

## NUFLO Scanner 2000 microEFM



*Mounts directly to turbine meters,  
orifice meters and cone meters*

Cameron's NUFLO™ Scanner® 2000 microEFM is among the most versatile flow computers on the market. The device can operate alone to fulfill a variety of measurement applications or be networked with other devices to provide a comprehensive flow management SCADA solution.

Flow Computer

Data Logger

Multi-variable Transmitter

PID Controller

## Key Features and Functions

- Autonomous operation for One year (typical) via integral lithium battery pack\*
- Measures
  - Industrial and hydrocarbon gases
  - Liquids
  - Saturated steam
- Senses
  - Differential pressure
  - Pressure
  - Temperature
  - Flow meter pulses
- Computes
  - Standard volume
  - Mass
  - Energy
- Logs, indicates and communicates any measured or computed variable
- Downloads historical data at high speeds for analysis and data export using full-featured Windows-based software
- Certified internationally for measurement and electrical safety
  - ATEX/IECEx
  - CSA
  - Measurement Canada
  - GOST
- Supports a variety of protocols
  - RTU Modbus®
  - Enron Modbus
  - FOUNDATION™ Fieldbus

The Scanner 2000 can operate autonomously with an integral battery for one year or longer. Using only its integrated sensors, the Scanner 2000 can measure differential pressure, pressure, temperature and flow meter pulses. The device can scale and calculate flow as well as indicate and record data, which can be downloaded to a user's PC via a USB connection. Alternatively, the integral keypad can be used to configure basic parameters and access historical data.

The instrument can be factory-installed on Cameron's gas and liquid turbine meters, orifice meters and cone meters or shipped separately for connection to other primary flow sensors. The Scanner 2000 can measure the standard volume, mass and energy flows of saturated steam and many types of gasses and liquids with custody transfer precision.

In its most basic form, the Scanner 2000 replicates the BARTON® 202 flow recorder, the BARTON 242 pressure and temperature recorder, and the BARTON 200 and 227 differential pressure indicators.

With the addition of external connections, the Scanner 2000 can also act as a multi-variable transmitter, RTU and PID controller. This additional information can be transferred to and from the 2000 by analog or pulse (frequency), Modbus or FOUNDATION fieldbus serial communications.

A single Scanner 2000 is powerful enough to measure the gas, oil and water flow from a two- or three-phase separator or compute the flow from an ultrasonic gas flow meter. The Scanner 2000 is also versatile enough to act as a simple two-stream turbine totalizer or provide a Fieldbus connection to a positive displacement or turbine meter.

For more information about Scanner 2000 applications, see the following publications:

- Scanner 2000 microEFM Solutions
- Scanner 2200 EFM Solutions
- Scanner 2000 microEFM Well Testing Solution
- Feature Profile on PID Control

\* Actual battery life is dependent on calculation, sampling and display update frequency.

## PID Control\*

When purchased with the PID control option, the Scanner 2000 can be used to control process variables such as static pressure, differential pressure, temperature and flow rate. A 4-20 mA output is configured to regulate a control valve or adjustable speed drive (ASD) and control parameters are tuned with the easy-to-use tools that are built into the standard Scanner 2000 software platform, ModWorX Pro. Users can configure the Scanner 2000 to provide PID control for a single parameter or opt for PID control of flow rate with a secondary pressure control.



See our feature profile on PID control on the Cameron website for more information.

\* Not available with FOUNDATION Fieldbus model

## FOUNDATION Fieldbus Communications

The Scanner 2000 for FOUNDATION Fieldbus is a CSA explosion-proof and ATEX intrinsically safe device that is approved by the Fieldbus Foundation. An integral Fieldbus module converts Scanner 2000 Modbus data to fieldbus signals. Additional inputs, flow volumes and calculations can be read by a fieldbus host and recorded. Power and communications are supplied by a Fieldbus network and the integral lithium battery provides backup power.

