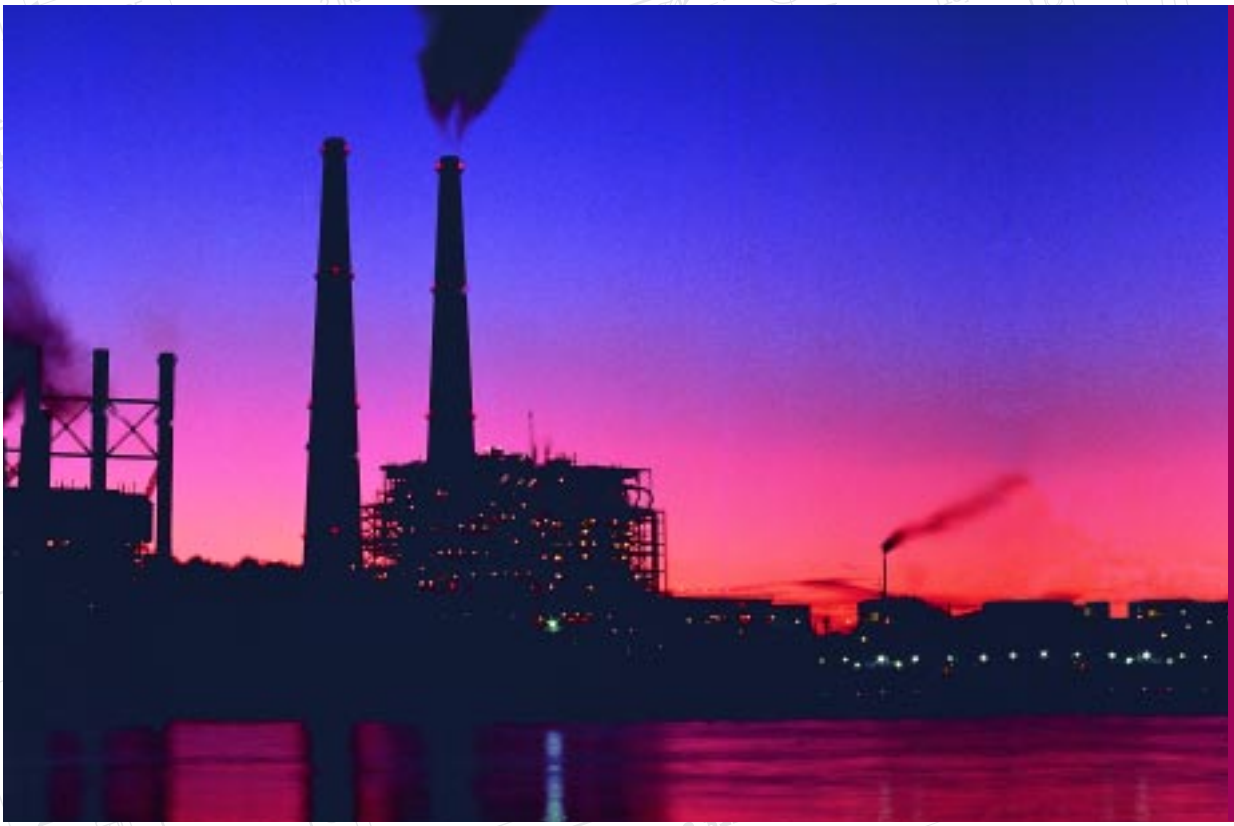
FCI MT Series:

Multipoint

Mass Flowmeters for



FCI MT SERIES

Gas or Air Service and

CEMS Stack Monitoring.

MT Series Multipoint Mass Flowmeters are ideal for today's most challenging industrial air or gas handling applications and continuous emissions monitoring systems (CEMS). Inside large combustion or preheater systems, HVAC units, ducts or flue stacks, MT Series multipoint flowmeters measure flow with exceptional precision under variable thermodynamic conditions. They are an excellent choice for measuring mass flow almost anywhere variable conditions limit single-point flowmeter effectiveness. Harsh environments, in which temperature, vibration, abrasion and corrosion pose difficulties for other meters, are no problem for the rugged MT Series multipoint flowmeters. Instrument accuracy is available to ±2% of reading, with repeatability of ±0.5%.

