sensia
Rockwell Automation + Schlumberger

+ MEASUREMENT SOLUTIONS

+ MC Synergy Flow Totalizer

Intelligent monitoring and enhanced connectivity

FEATURES

- + User-configurable condition-based monitoring, logging, and alarming
- + Wirelessly upload multi-point calibration and other important data for Sensia turbine meters and internals kits
- + Dual RS485 Modbus comm ports
- + Dual independent multifunctional isolated digital outputs
- + Optional loop-powered isolated analog output with HART comms
- + Optional Ethernet comms, ModbusTCP and Modbus over TCP
- + Easy-to-read configurable LCD display
- + High speed data downloads
- + Modbus map backwards-compatible with MC-III
- + 12-point K-Factor and meter factor linearization
- + Password protected security for keypad, HART, and Bluetooth
- + Large capacity internal batteries provide up to two years autonomous operation
- + Battery monitor reports voltage and remaining life
- + Real-time clock, backed up by coin cell battery
- + Nonvolatile memory
- + Complimentary app allows configuration via cell phone or tablet (Digital Data Plate)
- + Complimentary PC software allows configuration, online or offline (MC Synergy)
- + Complimentary PC software allows viewing of historical data, data exporting, and report creation (ScanData)
- + CEC, NEC, ATEX, and IECEx approvals

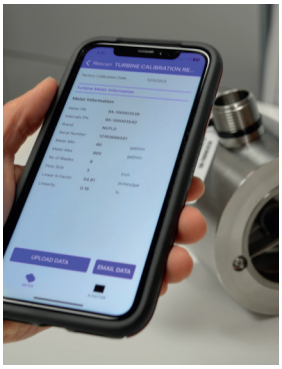
The NUFLO MC Synergy Flow Totalizer is the latest addition to a long history of industry-leading digital totalizers. Cutting-edge enhancements provide unprecedented benefits for users of the new features.

Like its predecessors, the MC Synergy Flow Totalizer is typically attached to a turbine flow meter, sensing the pulse frequency, calculating flow rate and total. The list of new enhancements is noteworthy, including fast and accurate configuration, improved measurement accuracy, flexible connectivity, predictive diagnostics, and condition-based monitoring.

Optimized for use with Sensia liquid turbine flowmeters; the MC Synergy also accommodates any device that outputs a sine wave, a pulse, or a contact closure.

The MC Synergy provides local and remote indications of total and rate in user-selected units, as well as user-defined variables. It acts as an interface device transferring real-time or historical data by analog or digital serial communication techniques to SCADA or automation systems. Optional HART and Ethernet communications available.

Log up to 384 daily flow records, 768 interval records (user-configurable, defaulted to hourly), 768 event records, and 768 alarm records. Complimentary Sensia software is available for viewing the data offline, in both tabular and graphical formats.



LOGS UP TO

384 daily flow records

768 hourly records

768 event records

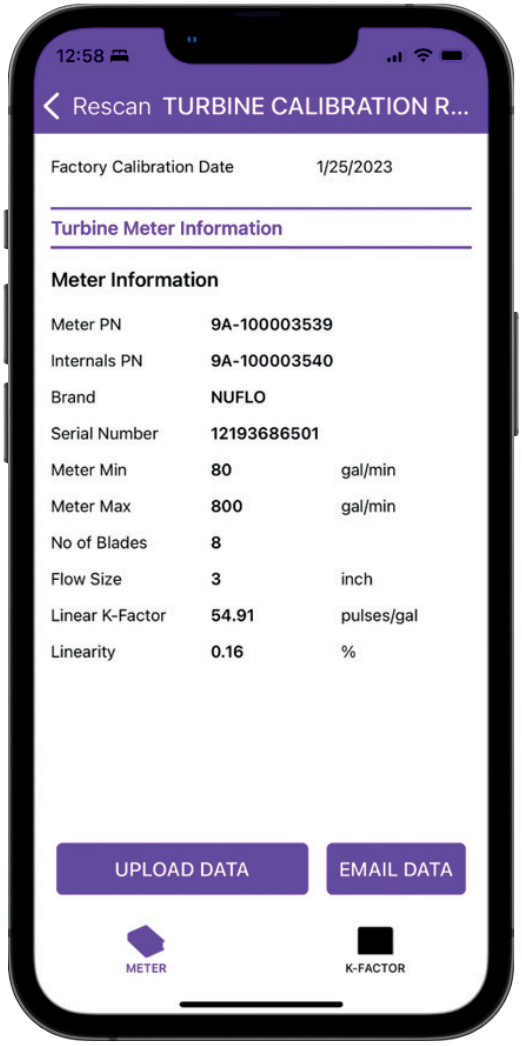
768 alarm records

IMPROVING TURBINE METER TECHNOLOGY

Turbine flow meters are a foundation technology to the global oil & gas industry due to their strong value proposition, delivering accuracy and flow rangeability at a low cost.

However, turbine meters have moving parts, potentially affecting performance over time. As operating companies strive to improve operating efficiencies, they are turning to technology which offers features such as device-based monitoring which will alert them if there are issues with the health of the meter or the process. This allows problems to be detected quickly and addressed promptly, as opposed to the normal time-based preventative maintenance service checks. Historically, only the latest and most costly devices have offered prognostic health monitoring and condition-based monitoring (CBM).

Ahead of its peers and for the first time, the MC Synergy allows BARTON and NUFLO turbine meters to offer diagnostic and predictive capabilities! One enabler of this innovative functionality is a QR code, supplied with all Sensia turbine meters and replacement internals kits manufactured after March 2021. This QR code contains key information about the meter, enabling a patented process to wirelessly upload data to the MC Synergy, an act of true seamless synergy between devices. It is important to note this functionality can also be retrofitted to other turbine meter brands who have imitated the NUFLO design. Simply installing a genuine Sensia calibrated internals kit with QR code will enable all the benefits described herein.



UPLOAD DATA IN SECONDS WITH THE MAGIC OF OUR DIGITAL DATA PLATE APP

MC Synergy Flow Totalizers are a prime example of technology without complexity. Take our patented QR code and Digital Data Plate app process. Using an Apple or Android smartphone or tablet, upload meter-specific data in seconds. No Internet connection is required.

While connected, view real time data or quickly revise configuration parameters.

+ Sync real-time clock
+ Set units of measure
+ Enable multipoint or linear K-Factor
+ Set display items
+ Set input type, sensitivity & health test parameters
+ Configure both RS482 ports
+ Configure HART and 4-20 mA analog

This pioneering approach dramatically reduces deployment time while also enabling quick and easy configuration with the display cover still in place – keeping your people safe and your operation moving. Detailed meter data from QR codes can also be emailed right from the app, enabling a digital audit trail of deployments.

	Current Day	Previous Day	Current Hour	Previous Hour	Current Month	Previous Month
Turbine Alarms	3	2	1	OK	5	4