## Approvals

### Explosion-proof Package

- CE approved
- Complies with EMC Directive 2004/108/EC
- ATEX and IECEx certified, II 2 GD Ex d IIC T6 IP68 40° F to 158° F (-40° C to 70° C)
- CSA certified for US and Canada Class I, Div. 1, Groups B, C, D, Class I, Div. 2, Groups A,B,C,D (non-sparking), Type 4 enclosure, ANSI 12.27.01 single seal (0 to 3000 psi)
- Measurement Canada certified for custody transfer, Approval No. AG-0557C
- GOST-R/GOST-K certified
- ASME pressure vessel code compliant (0 to 3000 psi); CRN OF10472.5C
- Fieldbus FOUNDATION approved

### Intrinsically Safe Package

- CE approved
- ATEX certified, II 2G Ex ia IIB T4 IP66 40° F to 172° F (-40° C to 78° C)
- Fieldbus FOUNDATION approved

## Display

- Two-line LCD with easy-to-read alphanumeric characters
  - 8-digit display of values (top line)
  - 6-digit display identifies each scrolling parameter and its engineering unit (bottom line)
- View up to 12 user-defined parameters
- View daily log data (99 days)
- User-selectable units of measurement
- Character height is 0.3"
- Adjustable contrast and update period

## Power

- Lithium battery for autonomous operation
- External power supply (6 to 30 VDC) optional with internal battery backup
- Fieldbus network power (Scanner 2000 FOUNDATION Fieldbus model only)

## Calculations

- Flow rate (natural gas, steam, liquid)
  - AGA-3
  - AGA-7
  - Compensated liquid turbine
  - ISO 5167
  - Cone
  - Averaging pitot tube (Annubar®)
- Fluid properties
  - AGA-8-92 (detail and gross)
  - IF-97 (steam)
  - Generic liquid (water or emulsions)
  - API-2540 liquid (crude oil, jet fuel, gasoline, fuel oils, lube oil)
- Wet correction (steam)
  - James (orifice)
  - Chisholm (orifice)
  - Steven (cone)

## Communications/

### Archive Retrieval

- Modbus (RTU) with two on-board RS-485 communications slave ports
  - COM 1 and COM 2 baud rates: 300 to 38.4K
- FOUNDATION Fieldbus with one on-board RS-485 communications slave port
  - COM 1 baud rate: 300 to 38.4K
- USB communications with optional adapter
- Enron Modbus compliant downloads
- User-definable block allows the grouping of up to 25 floating point values for faster data transfer when used with a SCADA system
- Full archive download in approximately three minutes with main board only (six minutes with expansion board option)

## Inputs

### Turbine Meter Inputs 1 and 2 (expansion board required for turbine input 2\*)

- Configurable sensitivity adjustment (20 mV to 200 mV, peak to peak)
- Frequency range: 0 to 3500 Hz
- Input amplitude: 20 mV to 3000 mV, peak to peak

- Turbine Input 2 cannot be used simultaneously with a pulse input

### Pulse Input

#### (Expansion Board Required\*)

- Accepts a signal from a turbine meter or PD meter
- Optically isolated
- Input: 3 to 30 VDC or contact closure
- Cannot be used simultaneously with Turbine Input 2

### Analog Inputs 1 and 2

#### (Expansion Board Required\*)

- Three-wire sensor interface
- Sensor power same as external power supply for main board (6 to 30 VDC)
- Accuracy: 0.1% of full scale
- Temperature effect: 0.25% of full scale over operating temperature range of -40° F to 158° F (-40° C to 70° C)
- Resolution: 20 bits
- User-adjustable sample time and damping

### Process Temperature Input

- 100 ohm platinum RTD with two-wire, three-wire or four-wire interface
- Sensing Range: -40° F to 800° F (-40° C to 427° C)
- Accuracy: 0.2° C (0.36° F) over sensing range at calibrated temperature
- Temperature effect (Fahrenheit): 0.54° F over operating range of -40° F to 158° F
- Temperature effect (Celsius): 0.3° C over operating range of -40° C to 70° C
- Resolution: 24-bits
- User-adjustable sample time and damping

\* Not available with FOUNDATION Fieldbus model

## Outputs

### Digital Output

- Configurable as pulse output or alarm output
- Solid-state relay
- Output rating: 60 mA max at 30 VDC
- Pulse output
  - Configurable pulse duration
  - Maximum frequency: 50 Hz
  - Configurable pulse representation (1 pulse = 1 MCF)
  - Based on any accumulator (flow run or turbine inputs)

- Alarm output
  - Low/high
  - Out-of-range
  - Status/diagnostic
  - Latched/unlatched
  - Normally open/normally closed

