DATASHEET

Liquid and Gas Flow Computer for ControlLogix®
MVI56-AFC

The Liquid and Gas Flow Computer is designed as an integrated component for ControlLogix® systems to measure hydrocarbon gases or liquids with accuracy and precision.

The flow computer calculates flow rates and accumulated totals of volume, mass, and energy (heating value) for specified liquids and gases. Selected calculated results are transferred to processor memory across the backplane for use in the application ladder programs. A SCADA host may retrieve the same values through any of three front-panel Modbus serial ports.

Features	Benefits
16 Meter Runs	♦ The module can calculate up to 16 meter runs with four streams per run simultaneously, making it cost effective, since more meters can be connected to a single flow computer. ♦ Monitor gas and liquid meters for flow rates, accumulator values, and other calculation results. All alarm data is displayed on the AFC Manager screen.
Three Configurable Modbus Ports	♦ Configuration can be changed online with no downtime. ♦ All ports can operate as Modbus slaves. One port can be configured as a Modbus Master. ♦ All data, including configuration, calculated results, and historical archives are available using Modbus through any of the three ports.
Customized Modbus Data Mapping	♦ Remapping to a virtual slave enables data concentration. ♦ Data concentration reduces bandwidth load on the communication system.
Auditability	♦ AFC Manager software provides the ability to download and view archives and events. ♦ Audit Scan captures process inputs and calculated results as "snapshots", allowing verification of calculations. ♦ Event Log records significant events and alarms. ♦ Hourly and daily archives are configurable historical records of user-selected data. ♦ Using Modbus, Audit Scan, Event Log, and Archives, can be viewed online, printed, or saved to a file in .txt or .csv format.
Meter Proving	♦ Version 2.07.000 or later allows meter proving with 4 configurable prover types.
Security	♦ Data download is secure with no data loss. ♦ Password protection schemes are available to control user access.

Configuration

The AFC Manager is a Windows 98/NT/2000/XP/Vista/7-based configuration, reporting, and monitoring tool provided with all AFC modules. Project configurations may be uploaded, downloaded, and saved to the PC under user-selectable file names.

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General Specifications

♦ Single-slot, 1756 backplane-compatible
♦ The module is recognized by the processor as an Input/Output module.
♦ The included sample ladder logic file is used for data transfer between module and processor.
♦ Configuration data can be downloaded over Modbus or delivered by user-defined ladder.

Functional Specifications

The AFC module operates as a powerful flow computer module, augmenting the operation of the ControlLogix® processor by providing a dedicated and accurate set of flow calculations.

♦ Supports 16 meter runs with 4 streams per meter run, measuring hydrocarbon gases and liquids using currently accepted industry measurement standards
♦ Calculates flow rates, accumulated volumes, accumulated mass, and accumulated energy
♦ Calculation results are transferred to processor memory and may also be transferred to a SCADA host using Modbus.
♦ User configurable, allowing each of the meter runs to be individually set up to meet the specific requirements of an application

Archiving

♦ Supports data archiving and event logging
♦ Data archiving is available for each meter run, hourly for two days (48 records) and daily for one month (35 records) under default configuration, with optional extended archives up to 1,440 hourly (60 days) and 1,440 daily. The actual number of archives is dependent upon the size set by the user for each archive type.
♦ Event logging feature provides storage of up to 1,999 station events.

Configurable Options

♦ User-selectable units for totalizers and flow rates on a per channel basis
♦ Roll-over value for resettable and non-resettable totalizers for every meter channel
♦ Process analog input units and ranges (pressure, temperature, differential pressure, density) from analog input modules and pulse inputs from pulse/frequency input modules in a ControlLogix chassis
♦ Fluid selection provides a choice of several liquid groups or gas measurement, using AGA or ISO calculations.
♦ Event log reports for all security-sensitive configuration data (for example, orifice diameter) are date and time stamped. This data can be saved to disk for importing into any spreadsheet or printed as a hard copy
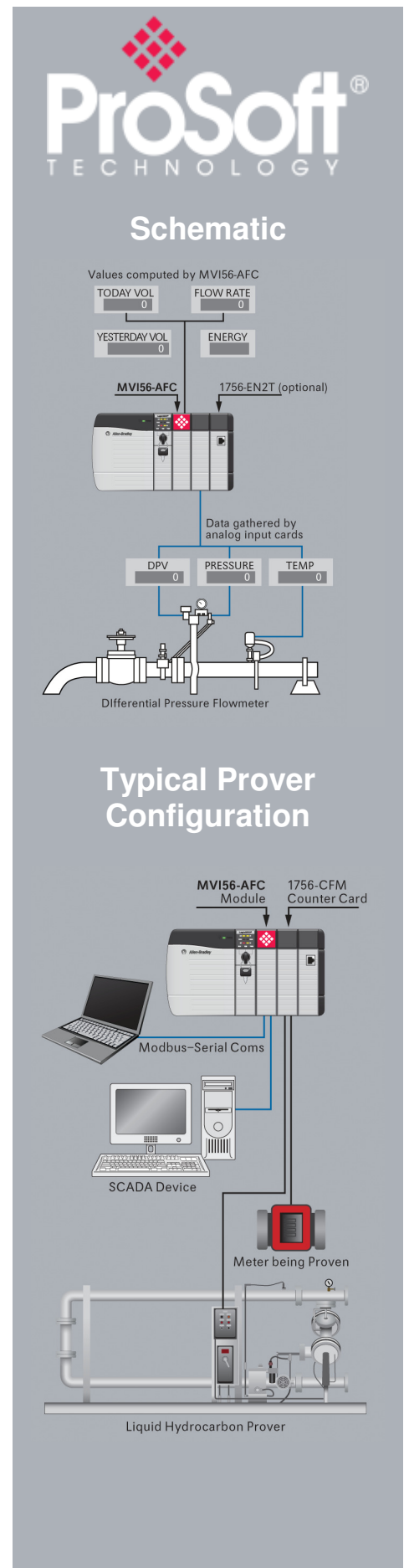
Modbus Interface

