

NUFLO Scanner 2000 microEFM Well Testing Solution

TECHNOLOGY



Making Measurement

Easy...

- To Afford
- To Operate
- To Integrate
- To Optimize

Cameron's NUFLO™ Scanner® 2000 microEFM packs the gas, liquid and ancillary measurement capabilities, traditionally found in large flow computers, into a compact, low-power instrument that operates economically as a stand-alone chart recorder replacement, flow computer, data logger and totalizer making it the ideal product for test separator measurement.

By gathering all liquid and gas flow rates, wellhead pressure and temperature, casing pressure, separator pressure and temperature into a single common platform, all the data is immediately available to view, log or trend via industry standard well testing software packages. A reduction between 15% to 20% of total transmitters and vastly simplified wiring makes rig up of portable test separators very quick and simple. All the transmitters are on a single RS485 loop.

The convenience

of a low-power, compact flow computer

Simplicity and ease of use are integral to the design of the Scanner 2000. All parameters can be easily configured using a PC or laptop and the ModWorX™ Pro software – which is included with every Scanner 2000.

Features

Power

- Low-power operation
- Fully autonomous operation via lithium battery pack (1-year typical) for stand-alone installations
- When device is externally powered; lithium battery pack provides back up power supply and data is protected for up to 10 years

Performance

- Industry standard calculation
 - AGA-3
 - AGA-7
 - ISO 5167
 - ASME MFC-12M (Averaging Pitot Tube)
 - AGA-8 (Detail & Gross)
 - IF-97 (Steam)
 - API-2540 (Liquid)
- Field recognized DP Cone meter algorithm
- Archives up to 16 user-selectable parameters
- Generous log capacity:
 - 768 daily records
 - 2304 interval records (6392 with expansion board option)
 - 1152 event/alarm records
- Fast data transfer
 - Full archive download in approximately three minutes with main board only
 - Six minutes with expansion board option

- API 21.1 compliant
- Non-volatile memory
- Adjustable logging interval
 - Five seconds to 12 hours

Packaging

- Easy-to-read LCD
- User friendly keypad operations
- Multiple enclosure and mounting options

Communications

- Two RS-485 communication ports
- USB local communications option
- Modbus® protocol (RTU and ENRON)
- Two wire communication

Calibration

- 1 to 12 calibration points available for all inputs

Inputs/Outputs

- Accurate, stable and repeatable input readings using an integral MVT
- Base unit:
 - Process temperature input
 - Turbine meter input
 - Digital output (volumetric pulse output or alarm)
- With expansion board:
 - Second turbine meter input
 - Pulse input
 - Two analog inputs
 - Analog output

The versatility of a common platform



Totalizer/TFM Mount for Liquid Measurement



Turbine Meter Mount

Cameron's EZ-IN turbine meter is the industry standard for well testing.

- Rugged, low cost design
- Reduced weight over conventional TFM's
- Easy to calibrate in the field
- Copes with sand and water mixture



Data Logging

Delivers casing, tubing, wellhead, separator pressures and temperatures onto the same RS485 loop.

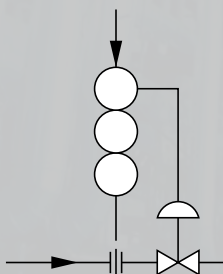
- Logs daily and interval records of up to 16 user-selectable parameters and stores the data in nonvolatile memory for up to 10 years
- Explosion-proof enclosure
- External 1 to 5 VDC or 4-20 mA transmitters or RTD



DP Cone Meter (or orifice fitting)

The direct mounted Scanner 2000/DP Cone system and reduces rig up time, leak paths and increases accuracy.

