

FMC Technologies



INVALCO Product Guide

Table of Contents

For over 50 years, FMC Technologies INVALCO product group has manufactured instrumentation and controls for the process and petroleum industries worldwide. Products groups include liquid/gas; turbine, positive displacement, gear and insertion meters with associated electronics; diaphragm operated control valves; level controls; water-in-oil and oil-in-water analyzers.



Flow Measurement **Page 3**



Totalizers, Flow Computers and Transmitters **Page 10**



Analytical Instruments **Page 12**



Valves **Page 15**



Micro Valves **Page 18**



Pneumatic Level Controls **Page 20**



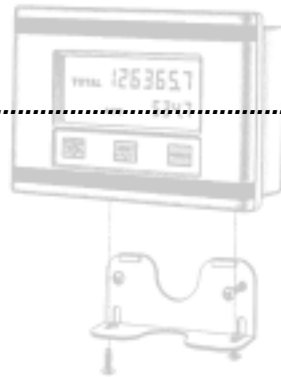
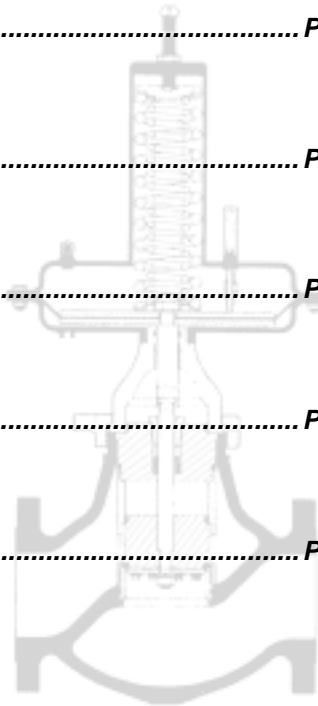
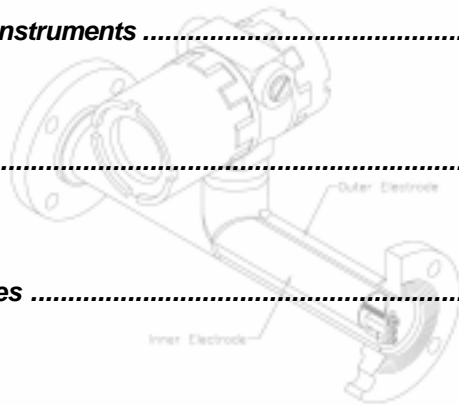
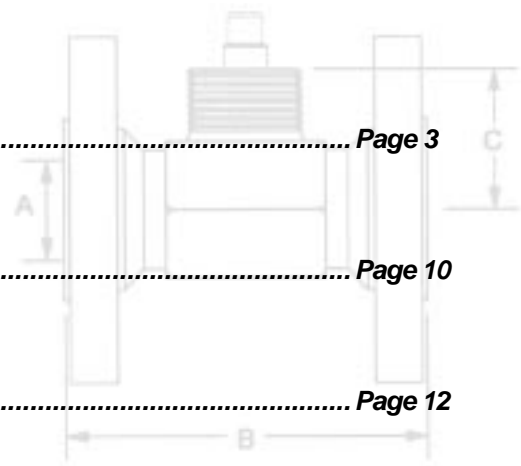
Electronic Level Controls **Page 21**



Pressure Switches, Controls & Miscellaneous **Page 22**



Controls **Page 23**



Flow Measurement

INVALCO has been designing and manufacturing quality liquid turbine meters for over 35 years, and was one of the pioneers in the use of tungsten carbide as bearing material for the stringent demands of the petroleum industry. INVALCO offers a full line of industrial and sanitary turbine meters to suit your measurement needs whether measuring anhydrous ammonia or deionized water, natural gas or compressed air. Thousands of INVALCO turbine meters are on the job today.

WH Series Turbine Meters

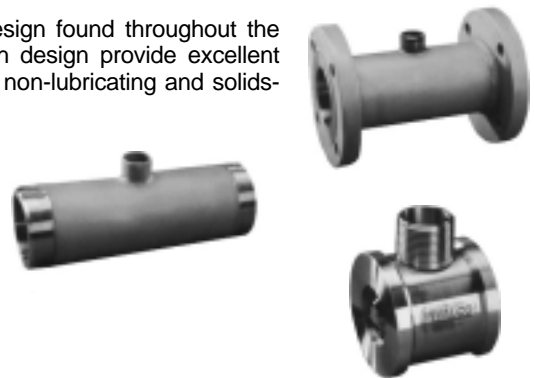
The WH Oilfield Series Meter utilizes a rugged, durable three-piece rotor/stator design. The double sleeve Tungsten Carbide bearing and flow through design provide excellent performance and unsurpassed mean-time-between-failure (MTBF).



- Various Meter Sizes and Connections Available - 1" & 1-1/2" NPT, 1, 1-1/2" and 2" Wafer, 2" F x F NPT
- Rotor Supports – heavy-duty upstream and downstream flow straightening for increased accuracy and durability.
- Helical Cast Rotor – cast from a highly wear-resistant stainless steel for durability and long service life.
- End Connection/Pressure Rating (CWP)
 - 1, 1-1/2" NPT 5000 psig (34,473 Pa)
 - 1", 1-1/2", & 2" Wafer As per flange connection rating to ANSI 1500 lbs.
 - 2" F x F NPT 5000 psig (34,473)
- Temperature Rating - -40°F to 228°F (-40°C to 109°C)
*Limited by pick-up coil; consult factory for temperatures outside this range.
- Linearity - $\pm 1.0\%$ or $\pm 0.5\%$ over stated range.
- All Stainless Steel Construction – All wetted parts are highly corrosion resistant stainless steel ensuring years of corrosion free service.

W Series Turbine Meters

The W Series turbine meters utilize the typical three-piece rotor/stator design found throughout the industry. The double sleeve Tungsten Carbide bearing and flow through design provide excellent performance and unsurpassed service life, even in tough applications with non-lubricating and solids-contaminated fluids.



- Linearity: $\pm 0.5\%$
- Repeatability: $\pm 0.05\%$
- Pressure Rating
 - NPT 5000 psig
 - Flange Class determines rating for flanged meters.
- Temperature Rate of Bearing
 - Tungsten Carbide: -40° F to 300° F (-40° C to 149° C)
 - Rulon: -40° F to 250° F (-40° C to 121° C)
 - High Temperature: -200° F to 800° F (130° C to 426° C)
- Connections:
 - W3 - Threaded
 - W4 - Flanged ANSI Raised Face
 - W4R - RTJ Flanged
 - W6 - Grooved
 - W9 Wafer

Sizes	Flow Rate		
	GPM	LPM	BPH
1/2"	1.5 - 6.0	5.7 - 23	2.1 - 8.6
3/4"	1.5 - 15	5.7 - 57	2.1 - 21
3/4" E	3.2 - 32	12 - 120	4.5 - 45
1"	6.5 - 65	24.6 - 246	9.3 - 93
1 1/2"	17.5 - 175	66.2 - 662	25 - 250
2"	33 - 330	124.9 - 1249	47 - 470
3"	60 - 600	222 - 2225	86 - 860
4"	110 - 1100	410 - 4100	160 - 1600
6"	300 - 3000	1110 - 11,100	430 - 4300

Flow Measurement

WS Series Sanitary Turbine Meters

Since the early 1960's INVALCO WS Series Turbine Meters have been certified as meeting 3-A Sanitary Standard 28-03 for metering milk and milk products. The WS Series Meters are also ideal for food and beverage applications including De-ionized water, wine, and many others. 3-A/FDA approved cemented tungsten carbide sleeve bearings and shaft are standard for excellent continuous non-lubricating service.



- Linearity: $\pm 0.5\%$
- Repeatability: $\pm 0.05\%$
- Pressure Rating : Tri-Clamp End Connections are limited to 250 psi at 375° F maximum.
- Temperature Rate of Bearing:
Rulon: -40° F to 250° F (-40°C to 121°C)
- Maximum Overrange: 125% of flow rate for intermittent periods.