Key Product Performance Features

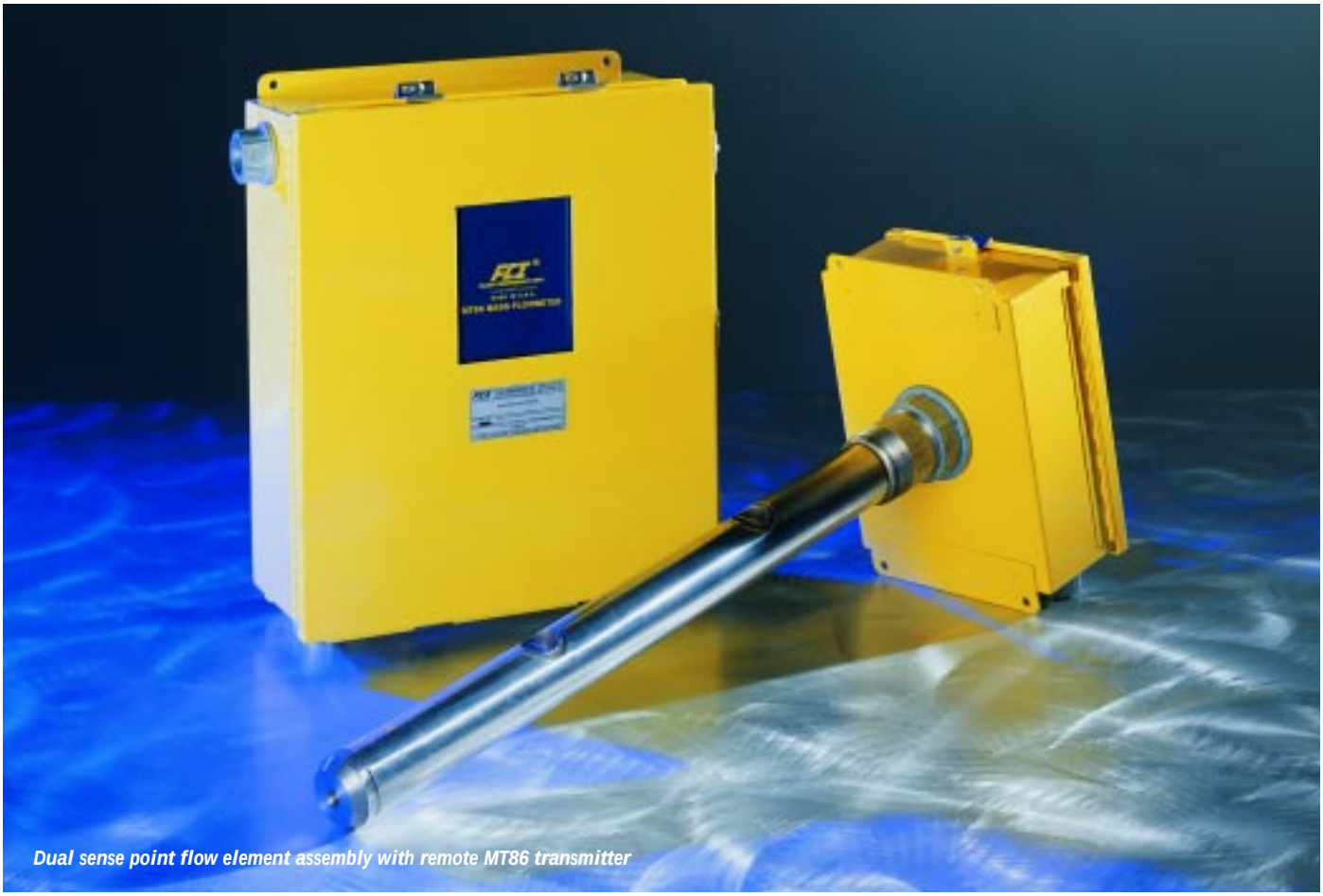
- High accuracy -- up to 16 flow sense points per meter.
- Diagnoses duct temperature stratification with dynamic temperature output capability.
- Wide temperature range from -50 to +850°F [-45 to +454°C].
- Pressures up to 50 psig [3.4 bar(g)].
- Continuous built-in testing and calibration adjustment prevent drift for superior repeatability.
- Averaging filter dampens response to rapid process fluctuations.
- RS232C, RS422 or RS485 serial ports for communication with field devices.
- Choose 4 to 20 mA, 1 to 5 or 0 to 10 Vdc outputs.
- Menu-driven control for ease of service.
- Rack mountable with card slots for expansion and option modules.
- Stainless steel flow element construction rated NEMA/CSA Type 4; flow electronics package rated NEMA/CSA Type 4.
- Easy maintenance with modular design and interchangeable components.
- Compatible with VORTAB™ flow conditioners.

MT86 and MT91 Series Multipoint Flowmeters

The MT86 and MT91 Series flowmeters are installed in thousands of applications worldwide. The MT91 Series flowmeter is highly versatile, with a wide turndown range available (from 5:1 to 100:1) and flow sensitivity from 0.25 SFPS (0.08 NMPS) to 150 SFPS (46 NMPS). With its smart digital flow transmitter and advanced thermal dispersion technology flow-sensing elements, the MT91 flowmeter meets federal environmental requirements for CEMS, CFR40, Part 75.

The MT86 and MT91 are multipoint flowmeters with sensor arrays of up to 8 (MT86 unit) or 16 (MT91 unit) independent thermal flow elements with a variable insertion length attached to a junction box and connected via cable to a remote electronics assembly. Individual flow elements are placed along a sensor assembly to meet application-specific requirements. The sensor assembly for both the MT86 and MT91 flowmeters is available with flanged, threaded and retractable process connections with

Dual sense point flow element assembly with rack mount MT91 transmitter



Dual sense point flow element assembly with remote MT86 transmitter

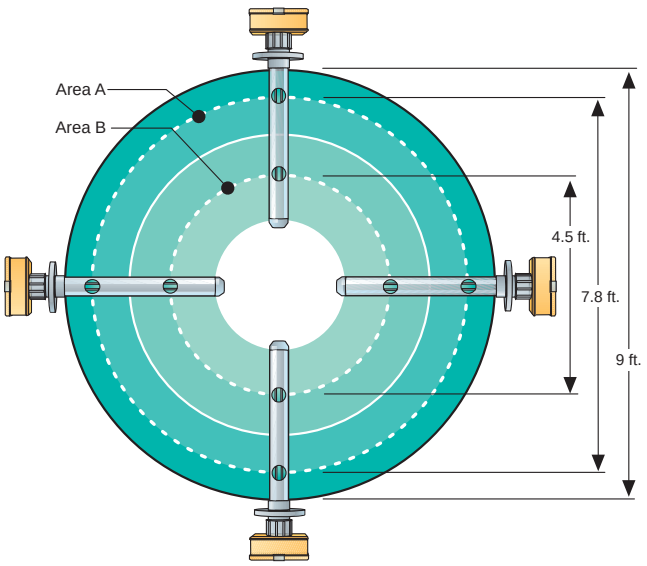
a NEMA/CSA Type 4 junction box and installed at the desired location with a choice of popular process connections.