- Wide range of flow
- Reduced personnel exposure to H₂S/HP gas
- Reduced weight
- No plates to change
- Less installation length from dual chamber orifice fittings
- Highly wear resistant



PID Control

- Level control of separator
- Automatic switching between high and low flow meters
- Separator pressure control
- Gas lift control
- Two analog inputs for external devices

Simultaneous Gas/Liquid Measurement

Inexpensive expansion board option delivers:

- Increased device memory
- Second turbine meter input
- Pulse Input
- Two analog inputs

The benefits of making it easy

to afford

Reduces the total number of transmitters required

Simplified wiring – only two pairs required for the entire package

Free interface software (ModWorX Pro)

Operates for up to 12 months on an internal battery

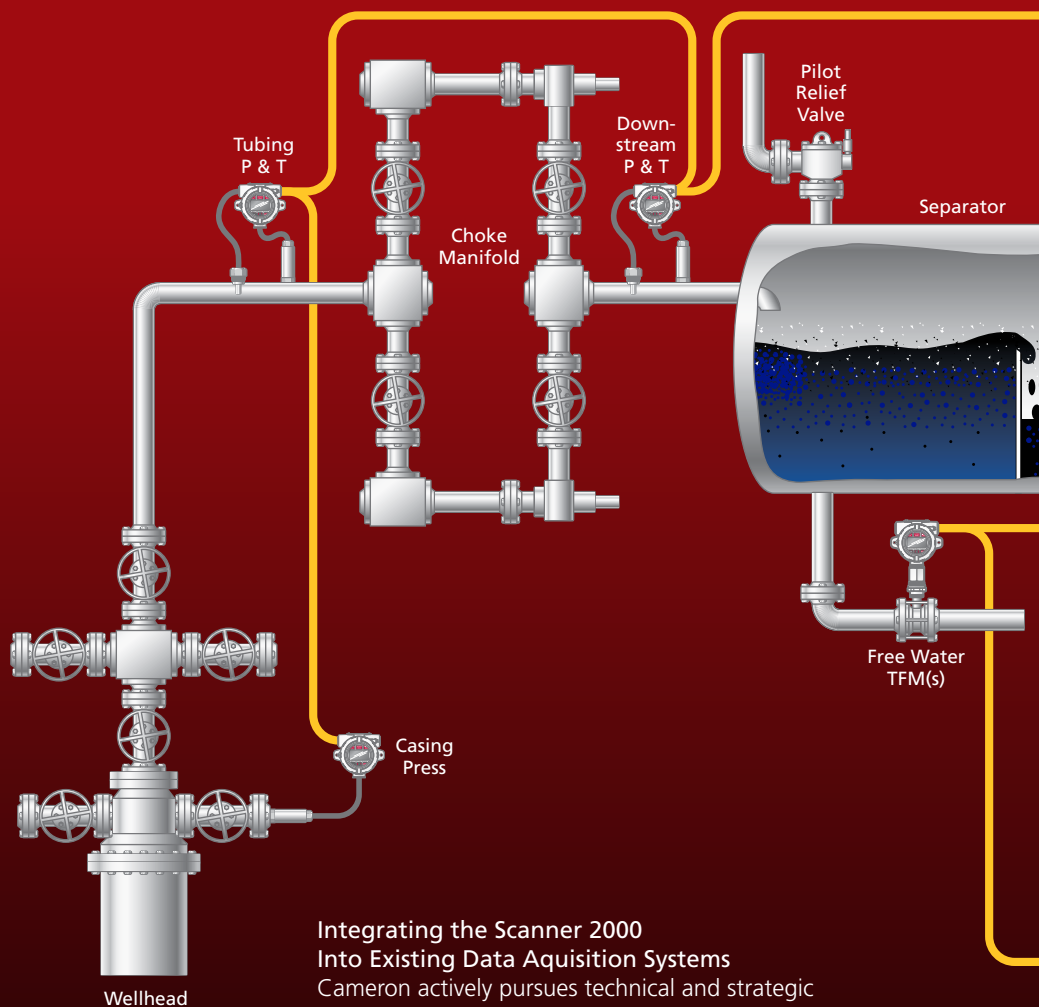
Simplified training – one platform for all transmitters

