FMC Technologies

Gas Flow Computer Specifications

Model 705

Bulletin SSIT004

*The **INVALCO Model 705 Gas Flow Computer** is a low cost, single loop, gas flow computer that incorporates three separate calculation choices dependent on application. The Model 705 accepts inputs from INVALCO's GT Series gas turbine meter and a wide range of other manufacturers' flow meters, such as vortex, orifice plate, averaging pitot tubes, and wedges.*

Features

- **Backlit alphanumeric LCD display of Mass Flow, Corrected Volume, and Energy Flow.**
- **Accepts frequency and 4-20 mA flow inputs**
- **Temperature and pressure compensation.**
- **Ten-point non-linearity correction.**
- **4-20 mA analog output, optional.**
- **Pulse output for remote counters.**
- **Data logging output, optional.**
- **RS232/422/485 Serial Communication Option.**

Operation

The Model 705 Gas Flow Computer incorporates compensation for gas and vapor to the following equations:

1. Ideal Gas Law using temperature and pressure correction, but where compressibility correction is not required.
2. General Gases where compressibility is calculated using the Redlich-Kwong[1] state equation. This equation is suitable for gases which have known properties.
3. Natural Gas using the NX-19 equation to calculate supercompressibility.

The backlit alphanumeric display simplifies programming and provides a clear indication of all parameters, as well as engineering units. The Model 705 is fully programmable and all operating parameters are entered via the front panel keyboard.

A scaled output suitable for driving remote totalizers is a standard feature, while options include an isolated 4-20 mA retransmission, high and low flow alarms, and an RS232/422/485 output.

The pulse output, 4-20 mA retransmission, and alarms will operate on either the mass, corrected volume, or energy outputs, depending on which value is programmed as the default display. The RS232/422/485 option will output all parameters which are displayed and protocols are provided for standard roll and column printers as well as for computer interface. (A real-time clock on the RS232/422/485 board provides time and date.

Model 705 Batch Controller

A unique feature available with the RS232/422/485 output is the ability to print flow rates and totals at programmable time intervals. This enables the instrument to function as a data logger when used in conjunction with a printer or other storage device. The totals can be programmed to reset via the front panel after each print or at 24:00 hours.

Two versions of the instrument are available: Model 705R with direct RTD temperature input and Model 705A with a 4-20 mA temperature input.

Both versions require a 4-20 mA input of pressure, either absolute or gauge.

Parameters Displayed

Information is displayed in a number of display windows which are selected using the Display key.

General

- Flow rate of the mass or corrected volume is displayed in units per day, hour, minute, or second.
- Total of the mass or corrected volume. A reset key on the front panel enables totals to be reset or the key can be disabled during setup. Totals are displayed with eight digits.

Gas Flow

- Corrected Volume at base conditions (ft^3 or m^3).
- Mass (lb or kg).
- Temperature (°F or °C).
- Pressure (psi or kPa) in absolute or gauge.
- Compressibility Z, for general gases.
- Supercompressibility FPV for natural gas (NX-19).

[1] *Redlich-Kwong, "An Equation of State", Chem Rev., vol 44, p233, 1949.*

Specifications

Display

Alphanumeric LCD display with backlighting and two lines x 20 characters/line. Each character is 5.5 mm high.

Keyboard

Sealed membrane keyboard with four keys.

Transducer Supply

8-24 Vdc field adjustable, 50 mA maximum (2-3V less than minimum input voltage).

Power Requirements

11.5 to 28.0 Vdc, 140 mA typical (no options). AC Mains: Set internally to 95-135 Vac or 190-260 Vac.

Operating Temperature

0 to 55 C

Facia

Watertight to NEMA 3S or IP65.

Dimensions

5.7" (144 mm) wide x 2.8" (72mm) high x 7.4" (188mm) deep x 7.4" (188 mm) deep.

Panel Cutout

5.5" (139 mm) x 2.6" (67 mm).

Frequency Input

Frequency Range
Minimum - 0.25 Hz on rate. 0 Hz on total.

Maximum - 10 kHz.

Input Circuits:
Will accept most sine, logic, and proximity switch inputs.

K-Factor Range:
0.1000 to 50,000.

Non-Linear Correction:
Up to ten correction points.

4-20 mA Inputs

Inputs:
Two each, pressure and temperature (705A option).

Input Impedance:
250 ohms.

Accuracy:
0.05%.

Circuit:
The 250 ohm resistors are connected to a common signal ground (current sinking).