The transmitter package for both the MT86 and MT91 flowmeters also is housed in a NEMA/CSA Type 4 or optional explosion-proof enclosure. The MT86 flowmeter's electronics package is connected remotely by cable to the flow element assembly up to 500-feet [152m] away, while the MT91 flowmeter's electronics package is similarly connected up to 1000 feet [305m] away. The MT91 flowmeter's electronics package is also available in an optional 19-inch DIN or ANSI/EIA rack mount assembly.

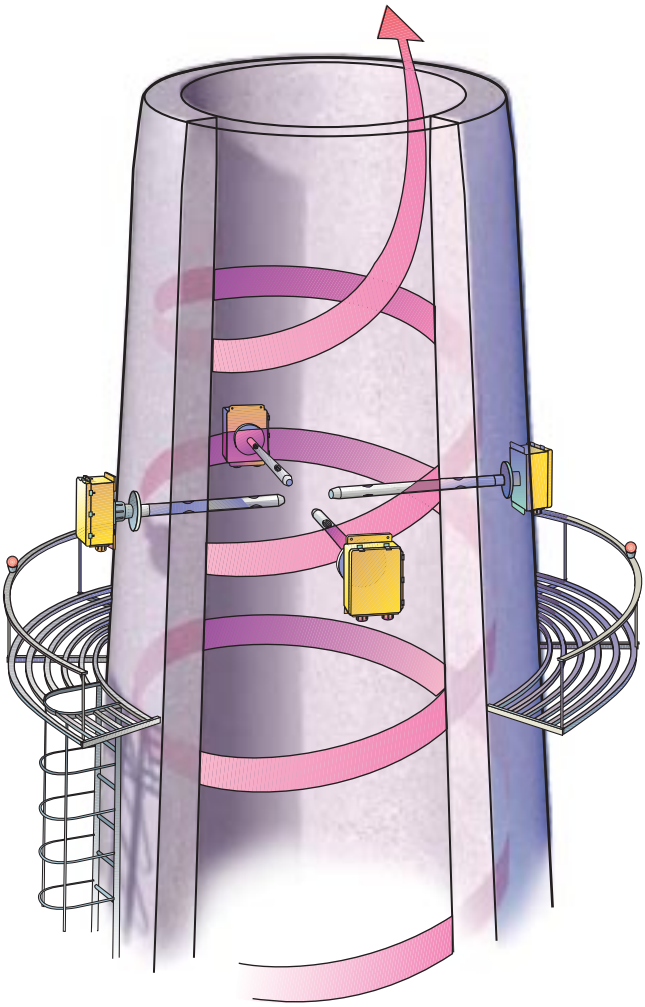
Thermal Flow Sensing Element FCI's advanced flow sensing element design, based on thermal dispersion technology, measures air or gas mass flow with exceptional accuracy and repeatability over a wide range of temperatures and environmental conditions. Each all-metal flow element features a fouling immune no-moving-parts design for simple maintenance and long life. The flow element incorporates two platinum resistance-temperature-detectors (RTDs) for temperature and flow measurement. All wetted surfaces are 316 stainless steel with nickel brazed joints per AMS 4777 (standard) or Hastelloy C as an option. Coating materials, such as electroless nickel plating and chromium carbide are also available.

Mass flow rate is determined by the MT Series multipoint flowmeter in the process stream by heating one of its RTDs while the other senses the temperature of the flowing media. The temperature differential between the RTDs relates to the mass flow rate and properties of the process media. Higher flow rates or denser media, for example, cause increased cooling of the heated RTD and a reduction in the temperature differential.

Smart Flow Transmitter The MT91 flow transmitter features a powerful microprocessor-driven design for superior signal processing and data collection. The design includes a user-



Equal-Area Sense Point Placement



Typical Stack Installation

friendly menu-driven structure with LCD screen and keypad for programming the control, monitoring, display, and driver/alarm functions. A nonvolatile EEPROM chip stores application and calibration data, and protects this data in the event of a power disturbance.

RS232C, RS422 and RS485 on the MT91 serial ports offer ease of communication with controllers or other field devices. Signal outputs available are 4 to 20 mA, 1 to 5 or 0 to 10 Vdc. Other features include real-time temperature compensation, dynamic process temperature indication, built-in testing and self-diagnostics, dynamic conversion, display of application statistics and security safeguards against unauthorized access or tampering.

