

# XMTC

## Panametrics Thermal Conductivity Binary Gas Transmitter

### Applications

A thermal conductivity gas transmitter for use in the following industries and applications:

#### Metals Industry

H<sub>2</sub> in N<sub>2</sub>; atmosphere in metal heat-treating furnaces

#### Electric Power Industry

H<sub>2</sub> in cooling systems for generators

#### Petroleum Industry

H<sub>2</sub> in hydrocarbon streams

#### Chemical Industry

- H<sub>2</sub> in ammonia synthesis gas
- H<sub>2</sub> in methanol synthesis gas
- H<sub>2</sub> in chlorine plants

#### Methane Industry

- CO<sub>2</sub> in methane

#### Landfill/Biogas Industry

- CO<sub>2</sub> in biogas
- CH<sub>4</sub> in biogas



#### Gas Production Industry

Purity monitoring of argon, hydrogen, nitrogen and helium

#### Food Industry

CO<sub>2</sub> in fermentation processes

### Features

- Ultra-stable glass-coated thermistors
- Single or dual gas push-button calibration
- PC interface package for digital output
- Type 4X/7 construction; ATEX, FM and CSA certified for Class I, Division 1 hazardous areas



The microprocessor-based XMTC is a compact, rugged, online thermal conductivity transmitter that measures the concentration of binary gas mixtures containing hydrogen, carbon dioxide, methane or helium. The analyzer also combines computer enhanced signal measurement with fast-response software, real-time error detection and digital communication via an RS232 or RS485 interface.

## Theory of Operation

Two ultrastable, precision glass-coated thermistors are used—one in contact with the sample gas and the other in contact with the reference gas (such as air in a sealed chamber). The thermistors are mounted so that they are in close proximity to the stainless steel (or Hastelloy®) walls of the sample chamber. The entire transmitter is temperature-controlled, and the thermistors are heated to an elevated temperature in a constant-current Wheatstone bridge. The thermistors lose heat to the walls of the sample chamber at a rate that is proportional to the thermal conductivity of the gas surrounding them. Thus, each thermistor will reach a different equilibrium temperature. The temperature difference between the two thermistors is detected in the Wheatstone bridge, and the resulting bridge voltage is amplified and converted to a linear 4 to 20 mA output proportional to the concentration of one of the constituents of the binary or pseudo binary gas mixture.

## Minimal Calibration and Service

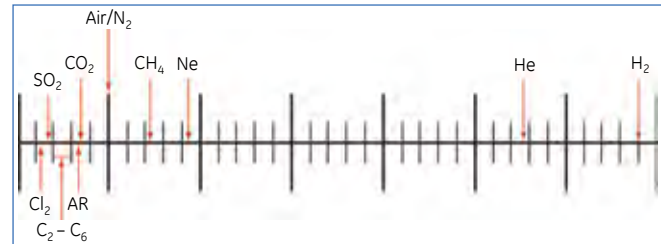
The XMTC is the most stable thermal conductivity analyzer on the market today. The rugged XMTC measuring cell resists contamination and remains insensitive to flow variations. Since the design uses no moving parts, the transmitter can easily withstand the shock, vibration and harsh environment found in many industrial applications. If the transmitter requires maintenance, its modular construction permits fast and easy servicing. Users can field-calibrate it quickly and replace the plug-in measuring cell with a precalibrated spare in minutes.

## Sample System

A sample system is mandatory for use with the XMTC. The design of the sample system will depend on the conditions of the sample gas and the requirements of the application. In general, a sample system must deliver a clean, representative sample to the XMTC at a temperature, pressure and flow rate that are within acceptable limits. Standard XMTC sample conditions are: a temperature of less than 122°F (50°C) for a cell operating temperature of 131°F (55°C) with a flow rate of 0.5 SCFH (250 cc/min) at atmospheric pressure. Higher temperature and pressure options are available.

GE offers sample systems for a wide variety of applications. For assistance in designing your own sample system, please consult the factory.