- Represents any measured variable (e.g., differential pressure) or calculated parameter (e.g., flow rate)
- Regulates control valve in PID control applications
- Optically isolated
- Resolution: 16-bits

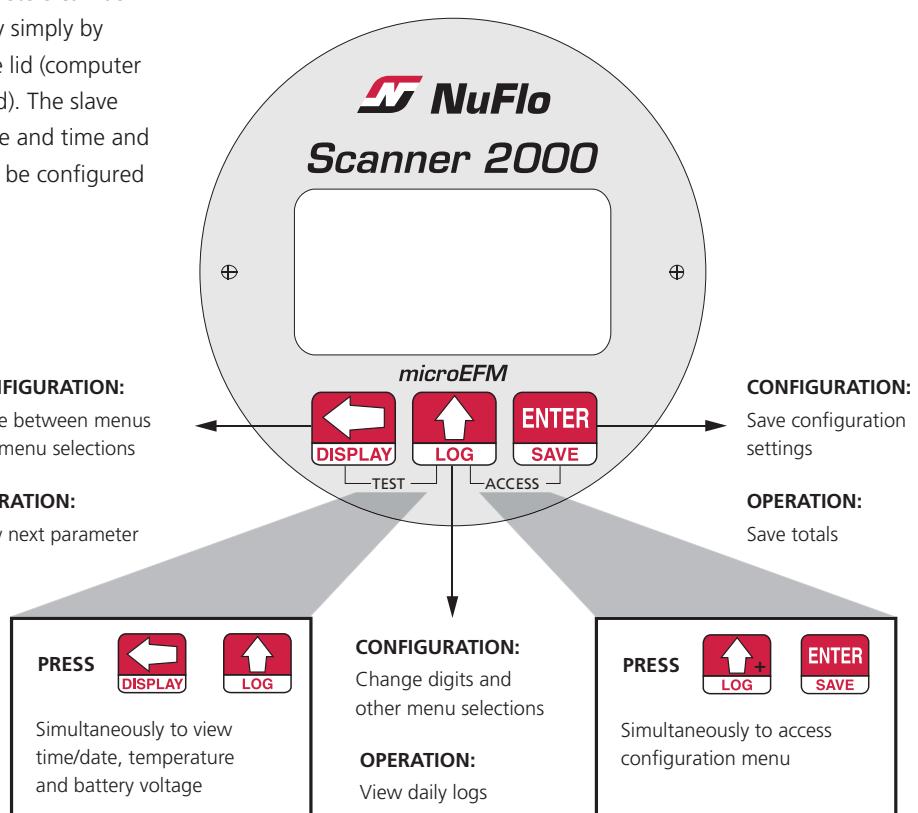
### Analog Output (Expansion Board Required\*)

- 4-20 mA
- Accuracy: 0.1% of full scale at 25° C (77° F), 50 PPM/° C (27.8 PPM/° F) temperature drift

\* Not available with FOUNDATION Fieldbus model

## Keypad Configuration

With the three-button keypad, changes to basic parameters can be made quickly and easily simply by removing the enclosure lid (computer software is not required). The slave address, baud rate, date and time and orifice plate size can all be configured from the keypad.



## Memory

- Non-volatile memory for configuration and log data
- 256 KB (512 KB with expansion board option)
  - Data stored up to 10 years without power

## MVT

- Provides linearized digital data
  - Static pressure
  - Differential pressure
- Available with bottom ports (gas measurement) or side ports (liquid or steam measurement)
- NACE compliant units also available
- User-adjustable sample time and damping

## MVT Pressure Ranges

Static Pressure/ SWP (PSIA)	Differential Pressure (in. H <sub>2</sub> O)	Maximum Overrange Pressure (PSIA)
100	30	150
300	200 <sup>(1)</sup>	450
	840	450
500	30 <sup>(2)</sup>	750
	200 <sup>(1)</sup>	750
1500	200 <sup>(1)</sup>	2250
	300	2250
	400 <sup>(1)</sup>	2250
	840	2250
3000 <sup>(3)</sup>	200 <sup>(1)</sup>	4500
	300	4500
	400 <sup>(1)</sup>	4500
	840	4500
5300 <sup>(3)</sup>	200 <sup>(1)</sup>	7420
	300	7420
	400	7420
	840	7420