Typical Applications

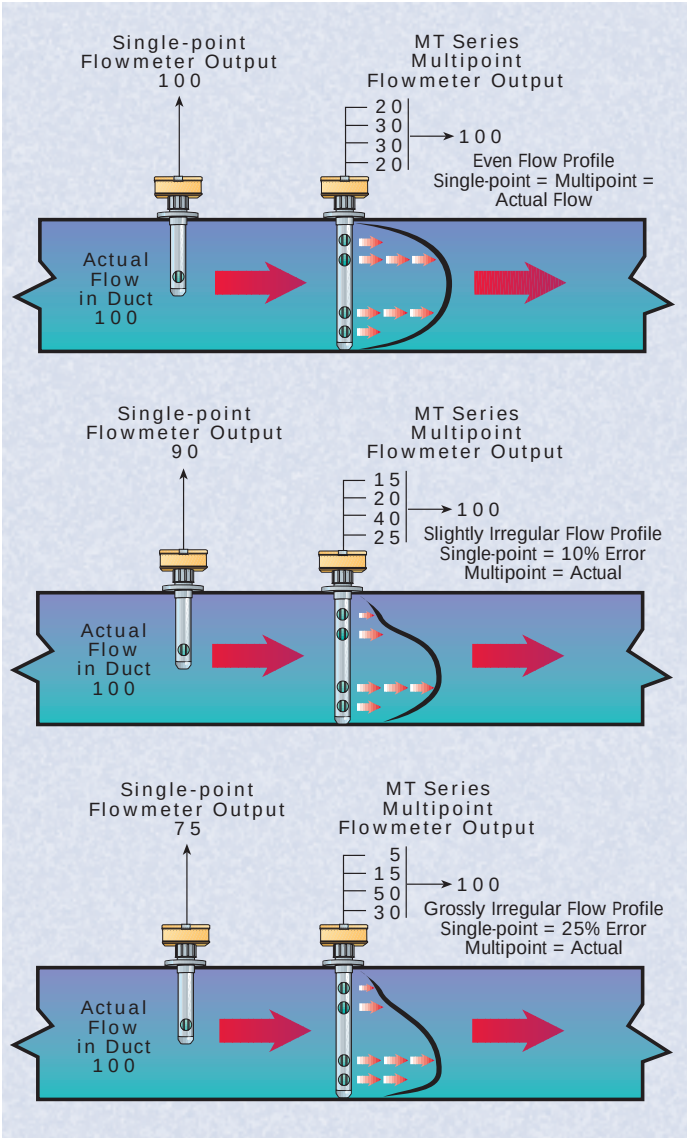
- Stack monitoring for Continuous Emissions Monitoring Systems (CEMS)
- Primary air flow monitoring
- Air flow monitoring for performance efficiency
- Air monitoring to low NOX burners
- Combustion air flow monitoring
- Flue gas recirculation monitoring
- Scrubber and precipitator balancing
- Induced or forced draft fan monitoring
- Preheater air to boilers or furnaces
- Heavy-duty industrial HVAC