## Relative Thermal Conductivities of Common Gases



212°F (100°C) is relative thermal conductivity at 212°F (100°C)

Gas	Formula	Chemical	Gas	Formula	Chemical
Acetylene	0.90	C <sub>2</sub> H <sub>2</sub>	Helium	5.53	He
Air	1.00	N <sub>2</sub> /O <sub>2</sub>	n-Heptane	0.58	C <sub>7</sub> H <sub>16</sub>
Argon	0.67	Ar	n-Hexane	0.66	C <sub>6</sub> H <sub>14</sub>
n-Butane	0.74	C <sub>4</sub> H <sub>10</sub>	Hydrogen	6.80	H <sub>2</sub>
Carbon Dioxide	0.70	CO <sub>2</sub>	Methane	1.45	CH <sub>4</sub>
Chlorine	0.34	Cl <sub>2</sub>	Methyl Chloride	0.53	CH <sub>3</sub> Cl
Ethylene Alcohol	0.64	C <sub>2</sub> H <sub>5</sub> OH <sub>4</sub>	Neon	1.84	Ne
Ethylene	0.98	C <sub>2</sub> H <sub>4</sub>	n-Pentane	0.70	C <sub>5</sub> H <sub>12</sub>
Ethylene Oxide	0.62	C <sub>2</sub> H <sub>4</sub> O	Sulfur Dioxide	0.38	SO <sub>2</sub>
Freon-11	0.37	CCl <sub>3</sub> F	Water Vapor	0.77	H <sub>2</sub> O

## Choosing the Reference Gas

The simple two-port version can be selected for measurement of zero-based gas mixtures using the sealed reference gas (air) or the four-port version (generally preferred for zero-suppressed gas mixtures) where higher accuracy is obtained using a specific flowing reference gas.

# XMTC Specifications

## Performance

### Accuracy

±2% of span

### Linearity

±1% of span

### Repeatability

±0.5% of span

### Zero Stability

±0.5% of span per week

### Span Stability

±0.5% of span per week

### Response Time

20 seconds for 90% of step change

### Measurement Ranges

- 0% to 2%
- 0% to 5%
- 0% to 10%
- 0% to 25%
- 0% to 50%
- 0% to 100%
- 50% to 100%
- 80% to 100%
- 90% to 100%
- 95% to 100%
- 98% to 100%

### Measurement Gases (Typical)

- H<sub>2</sub> in N<sub>2</sub>, air or CO<sub>2</sub>
- He in N<sub>2</sub> or air
- CO<sub>2</sub> in N<sub>2</sub> or air
- SO<sub>2</sub> in air
- Argon in N<sub>2</sub> or air
- H<sub>2</sub>/CO<sub>2</sub>/Air for hydrogen-cooled generators

### Ambient Temperature Effect

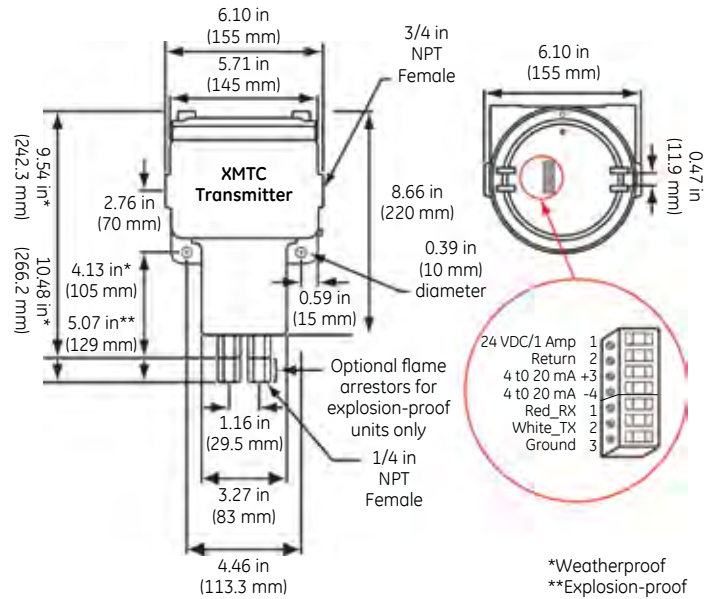
±0.09% of span per °F

±0.05% of span per °C

### Required Sample Flow Rate

0.1 to 4.0 SCFH (10 to 2,000 cc/min);

0.5 SCFH (250 cc/min) nominal



XMTC thermal conductivity transmitter dimensions

### Required Flow Rate for Optional Reference Gas

0.01 to 4.0 SCFH (5 to 2,000 cc/min);