<sup>(1)</sup> These ranges are stocked for quicker delivery

<sup>(2)</sup> Available on request

<sup>(3)</sup> Not evaluated for Measurement Canada approval

## MVT Accuracy

- Stability: Long-term drift is less than  $\pm 0.05\%$  of URL per year over a five-year period
- Differential pressure:  $\pm 0.05\%$  of span
  - Effect on differential pressure for a 1000 psi change in pressure
  - Zero shift:  $\pm 0.05\%$  of URL
  - Span shift:  $\pm 0.01\%$  of reading
- Static pressure:  $\pm 0.05\%$  of span
- Temperature performance: 0.25% of full scale over full operating temperature range
- Resolution: 24 bits

## Environmental

### Operating Temperature Range

- -40° F to 158° F (-40° C to 70° C)
- LCD contrast is reduced below -22° F (-30° C)

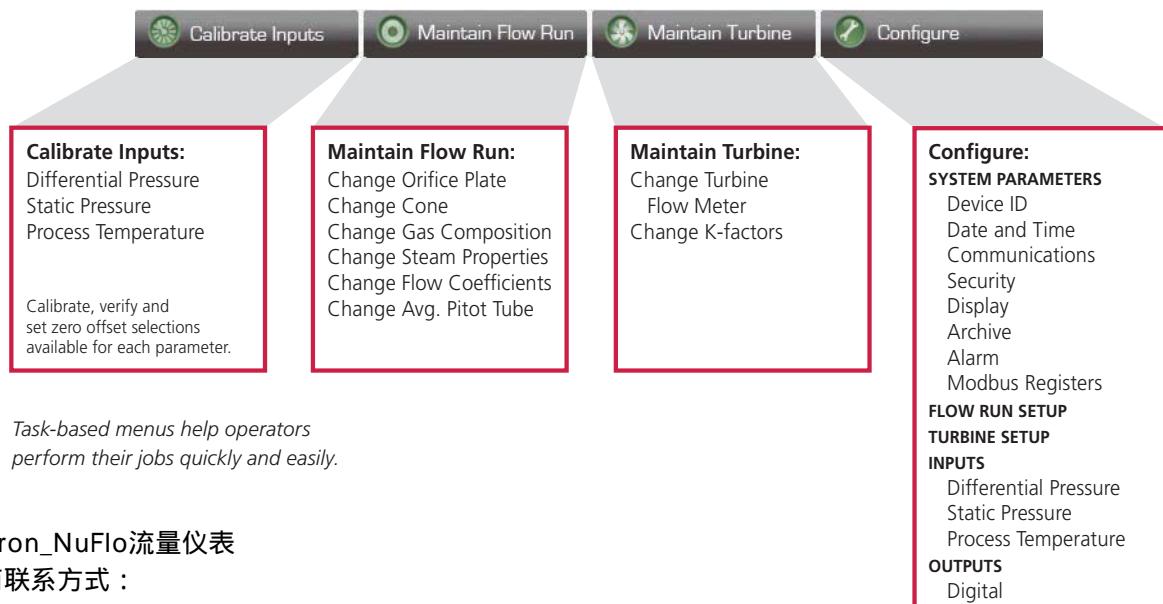
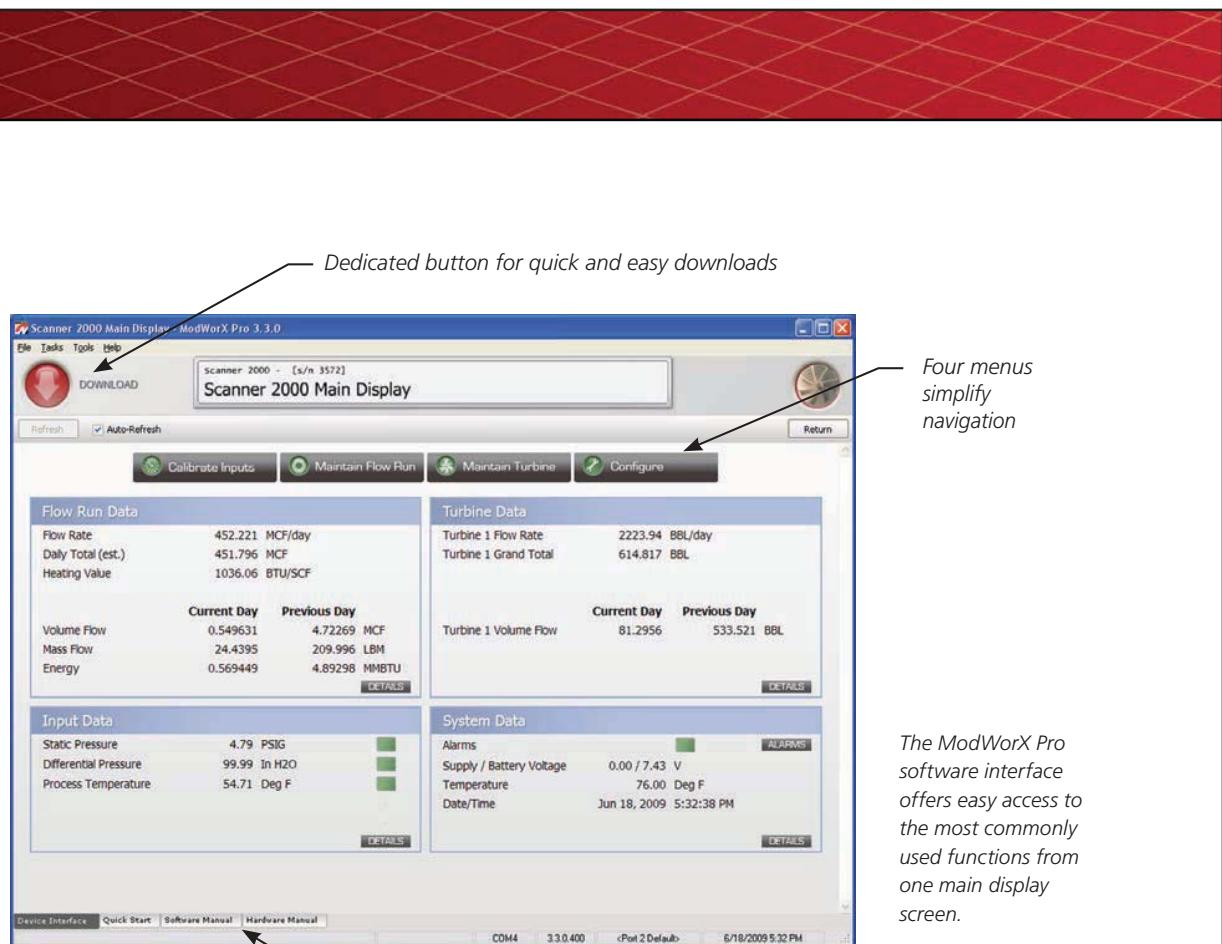
## Audit Trail