Sizes	Flow Rate	
	GPM	LPM
1/2"	1.5-6.0	5.5-22
3/4"	1.5-15	5.7-57
3/4" E	3.2-32	12-120
1"	6.5-65	24.6-246
1-1/2"	17.5-175	66.2-662
2"	33-330	124.9-1,249

WC/WG Series Cartridge Turbine Meters

The WC/WG Series turbine meters are ideal for general purpose liquid flow measurement. The WC/WG Series meters use a unique one piece cartridge design with integral flow straighteners, double sleeve bearing and flow through design provide excellent performance and unequalled service life in non-lubricating and solids contaminated fluids. The stainless steel/tungsten carbide construction provide for corrosion free service so that long life is guaranteed, even in the toughest applications.

- Linearity:
WC: $\pm 0.5\%$
WG: $\pm 1\%$
- Repeatability: $\pm 0.05\%$
- Pressure Rating
NPT 5,000 psi
*Flange Class determines rating for flanged meters.
- Temperature Rate of Bearing:
Tungsten -40° F to 300° F (-40° C to 149° C)
Rulon -40° F to 250° F (-40° C to 121° C)
High Temperature -200° F to 800° F (-130°C to 426°C)
- Connections:
W3 - Threaded
W4 - Flanged ANSI Raised Face
W6 - Grooved
W9 - Wafer (2" only)



Sizes	Flow Rate		
	GPM	LPM	BPH
3/4"	1.5 - 15	5.7 - 57	2.1 - 21
3/4" E	3.2 - 32	12 - 120	4.5 - 45
1"	6.5 - 65	24.6 - 246	9.3 - 93
1 1/2"	17.5 - 175	66.2 - 662	25 - 250
2"	33 - 330	124.9 - 1249	47 - 429

GT Gas Series Turbine Meters

The GT Series Gas Turbine Meters are the most flexible and affordable gas turbine meters available. Used for a variety of applications, the GT Series Gas Turbine Meters incorporate a truly unique cartridge design which allows each meter body (3/4" to 2") to have three different flow ranges. This provides flexibility suitable to more applications without requiring piping reduction or expansion fittings providing years of service in the toughest applications.

- Linearity: $\pm 1.0\%$
- Repeatability: $\pm .25\%$
- Flow Rates from .13 to 200 ACFM
- Pressures 3/4" to 2"
Vacuum to 2000 psi.
- Unique Tungsten Carbide V-Cup bearing assembly.
- Easy-to-Service Precalibrated Cartridge
- Temperature: -40° F to 300° F (-40°C to 149°C)
- Connections:
GT3 - Threaded
GT4 - Flanged ANSI Raised Face
GT4R - Flanged ANSI RTJ
GT9 - Wafer (Flangeless) All Bore Sizes 2" Connection Size



Sizes	Flow Rate (ACFM)
3/4" - Low flow rotor	0.13 - 1.3
3/4" - Normal flow rotor	0.5 - 5.0
3/4" - High flow rotor	0.75 - 7.5
1" - Low flow rotor	0.5 - 5.0
1" - Normal flow rotor	0.65 - 6.5
1" - High flow rotor	1.1 - 11
1 1/2" - Low flow rotor	0.6 - 6.0
1 1/2" - Normal flow rotor	1.65 - 16.5
1 1/2" - High flow rotor	3.0 - 30
2" - Low flow rotor	3.0 - 30
2" - Normal flow rotor	4.5 - 45
2" - High flow rotor	8.5 - 85
2" - Extended high flow rotor	20 - 200

Flow Measurement

Multipulse Positive Displacement Meters

INVALCO Multipulse Positive Displacement Meters provide high levels of accuracy and repeatability for a wide range of liquids from low viscosity solvents and chemicals to viscous oils, greases and food bases.

Low pressure drop allows for economical pump selection or gravity flow applications.

- 316L stainless steel, aluminum or UPVC construction.
- Accuracy +/-0.5% of rate.
- Measures low and high viscosity liquids.
- No requirement for flow conditioning.
- Has no stagnate chambers or cavities.
- Adaptable to hygienic installations.
- High Pressure models to 5150psi (350 bar)
- Flameproof or intrinsically safe electrodes (optional).
- Insensitive to mounting orientation.
- Optional LCD flow rate totalizer with pulse and analog outputs
- -40°F to +250°F (-40°C to 120°C)



Multipulse Positive Displacement Meters

Model	Size	Flow Rate	
		GPM	LPM
MP015	1/2"	0.04 - 2.67	.15 - 10.11
MP025	1"	0.5 - 13.2	1.89 - 50
MP040	1 1/2"	1.1 - 35	4.16 - 132.5
MP050	2"	3 - 88	11 - 333

Dual Pulse Insertion Flow Transducer

INVALCO Dualpulse Insertion Flow Transducers provide a cost effective and simple means of measuring the flow of water and a wide range of low viscosity liquids. Two models (DP490SS & DP525SS) cover pipe sizes from 1.5" - 100" (40 - 2500mm) nominal bore. Installation is quick and inexpensive. The model DP525SS is ideally suited for Hot Tap installations. The linear measuring range covers flow velocities from 0.7 to 33 ft/sec (0.2 - 10 meters/sec) without creating flow cavitation.

- All stainless steel construction.
- Dual independent pulse outputs.
- Direct input to PLC and computer.
- High pressure submersible design.
- Pipe sizes 1.5" - 100" (40 - 2500mm).
- Electrical interference immunity.
- Minimal pressure loss.
- Simple to install, low installed cost.
- European CE compliant.



Model	Size	Flow Rate	
		GPM	LPM
DP490	1 1/2" - 36"	4 - 99,600	15.74 - 377,027
DP525	2" - 100"	6 - 780,000	22.71 - 2,952,621.2

Flow Measurement

FMC INVALCO's FLOMEC Small Capacity Flowmeters provide precise volumetric measurement of small quantities of liquids or low flows found in a broad range of industries including automotive, aviation, mining, power, chemical, pharmaceutical, food, paint, petroleum & environmental. Applications include the metering of additives for fuel, consumer products, water treatment & flotation cells, corrosion inhibitors, catalysts, emulsifiers, oils, grease, fragrances, adhesives, solvents, ink & insecticides.



Features and Benefits

- High accuracy & repeatability, direct reading flowmeter
- No requirement for flow conditioning (straight pipe runs)
- Stainless steel rotors
- Measures high & low viscosity liquids
- Quadrature pulse output option & bi-directional flow

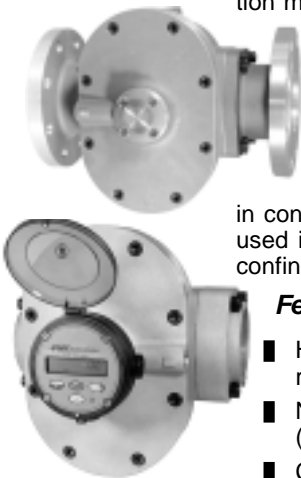
FMC INVALCO's FLOMEC Medium Capacity Flowmeters provide precise volumetric flow measurement of clean liquids found in a broad range of industries including automotive, aviation, mining, power, chemical, pharmaceutical, food, paint & petroleum. Applications include the distribution of fuels, fuel oils, lubricants, alcohols, solvents, blending of bio & ethanol fuels, metering of chemicals, grease, adhesives, ink, insecticides & non-conductive liquids either pumped or gravity fed.



Features and Benefits

- High accuracy & repeatability, direct reading flowmeter
- No requirement for flow conditioning (straight pipe runs)
- All metal rotors standard
- Measures high & low viscosity liquids
- Quadrature pulse output option & bi-directional flow

FMC INVALCO's FLOMEC Large Capacity Flowmeters are suited for receipt verification, loading, un-loading & distribution management at petroleum depots, mine sites, marine & aviation facilities. Common transfer applications involve fuels, oils, solvents, alcohols along with the blending of bio & ethanol fuels either pumped or gravity fed. The meters are compact & light weight in construction, important benefits when used in mobile installations or within confined spaces.