Reduced installation costs

Simplified spares requirements, each scanner shares the same basic components

No need for additional analog to digital interfaces

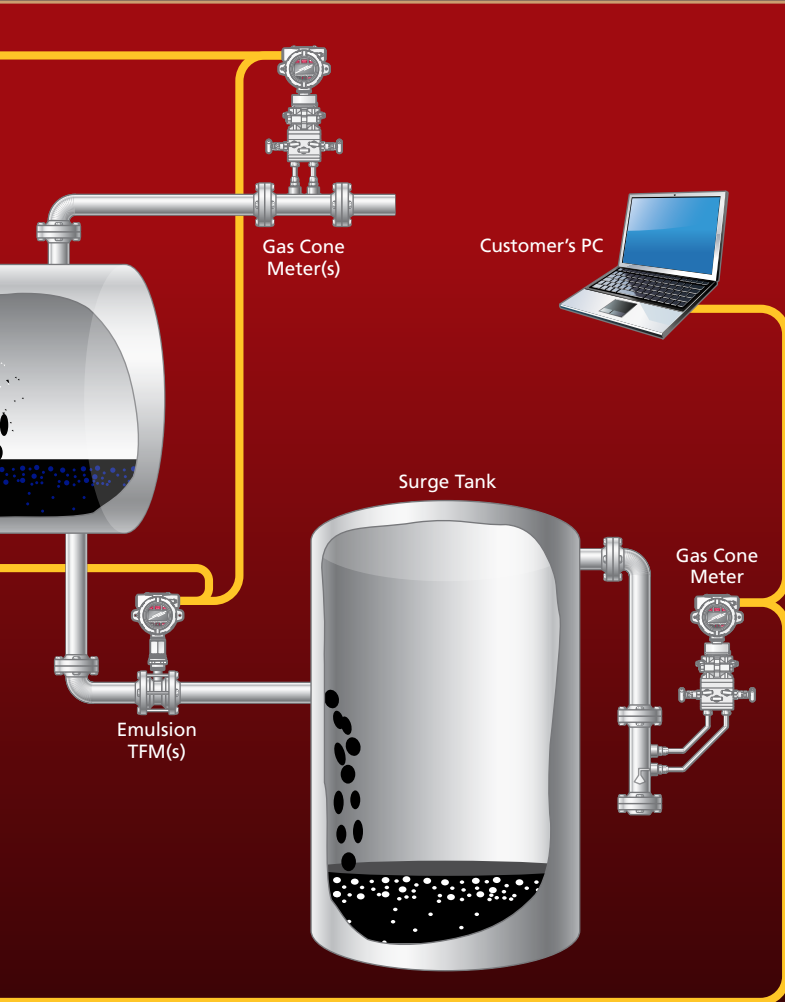
to operate and integrate



Integrating the Scanner 2000 Into Existing Data Acquisition Systems

Cameron actively pursues technical and strategic relationships with key well testing data acquisition solutions providers to ensure that the Scanner 2000 operates transparently with their software. We have worked alongside various providers to enable their software to log, trend and display fast (one second) updating displays from numerous Scanners in one system. Two-way communication allows for specific parameters, such as plate sizes, K-factors and gas SG to be written directly into the scanner from within their software in the control cabin.

to optimize



Transitioning Solutions

(from mechanical to electronic measurement)

- Low producing wells
- Unconventional gas
- Coalbed methane
- Shale
- Air measurement
- Well testing/Three-phase separator measurement
- Chemical fracturing
- Rotary meter measurement
- LACT measurement

Expanding or Modernizing Existing Measurement Systems

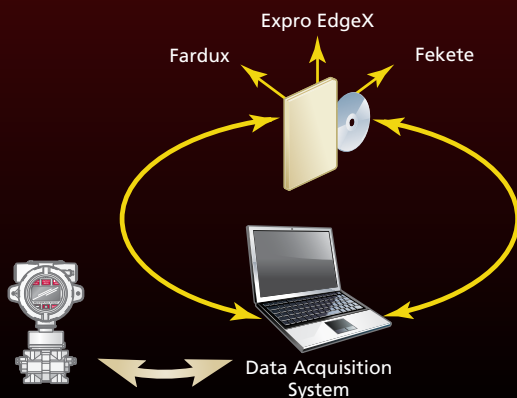
- Check meter
- Custody transfer/measurement Canada approval
- Gas storage
- Three-phase separator
- Salt water disposal