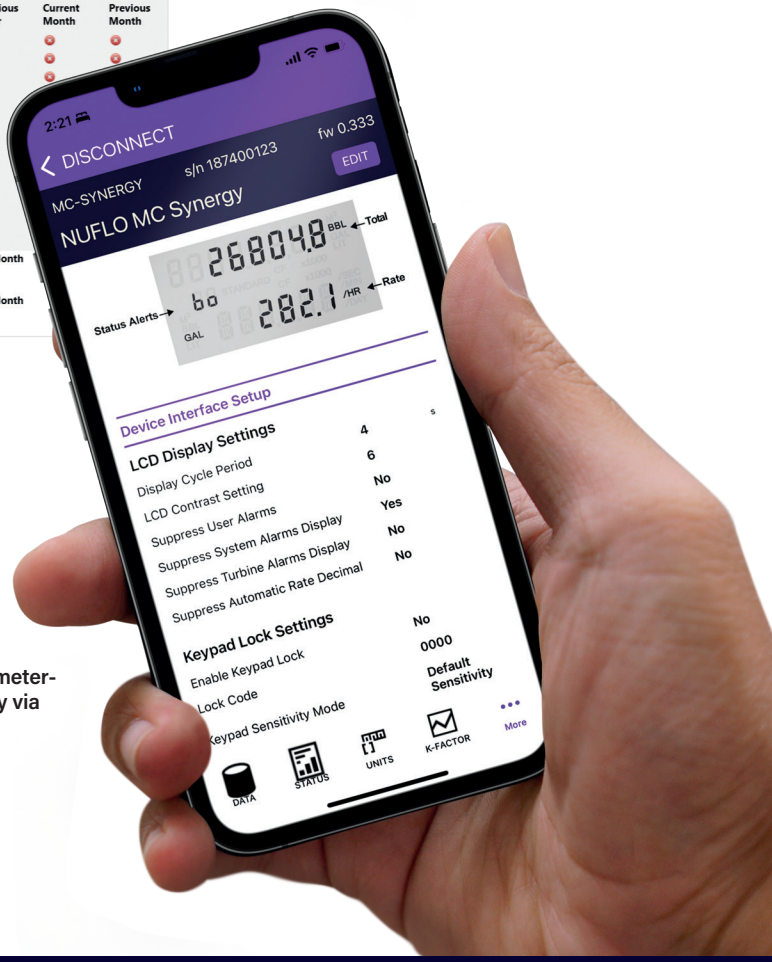
Turbine Alarms Detail

	Status	Current Value	Inst	Unack	Current Day	Previous Day	Current Hour	Previous Hour	Current Month	Previous Month
T1 Low Low Flow	✓	55.12 gal/min	-	-	-	-	-	-		
T1 Low Flow	✓	55.12 gal/min	-	-		-	-	-		
T1 High Flow		55.12 gal/min						-		
T1 High High Flow	✓	55.12 gal/min	-	-	-	-	-	-		
T1 Flow Stability Warning	✓	0	-	-	-	-	-	-		
T1 K-Factor Error	✓	0	-	-	-	-	-	-		
T1 Meter Factor Error	✓	0	-	-	-	-	-	-		
Bent Blade	✓	0	-	-	-	-	-	-		
Missing Blade	✓	0	-	-	-	-	-	-		
Erratic Signal	✓	0	-	-	-		-	-		
Replace Kit	✓	2.0441 days	-	-		-	-	-		

	Current Day	Previous Day	Current Hour	Previous Hour	Current Month
System Alarms	OK	OK	OK	OK	OK

	Current Day	Previous Day	Current Hour	Previous Hour	Current Month
User Alarms	OK	OK	OK	OK	OK

PC program status page provides details on current and historical alarms, as well as current state and parameter value



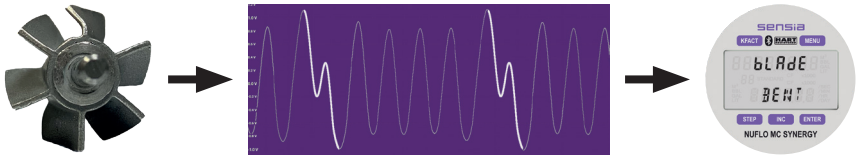
Scan the QR code and upload meter-specific data to the MC Synergy via Bluetooth connection

UNEQUALED DIAGNOSTIC AND HEALTH TEST MONITORING MINIMIZES COSTS AND HSE RISKS

Turbine and System alarm thresholds are automatically set when the MC Synergy is programmed wirelessly using the QR code from any genuine NUFLO or BARTON meter or internals kit. Each of the alarms can be enabled or disabled independently. You can choose to go into alarm status if any of the alarms are active, or combine alarms by specifying all those selected must be active to be in alarm status. Alarms assigned to the digital outputs can be latching or non-latching, normally-open or normally-closed. You can enable or disable writing alarms to the device event log. You can enable alarm data to appear on the LCD display.

Alarms parameters include some for monitoring flow rate, helping to prevent poor measurement or damage to the meter. They can tell you when you have entered an invalid k-factor and when it's the scheduled time to change the internals kit. The device can also tell you when you have power supply problems or when you need to change the on board lithium or alkaline battery packs.

The device also contains diagnostic tool for meter Health Test monitoring. This functionality samples and analyzes a large number of wave forms to detect anomalies in the signal coming from the turbine meter, which include erratic signal, bend blade, and missing blade. The user configures the sensitivity of the Health Test parameters to define when any of these conditions should be considered a legitimate alarm.



There are also 8 user-defined alarms, picked from a list of more than 30 parameters.

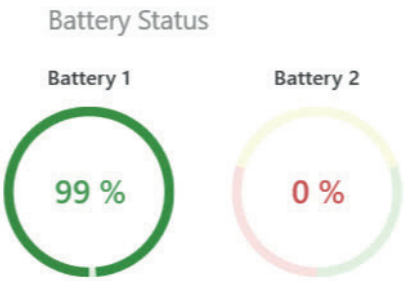
Turbine, System, and User Alarms can be routed to various outputs (refer to MC Synergy manuals for more details):

+ Local LCD Display
+ Digital Status Output
+ Alarm Registers in Modbus and HART
+ Recorded in MC Synergy Alarm Log

BATTERY RELIABILITY

The MC Synergy can be deployed with multiple concurrent power source configurations. An external DC source may provide the primary power, either via the main power terminals or by providing loop power via the optional analog/HART board. The optional Ethernet board must be powered directly and can be used to power the entire device. In the event of primary power failure, the device can remain operational for 2 to 4 years using one of several choices for internal back up battery. A coin cell battery is supplied to secure the device's memory and to maintain the precision real time clock.

Given the wide variability of use and power demands, it has been difficult for users to determine remaining battery capacity; however, Sensia has solved that problem by implementing a patented process using a Coulomb counter, which counts the energy delivered from the battery and compares it to the capacity of a new battery. The MC Synergy can accurately predict the remaining battery life by calculating how much energy has been withdrawn. The result is a longer notice to replace the battery and the confidence to use more of the battery's capacity, rather than changing them on a time-based service estimate, discarding batteries with possible significant remaining life. The status of the battery can be assigned to the display or to a status output. The data is also written to Modbus and to the MC Synergy Alarm Log.



MEASUREMENT HEALTH AND DIAGNOSTIC REALTIME MONITORING

Health and diagnostic conditions are monitored are in three categories

Turbine alarms

+ Flow rate outside of meter calibrated flow range (low or high)
+ Flow rate outside of meters operational flow range (low/low or high/high)
+ K-factor invalid
+ Flow stability warning (surging or slug flow)
+ Meter factor invalid
+ Erratic signal (electrical noise present)
+ Bent Blade (meters with flowrate size 1" and larger only)
+ Missing blade (meters with flowrate size 1" and larger only)
+ Replace internals kit (user-defined service interval exceeded)

System alarms

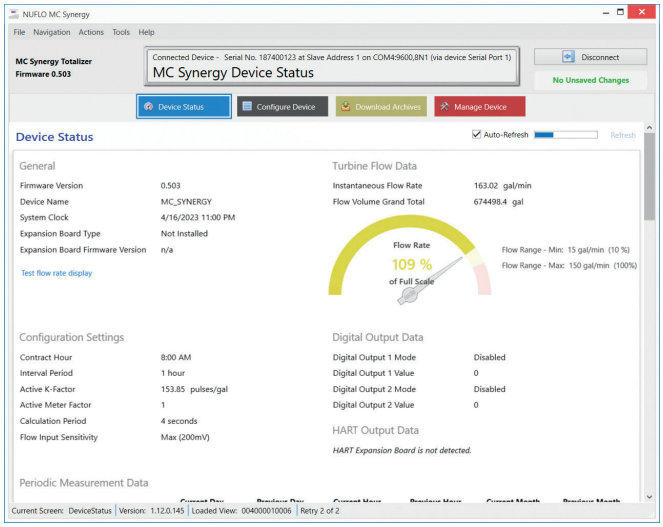
+ Time & Date not set
+ External power supply failure
+ Expansion board power supply failure
+ Internal battery voltage low (BAT1 and BAT2)
+ Internal battery remaining life low (BAT1 and BAT2)