Features and Benefits

- High accuracy & repeatability, direct reading flowmeter
- No requirement for flow conditioning (straight pipe runs)
- Compact & light weight construction
- All metal rotors
- Quadrature pulse output option & bi-directional flow

Model Prefix	OM004	OM006	OM008
Nominal Size	1/8" (4mm)	1/4" (6mm)	3/8" (8mm)
*Flow range GPM	0.13 - 9.5	0.5 - 27	4 - 145
*Flow range LPM	0.5 - 36	2 - 100	15 - 550

- Accuracy @ 3cp: +/- 1% o.r. (+/-0.2% w/ opt. RT12 using NLC)
- Repeatability: typically +/-0.03%
- Temperature Range: -4F to 250F (-20C to 120C)
- Maximum Pressure: Aluminum - 220 psig (15 bar)
316L stainless - 500 psig (34 bar)
high pressure stainless - consult factory for options
- Protection class: IP66/67 (NEMA4X), opt. EXD IIB T6 or I.S.
- Recommended Filtering: 200 mesh (75 microns) min.

Model Prefix	OM015	OM025	OM040	OM050
Nominal Sz. (mm)	1/2"	1"	1-1/2"	2"
*Flow range GPM	0.26 - 10.6	2.6 - 40	4 - 66	8 - 120
*Flow range LPM	1 - 40	10 - 150	15 - 250	30 - 450

- Accuracy @ 3cp: +/- 0.5% of reading (+/- 0.2% w/ opt. RT12)
- Repeatability: typically +/-0.03%
- Temperature Range: 4F to 250F (-20C to 120C)
- Maximum Pressure: See specification sheet for breakdown
- Protection Class: IP66/67 (NEMA 4X), opt. Exd IIB T6 or I.S.
- Recommended Filtering: 100 mesh (150 microns) min.

Model prefix	OM080	OM80H	OM100
Nominal size	3" (80mm)	3" (80mm)	4" (100mm)
*Flow Range GPM	10 - 200	13 - 260	20 - 400
*Flow Range LPM	35 - 750	50 - 1000	75 - 1500

- Accuracy @ 3cp: +/- 0.2% of reading (15:1 turndown) +/-0.5% for 20:1
- Repeatability: typically +/-0.03%
- Temperature Range: 4F to 250F (-20C to 120C)
- Maximum Pressure: See specification sheet for breakdown
- Protection Class: IP66/67 (NEMA 4X), opt. Exd IIB T6 or I.S.
- Recommended Filtering: 40mesh (350 microns) min.

Flow Measurement

UM Series Flowmeter

The **UM series Flowmeter** is specifically engineered for monitoring or controlling the movements of small to medium volumes of water, diesel fuels, or non-volatile low viscosity liquids in small pipe sizes. The UM series is available in either blind configuration with dual pulsed outputs (Hall Effect & Reed Switch) or with an onboard self powered register to display rate, total, batch total or the meter can be fitted with an integral batch controller.

Features and Benefits

- 3/4" (20mm) quick couple process connections.
- Wide flow range 0.3 to 18 gal/min (1 to 70 liters/min).
- Accuracy better than +/- 2% o.r.
- Repeatability better than 0.3% o.r.
- Hall Effect & Reed Switch outputs giving 114 ppg (30 ppl)
- 35°F to 195°F (2°C to 90°C) operation
- 145 psi (10 bar) max. operating pressure
- Low pressure loss suits gravity flow installations
- Integral strainer included
- Robust IP66 NEMA 4X construction
- Batch controller version available



SAP Super Acid Proof Positive Displacement Flowmeter

FMC INVALCO's Multipulse SAP Flowmeters are specifically engineered Positive Displacement meters which provide high levels of accuracy, repeatability and safety when dispensing batches of aggressive acids and other dangerous chemicals which react with metals. These meters suit both high and low viscosity liquids either pumped or gravity fed.



Model Prefix	MP010P	MP020P
Nominal Size	3/8" (10mm)	3/4" (20mm)
Flow Range GPM (LPM)	0.05 to 2.7 (0.2 - 10)	0.5 to 13.2 (2 to 50)

Features and Benefits

- Flows: 0.05 to 13 US gal/min (0.2 to 50 liters/min)
- Size: 3/8" & 3/4" (10 & 20mm) process connections
- High accuracy & repeatability, direct reading flowmeter
- No req. for flow conditioning (straight pipe runs etc)
- PVDF & PEEK construction resists most chemicals
- Quadrature pulse output option & bi-directional flow

Series 800 Beverage Meters

The **FMC INVALCO Beverage Meter** ranges are designed specifically for the drinks dispense industries including beer wines and spirits. They give high performance and competitive pricing with 6 flow ranges from .013 to .132 gpm (0.05 to 15 liters per minute). They have totally non-metallic wetted components which makes them the ideal choice for the metering of food based products and even ultra-pure water. The standard inlet tubes are either barbed to accept two hose sizes .32" (8mm) and .47" (12mm) or on the beverage meter 3/8" push on pipe connectors, for OEM use alternatives are available. The bearings are made of sapphire for long life and reliability, the body is moulded in a choice of thermo-plastics (PVDF as standard) and the 'O' ring seal is typically Viton™ but may be any elastomer.



Features and Benefits

- 0.1% Repeatability
- 4.5 to 24 V dc
- Options to 257°F (125°C)
- Pulse output
- 145 psi (10 Bar) rating

Model	Flow Range gpm	Flow Range l/min
803	.013 to .132	0.05 to 0.5
815	.03 to .40	0.12 to 1.5
845	.05 to 1.19	0.2 to 4.5
865	.07 to 1.72	0.25 to 6.5
810	.079 to 2.64	0.3 to 10
824	.132 to 3.96	0.5 to 15

Flow Measurement

S900 Paddle Wheel Flowmeter

The **FMC INVALCO 900 Series Flowmeter** includes a high quality Pelton wheel which offers accurate performance with very reasonable operating cost.

Rugged construction, robust bearings and some of the most chemically resistant materials available ensures that these meters can be installed with confidence in a wide variety of applications. The meters may be used in industry, laboratories, pilot plant and educational establishments and can offer simple flow indication or complex flow control. The pulse output from the flowmeter may be used for rate measurement, totalizing, process control, batching, data logging or may be fed directly into PLC's for real-time monitoring and control.



Features and Benefits

- 257°F (125°C) operation
- Rugged sapphire bearings
- +/- 0.1% repeatability
- PVDF and 316 SS wetted parts
- Low power consumption (8mA)
- Choice of end fittings
- Hall Effect detector
- Traceable calibration
- 145 psi (10 bar operation)
- 4.5V to 25V DC

Model 1/4" BSP	Flow Range gpm	Flow Range L/min	Linearity & FSD	Approx. K Factor
903	.013 to .132	0.05 to 0.5	2.0	17,000
910	.079 to 2.64	0.3 to 10	1.0	1,420
915	.03 to .40	0.12 to 1.5	2.0	7,000
924	.05 to 1.19	0.2 to 4.5	1.0	980
945	.132 to 3.96	0.5 to 15	1.5	3,500
965	.04 to 1.72	0.15 to 6.5	1.5	2,100



Turbo Pulse Industrial Series Turbine Flowmeter

FMC INVALCO's Turbopulse Turbine Flowmeters are precise, reliable and robust units for the volumetric flow measurement of clean low viscosity liquids. Stainless steel construction with tungsten carbide bearings provides long life with a wide range of aggressive and non-lubricating liquids in petrochemical and general industrial applications.

Multiple sizes cover flows from 120 to 30000 USGPM (27 to 7000m³/hr) with +/- 0.5% linearity. Enhanced linearity is available in larger sizes where custody transfer performance is required.

Features and Benefits

- 15 sizes from 4 to 20" (100 to 500mm)
- Pressure to 3675 psi (250 bar)
- Standard range of -58 to 250°F (-50 to 120°C)
- Long life tungsten carbide bearings
- +/- 0.5% linearity (10:1 turdown)

Model	DN Inches	DN (mm)	USGPM	m ³ /hr
TP100	4	100	120 - 1200	27 - 270
TP150	6	150	240 - 2400	55 - 550
TP200	8	200	480 - 4800	110 - 1100
TP250	10	250	840 - 8400	190 - 1900
TP300	12	300	1200 - 12000	270 - 2700
TP400	16	400	1800 - 18000	400 - 4000
TP500	20	500	3000 - 30000	700 - 7000

Totalizers, Flow Computers & Transmitters

INVALCO also offers a wide variety of readout equipment. Our flow totalizers and rate indicators are inexpensive and easy to use for a broad range of applications.