♦ All three Modbus slave ports allow for SCADA communication and can be configured for RTU or ASCII mode.
♦ Modbus table may be re-mapped as a virtual Modbus slave for user-assigned contiguous register polling by a SCADA master (up to 20,000 registers).
♦ One of the three ports can be configured as a Modbus Master port to poll data from remote devices.

System Requirements - AFC Manager

This configuration software is designed for Microsoft Windows 98/NT/2000/XP/Vista/7. Minimum hardware requirements for a Windows 98 system are as listed below. More advanced operating systems have signifigantly higher minimum requirements regardless of AFC Manager minimum requirements.

♦ 100 MHz or faster Pentium PC
♦ 128 MB RAM
♦ CD-ROM drive
♦ 100 MB available hard drive space
♦ Available RS-232 serial port and null modem cable

Schematic

Values computed by MVI56-AFC

| TODAY VOL | FLOW RATE |
| 0 | 0 |

| YESTERDAY VOL | ENERGY |
| 0 | |

MVI56-AFC   1756-EN2T (optional)

Data gathered by analog input cards

| DPV | PRESSURE | TEMP |
| 0 | 0 | 0 |

Differential Pressure Flowmeter

Typical Prover Configuration

MVI56-AFC   1756-CFM
Module   Counter Card

Modbus–Serial Coms

SCADA Device

Meter being Proven

Liquid Hydrocarbon Prover

Hardware Specifications

Specification	Description
Backplane Current Load	800 mA @ 5 Vdc 3 mA @ 24 Vdc
Operating Temperature	32°F to 140°F (0°C to 60°C)
Storage Temperature	-40°F to 185°F (-40°C to 85°C)
Shock Vibration	30g operational, 50g non-operational 5g from 10 Hz to 150 Hz
Relative Humidity	5% to 95% RH, with no condensation
LED Indicators	Module Status, Backplane Transfer Status, Application Status, Serial Activity
Debug/Configuration port (Config)	
Serial Interface Type	RJ45 (DB-9M with supplied cable), RS-232 only
Application ports (MODBUS 2 & MODBUS 3)	
Serial Interface Type	RJ45 (DB-9M with supplied cable) RS-232, RS-485, RS-422 jumper selectable RS-232 handshaking configurable 500V optical isolation from backplane Full hardware handshaking control, providing radio, modem and multi-drop support
Shipped with Unit	RJ45 to DB-9M cables for each port 6-foot DB-9F to DB-9F null modem cable InRax CD-ROM with AFC Manager and sample ladder

Measurement Compliance Standards

- API MPMS Chapter 14.3 (AGA Report No. 3), 1992 ed.
- ISO 5167, Part 2, 2003 ed.
- AGA Report No. 7
- API MPMS Chapter 14.2 (AGA Report No, 8), 1992 ed., Detail Characterization Method (for compressibilities and densities) and Appendix C.3 (for energy content)
- API MPMS Chapter 14.9 (AGA Report No. 11) (Coriolis mass meters)
- AGA Report No. 9 (Ultrasonic meters)
- API MPMS Chapter 11.1, 2004 ed. (complete)
- API MPMS Chapter 11.2 (CPL for lower-density liquids)
- GPA Technical Paper 27 (CTL and density correction for lower-density liquids)
- GPA Technical Paper 15 (vapor pressure for lower-density liquids)
- API MPMS Chapter 12.2 Parts 1, 2 and 3
- API MPMS Chapter 20.1 (measurement of liquids with high water content)
- API MPMS Chapter 21.1 (gases)
- API MPMS Chapter 21.2 (liquids)
- GPA 2145-03
- GPSA Engineering Data Book (SI)
- GPSA Engineering Data Book (FPS)

Agency Approvals & Certifications

ANSI / ISA	ISA 12.12.01 Class I Div 2, GPs A, B, C, D
CSA/cUL	C22.2 No. 213-1987
CSA CB Certified	IEC61010
ATEX	EN60079-0 Category 3, Zone 2 EN60079-15
IC	Industry Canada certification for custody transfer (gas measurement)

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