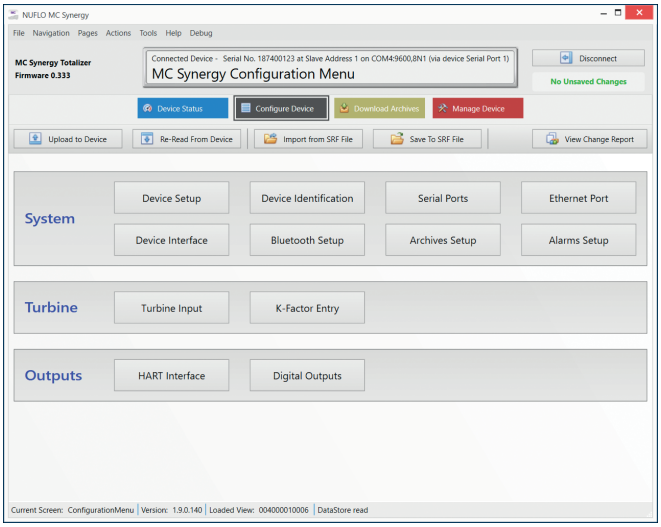
User-defined alarms

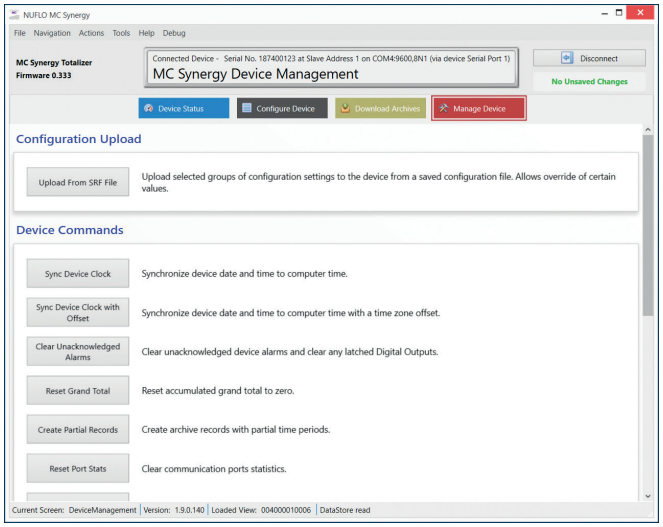
+ 8 user configurable alarms (select variables from over 30 items)

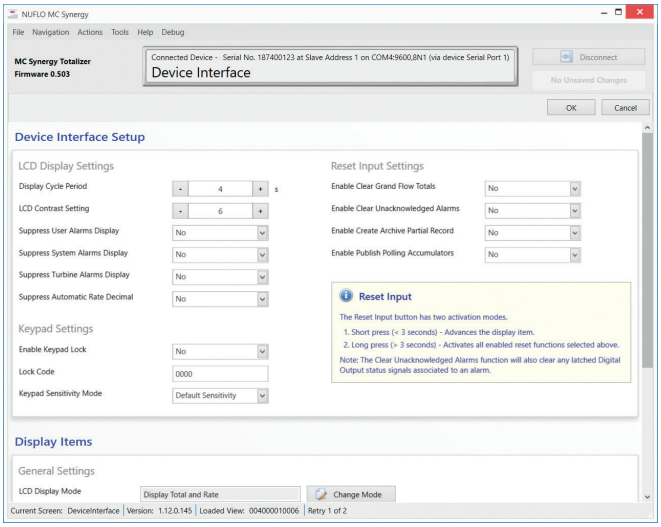
SOFTWARE TOOLS THAT CONVERT MEASUREMENT DATA TO KNOWLEDGE DIFFERENTIATES SENSIA

Sensia's heritage of being the only manufacturer of flow computers, turbine meters, and totalizers uniquely positions you with the ability to effectively turn data into knowledge. Our very name is based on sensing and intelligent action. Of all the MC Synergy's connectivity methods, the software provides the richest user experience, with both off-line and on-line configuration. This software is also used to collect archive data.

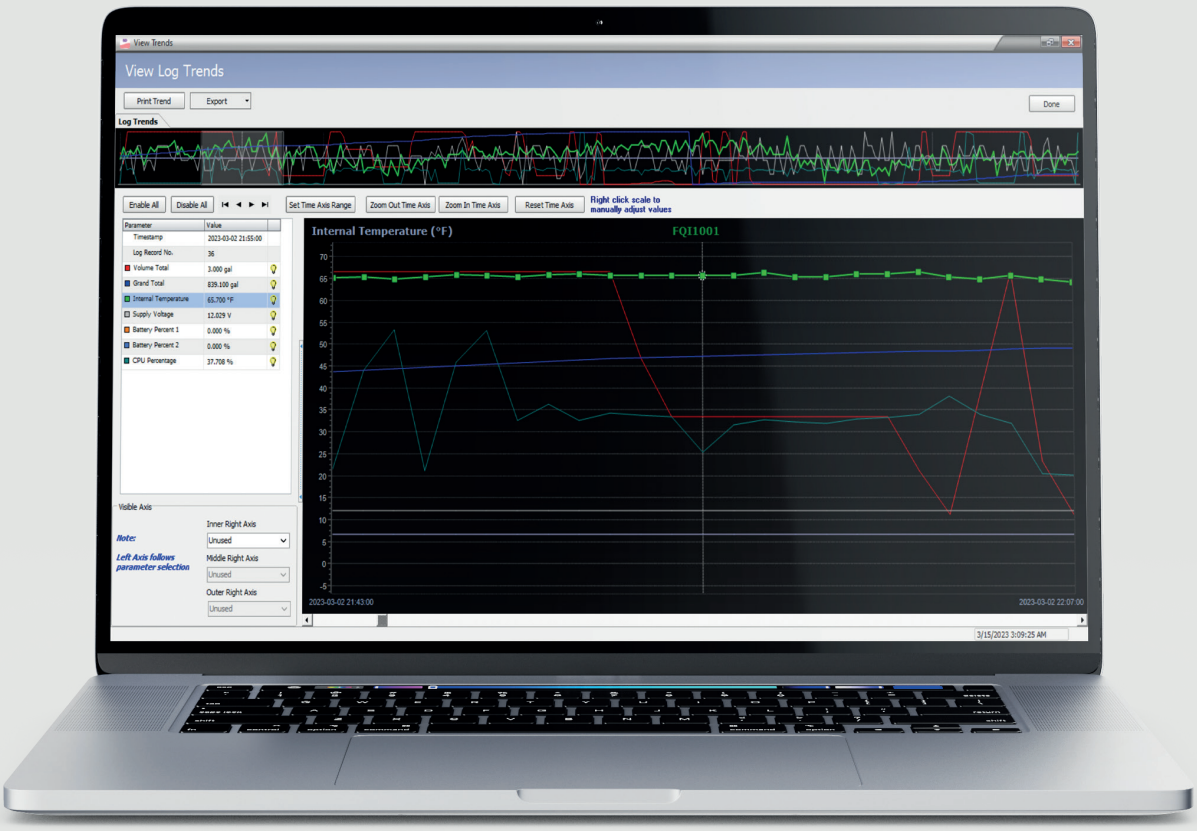


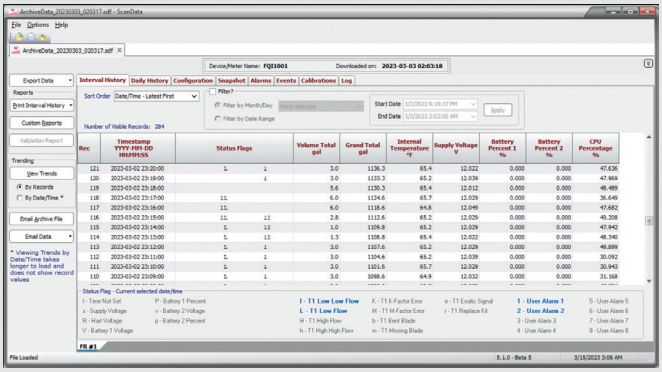






MC Synergy Software Program





ScanData Software Program

Once collected, Sensia's proven ScanData software presents the data in context, so the flow conditions are well understood during a review or audit. ScanData presents data graphically, with the ability to look at different date ranges and to zoom in and out on areas of interest. The same data is offered in a tabular spreadsheet view. Data on device configurations, a snapshot of current conditions, alarms, events, calibration data, and more are all at your fingertips. The ScanData software even provides customizable report writing and data exports so you can share knowledge effectively.

ScanData has so many comprehensive features, it has its own product datasheet available on the Sensia website. Remarkably, this highly-developed software is complimentary. This software is compatible with any Sensia device that generates an SDF download, including the MC Synergy and all Sensia flow computers. Ask your local Sensia representative to arrange a demonstration.

Even though some other brands of totalizers offer serial communications, many do not offer data logging capabilities. You'll be fortunate if their software does more than provide raw data exports to Excel. The MC Synergy's rich datalogging can provide backup data to a primary automated data acquisition system, or it can be used as the primary data acquisition device.