Model 4200 Meter Mounted Rate Totalizer



Model 4300 Battery or Loop Powered Totalizer



Model 212 Heat Calculator



FC420 Frequency to Current Voltage Converter

Model 212 Heat Calculator

The Model 212 Heat Calculator measures the energy consumed in hot water heating systems and chilled water cooling systems. The 212 is supplied complete with temperature probes and will interface with a wide range of flowmeters, including positive displacement and inferential water meters, magnetic flowmeters with pulse outputs, turbine and paddle wheel flowmeters.

- Complies with OIML R75 and EN1434 standards
- Multilingual capability, Metric or US units
- Built-in density and enthalpy tables
- Meter-bus interface or RS485 communications
- 4-wire Pt100 RTD temperature inputs
- Fully programmable, High Accuracy
- Calculates and displays Volume, Energy, Temperatures and Peak Energy
- CE compliant, Watertight to IP66 (NEMA 4X)
- 4-20mA output option

Model FC420 Frequency to Current Voltage Converter

The Model FC420 is a precision frequency to current or frequency to voltage transmitter. The signal is directly proportional to the frequency input to the unit from a turbine flow meter pickup or related device. The span of the unit is field adjustable to accommodate a wide range of flow rates. By design, the transmitter is immune to voltage drops caused by long wire runs and electrical noise due to motors, relays, switches, transformers, and other industrial equipment.

- 4 - 20 mA Current Output
- Switch Selectable Signal Ranges, Output Signal Proportional to Flow
- Two or Three Wire Current Output
- CE Compliant

Model 4200 Meter Mounted Rate Totalizer

The Model 4200 Rate/Totalizer is designed to accept frequency or pulse inputs from a wide range of flowmeters and to display flowrate and a re-settable total directly in engineering units. Two different versions of the instrument are available: Battery powered version with scaled pulse output. Loop powered version with 4-20mA output. The Model 4200 is fully programmable with K-Factors, linearization of multiple K-factors, decimal point positions, and timebase being programmed via the front panel switches. The instrument is housed in a durable weatherproof polycarbonate enclosure that can be mounted directly on a flowmeter, panel-mounted or wall mounted using a pivoting bracket.

- Intrinsically safe to Class 1, Div. 1, Grp A,B, C & D CUL/UL
- Displays Rate, and Accumulated Total
- Battery, Loop or DC powered
- Weatherproof and Corrosion Resistant
- Wall, Panel or Flowmeter mounting
- Fully Programmable
- 4-20 mA Output Option
- Password Protection
- K-Factor Linearization

Model 4300 Battery or Loop Powered Rate Totalizer

Featuring 5 digits of rate and 8 digits of total, the Model 4300 is a battery or loop powered indicator capable of accepting magnetic pickup, DC pulse or switch closure inputs from pulse producing flowmeters. The unit can be ordered with an optional 4-20mA output (Models 4300-3I and 4300-3O). The 4300 uses the 4-20mA loop to provide power when this output is used.

- Accepts Inputs From: Magnetic Pickups, Contact Closures, DC Pulses (Optically Isolated) from Pulse Producing Flowmeters
- Displays Rate & Total Simultaneously
- 5 Digit Rate Display, 8 Digit Totalizer Display
- 4-20mA Analog Output Option (8 updates/sec)
- Powered From Internal Battery, External DC Supply or 4-20 mA Output Loop
- 20 Pt. Linearization
- Isolated Scaled Pulse Output
- Nonvolatile Flash Memory of Setup Data
- Extended Battery Life
- RS 485 Modbus Option

Totalizers, Flow Computers & Transmitters

Model 700 Batch Controller

The Model 700 Batch Controller is a single or dual stage controller complete with volume and non-linearity correction as well as automatic overrun compensation.

- Automatic overrun compensation.
- Batch limit.
- Signal time-out.
- Auto restart.
- Remote start/stop.
- Pulse output for remote counters.
- RS-232/422/485 or 4-20 mA Output available.
- 4-20 mA inputs (700 LA only).

Model 715 Liquid Flow Computer

In its simplest form, the Model 715 Liquid Flow Computer is a panel-mounted rate/totalizer, that will, with the proper options, correct for volume changes caused by temperature or product density. Additional features include mass flow using a density or temperature input, volume correction to 60° F or 15° C for petroleum products, and volume correction for general liquids using the Thermal Coefficient of Expansion.

- Large LCD display of rate, resettable total, accumulated total, gross total and temperature.
- Mass flow or corrected volume calculation using a temperature or density input.
- Pulse output for remote counters.
- Total conversion.
- Non-linearity correction.
- Analog or RS232/432 output.
- Quadrature pulse input.
- Relays for hi-lo alarms.

RT Series Universal Rate Totalizer

The INVALCO RT Flowrate Totalizer has been specifically designed to operate with common pulse producing flowmeters such as positive displacement, turbine and paddlewheel sensors, without the need for external power. Ultra low power consumption is a result of innovative design which provides many years of service from replaceable lithium batteries. External power may be applied to interface with common controllers such as PLC's via the scaleable pulse output and/or optional analog output.

- Self powered, 8 digit total and accumulated total, 5 digit LCD instantaneous rate display.
- Simple flow chart programming with English prompts.
- -4° to 176°F (-20° to 80°C) operation.
- PNP/NPN transistor scaleable pulse output as standard.
- Robust IP67 (Nema 4X) enclosure with M20 x 1.5 or 1/2" NPT electrical conduit entries.
- All data is retained in the event of power loss or battery removal.
- Extended battery life beyond 10 years with unique programmable power management function.
- Multipoint linearity correction when externally powered.

Model 705 Gas Flow Computer

Designed for use with our GT Series Gas Turbine Meters, the Model 705 Gas Flow Computer compensates for pressure and temperature changes within the measurement stream. A backlit, two line, alphanumeric display provides a clear indication of all parameters.

- 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.
- Pulse output for remote counters.
- 4-20 mA analog output, optional.
- Data logging output, optional.
- RS232/422/485 Serial Communication Option.



Model 700 Batch Controller



Model 705 Gas Flow Computer



Model 715 Liquid Flow Computer



RT Series Universal Rate Totalizer

Totalizers, Flow Computers & Transmitters

ES Ecobatch System- High Speed Batching System

The ES high speed batching system has been specifically package as an installation ready metering assembly suitable for the most common of liquid transfer applications throughout industry.

The batching of small to medium volumes of water or similar low viscosity liquids is a common requirement within many industries. Typical applications are found in the manufacture of car care products, food and beverage solutions, adhesives, building products, cosmetics, pharmaceutical, paint and chemicals.



Features and Benefits

- High speed count
- Complete close coupled batching system
- Brass flowmeter, solenoid valve & integral strainer
- Automatic overrun compensation
- Local or Remote start/stop
- Maximum batch size limiting
- Brass body with 3/4" NPT or BSP connections
- Flow 0.3 to 18 gal/min (1 to 70 l/min)
- 4 to 150 PSI (0.2 to 10 bar) working pressure
- Process temperature up to 180F (80C)n
- Batch metering accuracy better than +/-0.5% with steady flow
- Large 8 digit LCD Display
- 24vdc or optional 110~240vac supply

EB Ecobatch High Speed Batch Controller



The EB *Ecobatch* high speed batch controller is specifically designed to operate with common pulse producing flowmeters such as positive displacement, turbine, mass, vortex or magnetic style. The instrument displays batch value, batch progress & cumulative total in engineering units as programmed by the user, it also logs the total number of batches performed. *Ecobatch* scrolls messages to prompt the user at each stage of operation. Batch limiting and no-flow detection are "feature safeguards" against erroneously high batch entries, loss of the flow input signal or control valve or pump failure.

Features and Benefits

- Large 8 digit LCD batch total display & cumulative totalizer
- Robust IP66 field mountable housing with protection cover or DIN panel mount version
- Simple flow chart touch key programming
- Scalable universal high speed pulse & frequency flow inputs
- Two stage control available for soft start & close sequencing PIN protected programming
- Automatic overrun compensation Missing pulse (*no flow*) alarm
- Multiple batcher interlock function (*network up to 10 controllers*)
- Gallons, litres, m3, lbs, kgs or no eng. units displayed
- *Operating Temperature* 14 to 176°F (-10 to +80°C) refer to factory for higher temp.
- Power Requirements: 12 - 24Vdc, 50mA, 95 - 260Vac options
- Reed switch, open collector, coil (15mV P-P min.) Namur & other proximities. Max. frequency 10Khz

BT Series Battery Totalizer



The BT self powered totalizer is specifically designed for computing & displaying totals from flowmeters or machinery with frequency, sine wave or pulse outputs. The instrument simultaneously displays resettable (batch) total & a cumulative total in engineering units as programmed by the user. Ultra low power consumption is a result of innovative design which provides as much as 10 years of service from the replaceable 3.6V lithium battery. The BT may also be externally powered by 8~24Vdc.