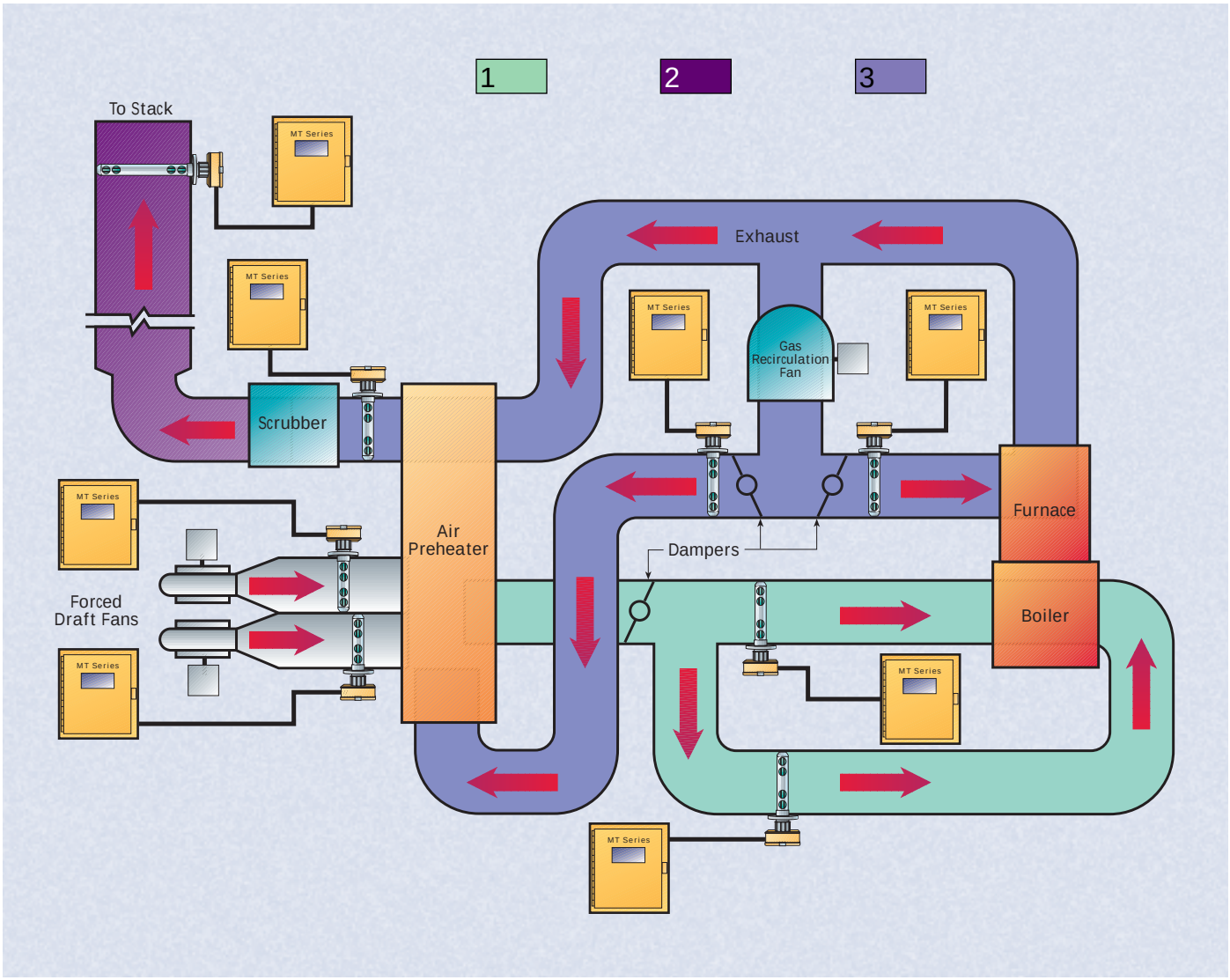
Multipoint Versus Single-point Sensing

The unstable air currents and gases, often with particulates, that are found in large industrial facility ducts or flue stacks and in air or gas handling systems turn the task of mass flow measurement into a complex process. This task is often beyond the capabilities of single-point flowmeters or differential pressure averaging devices.

As depicted in the accompanying illustration below, inaccurate flow rate reading can result when single-point metering instruments are used in ducts and stacks where large cross-sectional areas or limited straight-run lengths create irregular flow profiles.

Designed especially for such air/gas handling systems, the MT Series offers up to 16 sense points which meter the mass flow rate of individual segments of the flow stream. Representing those rates, the signal outputs of each sensor element are summed by the instrument's control logic to provide an accurate reading of total mass flow rate through the entire duct.





Improving the Efficiency of Industrial Air / Gas Systems with the MT Series Multipoint Mass Flowmeters

1. Combustion Air and Preheater Air

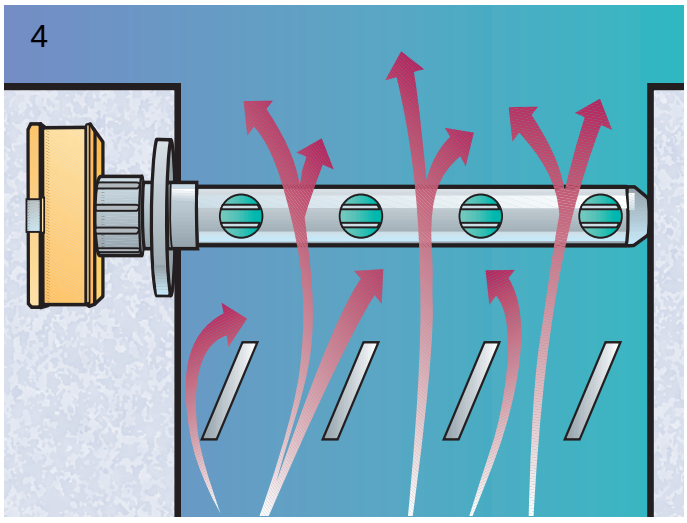
To keep boilers, furnaces, and cogeneration units operating at maximum efficiency, individual combustion and preheater air flow feed lines are metered with the MT Series.

2. Stack Emissions

Reliable and accurate measurement of flow from effluent stacks in power, cogeneration, chemical, paper refinery, and other industrial plants is critical to properly calculate total emissions. The MT Series can be used alone or in conjunction with environmental and/or radiation monitors for this purpose.

3. Flue Gas/Scrubber Balancing

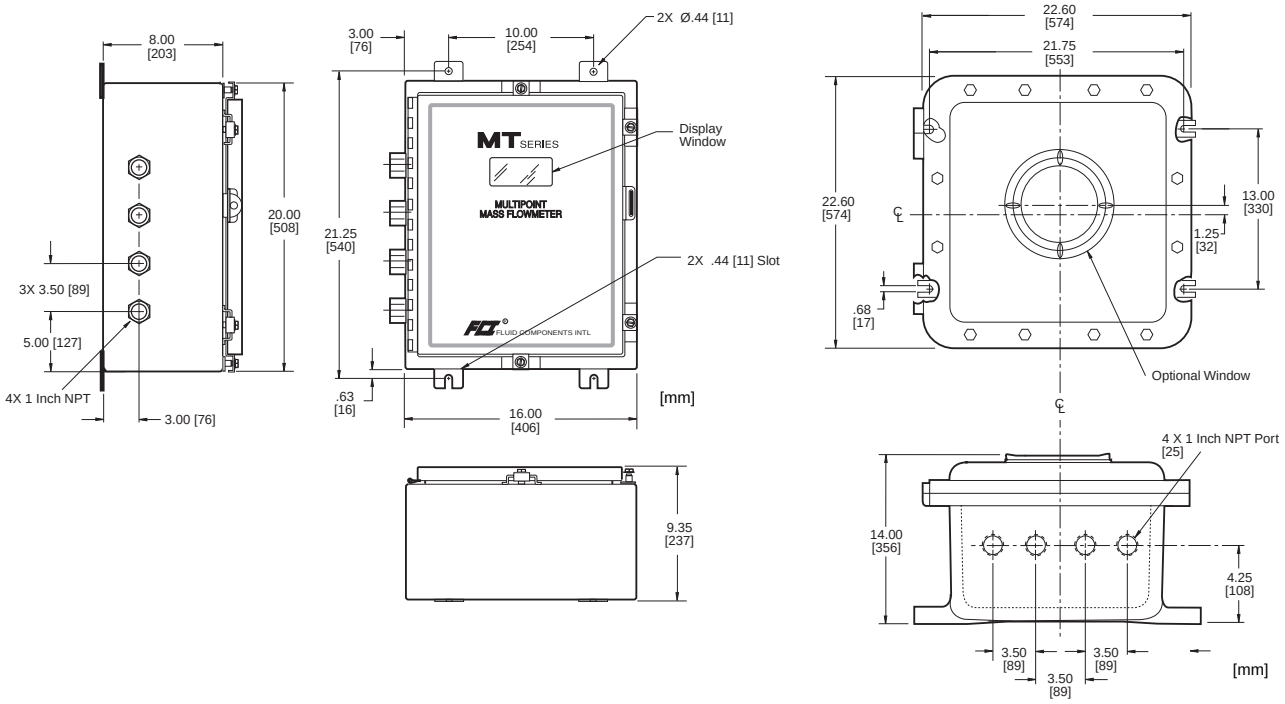
Industrial pollution control systems can be operated far more effectively by utilizing the MT Series to meter and balance the flow of flue gas through scrubbers, precipitators and bag houses. Ultra-sensitive, the MT Series offers unsurpassed accuracy across broad flow ranges. The unit's low-profile, no-moving-parts design causes virtually no pressure drop in large lines, and the optional abrasion-resistant probe coating provides outstanding protection against flyash and other particulate matter.