IDEAL FOR MANY OPERATING ENVIRONMENTS AND EXPECTATIONS

For allocation measurement, the MC Synergy is a robust, internally powered, stand-alone flow measurement system storing 384 daily records, 768 interval records, 768 event records, and 768 alarm records. The MC Synergy can be virtually as easy to deploy as a basic battery-powered totalizer which provides only a local display with current flow rate and a single accumulated total. Comparing the data provided by a basic totalizer to the MC Synergy is like comparing a low resolution still photograph to an HD video recording.

Where the MC Synergy's outputs supply real time or period data frequently, one or more of the wide range of output types can be connected to an automated data acquisition system, providing a snapshot of current conditions and logged information. The internal battery acts as an uninterruptable back up power supply, which means long term data is retained and you are assured the device will continue to operate, even in the event of a power failure. You will never be without your data.

AN EASY TRANSITION

The transition from the MC-III totalizer and all the totalizer manufacturers who have applied the MC-III Modbus map as a de facto industry standard will find the transition to the MC Synergy very easy. While the MC Synergy will have an expanded Modbus map to accommodate all the new capabilities, the MC-III map has been preserved within the MC Synergy. Therefore, it can be deployed without changes to the software driver currently being used and without reassigning core Modbus registers.

Both the MC-III and the MC Synergy feature Enron Modbus and Modbus RTU register sets.

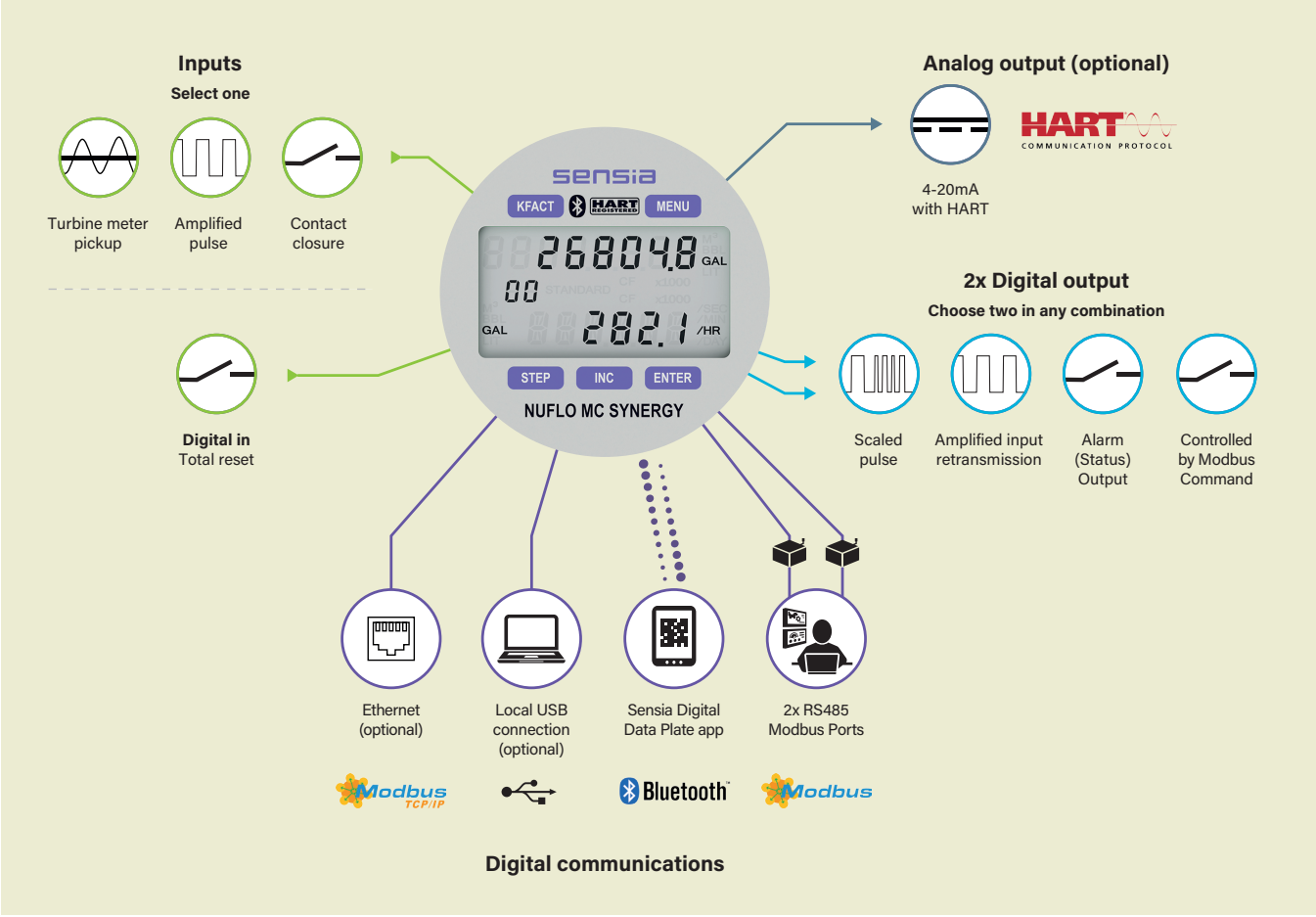
The MC Synergy features a high-performance real-time clock that typically eliminates clock synchronizing routines with the clock of the data collection device. The real time clock is backed up by a lithium coin cell battery, so in the event of total power failure the clock will continue to operate. The clock will keep accurate time, not varying by more than 1.84 minutes per year, over ambient temperatures ranging from -40°C to 70°C.

INTERFACING WITH THE MC SYNERGY

The MC Synergy offers more methods to communicate than ever before. Choosing the best method depends on the task and preferences.

Condensed list of information available by each communication method[1]	RS485, USB, or Ethernet	Local keys on the display	Bluetooth	HART
	MC Synergy PC program	Through the glass or cover off tactile	DDP iOS/Android App	HHC or data acquisition system
View real-time data	●	●	●	●
Configure display units, turbine input, reset total	●	●	●	●
Edit K-factors and meter factors, sync real time clock	●	●	●	●
Configure display items, analog out, serial ports	●	●	●	●
Configure HART, meter input type and signal sensitivity	●	●	●	●
Clear active alarms	●	●	●	
Import factory meter data			●	
Configure Ethernet, archive data, alarms	●			
Upgrade firmware, download data	●			

Note 1. The MC Synergy hardware installation, operation & maintenance manuals offer an expanded list.



The MC Synergy can be equipped with a 4-20 mA analog output with HART communications, powering the entire device. The module can be configured to run HART point-to-point, operating as a typical 4-20 mA transmitter, or it can run in multi-drop mode where the output of all devices on the network are fixed at 4 mA.

Also offered is an Ethernet communications board. Protocols include Modbus TCP and Modbus over TCP. External power is run to the Ethernet board, which also provides power for the entire device.

Both boards are optically isolated from the I/O on the main board, so you utilize an expansion board while maintaining full main board functionality and connectivity, such as an amplified output retransmitting the raw signal from the turbine meter.

Both the analog/HART and Ethernet modules are available as retrofit kits, which can easily be installed in the field. Note there is space for only one optional module, so you would choose either analog/HART or Ethernet.

The local display on the MC Synergy Zone 1 / Division 1 EXP model has a keypad for menu navigation. These are "through the glass" capacitive touch, allowing you to program the unit under power in a hazardous area without removing the explosion-proof cover. If the cover is removed in a unclassified area, separate mechanical push buttons are located on the perimeter of the display board, providing tactile feedback.

The same keys on the MC Synergy Division 2 WP model are accessible without restriction.

The default setting on the display indicates flow rate and flow total. The items displayed are user configurable, allowing you add up to a total of 8, selecting from 39 different parameters.

HART

The HART based activities listed in the communications section above are accessible, as are the real time health and diagnostics monitoring data.

The Dynamic Measured Variable are Instantaneous Flow Rate, plus your choice of three others from the below list.