0.5 SCFH (250 cc/min) nominal

## Functional

### Analog Output

4 to 20 mA isolated, 800 Ω maximum field-programmable

### Power

24 VDC ±2 VDC, 1.2 A maximum

### Temperature

• Standard: 131°F (55°C)

• Optional: 149°F (65°C)

# XMTC Specifications

## Physical

### Sensor Wetted Materials

- Standard:  
316 stainless steel, glass and Viton® O-rings
- Optional:  
Hastelloy C276, titanium and Chemraz® O-rings

### Dimensions

- Weatherproof unit (h x diameter):  
9.53 in x 5.71 in (242 mm x 145 mm)
- Explosion-proof unit (h x diameter):  
10.47 in x 5.7 in (266 mm x 145 mm)

### Weight

9.5 lb (4.3 kg)

### Connections

- 3/4 in NPTF (electrical conduit)
- 1/4 in NPTF (sample inlet/outlet and optional reference inlet/outlet)

### Environmental

- Weatherproof: Type 4X/IP66
- Explosion-proof: Class I, Division 1, Groups A,B,C&D  
FM File No. J.I.2Z4A8.AE (3615) CSA LR44204-15
- Flameproof: II 2 GD EEx d IIC T6 or T5  
ISseP02ATEX022

### European Compliance

Complies with EMC Directive 2004/108/EC and PED 97/23/EC

# Order and Calibration Information

## XMTC Thermal Conductivity Transmitter

### Measuring Cell Package

- 3 Weatherproof, four-port, flowing reference gas, CPVC cell
- 4 Explosion-proof enclosure, four-port, flowing reference gas, CPVC cell
- 5 Weatherproof enclosure, two-port, sealed reference gas, FEP-coated aluminum cell
- 6 Explosion-proof, two-port, sealed reference gas, FEP-coated aluminum cell
- W No enclosure, two-port, sealed reference gas, FEP-coated aluminum cell (spare)
- Y No enclosure, two-port, flowing reference gas, CPVC cell (spare)

### CE Compliance

- 2 4 to 20 mA
- C CE Compliant

### Calibration Label for Explosion-proof Options

- 1 T6 Rating for Ambient Temperatures Up to 55°C
- 2 T5 Rating for Ambient Temperatures Up to 65°C

### Materials

- 1 316 stainless steel
- 2 Hastelloy C276

XMTC - \_\_\_\_\_ Use this number to order product

*For explosion-proof/flameproof packages, select temperature as follows: 131°F (55°C) for EEx d IIC T6 or 149°F (65°C) for EEx d IIC T5. For weatherproof packages, select temperature as follows: 149°F (65°C).*

## XMTC Calibration Specifications

### Cell Range

- |   |           |   |             |
|---|-----------|---|-------------|
| 2 | 0% to 2%  | 8 | 0% to 100%  |
| 3 | 0% to 5%  | A | 90% to 100% |
| 4 | 0% to 10% | B | 80% to 100% |
| 6 | 0% to 25% | C | 50% to 100% |
| 7 | 0% to 50% | D | 98% to 100% |
|   |           | E | 95% to 100% |
|   |           | S | Special     |

### Calibration Gases

- 1 H<sub>2</sub> in N<sub>2</sub>
- 2 CO<sub>2</sub> in N<sub>2</sub> (minimum range 0% to 20% CO<sub>2</sub>)
- 3 CO<sub>2</sub> in air (minimum range 0% to 20% CO<sub>2</sub>)
- 4 He in N<sub>2</sub>
- 5 He in air
- 6 Calibration for hydrogen-cooled generators, H<sub>2</sub>/CO<sub>2</sub>/air
- 7 CH<sub>4</sub> in CO<sub>2</sub> (min range 0% to 10% CH<sub>4</sub>)
- S Other, please specify

### Temperature Control Set Point

- 1 131°F (55°C), suitable for ambient temperatures up to 122°F (50°C)
- 2 158°F (70°C), suitable for ambient temperatures up to 149°F (65°C)
- S Special

XMTC-Cal \_\_\_\_\_ Use this number to order product

*Binary or pseudobinary gas composition must total 100%*



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