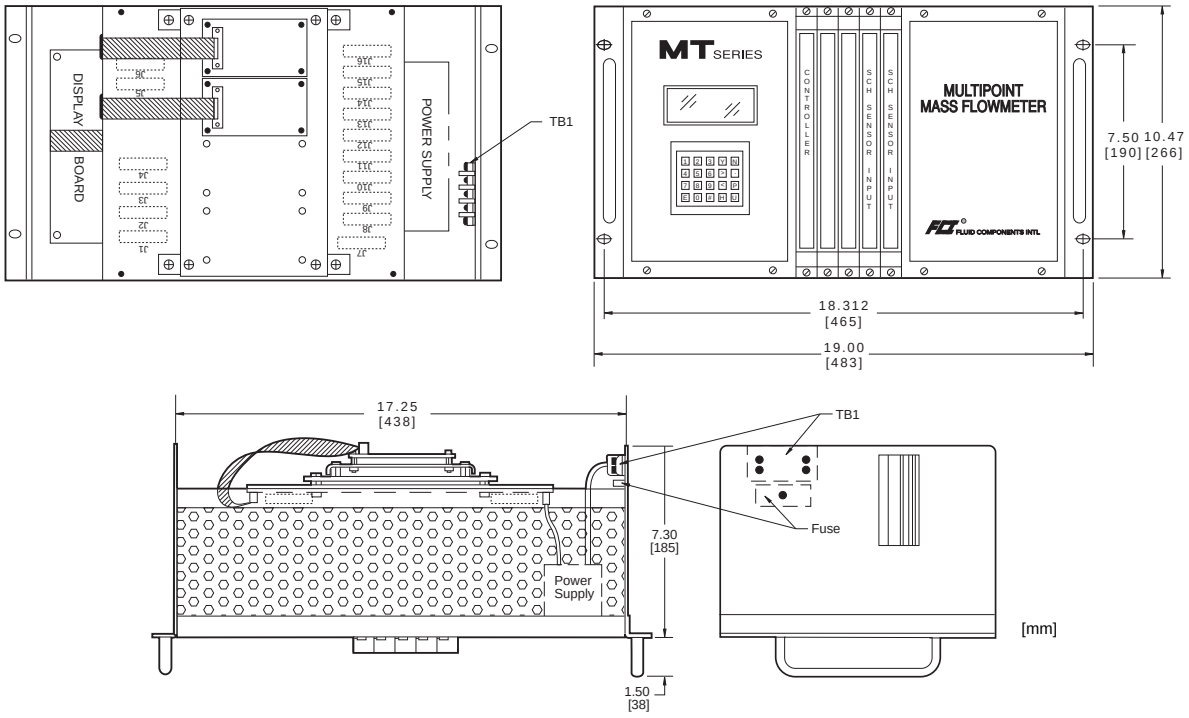
4. Heating, Ventilation & Air Conditioning

Ultra-low flow sensitivity, wide turndown and easy duct mounting make the MT Series the choice for HVAC flow metering. Accurate at the low flow rates typical in such systems, the MT Series not only measures and totals air flow, it can also be used for controlling louvers to balance flow within the system.