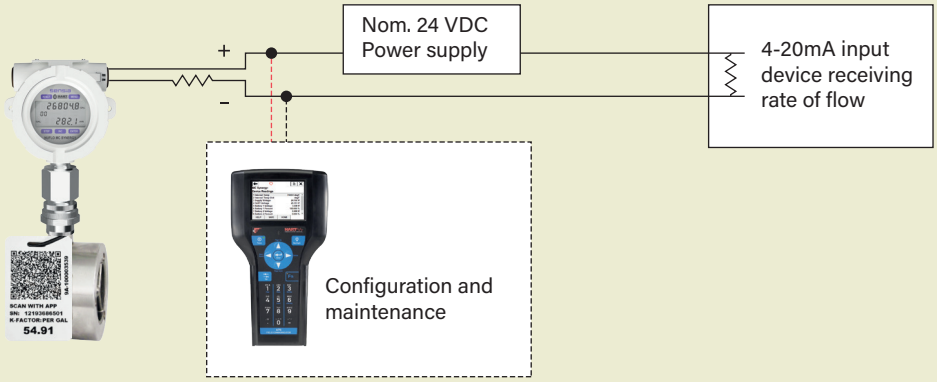
- + Grand total
- + Daily total
- + Hourly total
- + Polling total
- + Previous day total
- + Previous hour total
- + Previous polling total

Instead of waiting for a request, the MC Synergy's HART can be set to Burst Mode, which rapidly broadcasts the Dynamic Measured Variable data. The device will publish cyclical process data without any actions from the host. Multi-drop HART or HART over 4-20 mA is selectable.

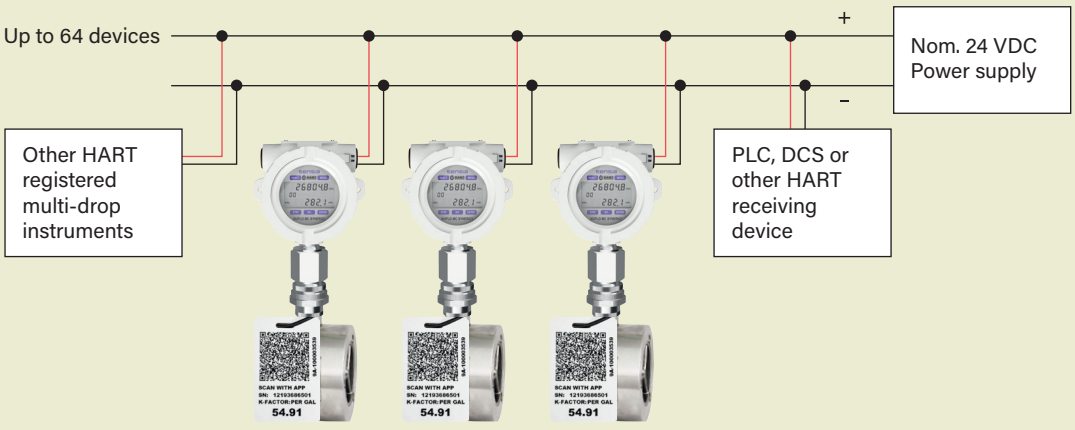
The burden to accurately populate certain HART parameters related to the details of the turbine meter's flow range and calibration data is reduced, thanks to the automatic population of data from the QR code associated with the turbine meter or internals kit.

HART COMMUNICATION PROTOCOL

4-20 mA output



Multi-drop



ENHANCED MEASUREMENT PERFORMANCE BY LINEARIZATION

Turbine meters are among the best technologies for measurement repeatability and flow rangeability. Meters are linear across standard flow ranges in liquid service, from the maximum flow rate capacity down to 10% of maximum capacity. Sensia has always flow tested every turbine meter and internals kit, each at multiple flow rates, distributed equally across the meter's flow range.

Sensia liquid turbine meters and replacement internal kits	Repeatability % of flow rate	Data points tested
BARTON	±0.020%	10
NUFLO industrial grade	±0.020%	5
NUFLO standard grade	±0.050%	5

Note 1. BARTON meters are tested at 8 different flow rates, with two points re-tested to validate meter repeatability.

Sensia is applying these same principles to the measurement system consisting of the turbine meter and digital totalizer. Multi-point calibration data stored on the turbine meter's QR code is wirelessly transferred to the MC Synergy. The flow rate, flow total, and all associated outputs from the MC Synergy will reflect the linearization, significantly enhancing measurement system accuracy.

The factory calibration data is reliable, provided the user installs the meter in accordance with recognized industry standards, which often recommend straight runs of 10 pipe diameters upstream of the meter and 5 diameters downstream. Calibration data from other devices, manufacturers, or from subsequent calibrations can be applied by data entry via Digital Data Plate, PC program, or keypad.

LINEARIZATION

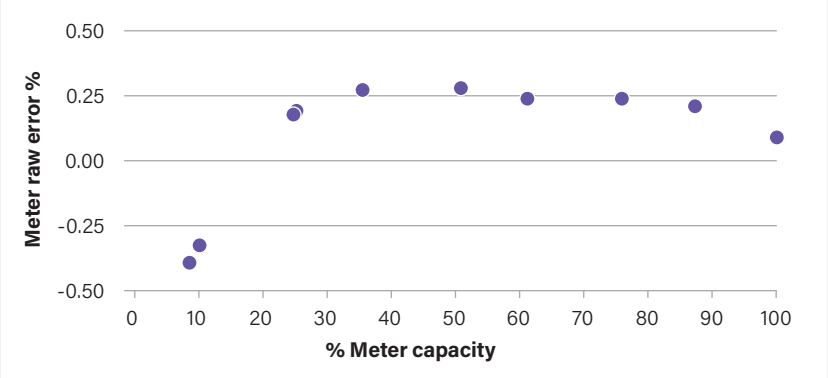
The difference between repeatability and accuracy is the results from calibration of individual meters against a trusted reference.

The figure on the right plots the data obtained from the factory calibration test. The "error" is calculated by comparing the K-factor obtained at each flow rate to a single median K-factor.

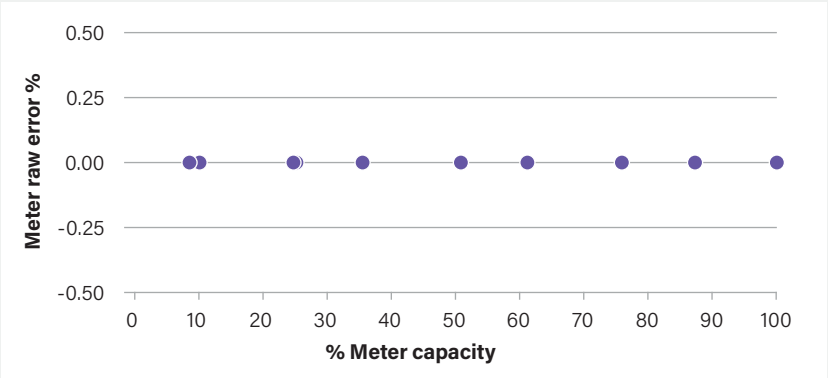
For decades many totalizers and flow computers have offered the ability to apply calibration linearization; however, it requires the user to program the flow rate and K-factor for each datapoint. Although somewhat tedious, the improvement to meter accuracy is significant.

In fact, manufacturers of many measurement device types apply linearization during manufacturing. Using pressure transmitters as an example, you cannot buy a pressure sensor cell from one vendor and an amplifier from another. They are sold as a single device, where the manufacturer permanently pairs the two, linearizing the output to enable the device to perform to published specifications. Differential pressure and temperature measurement sensors are also linearized using industry accepted formulas.

Before linearization – measurement accuracy is +/- 0.3% of rate



After linearization measurement accuracy is = repeatability, plus interpolation between test points



METER FACTORS

The MC Synergy allows for the ability to program a single-point or a multi-point meter factor. Using a meter factor preserves the existing K-factor, applying a multiplier to correct the flow rate output. A meter factor is typically derived when the meter is flow tested during commissioning or during subsequent calibration. The magnitude of a meter factor can be a useful indicator of the health of the meter's internals. The following examples explain the adaptability of this feature.

Figure 1. In this scenario, a single flow rate was tested. The meter output read 0.15% low, relative to the reference test device, such as a small volume prover. The user can compensate for the difference by entering a meter factor. This value is derived by dividing the reading from the reference device by the reading from the turbine meter's digital totalizer. For example, if the reference device indicates a flow total of 100.00 gallons and the turbine meter indicates a flow total of 99.85 gallons, the resulting calculation is "100.00 / 99.85 = 1.0015023". This allows the MC Synergy to take a reading of 99.85, multiply it by 1.0015023, resulting in a flow total of 100.00 gallons. The single meter factor menu choice simplifies the task.