Features and Benefits

- Self powered, 8 digit LCD cumulative totalizer & large 5 digit resettable total.
- Robust field mountable housing with protection cover as standard.
- Simple flow chart touch key programming
- Scalable universal pulse inputs
- PIN protected programming
- IP66 Weatherproof (NEMA 4X)
- 5 digit x .3" (7.5mm) high, programmable to 3 decimal places - Resettable Total
- Litres, MLitres, gallons, Mgallons m3, lbs, kgs or no engineering units displayed
- Input Types: Reed switch, open collector, coil (15mV P-P min.), namur & other proximities
- Max. Input Frequencies: Coil 5Khz, hall 2.5Khz, namur 250hz
- Operating Temperature: 14 to 140°F (-10 to +60°C) , refer factory for higher temp.
- Power Source: 1 x 3.6V lithium battery, can last to 10 yrs.

Analytical Instruments

On-line monitoring for ppm concentrations of petroleum oils in effluent & produced water



Hydro Surveillance System 1006

The **INVALCO HSS 1006** is the engineered combination of three unique designs. The sensing chamber contributes a continuous controlled water sample while the optical sensor package hovers above the passing stream. The controller then monitors the multiple signals to provide a reliable ppm concentration output.

Features and Benefits

- The special UV absorbing flow plate sheens the water over a large surface area. The resulting high surface area to depth ratio provides many benefits.
- The sensitivity to oil molecules is increased by maximizing the optical viewing area.
- The minimal depth discourages oil molecules from 'hiding' behind particulates in the water.
- The large lamp source targets the water from multiple angles to get a representative sampling of all oil.
- The large sample target area ensures a representative and stable snapshot of the water conditions.
- The unit can tolerate suspended solids up to 400 mg/l.

On-line monitoring for ppm petroleum oil in industrial filtered water and cooling water



Hydro Surveillance System 1016

The **INVALCO HSS 1016** offers a high accuracy approach to monitoring low concentrations of free and soluble oils in water. Combining many unique design features into a compact package makes this an ideal solution to monitoring for oil contamination in your water system.

The HSS 1016 uses a UV fluorescence technique to target the aromatic component of the oil contamination. Through a site calibration this aromatic tag is able to provide an indication relative to total oil. A slip stream approach directs a continuous sample flow through the HSS 1016 unit and back into the process stream. While it passes through the sample cell, filtered UV light is targeted in the water. The soluble and emulsified oils in the water will excite from this light energy and fluoresce light energy back out of the water at a signature wavelength. The intensity of light energy at this wavelength is measured to provide an indication of the ppm concentration.

On-line alarm for oil presence in filtered effluent and cooling water

Hydro Surveillance System 1026

The HSS 1026 uses a light scatter technique to respond to oil contamination in the water. A slip stream approach directs a continuous sample flow through the HSS unit and back into the process stream. While it passes through the sample cell a controlled light source is directed into the water. The emulsified oils in the water will scatter the light toward the light sensors placed strategically around the cell. The intensity of light energy is measured to provide an indication of the ppm concentration.

Features and Benefits

- Ultrasonic disc generates a continuous cleaning action within the sample cell to reduce maintenance frequency
- Compensation for temperature and lamp deterioration minimizes re-calibration requirements
- Long life lamp
- Desiccant chamber keeps electronics dry in humid conditions
- Continuous display updates every one second
- No consumables or chemical used
- Sample flow returns to the process
- Sample cell can be exchanged with prepared samples for easy testing and calibration
- No tools necessary for routine maintenance

Technical Specifications

- Power Input 24 vdc or 110 vac or 220 vac
- Operating Temperature 50°F to 122°F (opt. to 194°F)
10°C to 50°C (opt. to 90°C)
- Alarm Relays 2 x 2 amp, SPDT, dry
- Output 4-20 mA or RS-485
- Standards UL, CSA, CE
- Enclosure Type 4X polycarbonate, IP65
- Range 0-100 ppm
- Display Resolution 0.1 ppm
- Instrument Accuracy +/- 0.1 ppm
- Process Accuracy +/- 1.0 ppm under stable conditions



Analytical Instruments

Benchtop monitor for ppm concentrations of petroleum oils in effluent water

Hydro Surveillance System 1036

The HSS 1036 uses a UV fluorescence technique to target the aromatic component of the oil contamination. Through a site calibration this aromatic tag provides an indication relative to total oil. The sample tube is placed into the sample well. A non-contacting UV light source targets the sample with filtered light energy. The soluble and emulsified oils in the water will excite from this light energy and fluoresce light energy back out of the water at a signature wavelength. The intensity of light energy at this wavelength is measured to provide an indication of the ppm concentration.

Features and Benefits

- long life lamp
- reading printout serial port
- controlled and safe use of solvents
- bright backlit display of ppm readings
- easy calibration and instrument set-up
- no lag time, sample injection, or evaporation
- fast sample preparation and immediate readings
- ideal for site screening and process trend monitoring
- compliments and supports existing laboratory results
- solvent extraction qualifies sample to ISO & EPA methods



Reliable monitoring of sumps and containments for oil spills

HSS 1046 Floating Oil Spill Alarm

The INVALCO Floating Oil Spill Alarm sensor monitors the surface dielectric and locks in on the capacitance of the water. Oil that separates to the surface changes the capacitance field and activates the relay alarms.

This unit is normally used in sumps or containments where oil is not typically present. An upstream leak or spill that accumulates in the sump will alarm the monitor. The floating design allows the unit to track the changing water level in the sump and immediately alert operators, pumps or valves.

Features and Benefits

- alarms at 6mm separated surface oil
- stable tri-float design follows level changes
- adjustable time delay and sensitivity to eliminate nuisance alarms
- remote electronics via standard twisted pair
- available with Intrinsic Safety Barrier for Hazardous Locations
- waterproof PVC and SS wetted parts allow for use in harsh environments
- unit also alarms on dry sump conditions to shut down pumps
- capacitance technology responds to all types of oils and separated liquids of similar dielectrics



Analytical Instruments



Model 7300 Temperature Compensated Water Cut Monitor/Probe

The Model WCM 7300 is designed to provide the highest possible sensitivity, resolution, and accuracy for water content determination in crude oil, other hydrocarbons, or other low dielectric liquids from a maximum of 25% to levels below

1,000 parts per million (ppm). In oil and natural gas (condensate) production, water cut and S&W measurements are significantly improved with the WCM 7300 technology.

- Enhanced digital signal precision.
- Full product temperature compensation.
- Probe sizes from 2" through 12" are available.
- The WCM 7300 will provide a 0-5 Vdc output for use with the Model 4728 S & W Monitor where remote monitoring is desirable.



WCM 7300 E Insertion Style Probe

The WCM 7300E Insertion Probe is designed to lower the cost of measuring the water cut or S&W in larger pipelines where the use of an inline probe is uneconomical. This unit maintains the accuracy of our inline WCM 7300, but can be installed into any size line above three inches.



Model 2100 Net Oil Computer

The INVALCO Model 2100 Net Oil Computer is used to determine net oil, net water, BS&W content, and net gas produced in a well test or similar operation.

- 3 Meter Inputs
- Four Line 20 Character Alpha Numeric Display
- Jumper Selectable RS485 or RS232 Communication Option
- Four 10 amp SPDT Dry Contact Relays
- One Megabyte of CMOS RAM Data Storage with Battery Backup.



4728 WP Enclosure



4728 XP Enclosure



CX-645 Probe

Model 4528 EZ Detector and Model CX-645 Probe

The INVALCO Model 4728 S&W Monitor, in conjunction with a Model 4528EZ Detector and a Model CX-645 Capacitance Probe is a continuous on-line monitor of percent water in a flowing crude oil emulsion stream. This unit displays percent of water in various ranges from 0-5% up to and including 0-20% on a digital LCD indicator. In addition, the Model 4728 provides a 4-20 mA analog output proportional to input range, and a field-adjusted, time-delayed, limit relay for valve control or alarming.