- Daily records: 768 (more than two years)
- Interval records: 2304 (greater than 3 months of one-hour intervals); 6392 (greater than 8 months of one-hour intervals) with expansion board option
  - Adjustable from five seconds to 12 hours
- Event/alarm records: 1152
- Records up to 16 user-defined parameters

## Interface Software

- Provided at no charge
- Easy to use
- Real-time data polling
- Complete configuration
  - Configuration upload tool for configuring multiple units
- Multi-level security

- Field calibration
  - 1 to 12 calibration points for each parameter
  - Three methods: multipoint, set zero point and verify
  - Inputs are automatically locked during calibration
- Maintenance
  - Change plate
  - Change cone (linearization: 1 to 12 points)
  - Change averaging pitot tube
  - Change gas composition
  - Change steam properties
  - Change liquid parameters
  - Change flow coefficients
  - Change K-factor (linearization: 1 to 12 points)
  - Change turbine flow meter
- Archive data downloads
  - Configurable downloads of all or new records
  - Download types: daily, interval and event/alarm records
  - Downloads are automatically saved in uneditable binary (SDF) files
  - Exports to .xls, .csv, .rtf, .html, Flow-Cal® and PGAS® formats
- Reporting
  - Daily logs (table or trend graph)
  - Interval logs (table or trend graph)
  - Event/alarm logs
  - Configuration settings
  - Calibration settings
  - Snapshot of current status data and calculated parameters
- Online documentation
  - Quick start guides
  - Hardware manual
  - Software manual



Cameron\_NuFlo流量仪表

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