Figure 1. Single meter factor

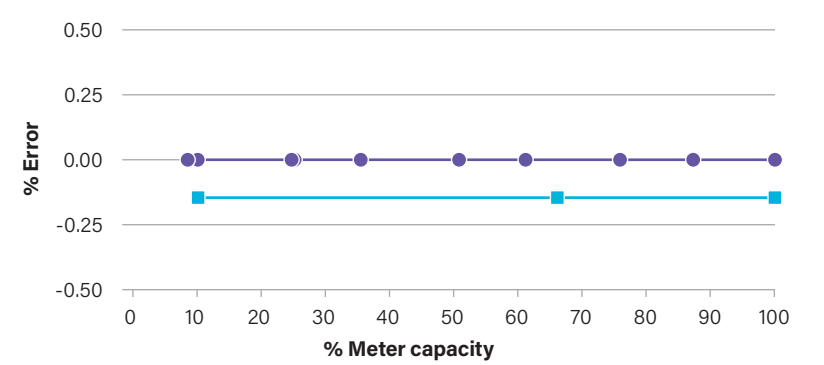


Figure 2. In this scenario, two flow rates were tested at rates typical for the application. In this example, we will assume the rates represent 29% and 66% of the meter's flow range. Because two meter factors are entered, the MC Synergy will linearly interpolate the correction for any flow rate between 29% and 66% of the flow range. In the event the flow rates fall below or above the rates associated with the two meter factors, the MC Synergy will use the meter factor associated with the lowest frequency for all flow rates below that frequency and it will use the meter factor associated with the highest frequency for all flow rates above that frequency.

Figure 2. Multiple meter factors

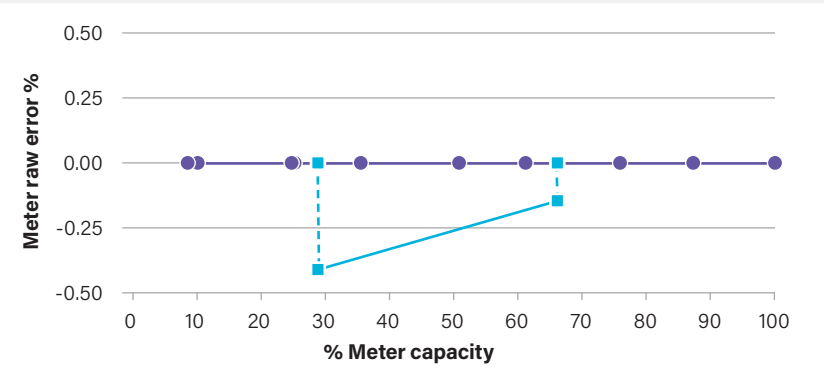
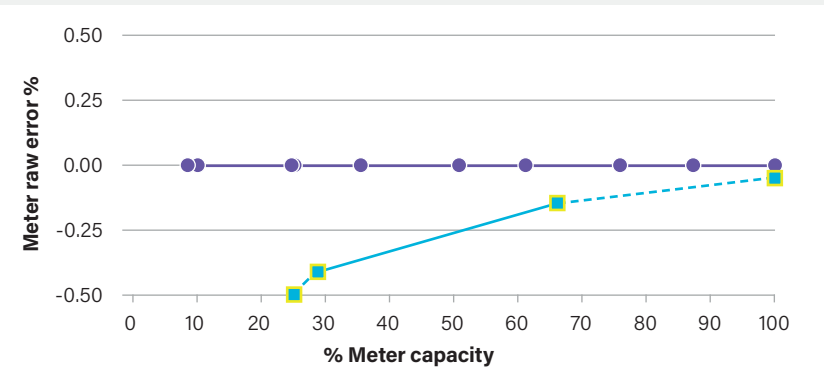


Figure 3. It is well known that liquids with viscosities significantly higher than water will affect both the low flow capacity and the linearity of a turbine meter. The influence on linearity increases as the flow rate decreases. Adding two synthetic datapoints based on prediction provides a better metering result than figure 2. In this example, the user added a synthetic data point below the lowest flow rate tested, in recognition of an increasing influence. A second synthetic data point above the highest flow rate tested was positioned with general knowledge that elevated viscosities have less of an effect as the flow rate approaches the maximum capacity of the meter.

Figure 3. Multiple meter factors with prediction



A MEASURABLE DIFFERENCE IN SAFETY, INTEGRITY, AND QUALITY

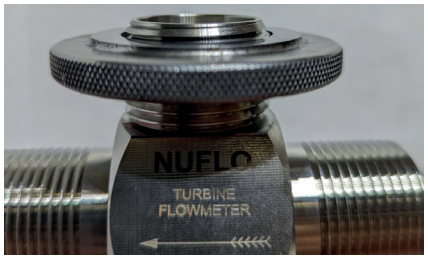
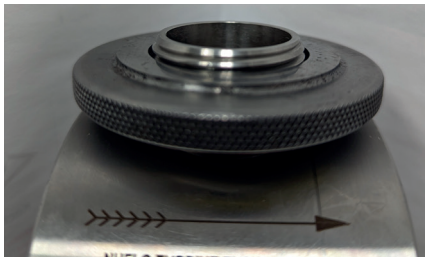
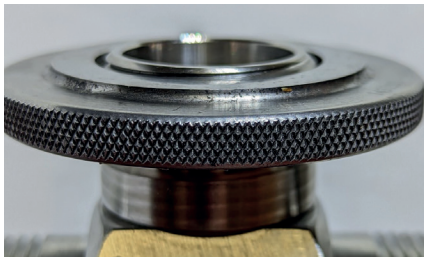
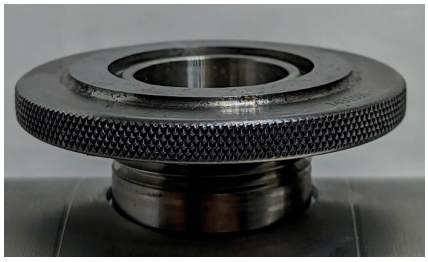
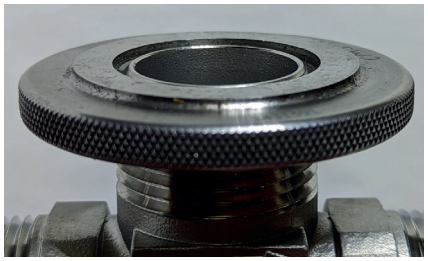
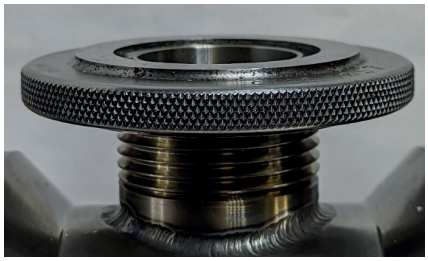
Several manufacturers have attempted to copy the NUFLO turbine meter design; however, it is apparent some have overlooked a very important safety-related detail. Turbine meters are often installed in locations where combustible gases may be present in the atmosphere. Hazardous areas are classified using a system based on the number of hours per year the combustible matter will be present. Zone 1 (similar to Division 1) is assigned to locations where this condition exists normally between 10 and 1,000 hours per year. In Zone 2 (Division 2), the condition exists 10 hours or less per year.

Electrical equipment can be a source of ignition. Zone 1 locations typically use flame-proof (explosion-proof) protection methods, including enclosures certified to contain the momentary extreme pressure rise resulting from internal combustion. A secondary requirement is the pressure must be quickly dissipated. The method is to allow some of the expanding gas to traverse through the threads of a pipe joint which is free of any sealants which would prevent the connection from "breathing". These connections are NPT or Metric threads. The electrical codes require the threads to be specially formed to ensure a minimum number are engaged, which exceeds the standard thread design specifications. A standard threaded pressure-containing connection requires 3 threads of wrench-tight engagement; however, the electrical standards state the engagement MUST be a minimum of 5 threads. This allows expanding gas to cool down adequately before reaching the atmosphere. If fewer threads are engaged, the flame front of the expanding gas may reach the atmosphere, with potentially catastrophic results.

Sensia assessed the threads on pickup coil adapters on four turbine meters from two manufacturers who market their products as equal to our NUFLO meter design. These adapters are considered conduit connections. When used with the deep flameproof-compliant female threads on the totalizer, together they form the required cooling pathway described above.