The Model 4728 utilizes CMOS circuitry for low power consumption, high reliability, and wide temperature stability.

- Real-Time Display and Retransmission of S&W - Allows quick response to upset conditions for downstream controls.
- Adjustable Delay of Relay Closure - Prevents nuisance alarms and "actuator overload".
- Direct Analog Output from Model 4528EZ Detector - A 4-20 mA signal is standard from the probe without the need to include the Model 4728 monitor.

Model 4728 BS&W Monitor

The Model 4728 S&W Monitor in conjunction with a Model 4528 EZ Detector and a Model CX-645 Capacitance Probe is a continuous on-line monitor of percent water in a flowing crude oil emulsion stream.

- 4-20 mA analog output proportional to input range, and a field-adjusted, time-delayed, limit relay for valve control or alarming.
- CMOS circuitry for low power consumption, high reliability, and wide temperature stability.
- Adjustable Delay of Relay Closure prevents nuisance alarms and "actuator overload".
- Display Ranges: 0-5%, 0-10%, 0-20%.
- Digital LCD Indicator.

Valves

INVALCO valves are known as the industry standard when rugged and reliable dump/control, fuel control, back pressure and pressure relief valves are required.

Whether the requirement is to dump large volumes of fluid quickly at low or high pressures or to control blending, INVALCO valves will meet the application. Many valves are available with ductile or steel bodies to meet both low and high pressure applications and most valves are offered with a variety of trim options to suit demanding operating conditions. Most valves are Nace adaptable making them easily modified for sour service. Hammer union construction is utilized in manufacturing to guarantee reliability and reduce downtime for repairs.

415/416 Vessel Dump Control Valve

Ideal for low or high pressure separators. All parts are interchangeable with the obsolete Series 414 cast iron valve.

418/420 High Pressure Dump/Control Valve

Ideal for high pressure separators and dehydrators.

423 Non-Freeze Dump/Control Valve

Perfect for use as a liquid dump valve on high pressure separators with trim and seat that are total immersed in the fluid to prevent freeze ups.

424 Non-Freeze Dump/Control Valve

Perfect for use as a liquid dump valve on high pressure separators with trim and seat that are total immersed in the fluid to prevent freeze ups.

430 Flanged Dump/Control Valve

Perfectly suited for moderate pressure and temperature applications that require a flanged valve.

432 NPT/Grooved Dump/Control Valve

Ideal for high pressure separators or any application that requires moving large volumes of fluid or gas quickly.

433 Balanced Trim Dump/Control Valve

Ideal for high pressure separators or any application that requires moving large volumes of fluid or gas quickly.



415/416 Vessel Dump/Control Valve



418/420 High Pressure Dump/Control Valve



423 Non-Freeze Dump/Control Valve



424 Non-Freeze Dump/Control Valve



430 Flanged Dump/Control Valve



432 Flanged Dump/Control Valve



433 Balanced Trim Dump/Control Valve

Model	Body Material	Body Cover	End Connections	Nace Adaptable	Trim
418/420	Ductile or Steel	Steel, Union	Threaded	Yes	Wide of !
423	Low Temperature Carbon Steel	Steel, Union	MNPT/FNPT	No	Replc
424	Low Temperature Carbon Steel	Steel, Union	MNPT/FNPT	No	Replc
430	Cast Iron A-126	Cast Iron A-126	125 lb. Flat Face	No	Stainle in 3 Dc a Variet
432	Steel	Steel	NPT/Grooved	Yes	
433	Steel	Steel	Threaded	Yes	

Valves

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434 Flanged Dump/Control Valve



Series 436/438 Valve

434 Flanged Dump/Control Valve

The 434 valve is ideal for high or low pressure separators, treaters, dehydrators or any other pressure vessel. Perfect for use on offshore vessels.

436/438 Flanged Dump/Control Valves

Ideal for a variety of applications that require a steel bodied valve. This could include high or low pressure separators, treaters, dehydrators, or any other pressure vessel.

455 Double Port Dump/Control Valve

The perfect valve for any low to moderate pressure applications that require discharge of large amounts of fluid quickly. The soft plug makes this the ideal choice for large treaters, separators and water knockouts.

Series 465/468/470 Fuel Control Valve

The Series 465 Valve is commonly used as a fuel valve. Suitable applications include thermostat service or fuel shut-off for oil, gas, water, glycol, and distillate service.

476 3-Way Control Valve

The Series 476 3-Way 2" Control Valve is perfect for use in diverting, blending, manifolding, and volume metering service. Its primary use is in LACT service, but it can also be used in other blending applications.



455 Flanged Dump/Control Valve



Series 442/443 Diatroller Treater Valve

442/443 Diatroller Treater Valve

The Diatroller is a combination liquid level controller and liquid valve. Closed, the force of the weighted rod on top exceeds the liquid pressure under the valve diaphragm. As the liquid level rises in the vessel, the increased head pressure raises the diaphragm, opening the valve. Gas from the top of pressure vessels is piped to the valve diaphragm's top side to equalize pressure.



Series 468 Fuel Control Valve



476 3-Way Control Valve

Model	Body Material	Body Cover	End Connections	Nace Adaptable	Trim
434	Steel	Carbon Steel, Union	Flanged	Yes	Quick
436/438	Steel	Steel	Flanged	Yes	
442/443	Cast Iron	Cast Iron	Threaded or Flanged	No	Quick
455	Ductile Iron	Ductile Iron	150 lb. Raised Face	Yes	
465/468/470	Ductile or Carbon Steel	Stainless			
476	Ductile Iron	Carbon Steel	Threaded or Grooved	Yes	

Valves

Series 504/507/510 Back Pressure Valve

Perfect for maintaining back pressure on vent lines from separators, treaters, dehydrators, compressor stations, gas gathering systems, etc.

Series 518 Low Pressure Relief Valve

Ideal for use as a non-code relief valve in low pressure tanks and vessels, such as storage tanks. It is primarily designed for glycol reboiler applications.

Series 524 Lever Operated Dump Valve

The Series 524 Valve can be used as an oil or water dump valve on separators, treaters, free water knock-outs, or similar vessels that require a lever-operated valve.

Series 550 Socket Weld Long Nose Choke

Typically used in indirect heaters, but can be used in any application requiring a long nose choke design. Long Nose Chokes are primarily used to expand high-pressure gas inside the flow coil of indirect heaters. The "long nose" name is derived from the fact the outlet section of the angle-type body is extended permitting the choke orifice area to be immersed within the indirect heater bath. The heat generated in this manner minimizes the formation of hydrates, which occurs as high pressure gas expands.

Series 596 Valve Actuators

Designed specifically for use with butterfly valves, ball valves and other applications where powerful reciprocating motion is required. A wide selection of diaphragm sizes and spring rates provide economic automation and valve control.



Series 504
Back Pressure Valve
with Internal
Sensor Line



Series 507
Back Pressure Valve
with External
Sensor Line



Series 510
Back Pressure Valve
with External
Sensor 2" to 6"



Series 518
Low Pressure
Relief Valve



Series 550 Socket Weld
Long Nose Choke



Series 596 Valve Actuator

Model	Body Material	Body Cover	End Connections	Nace Adaptable
504	Ductile	Steel	FNPT	Yes
507	Ductile	Carbon Steel	Grooved or FNPT	Yes
510	Ductile	Ductile	Flanged	Yes
518	Carbon Steel		NPT	No
524	Ductile	Ductile	Flanged	Yes
550	Forged Steel	Carbon Steel	Socket Weld	Yes



Series 524 Lever Operated
Dump Valve

Micro Valve®

Since its introduction in 1956, Micro Valve has provided successful service through thousands of applications. This makes choosing the right miniature instrument and control valve a snap. Choose Micro Valve, the best valve to solve liquid, air, and gas service design problems. It absolutely will not leak. With other miniature valves, leakage occurs when flow is redirected from one port to another. But with the Micro Valve, flow is instantly redirected so there is no leakage.

Quick, Sure Response with Design Adaptability

With a unique, over-center snap-action you get a quick, sure response. There are no sliding seals, packing, or tight-fitting moving parts to leak, wear out or stick. Therefore, no lubricants are required. All models have been tested through several million cycles without maintenance, thus guaranteeing your systems' performance.