Application Solutions

- Single flow run
- Multiflow run
- Steam
- Compensated liquid

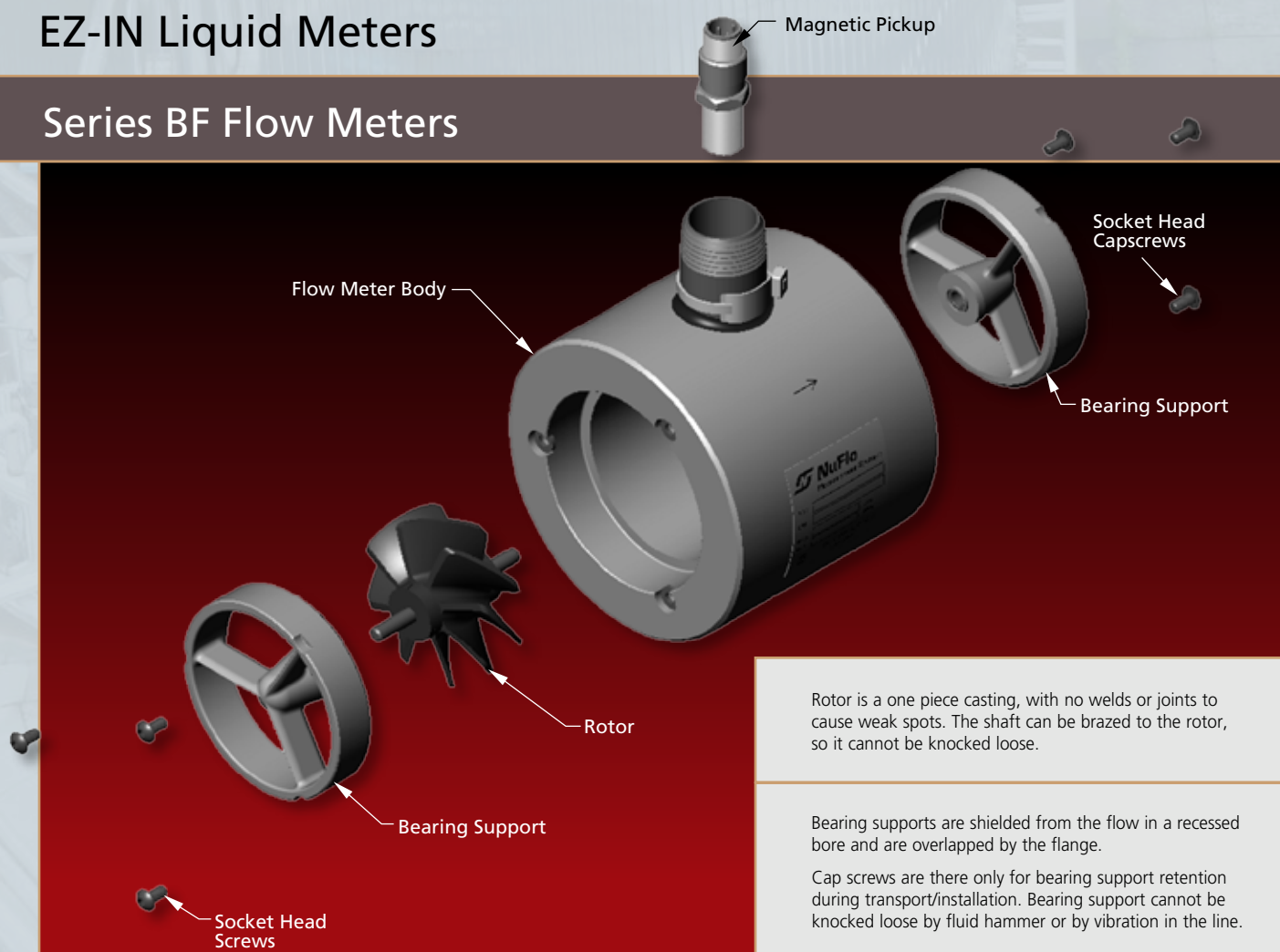
Single Source for Meters and Electronics: Easy Product Packages

- Scanner 2000 and NUFLO Orifice Meters
- Scanner 2000 and NUFLO DP Cone Meters
- Scanner 2000 and NUFLO Turbine Meters
- Scanner 2000 and BARTON® Turbine Meters