The test utilized a ring gauge compliant to the ANSI/ASME B1.20.1 pipe thread standard. When hand-tightened, if the gauge is flush with the top of the threads, it means when they are wrench-tight the fitting will meet the standard 3 threads of engagement. However, the electrical code requires 5 threads of wrench-tight engagement, which means the hand-tight gauge must go at least 1.25 threads beyond flush. The other manufacturers either barely met or failed to meet the standard 3 thread requirement, let alone the 5 thread requirement. Genuine NUFLO meters consistently gauge to at least 1.25 beyond flush.

Coupled with the mounting hardware on the MC Synergy (adapters, standoffs, specialized local comm ports, and stopping plugs), which all comply with the minimum 5 thread engagement, the entire Sensia turbine and totalizer measurement solution fully complies with electrical code requirements. Sensia is completely committed to contributing to a safe workplace. Users should be aware there may be risks associated with installing non-compliant imitation meters.

	Threaded meter	Wafer meter
NUFLO		
Competitor 1		
Competitor 2		

TWO HOUSING ALTERNATIVES

The MC Synergy EXP flow totalizer can be provided with either a CEC/NEC explosion-proof or ATEX/IECEx flameproof certification. To endure harsh offshore conditions, an all 316 stainless steel housing option is available for both.

NUFLO MC Synergy WP flow totalizer has a weatherproof enclosure, delivering savings in purchase price and installation cost, utilization non-arcing, non-heat-producing, and non-incendive protection techniques. This version has North American CEC/NEC Division 2 hazardous location certifications. Other benefits of this model include providing unimpeded access to the keypad and battery. When directly mounted to the flowmeter, the head may be swiveled and tilted for optimal display viewing.

CEC/NEC explosion-proof enclosure

ATEX/IECEx flameproof enclosure

Weatherproof enclosure

SPECIFICATIONS

Certification

NUFLO MC Synergy EXP

Electrical Safety Classification	**Approved by CSA for US and Canada:** Class I, Div. 1, Groups B, C, D, T6 (explosion-proof) Class II, Div. 1, Groups E, F, G, T85C Class III Type 4 enclosure Tamb: -40°C to 70°C (lithium-powered) Tamb: -18°C to 55°C (alkaline-powered)
	ATEX/IECEx: ATEX CSANe 21ATEX1250X IECEx CSAE 21.0032X ⟨Ex⟩ II 2 GD Ex db IIB+H2 T6 Gb Ex tb IIIC T85°C Db IP66 Tamb: -40°C to 70°C (lithium-powered)
Enclosure	Cast aluminum (less than 0.05% copper), painted with epoxy and polyurethane, with single window is standard. Stainless steel optional
Weight	4.75 pounds (typical)

Certification

NUFLO MC Synergy WP

Electrical Safety Classification	**Approved by CSA for US and Canada:** Class I, Div. 2, Groups A, B, C, D, T5 Type 4 enclosure	
Enclosure	Fiberglass polyester with Lexan polycarbonate viewing window	
Weight	4.75 pounds (typical)	
Environmental	Maximum relative humidity: 80% Altitude: Up to 2000 m, maximum Pollution degree: 3 Overvoltage category: I	
System Power	Internal power	Up to two 3.6 VDC, D-size lithium batteries (2-year life is typical for a single battery). Transport is restricted as Dangerous Goods.
		Batteries can be used as primary power source and an automatic back-up of an external source. (External power is required when Ethernet or HART/4-20 mA option boards are in use.)
		Alkaline battery pack contain industrial-grade batteries (for use only in devices with North America approval) The EXP uses 3 C-size cells and the WP uses 3 D-size cells Transport is unrestricted.
	Clock battery	A lithium coin cell powers the real-time clock when no other power source is connected. See also Real-Time Clock specifications.
	External power	Expanded operation, including Ethernet or 4-20 mA/HART require an external power source. External power supply: 6 to 27 VDC @ 60 mA max. (reverse polarity protected), 5 mA typical
		4-20 mA/HART Expansion Board - Loop power supply: + 12.5 to 27 VDC @ 22 mA max. with internal battery backup (reverse polarity protected) + Load loop resistance: 725 ohms @ 27 VDC; 575 ohms @ 24 VDC
		Ethernet Expansion board: 6 to 27 VDC @ 60 mA max. (reverse polarity protected)
WARNING	Housing temperature must not exceed 70°C (158°F). Excessive temperatures, which could result from ambient conditions combined with radiated and conductive heat from the process, could cause the internal lithium battery to ignite or explode.	
Operating Temperature	Lithium-Powered: -40°C to 70°C (-40°F to 158°F) Alkaline-Powered: -18°C to 55°C (0°F to 130°F) Display contrast is reduced at temperatures below -20°C (-4°F)	
LCD Display	Two display modes: + Display rate and total + Display up to 8 user-selected parameters (grand total, current day, previous day, current interval, previous interval, etc. (configurable via MC Synergy software or Sensia Digital Data Plate Mobile app)	
	8-digit Total (volume) display (7-segment characters) 6-digit Rate display (11-segment characters for easy-to-read prompts) 0.3" character height Adjustable contrast and update period	
	Total units of measurement are user-selectable: + Pre-programmed units: BBL, GAL, LIT, M3, CF, SCF, any unit x 1,000	
	Rate units of measurement are user-selectable: + Pre-programmed units: BBL, GAL, LIT, M3, CF, SCF (per DAY, HR, MIN, SEC), any unit x 1,000 (per DAY, HR, MIN, SEC)	
Real-Time Clock	Clock display format: Day, Month, Year, Hour, Minute, Second	
	Accuracy: 3.5 PPM Tolerance and drift over temperature: 1.84 minutes / year	
	Battery retention period: 1.75 years in active use; 10 years in backup/standby mode	
	A lithium coin cell powers the clock when no other power source is connected. The coin cell is user-replaceable in a non-hazardous area. Transport is unrestricted (less than 0.01 g lithium).	

User Interface	Users can configure the MC Synergy with any of three user interfaces. Most selections are supported by all three; some are available only in software and/or the Bluetooth app.	
	Keypad	Through-the-glass navigation via 5 capacitive buttons. Button sensitivity is adjustable. Duplicate set of tactile mechanical buttons are accessible with the lid removed. User-configurable security/lock code
	Mobile app	The Bluetooth-enabled Sensia Digital Data Plate app is compatible with iOS and Android operating systems (8 dBm, 2400 to 2483.5 MHz) BLE 5 compliant Wireless (Bluetooth) connection can be disabled via the keypad or software Optional 6-digit pairing code is software-configurable for added security User-configurable session period (default is 5 min)
	PC software	Full-featured MC Synergy interface software is free of charge and downloadable from the Sensia website. Sensia's ScanData software simplifies data analysis by allowing users to view, print, and export logged data.
Logging	384 daily logs, 768 interval logs, 768 event logs, & 768 alarm logs Interval period: user defined, 1 minute to 12 hours (default is 1 hour) Flow archive contents: 8 user-defined parameters	
Inputs	Turbine Meter Input (raw AC sine wave signal) Sensitivity is configurable via keypad, Digital Data Plate, or PC program Sensitivity selections: 20 mV P-P, 50 mV P-P, and 100 mV P-P Frequency range: 0 to 5000 Hz Calibration: linear or 12-point calibration factors Meter Factor Correction: linear or 12-point meter factors	
	Pulse Input (typically from a turbine pre-amplifier) Logical high must be 3 to 27 VDC Frequency range: 0 to 5000 Hz	
	Contact Closure Input Dry contact 100 kΩ pullup to 2.8 VDC with debounce filtering	
	Remote Reset Input 3 to 27 VDC Enabled via pulse or contact closure Pulse duration > 3 seconds to reset grand total 22.1 kΩ pullup to 2.8 VDC for contact closure Input can be configured via software to toggle displayed parameter, clear alarms, create a partial record, or publish a polling total.	
Digital Outputs	Two isolated Digital Outputs Output rating: 60 mA max. @ 27 VDC, on-state drop = 0.057 VDC @ 60 mA, 0.007 VDC @ 10 mA, open drain transistor output Outputs can be independently assigned as frequency (amplified flow meter signal), volumetric pulse, alarm (status) outputs, or controlled by Modbus	
	Frequency Output	Amplified frequency output of turbine meter input signal supports 0 to 5,000 Hz
	Volumetric Pulse Output	Configurable pulse width (duration): 10 to 60,000 ms Configurable pulse representation
	Alarm (Status) Output	Output of process conditions or measurement health Selectable for multiple alarm conditions ORed or ANDed together Latching or non-latching Normally open or normally closed
	Controlled by Modbus	Modbus write to digital register will change the state to ON/OFF