RTD Input (Model 705R)

Temperature Measurement Range:
-148°F to 392°F (-100°C to 200°C). Note: A wider temperature range can be handled via a 4-20 mA input.

Approvals

Canadian Standards Association (CSA) pending CE compliant.

Accuracy:
0.1°C

RTD Type:
Platinum PT100, two, three, or four-wire.

Linearity:
The non-linearity of the RTD is internally compensated for.

Pressure Input

Type:
Absolute or gauge.

Span:
The absolute or gauge pressure at both 4 mA and 20 mA is programmable.

Atmospheric:
If a gauge pressure sensor is used, the atmospheric pressure can be programmed.

Pulse Output

Pulse Width:
10 mSec (negative going pulse).

Duty Cycle:
Maximum of 49 pulses per second.

Output:
An open-collector transistor will sink 100 mA maximum. The pulse output is suitable for driving remote counter or PLC's.

RS232/485 Option

Type:
RS232 four wire RS422 and two wire RS485 are provided. When using the RS422/485, multipoint communication can be implemented with up to 32 instruments connected to a common bus.

Function:
Printer and computer protocols are fully programmable.

Printer:
A print is initiated on each reset or at a programmable time interval. Protocols are provided for roll and column printers.

Computer:
An ASCII-based protocol enables all displayed parameters to be read and the totals to be reset.

Baud Rate:
300 to 9,600.

Data Bits:
Seven or eight.

Parity:
None, odd, or even.

Data Logging:
Output generated at intervals of once a minute to once every 24 hours. The totals can be programmed to reset on each print or at 24:00 hours.

Time:
A real-time clock is provided to give time and date on each output.

4-20 mA Output Option

Function:
The flow rate, mass, corrected volume, or energy is output. The 4 mA and 20 mA points can be programmed to provide a fully-scaled output.

Resolution:
Ten bits.

Accuracy:
Better than 0.1%.

Maximum Load:
Voltage Burden: 5V

500 ohms internally powered.

950 ohms from external 24 Vdc.

Isolation:
Output is isolated.

Relay Output Option

Function:
High and low flow rate alarms based on the flow rate, mass, corrected volume, or energy.

Maximum Switching Power:
250 VA

MaximumSwitching Voltage:
250 Vac, 30 Vdc.

Maximum Switching Current:
5 Amps.

Ideal Gas

Display:
Corrected volume (ft^3 or m^3). Mass (lb or kg).

Temperature Range:
-450°F to 800° F (-237°C to 450°C).

Pressure Range:
0 kPa abs (0 psia) to 100,000 kPa abs (10,000 psia).

General Gas

Gases:
Handles most gases for which the critical temperature, pressure, and specific gravity are known.

Compressibility:
Calculated using the Redlich-Kwong equation.

Temperature Range:
-450°F to 800°F (-273° C to 450°C). (RTD has a more limited range.)

Pressure Range:
0 psia abs (0 kPa) to 10,000 psia abs (100,000 kPa).

Natural Gas

Calculations:
Uses NX-19 equation to calculate supercompressibility FPV.

Temperature Range:
-40°F to 240°F (-40°C to 115°C)

14.69 psia abs (101.325 kPa) to 4,85 psia abs (34,380 kPa).

Specific Gravity Range:
0.554 to 1.000.

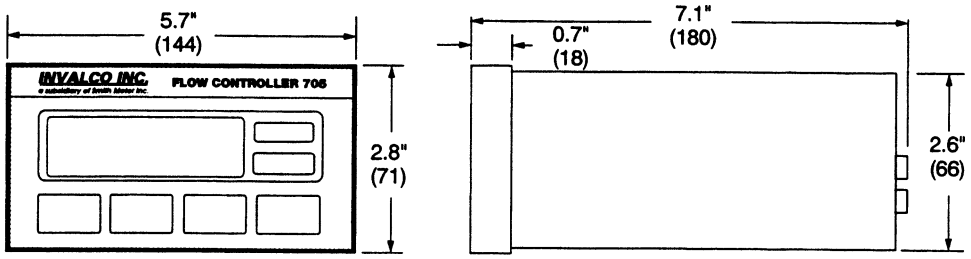
Carbon Dioxide:
0 to 15% mole.

Nitrogen:
0 to 15% mole.