Micro Valves will withstand abrasive-bearing fluids. With all ports having some connection, external contaminants cannot enter the units. Dirt and grit will not prevent tight seating and will not cause the valve to stick.

Dependable Performance

The valve offers sure response, with no "neutral" position, and no varying time lag between positions. Micro Valves maintain either position without holding force, and cannot be vibrated or jarred out of position.

Valve action is full-speed regardless of operator speed or force applied. Trip-point position repeats accurately and is essentially independent of the speed of the external actuating device.

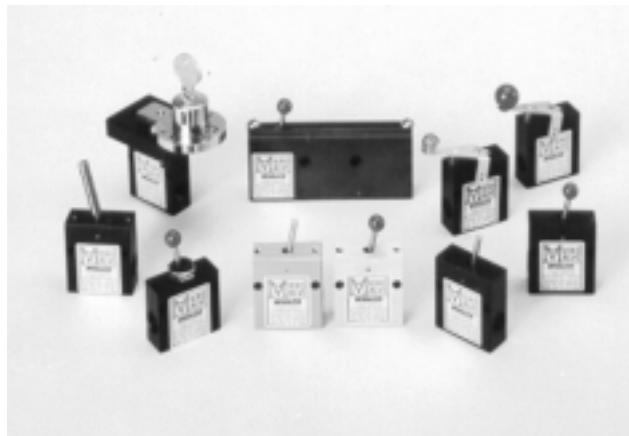
Light operating forces are required and not affected by operating pressure or flow rate. Shut-off is bubble-tight up to rated pressures.



The Micro Valve is a unique miniature valve offering versatility and rugged construction.

Features and Benefits

- Flow is instantly redirected, so there is no leakage.
- Unique over-center snap action provides quick, sure response.
- No sliding seals, packing or tight-fitting moving parts to leak or wear out.
- Requires no lubrication; no need to introduce a system lubricator.
- Suitable for vacuum service.



The Micro Valve Product Line

Gas Operating Range						
Series 316 Micro Valve Gas Flow			Series 38 Micro Valve Gas Flow			
ΔP (psig)	Q (SCFH*)			Q (SCFH*)		
	1/16" Orifice	1/32" Orifice	3/32" Orifice	1/8" Orifice	1/16" Orifice	3/16" Orifice
1	23.6	6.3	59.4	98.4	23.6	222.5
2	33.1	8.9	79.6	138.3	33.1	296.0
3	40.6	11.0	98.1	168.4	40.6	362.1
4	46.7	12.6	112.1	194.6	46.7	415.5
5	52.0	14.0	125.0	217.0	52.0	464.3
6	57.1	15.4	137.3	237.2	57.1	509.1
7	61.3	16.5	147.4	255.8	61.3	547.6
8	65.2	17.6	156.6	272.7	65.2	580.1
9	69.1	18.7	165.9	289.7	69.1	613.0
10	75.0	20.0	183.0	304.0	75.0	686.3
20	110.0	29.0	250.0	439.0	110.0	948.3
30	143.0	37.0	330.0	622.0	143.0	1275.4
40	170.0	45.0	390.0	789.0	170.0	1473.3
50	197.0	53.0	475.0	915.0	197.0	1765.6
60	235.0	61.0	530.0	1042.0	235.0	2041.8
70	270.0	69.0		1182.0	270.0	2347.8
80	305.0	77.0		1345.0	305.0	2535.1
90	337.2	85.0		1487.0	337.2	
100	369.4	93.0		1629.1	369.4	
110		101.0			401.6	
120		110.0			433.8	
130		119.0			466.0	
140		128.0			498.2	
150		136.0			530.4	
160		144.0			562.7	
170		153.0			594.9	
180		161.0			627.1	
190		170.0			659.3	
200		178.0			691.5	
210		186.0			723.7	
220		194.0			755.9	
230		202.0			788.1	
240		210.0			820.3	
250		218.0			852.5	

Note: The above flow rates are for air, to find the flow rate of other gases, divide the flow rate by the square root of the gas's specific gravity.

*Standard cubic feet per hour



The Micro Valve is available with 1/4" and 3/8" NPT type connections and in orifice sizes from 1/32" to 3/16". They can handle flow ranges from 6.3 to 2535 SCFH for gas applications and .02 to 6.5 gpm for liquid applications. (see charts at left)

Liquid Operating Range						
Series 316 Micro Valve Liquid Flow			Series 38 Micro Valve Liquid Flow			
DP (psig)	Q (gpm)			Q (gpm)		
	1/16" Orifice	1/32" Orifice	3/32" Orifice	1/8" Orifice	1/16" Orifice	3/16" Orifice
1	0.09	0.02	0.20	0.37	0.09	0.73
2	0.12	0.03	0.28	0.52	0.12	1.03
3	0.15	0.04	0.35	0.64	0.15	1.26
4	0.18	0.05	0.40	0.74	0.18	1.46
5	0.20	0.05	0.45	0.83	0.20	1.63
6	0.22	0.06	0.49	0.91	0.22	1.79
7	0.23	0.06	0.53	0.98	0.23	1.93
8	0.25	0.07	0.57	1.05	0.25	2.06
9	0.26	0.07	0.60	1.11	0.26	2.19
10	0.28	0.08	0.63	1.17	0.28	2.31
20	0.39	0.11	0.89	1.65	0.39	3.26
30	0.48	0.13	1.10	2.03	0.48	4.00
40	0.56	0.15	1.26	2.34	0.56	4.62
50	0.62	0.17	1.41	2.62	0.62	5.16
60	0.68	0.19	1.55	2.87	0.68	5.65
70	0.74	0.20		3.10	0.74	6.11
80	0.79	0.21		3.31	0.79	6.53
90	0.83	0.23		3.51	0.88	
100	0.88	0.24		3.70	0.88	
110		0.25			0.92	
120		0.26			0.96	
130		0.27			1.00	
140		0.28			1.04	
150		0.29			1.08	
160		0.30			1.11	
170		0.31			1.15	
180		0.32			1.18	
190		0.33			1.21	
200		0.34			1.24	
210		0.35			1.28	
220		0.36			1.31	
230		0.36			1.33	
240		0.37			1.36	

Note: The flow rates are for water, to find the flow rate of other fluids, divide the flow rate by the square root of the fluid's specific gravity.

Micro Valve applications include:

- Pressure switches
- Level controls
- Air switch to operate pneumatic tool.
- Pilot operation of main valves.
- Limit switches on cylinder actuated devices.
- Diverting valve used to introduce additive to two independent flow systems.
- Vial or container filling or sampling with instant and dripless shut off.
- Machine shop and assembly area for parts "blow off".

Level Controls

CT Flex Tube Level Control

General Purpose Enclosure

The CT (control throttling) Series Flex Tube has been an industry standard for over five decades in fluid level control. Its simplicity, reliability, ease of maintenance, and rugged construction have made it popular where downtime for repairs could be critical to processes or where minimum maintenance is desirable. The general purpose pilot enclosure is suitable for many exposed applications. All exhaust gas is vented inside the enclosure and then to the atmosphere through a screened vent connection.



Weatherproof Enclosure

The weatherproof pilot enclosure has been developed to provide a weather-tight pilot enclosure to completely protect the control from the elements and even hose cleaning operations. In addition, it allows hazardous exhaust gases to be vented through piping to a safe release area. An optional Acrylic or Pyrex sight glass can be included in hammer union models to aid in calibration and operation verification.

Model CMAQ/CMAF Level Controls

The Models CMAQ and CMAF are snap-action, float operated level controls, equipped with the popular three-way MICRO VALVE unit, actuated by two adjustable yoke-type pusher arms. Adjustable pusher arms permit the control range to be adjusted easily and accurately to the range desired. With the liquid level below the float, the three-way MICRO VALVE will be in the low level position and will remain there until the float rises to the preset high level. The MICRO VALVE will reverse positions until the float drops to the preset low level position.



- Adjustable span allows for pump up and pump down control. Easy-to-set desired level detection point.
- Proven MICRO VALVE unit provides long life and ease of maintenance.
- Over 35 years of proven field service demonstrates product reliability.
- Steel or ductile iron models are Nace adaptable for use in harsh, corrosive service.
- Standard gear stem assembly is 303 Stainless Steel; 316 Stainless Steel is optional (consult factory).

