



XMTC

Panametrics Thermal Conductivity Binary Gas Transmitter

Applications

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

Metals industry

H₂ in N₂ atmosphere in metal heat-treating furnaces

Electric power industry

H₂ in cooling systems for generators

Petroleum industry

H₂ in hydrocarbon streams

Chemical industry

- H₂ in ammonia synthesis gas
- H₂ in methanol synthesis gas
- H₂ in chlorine plants

Methane industry

- CO₂ in methane

Landfill/biogas industry

- CO₂ in biogas
- CH₄ in biogas

Gas production industry

Purity monitoring of argon, hydrogen, nitrogen and helium

Food Industry

CO₂ in fermentation processes

Features

- Ultra-stable glass-coated thermistors
- Single or dual gas push-button calibration
- PC interface package for digital output
- Type IP66/4X construction
- ATEX, IECEx, FM and CSA certified for Zone I and Division 1 hazardous areas

The microprocessor-based XMTC is a compact, rugged, online thermal conductivity transmitter that measures the concentration of binary gas mixtures including hydrogen, carbon dioxide, methane, helium and many others. 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

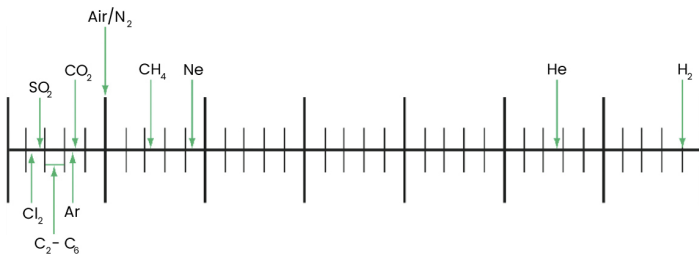
The XMTC is the most stable thermal conductivity analyzer on the market today. The rugged XMTC measuring cell resists contamination and remains insensitive to flow variations. Since the design uses no moving parts, the transmitter can easily withstand the shock, vibration and harsh environment found 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. A higher temperature option is available.

Panametrics offers sample systems for a wide variety of applications. For assistance in designing your own sample system, please consult our application engineering team.

Relative thermal conductivities of common cases



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

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

- H₂ in N₂, air, O₂ or CO₂
- He in N₂ or air
- CO₂ in N₂ or air
- SO₂ in air
- Argon in N₂ or air
- H₂/CO₂/air for hydrogen-cooled generators

Required Sample Flow Rate

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

0.5 SCFH (250 cc/min) nominal

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 load, field-programmable

Power

24 VDC ±2 VDC, 1.2 A maximum

Temperature

- Standard: 131°F (55°C)
- Optional: 158°F (70°C)