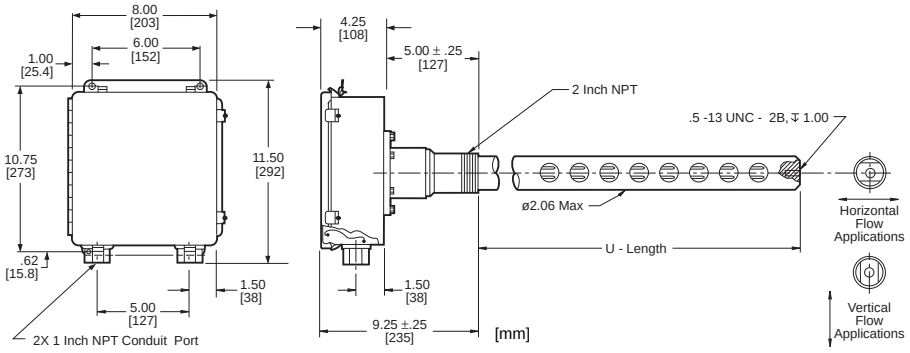
Remote MT91 Transmitter Assembly -- NEMA / CSA Type 4 and Explosion Proof



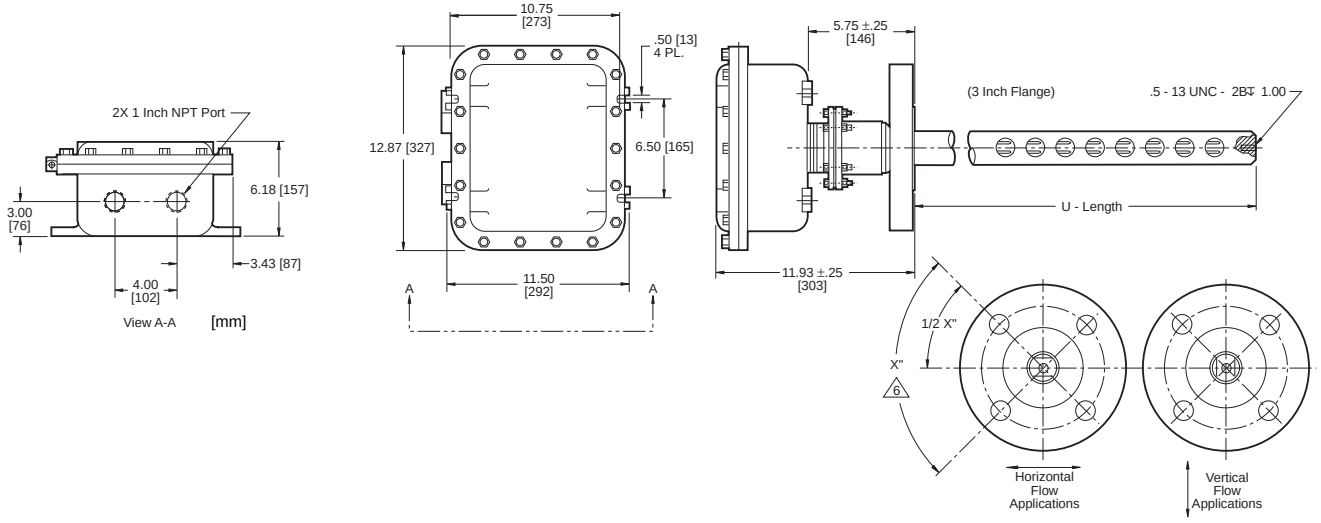
Remote MT91 Transmitter -- Rack Mount



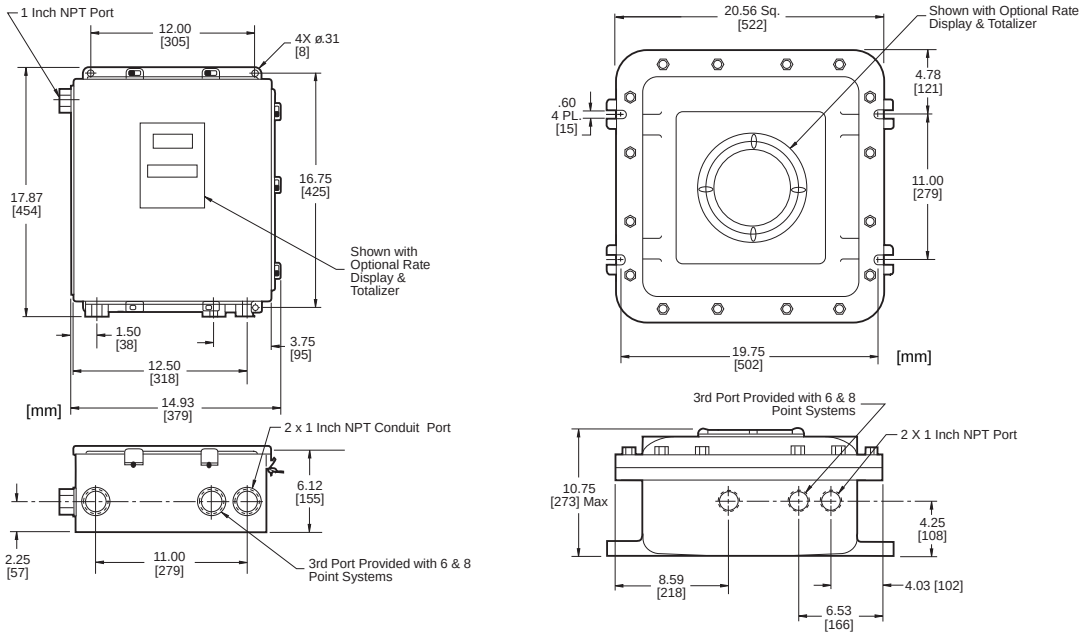
MT Series Flow Element Assembly -- NEMA / CSA Type 4



