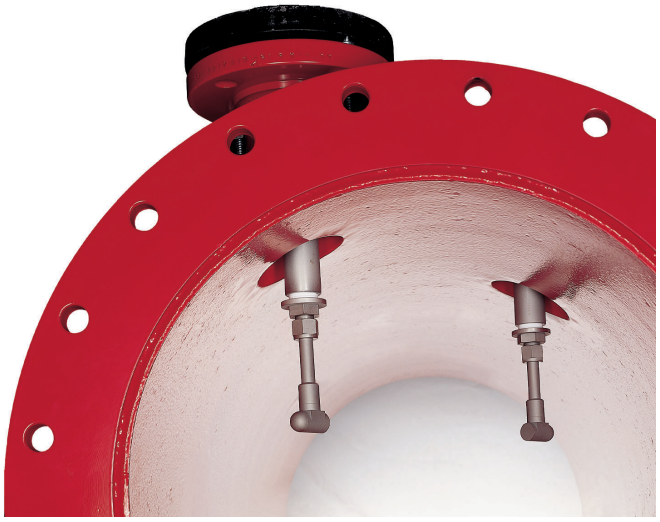
**Transducer Materials**
- Standard: Titanium
- Optional: Monel® or Hastelloy® alloys

**Process Connections**
Flanged and compression fittings

**Mountings**
Flanged flowcell, hot tap or cold tap

**Area Classifications**
- Standard: General purpose
- Optional: Weatherproof Type 4X/IP65
- Optional: Explosion-proof Class I, Division 1, Groups C&D
- Optional: Flameproof
  Ex II 2 G EEx d IIC T6

*Transducers and flowcells for specific applications are available. Consult GE for details.*



*Inside view of a Bias 90 flare gas installation*

## Transducer Cables

- Standard: One pair of coaxial cables, type RG62 AU, or as specified for transducer type
- Optional: Lengths to 1000 ft (330 m) maximum

## Pressure and Temperature Transducers

Available upon request.

## Additional Options

**PanaView™ PC-Interface Software**
The DigitalFlow GF868 communicates with a PC through a serial interface and Windows® operating systems. Consult the manual for details on sites, logs and other operations with a PC.

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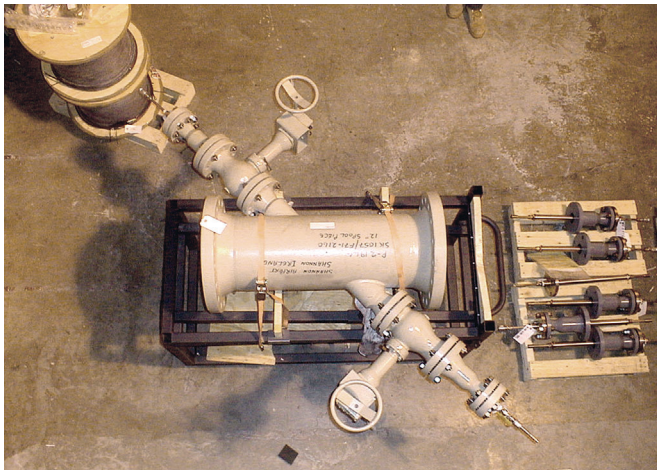
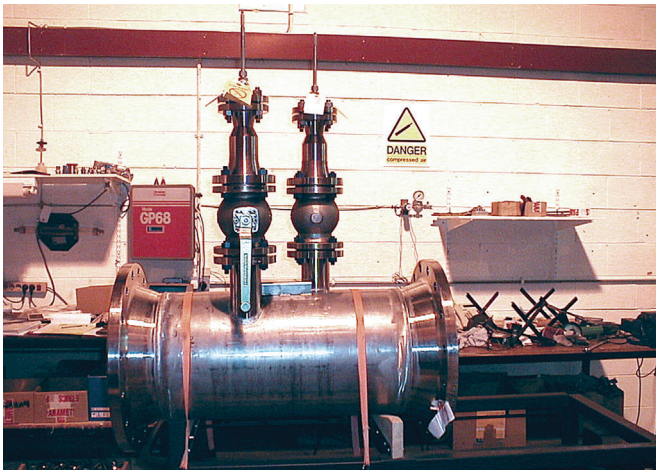
## Spoolpiece

- Best/preferred solution
- New build
- Planned shutdown






## Hot/Cold Tap

- Large lines
- New build-shutdown/turn around
- Retrofit

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## Hybrid Clamped "Tee"

- Retrofit
- No welding
- Special requirements

N4271


920-009B



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F 502-479-6722

Instructions: Please fill out the fields in color. Any field with a block is a required field.