Ordering Information

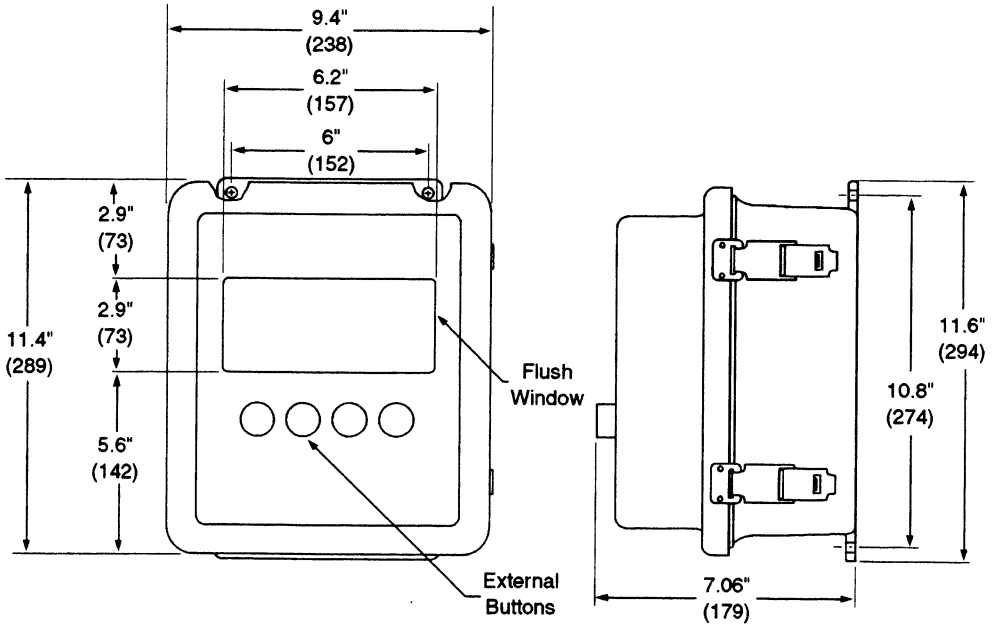
General Description	
705-A	Pressure/Temperature Compensated Rate, Total, and Scaled Pulse Output w/Analog Press./Temp. Inputs
705-R	Pressure/Temperature Compensated Rate, Total, and Scaled Pulse Output w/RTD Temp. Input and Analog Press.
Enclosure Options	
- 1xxx	Panel Mount (Nema 4 Facia) (includes mounting hardware)
- 2xxx	Weather-proof to Nema 4X Definition (IP66)
- 3xxx	Explosion-proof to Nema 7 Definition
Output Options	
- x0xx	No Output Options Required
- x1xx	4-20mA Output of Rate
- x2xx	RS-232/422/485 Serial Communication
- x3xx	Hi/Lo Alarm Relay's
- x4xx	4-20mA Output of Rate and High/Low Alarm Output
- x5xx	RS-232/422/485 Serial Communication and High/Low Alarms
Power Supply Options	
- xxAx	12/28 Vdc or 110/120 Vac, Selectable (Standard Selection)
- xxEx	220/240 Vac Input
- xxDx	12/28 Vdc Only (Typical for Truck Applications)
Other/Special Options	
- xxxC	Conformal Coating of PC Boards
- xxxH	50 Watt Heater (only when enclosure is used)
- xxxG	German Language Version
Blank	No Requirements

Dimensions



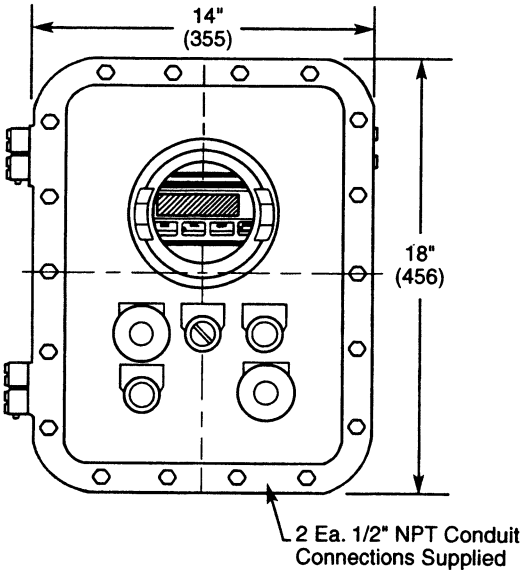
Cutout: 5.5" Wide x 2.6" High
Depth Behind Panel: 6.5"

Panel Mount Enclosure



Weatherproof Enclosure (NEMA 4X)
(Conduit Holes Not Provided)

Notes: *Dimensions -- Inches to the nearest tenth (millmeters to the nearest whole mm), each independently dimensioned from respective engineering drawings.*



Explosion Proof Enclosure (NEMA 7)

www.fmcinvalco.com

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