MT Series Flow Element Assembly -- Explosion Proof



Remote MT86 Transmitter Assembly -- NEMA / CSA Type 4 and Explosion Proof



MT86 and MT91 Multipoint Mass Flowmeter Specifications

Flow Element -- MT86 and MT91

Process Connection: 2 inch MNPT or 3 inch 150 lb. raised-face carbon steel flange. Other flange connection sizes and materials available.
Insertion Length: Variable insertion lengths; customer specified.
Material: All wetted surfaces are 316 stainless steel with nickel brazed joints per process specifications AMS 4777. Hastelloy C-276 and other materials and electroless nickel or chromiun carbide plating also available.
Number of Sense Points per System: Up to 16 points.
Flow Element Range: 0.25 to 150 SFPS (.08 to 46 NMPS) in air at standard conditions -- 14.7 psia, 70°F [1 bar(a), 20°C]. Consult factory or manufacturer's representative for application information pertaining to gases other than air.
Flow Element Enclosure: NEMA/CSA Type 4 and equivalent to IP66, optional explosion proof groups B, C, D - Division 1 and 2.
Temperature Range:
Low Temperature: -50° to +350°F [-45° to +177°C]
High Temperature: -50° to +850°F [-45 to +454°C]
Operating Pressure: Up to 50 psig [3.4 bar(g)]
Design Pressure: to 500 psig [34 bar(g)]

Transmitter -- MT86

Outputs:
Standard: 4 to 20 mA, 1000 Ω maximum load
Optional: 10 to 50 mA, 400 Ω maximum load;
0 to 5 Vdc, 2 mA maximum current; 1 to 5 Vdc, 2 mA maximum current; 0 to 10 Vdc, 2 mA maximum current
Power Requirements:
Standard: 115 Vac, 50/60 Hz, 50 Watts max., 1/2 Amp fuse
Optional: 230 Vac, 50/60 Hz, 50 Watts max., 1/4 Amp fuse
100 Vac, 50/60 Hz, 50 Watts max., 1/2 Amp fuse
24 Vdc, 1.5 Amp fuse
Transmitter Enclosure: Electrical components are mounted in a remote NEMA/CSA Type 4 and equivalent to IP66 electrical enclosure. Explosion proof optional.
Electrical Connections: 1 inch female national pipe thread (FNPT)
Operating Temperatures (transmitter): -50° to +150°F [-45° to +66°C]; with Liquid Crystal Display: 0° to 150°F [-18° to +66°C]
Accuracy: ±3% of full scale.
Repeatability: ±1% of reading.
Turndown: 100:1 maximum; 5:1 minimum.

Transmitter -- MT91

Outputs: Accommodates up to four (4) output modules that are field programmable for flow or temperature outputs. Dual high resolution (15 ppm) analog output configured as:
4 to 20 mA into a maximum of 600 Ω, or
0 to 10 Volts into a minimum of 5000 Ω, or
1 to 5 Volts into a minimum of 2500 Ω.
Dual, mid resolution (3900 ppm), analog output configured as:
4 to 20 mA into a maximum of 600 Ω, or
0 to 10 Volts into a minimum of 5000 Ω, or
1 to 5 Volts into a minimum of 2500 Ω.
Dual DPDT alarm: 2 Amp contact rating.
Contact factory for isolation output availability.
Power Requirements:
85 to 265 Vac, 47 to 63 Hz, 3.5 Amp fused; 20 to 32 Vdc, 24 Vdc nominal. Consult factory for special power requirements.
Auxiliary Inputs: Accepts a 4 to 20 mA or 0 to 10 Volt independent input signal for output conditioning.
Electrical Enclosure (transmitter): Electrical components are mounted in a remote NEMA/CSA Type 4 and equivalent to IP66 electrical enclosure. 19 inch rack in accordance with DIN 41494 part 1, ANSI/EIA-RS-310C.
Electrical Connections: 1 inch female national pipe thread (FNPT).
Serial Communication Port: RS-232C or RS-422 or RS-485 field selected and programmed by customer.
Operating temperature (transmitter):
32° to 140°F [0° to 60°C] (Functional local display).
0° to 140°F [-18° to 60°C] (Local display not observed).
Display: Four (4) line by (20) character liquid crystal display (LCD). Menu driven system prompts the user for system commands.
Keypad: Twenty (20) keys for input provide easy touch programming to change zero, span, switch points, unit of measure, and other menu driven operations.
Accuracy: ±2% reading or ±0.2 SFPS (± 0.06 NMPS) over a ±30°F [±17°C] temperature range; ±4% reading or ±0.5 SFPS (±0.15 NMPS) over a ±100°F [±55°C] temperature range.
Repeatability: ±0.5% reading.
Turndown: 100:1 maximum; 5:1 minimum.
Stated performance for low flow range from 1 to 100 SFPS (0.3 to 30 NMPS). Contact factory for accuracy in applications above 100 SFPS (30 NMPS) or below 1 SFPS (0.3 NMPS).
Temperature Output Accuracy: ±0.9°F [±0.5°C] for temperatures from 32° to 212°F [0° to 100°C]; ±1.8°F [±1°C] for temperatures less than 32°F [0°C] and greater than 212°F [100°C].
Temperature Output Repeatability: ±0.2% reading for temperatures from 32° to 212°F [0° to 100°C]; ±0.5% reading for temperatures greater than 212°F [100°C].
Stated temperature performance at a minimum flow rate of 5 SFPS (1.5 NMPS). Contact factory for accuracy of temperature indication when flow rate is below 5 SFPS (1.5 NMPS).

Calibration -- MT86 and MT91

Performed on NIST traceable equipment.
Accuracy for specific duct configuration will be determined by manufacturer upon completion of application data sheet.

FCI FLUID COMPONENTS INTL
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