Analog Output (Optional)	Optional expansion board supports two-wire transmitter and wired HART protocol	
	Loop power: 12.5 to 27 VDC	
	Two-wire transmitter	4 to 20 mA isolated, loop-powered
		Accuracy (after 2-point calibration): ± 0.1% of span maximum error at 25°C (77°F)
		Temperature drift: ±50 ppm/°C (±27.8 ppm/°F)
		Resolution: 16 bits
		Zero and full-scale values configurable from keypad
		Update period: 1 second
		Represents flow rate
	Wired HART communications	HART registered product
		Protocol revision 7.6
		Supports point-to-point, multidrop, and burst modes
		14 device variables
		4 mappable dynamic variables (SV,TV,QV) – flow rate is always primary variable
		Device description file can be downloaded from **www.fieldcommgroup.org**

RELATED TURBINE ELECTRONICS

See the Scanner Electronic Flow Computer product line for use in applications where volume correction to base conditions is required and the flowing pressure and temperature vary. Wireless options available.

https://www.sensiaglobal.com/measurement/flow-computers

HOW TO ORDER

The MC Synergy product line uses an intelligent model code scheme that allows the user to select all pertinent characteristics of the device. Submission of a complete model code will allow Sensia or our channel partners to identify the exact device the user requires. This greatly reduces the chances of miscommunication and greatly increases Sensia's ability to provide the correct device to the user on a timely basis.

CODE	DESCRIPTION
	NUFLO MC SYNERGY EXP TOTALIZER - CEC/NEC
	Haz Loc Approval:
C	CEC/NEC Class 1 Div 1 Explosion-proof
	Enclosure:
A	Aluminum, low Copper, Epoxy and Polyurethane-Coated, 3/4" Conduit Connections
S	Stainless Steel. 3/4" Conduit Connections
	Mounting Style:
D	Direct to turbine pickup coil adapter
R	Remote, Carbon Steel Mounting Bracket
S	Remote, Stainless Steel Mounting Bracket
	Totalizer Cable: (For Mounting Style "Remote" only, Omit this code when Mounting Style "Direct" is selected)
00	None
10	Explosion-proof terminal housing and cable. 10 Foot
20	Explosion-proof terminal housing and cable. 20 Foot
25	Explosion-proof terminal housing and cable. 25 Foot
50	Explosion-proof terminal housing and cable. 50 Foot
	Selecting Mounting Style "Remote" and Totalizer Cable ""None" assumes user will install their own hazardous area cabling.
	Meter Connection: (For Mounting Style "Direct" only, Omit this code when Mounting Style "Remote" is selected)
R	Reducer and Union • CEC/NEC Class I Division 1, for NUFLO turbine meter
	Pickup Extension/ Adapter
O	None
E	Adapter, Mag Pickup extension, for EZ-IN and small high pressure flanged meters, 1"M x 1"F, 3.0" long
A	Adapter to mount to BARTON turbine meters, 3/4" FNPT X 1" MNPT
	Communications Adapter for Local Cable Connection
O	None
S	Serial RS485
U	USB
	Reset Switch
O	None
R	Reset and Control
	Battery Pack
O	None
L	Lithium single D cell (Lithium content restricts transport options.)
2	Lithium two D cell (Lithium content restricts transport options.)
A	Alkaline three D cell (North American CEC, NEC approved units only.)
	Expansion Board
O	None
A	Analog Output, complete with HART
E	Ethernet, Modbus TCP & Modbus over TCP
	Stopping Plug Material
B	Brass
S	Stainless Steel
	Totalizer Tag
O	None
S	Factory SST Tag
P	Paper Tag
	Specify tag information

CODE	DESCRIPTION	
	NUFLO MC SYNERGY EXP TOTALIZER - ATEX/IECEx	
	Haz Loc Approval:	
A	ATEX/IECEx ▪ Category II, Group 2 ▪ Flameproof	
	Enclosure:	
A	Aluminum, low Copper, Epoxy and Polyurethane-Coated, 3/4" Conduit Connections	
S	Stainless Steel. 3/4" Conduit Connections	
	Mounting Style:	
D	Direct to turbine pickup coil adapter	
R	Remote, Carbon Steel Mounting Bracket	
S	Remote, Stainless Steel Mounting Bracket	
	Totalizer Cable: (For Mounting Style "Remote" only, Omit this code when Mounting Style "Direct" is selected)	
00	None	
	Meter Connection: (For Mounting Style "Direct" only, Omit this code when Mounting Style "Remote" is selected)	
S	Standoff Tube ▪ ATEX/IECEx Cat II. Grp 2	
	Standoff Tube Type	
1	3/4" MNPT x 3/4" FNPT (for BARTON turbine meters)	
2	3/4" MNPT x 1" FNPT (for NUFLO turbine meters)	
	Standoff Tube Length	
	NUFLO	BARTON
S	4.0" (101mm)	4.0" (101mm)
M	6.0" (152mm)	6.0" (152mm)
L	9.0" (229mm)	9.0" (229mm)
	Communications Adapter for Local Cable Connection	
O	None	
S	Serial RS485	
	Reset Switch	
O	None	
R	Reset and Control	
	Battery Pack	
O	None	
L	Lithium single D cell (Lithium content restricts transport options.)	
2	Lithium two D cell (Lithium content restricts transport options.)	
	Expansion Board	
O	None	
A	Analog Output, complete with HART	
E	Ethernet, Modbus TCP & Modbus over TCP	
	Stopping Plug Material	
B	Brass	
S	Stainless Steel	
	Totalizer Tag	
O	None	
S	Factory SST Tag	
P	Paper Tag	
	Specify tag information	

CODE	DESCRIPTION
	NUFLO MC SYNERGY WP TOTALIZER - CEC/NEC
	Haz Loc Approval:
W	CEC/NEC • Class I Div 2 Groups A, B, C, D: Type 4 enclosure, T5 Temp Class, Fiberglas polyester with Lexan polycarbonite viewing window
	Mounting Style:
D	Direct to turbine pickup coil adapter
R	Remote. Set of (2) aluminum mounting brackets with 2.5" steel U-bolt kit
	Totalizer Cable: (Omit this code when Mounting Style "Direct" is selected)
00	None
10	Remote mount cable, with Waterproof cap, Cord connector, Amphenol connector; and 10 foot signal cable
15	Remote mount cable, with Waterproof cap, Cord connector, Amphenol connector; and 15 foot signal cable
20	Remote mount cable, with Waterproof cap, Cord connector, Amphenol connector; and 20 foot signal cable
25	Remote mount cable, with Waterproof cap, Cord connector, Amphenol connector; and 25 foot signal cable
30	Remote mount cable, with Waterproof cap, Cord connector, Amphenol connector; and 30 foot signal cable
50	Remote mount cable, with Waterproof cap, Cord connector, Amphenol connector; and 50 foot signal cable
A0	Remote mount cable, with Waterproof cap, Cord connector, Amphenol connector; and 100 foot signal cable
B0	Remote mount cable, with Waterproof cap, Cord connector, Amphenol connector; and 200 foot signal cable
	Selecting Mounting Style "Remote" and Totalizer Cable "None" assumes user will install their own hazardous area cabling.
	Pickup Extension I Adapter
O	None
E	Adapter, Mag Pickup conduit adapter extension, for EZ-IN and small high pressure flanged meters,
A	1"M x 1"F, 3.0" long adapter to mount to BARTON turbine meters, 3/4" FNPT X 1" MNPT
	Battery Pack
O	None
L	Lithium single D cell (Lithium content restricts transport options.)
2	Lithium two D cell (Lithium content restricts transport options.)
A	Alkaline three D cell (North American CEC, NEC approved units only.)
	Expansion Board
O	None
A	Analog Output, complete with HART
E	Ethernet, Modbus TCP & Modbus over TCP
	Totalizer Tag
O	None
S	Factory SST Tag
P	Paper Tag
	Specify tag information

More information?

Identify your local representative at
https://sensiaglobal.com/Partner-Locator

Contact Sensia directly
measurement@sensiaglobal.com

sensia
Rockwell Automation + Schlumberger