Model CADM-201 and CADMEX-201

These diaphragm-operated liquid level controls are available with either a pneumatic or electrical control switch. The INVALIDCO Model CADMEX-201 is supplied with an explosion-proof SPDT Micro Switch. This switch is UL and CSA approved. The Model CADM-201 is supplied with the popular snap-action, three-way Micro Valve®, ideally suited for diaphragm motor valve control. The 2" process connections are recommended where high paraffin or sediment content is present in the measured material. The most outstanding feature of these controls is the absence of troublesome small orifice and chambers usually found in similar types of floatless level controls.

- Temperature: -20°F to 250°F
- Maximum High Level: 22 feet W.C.
- Maximum Control Span: 11 feet W.C.
- Materials: Body - Steel, Diaphragm - Buna N
- Containment Pressure: 100 psi
- Model CADM Control Switch: Micro Valve, 3-way, 1/4" NPT Ports, 1/8" orifice, 100 psi max. W.P.
- Model CADMEX Control Switch: SPDT, Explosionproof Micro Switch, Amps @ 125, 250, or 480 Vac, CSA, and UL approved.



Model CQ-401 Float Type, Continuous Drain

The INVALIDCO Model CQ-401 offers dual purpose action to automatically discharge vapor or liquid from a tank. The continuous drain valve is widely used in the bottom of fuel gas scrubbers to provide continuous drainage of the accumulated liquids and thus prevent transfer of the liquid to the burner section.

- Float: 3-1/2" x 6" long, S.S. ball type
- Orifice: 1/4", 1/8", 3/16" and 3/8" available
- Float Rod: 5-1/2" long standard. 14-1/2" long available.
- Mounting Connector: 4" grooved coupling adapter
- Flapper: Molded Buna-N



Level Controls

Model IMS 780 “RF” Capacitance Interface Measurement

This measurement system is a capacitance-type device offering precise control of liquid interface. A non-fouling probe for continuous, reliable use is standard.

- Sensitivity of +/-0.3 pf
- Maximum working pressures to 1500 psig.
- Operating temperature -20° to 160° F.
- Accuracy: +/- 0.25”
- Control Interface up to 18” from probe.



Model 9450 Leveltronic Conductance Level Switch



The Model 9450 Leveltronic Control Relay is a conductance level switch for detecting the level of conductive materials. When this material comes in contact with the electrode, the electrode is “shorted” and establishes a current path to ground. The unit responds to the “short” by actuating a relay.

- Sensitivity is 250-400K Ohms.
- Maximum distance from probe is 900 feet.
- Operating temperature is -40° to 185° F.
- Can be set to ignore foaming liquids.

Model CMAS-203/CMEASX-203 Level Control

The Model CMAS-203 utilizes a stainless steel ball-type float and a three-way snap-action MICRO VALVE to provide a positive pneumatic output for control of liquid level.

- Override feature permits adjustment of set points without disturbing process level.
- Adjustable Span allows for pump up and pump down control. Easy-to-set desired level detection point.
- Proven MICRO VALVE unit provides long life and ease of maintenance.



Models CMEAQX and CMEAFX

The **INVALCO Model CMEAQX and CMEAFX Float Controls** provide electrical contact switch closure for alarm or control functions. An explosion-proof Micro Switch is actuated by two adjustable yoke-type pusher arms permitting the control range to be easily and accurately adjusted. With the liquid level below the float the Micro Switch will be in the low level position and will remain there until the float resets to the preset high level. The Micro Switch will reverse positions until the float drops to the preset low level position.

- Adjustable span allows for pump up and pump down control. Easy-to-set desired level detection point.
- Proven design provides long life and ease of maintenance.
- Over 35 years of proven field service demonstrates product reliability.
- Steel and ductile iron models are NACE adaptable for use in harsh, corrosive service.
- Standard gear stem assembly is 303 Stainless Steel 316 Stainless Steel optional (consult factory).



Pressure Switches & Other Controls



Model CDM 3801B

The Model CDM is a diaphragm operated pressure switch for pneumatic or hydraulic control. The unit is equipped with one or two snap-acting three-way Micro Valves to provide on/off output to one or more controlled circuits at pressures up to 100 psig. Two Micro Valve sizes provide extreme flexibility in application to simple or complex control systems. Since the Micro Valves are completely isolated from the diaphragm, and also isolated from each other, various control output pressures and media may be used in the same CDM Switch.

CADM/CADMEX Series Pneumatic and Electric Pressure Switches

The Model CADMEX is furnished with an explosion-proof Micro Switch providing dependable operation for systems requiring electrical control. The standard Micro Switch has SPDT contacts and UL and CSA hazardous area approval. An optional switch arrangement is available with DPDT contacts and spring loaded design. The DPDT Micro-Switch does not have the adjustable differential capability of the SPDT and, therefore, is actuated and released at approximately the same pressure. The CADMEX is offered with a choice of four spring ranges providing a wide range of flexibility in application.



Model CADM 3801B

The Model CADM is a diaphragm operated pilot valve for pneumatic or hydraulic control. The unit may be equipped with one, two or three snap-acting three-way Micro Valves to provide on/off output to one or more controlled circuits at pressures up to 100 psi. Two Micro Valve sizes and four spring ranges provide extreme flexibility in application to simple or complex control systems. Since the Micro Valves are completely isolated from the diaphragm, and also isolated from each other, various control output pressures and media may be used in the same CADM pilot.

Model CTS-5025 Temperature Controller

The Model CTS-5025 Pneumatic Type Temperature Controller provides pneumatic temperature control in a wide control range. It can be set to control at temperature from 0° F to 750° F. Under laboratory conditions temperatures can be controlled within +/-1° F. Actual operational range is determined by control location, circulation rate, etc. The stainless steel construction is a simple design - the head, inner valve, spring, and link can be removed, inspected, and reassembled in a short time. A 5° F temperature change causes 3-15 psi output signal change with 20 psi to 25 psi supply recommended.



Model CTS-5025B Temperature Controller

The Model CTS-5025B is the latest version of the thermal expansion-type temperature controls. It is provided with two adjustments.

- 1) **Temperature setpoint control.**
- 2) **A unique proportionality control.**

The temperature setpoint control permits the instrument to be set at any position from 0° F to 750° F. The proportionality control allows the operator to set the temperature span desirable. It is calibrated from 4° F to 60° F, which is the temperature change required to produce 3-15 psi output.

The principle difference between standard CTS-5025 and the CTS-5025B throttling control is the rotatable seat adjustable from the control face. The orifice in the seat is drilled eccentrically so that rotating the seat moves the orifice with respect to the adjusting screw. This regulates the amount the orifice is opened per degree of temperature reduction.



Controls & Miscellaneous

Model CM7 Pilot Guard

The CM7 Pilot Guard is designed to provide positive shut-off of the gas supply to both the pilot and main burner in the event of a flame-out. The CM7 requires no external power source, and can be used in remote locations where no electrical power is available.



- Contains no mercury.
- Detects pilot flame outage quickly.
- Requires no external power source.
- Controls both burner and pilot gas.
- Ensures that the burner port is closed during pilot ignition.
- Latchable reset for one-man pilot ignition.
- Uses proven thermocouple technology for long service life.
- Available with 15' thermocouple leads.
- Easily serviced; requires no special tools.
- Constructed of anodized aluminum to withstand harsh conditions.
- Main burner port vents through pilot port flame out.
- Manufactured with stainless steel internal valve parts for a long, trouble-free life.
- Seals constructed of Viton for long life and resistance to most chemicals.

Vent Line Flash Arrestor

Vent Line Flash Arrestors are available for use on tank or similar low pressure, vertical, vent lines to reduce chances for combustion within the line from an external source.

All steel construction except 4" thick aluminum element.



Model 80 Gas Scrubber Valve

The Model 80 Gas Scrubber Valve is used in Fuel Gas Scrubbers, and Air Eliminators. Installs through 2" pipe coupling or can be wholly contained by mounting by 1" nipple welded through cover. Can be used as a replacement for the Model IC-125 Scrubber Valve.





www.fmcinvalco.com

FMC Technologies
Fluid Control
2825 W. Washington
Stephenville, TX 76401
254.968.2181
800.468.2526
Fax: 254.968.5709