EZ-IN Liquid Meters

Series BF Flow Meters



EZ-IN Series BF Flow Meter Specifications

Flow Meter Size	Linear Flow Ranges (based on Water)			Nominal Calibration Factor	Max. Output Frequency	Δp at Max.
in.	gal/min	m ³ /h	B/D	pulses x 1000/m ³	pulses/gallon pulses/sec	psi (kPa)
3/8	0.3 to 3	0.068 to 0.68	10 to 100	22,000 (5812)	1100	4 (28)
1/2	0.75 to 7.5	0.17 to 1.70	25 to 250	14,500 (3830)	1815	12 (83)
3/4	2 to 15	0.45 to 3.41	68 to 515	2950 (780)	740	18 (124)
7/8	3 to 30	0.68 to 6.81	100 to 1000	2350 (621)	1175	20 (138)
1	5 to 50	1.14 to 11.36	170 to 1700	900 (28)	750	20 (138)
1 1/2 x 2	15 to 180	3.41 to 40.88	515 to 6000	325 (86)	975	16 (110)
2	40 to 400	9.09 to 90.85	1300 to 13,000	55 (14.5)	365	22 (152)
3	80 to 800	18.17 to 181.7	2,742 to 27,428	57 (15.2)	760	16 (110.4)
4	100 to 1200	22.71 to 272.55	3400 to 41,000	30 (7.9)	600	10 (69)
6	250 to 2500	56.78 to 567.82	8600 to 86,000	7 (1.8)	2900	10 (69)
8	350 to 3500	79.49 to 7944.94	12,000 to 120,000	3 (0.8)	175	6 (41)

Note: The linear flow range of liquids with non-lubricating characteristics is limited to the upper 60% of the upper rating. If using the flow meter with liquids having viscosities more than five centistokes, consult the factory for engineering assistance.

Cone Meter

benefits over an orifice plate

- Wide turndown (10:1)
- Reduced capital and maintenance costs
- Long term stability and accuracy
- Lower pressure loss for similar flow
- Reduced installation space
- Stable, low noise measurement
- Ability to cope with wet gas
- Self conditioning effect
- Lighter and easier to install and transport
- No changing plates – human error, H₂S/HP safety, removing damaged plate
- Simplified training
- Quicker delivery
- Digital information/data logging available from the Scanner 2000



Wide Rangeability

Cameron's NUFLO Cone Meter is designed to operate over large turndowns which allows differential pressures to be measured down to < 1" water column. The cone meter also generates a low noise differential pressure signal at the center and back of the cone.

High Performance Characteristics

The NUFLO Cone Meter achieves accuracies of up to $\pm 0.5\%$ of reading (Reynolds number and fluid dependent) with a nominal repeatability of 0.1% under many conditions and modes of operation. The meter can operate with turndowns nominally up to 10 to 1. These specifications meet custody transfer performance requirements for natural gas transmission measurements with sizes to > 36". (Contact Cameron for exact rangeability per process fluid.)

Technical Flexibility

The NUFLO Cone Meter can be manufactured in diameters from 1" to 48" with flanges ranging from Class 150 to 1500 in accordance with ASME B31.3. This sizing flexibility, plus the availability of special materials (duplex stainless steel and hastelloy) offers a new solution for specialty fluid metering requirements.

Space Savings and Weight Reduction

Differential pressure systems usually require long upstream and downstream lengths which add high overall cost to most metering installations. The NUFLO Cone Meter has the ability to re-distribute and change the velocity profile upstream of its cone. This flow conditioning allows for the use of a shorter meter run which in turn reduces installation and setup costs. This is especially significant in the well testing environment where space and weight issues are relevant and where real estate is at a premium.

Low Cost of Ownership

The NUFLO Cone Meter has no moving parts nor does it require the replacement of primary spare parts for the operational life of the unit. The meter is constructed from high grade traceable materials and both high quality welding and NDT techniques are strictly applied throughout in the manufacturing process.

Minimum wear occurs at the beta edge of the cone because this edge is downstream of the flow which helps to maintain a constant stable geometry through the meter's operating life.

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**HSSE Policy Statement**

At Cameron, we are committed ethically, financially and personally to a working environment where no one gets hurt and nothing gets harmed.