Today's Date:

# GE Sensing Flare Gas Application Data Sheet

## Contact Information

| | | | |
|---|---|---|---|
| Name: | | Phone: | |
| Company: | | Fax: | |
| Address: | | E-mail: | |
| Installation Address: | | | |
| Account Manager/Sales rep (if known) | | | |

## Process Data

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Tag Number(s): | | | | | | | |
| Stream composition and %: | | | | | | | |
| Typical % of attenuating gases: | CO2% | | H2% | | | | |
| Typical % of corrosive gases: | Wet H2S% | | | Chlorides % | | Other | |
| Flow Rate: | Units: | | Minimum: | | Nominal: | Maximum | |
| Bidirectional Flow: | ☐ NO | | ☐ YES | | | | |
| Molecular Weight | Units: | | Minimum: | | Nominal: | Maximum | |
| Viscosity: | Units: | | Minimum: | | Nominal: | Maximum | |
| Density: | Units: | | Minimum: | | Nominal: | Maximum | |
| Pressure: | Units: | | Minimum: | | Nominal: | Maximum | |
| Temperature: | Units: | | Minimum: | | Nominal: | Maximum | |
| Liquid Droplets: | ☐ NO | ☐ YES | If yes, please specify % by volume: | | | | |
| Suspended Solids: | ☐ NO | ☐ YES | If yes, please specify % by volume: | | | | |

## Transducer/Flowcell Installation

| | | | | | | |
|---|---|---|---|---|---|---|
| Pipe Details | Pipe Material: | | Pipe Size: | | Wall Thickness/Pipe Schedule: | |
| | Pipe Lining: | | Flange Rating: | | | |
| Approx. Stright run of pipe: | Upstream: | | Downstream: | | *Recommend for Gas: 20 Upstream, 10 Downstream* | |
| Measurement Location: | ☐ Main Header | | ☐ Flare Lateral Header | | ☐ Other | Other Details |
| | ☐ Pipe Vertical | | ☐ Pipe Horizontal | | | |
| | ☐ Before Seal Drum | | ☐ After Seal Drum | | | |
| | ☐ Before knock-out drum | | ☐ After knock-out drum | | | |
| Flowcell Required: | ☐ NO | ☐ YES | (If Yes, complete FLOWCELL APPLICATION DATA SHEET) | | | |
| Isolation Valve (for transducer removal): | ☐ Provided By Customer | | ☐ Provided By GE Sensing | | ☐ None | |
| Transducer Location: | ☐ Indoors | ☐ Outdoors | | | | |
| | ☐ Hazardous | ☐ Nonhazardous | ☐ Nonhazardous Weatherproof | | | |
| | ☐ Non Hazardous | ☐ Hazardous | | | | |
| | If Hazardous, specify area rating: | | | | | |

## Measurement Parameters

| | | | | | |
|---|---|---|---|---|---|
| Flow Measurement: | ☐ Actual Volumetric | ☐ Std Vol | ☐ Mass Flow | | |
| Outputs: | ☐ 0 to 20 mA | ☐ 4 to 20 mA | ☐ Other | | |
| | ☐ Foundation Fieldbus | | ☐ HART | ☐ Modbus/RS485 | ☐ Modbus/TCP |
| | ☐ Ethernet | ☐ OPC Server | ☐ PanaView/RS232 | ☐ PanaView/RS485 | ☐ Pulse/Frequency |
| Analog Inputs: | ☐ 4 to 20 mA | ☐ Direct RTD | | | |
| Alarms: | ☐ None | ☐ Standard | ☐ Hermetically Sealed | | |
| Quantities of Each I/O: | | | | | |

## Electronics Requirements

| | | | |
|---|---|---|---|
| Area Clasification: | ☐ Non Hazardous | ☐ Hazardous | |
| If Hazardous (*Fill out Further Info*) | If Hazardous, specify area rating: | | |
| Electronic Housing Requirements: | ☐ Weatherproof, corrosion-resistant NEMA 4X | ☐ Explosionproof NEMA 7 | |
| | ☐ 19" Rack | | |
| Console Installation: | ☐ Indoor | ☐ Outdoor | |
| Ambient Conditions (Corrosive gas, temperature, humidity): | | | |
| Cable distance from electronics transducers (1,000 ft max): | | | |
| Power Available: | ☐ 100/120 VAC | ☐ 220/240 VAC | ☐ 12 to 24 VDC |
| Desired Accuracy (% of reading): | | | |
| Desired Repeatability (% of reading): | | | |
| Surge (Lightning Protection): | ☐ Transducer Connection | ☐ Main Power | |
| | ☐ 4 to 20 Output | ☐ 4 to 20 Input | |
| Special Requirements (calibration, HRVOC, AQMD, etc.): | | | |

## Attach File of Isometric as a separate file