

Gas Measurement Manual

PART FIFTEEN

ELECTRONIC VOLUME CORRECTORS

Prepared by:

Transmission Measurement Committee and Customer Field
Service and Measurement Committee



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FORWARD

This manual presents information on electronic volume correctors (EVCs) for installation, operation, calibration, and maintenance of EVCs. This is not a standard for electronic volume corrector (EVC) design. The information is intended to cover only instruments considered auxiliary devices mounted on the gas meter or receiving a direct pulse from a linear flow meter. *This does not include the primary flow measurement device (meter) but does include the integral temperature and pressure correcting devices that are incorporated now as part of the metering assembly.*

HISTORY AND BACKGROUND

Over the years, mechanical devices have been providing a means for correcting measured gas volume to base conditions of pressure and temperature. Their origin can be traced back to the 1920s when chart recorders were used to record line pressure at the gas meter. These charts would then be read to determine average line pressure so that the volume measured by the gas meter could be corrected to base pressure conditions. Today, very few mechanical chart recorders are still used for volume correction. They may record any metered volume, line pressure or line temperature combination. Another means of gas volume correction emerged during the 1950s. Mechanical instruments mounted on gas meters automatically corrected metered volume to base conditions. They mechanically measured and applied pressure and temperature correction factors to a gear-driven index through linkages and clutches.

Later, mechanical volume correctors were improved by adding an approximating cam for super compressibility correction and a switch contact output to allow connection to separate volume recorders or telemetering devices. The origin of electronic volume correction can be linked to the Supervisory Control And Data Acquisition (SCADA) systems that the gas and liquid transmission companies fielded in the early 1970s. Although electronic measurement and correction were much more accurate than that period's mechanical chart recorders or volume correctors, it was too costly for distribution.

However, this is no longer true. Advances in electronic technology have made it possible to provide cost- effective gas-volume correction in virtually all applications previously supported by mechanical correcting devices. Not only are the electronic volume correctors comparable in initial cost, but they also provide an increase in performance beyond the range of mechanical corrector technology. Performance improvements include increased measurement accuracy, data storage capacities, audit trail memory, better long-term stability, quicker calibration, and a decreased load on the instrument drive shaft.

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PROPOSAL TO REVISE GAS MEASUREMENT MANUAL-ELECTRONIC VOLUME CORRECTOR		

DEFINITIONS

Base condition	Defined pressure and temperature used in the custody transfer measurement of fluid volume and other calculations. Base conditions may be defined by regulation, contract, local conditions or organizational needs. Base conditions may vary within regions such as: 1) USA, pressure 14.73 psi absolute, temperature 60 °F, as defined by NAESB. 2) Canada, pressure 101.325 kPa absolute, temperature 15 °C. 3) Mexico, pressure 1 kgf/cm ² (equivalent to 98.1 kPa absolute), temperature 20 °C.
Baud rate	The baud rate is the rate at which information is transferred in a communication channel. Baud rate is commonly used when discussing electronics that use serial communication. In the serial port context, "115,200 baud" means that the serial port can transfer a maximum of 115,200 bits per second
Data log	It is data collection and storage over period. Sometime in industry refers to as histories, audit trail, event logs etc.
Form A	A "Form A" would mean the contacts are normally open when the coil of the relay is not energized or the there is no magnetic field nearby in a reed switch.
Form B	A "Form B" would mean the contacts are normally Closed when the coil of the relay is not energized or the there is no magnetic field nearby in a reed switch.
Form C	A "Form C" would have three leads and would have one normally open contact and one normally closed contact. This is also called a "changeover" device because the common contact changes from the normally closed position to the normally open position when the coil is energized in a relay, or a magnetic field is nearby in a reed switch.
Standard Condition	A standard cubic foot of gas is the amount of gas that occupies one cubic foot at base conditions.
Wiegand Sensor	Wiegand sensors are magnetic sensors that make use of the Wiegand effect to generate a consistent pulse every time magnetic field polarity reverses and therefore do not rely on any external voltage or current.

ABBREVIATIONS

ACFH	Actual Cubic Feet Per Hour (Uncorrected)
AMI	Advanced Metering Infrastructure
AMR	Automatic Meter Reading
CF	Cubic Feet
EVC	Electronic Volume Corrector
I/O	Input and/or Output
IrDA	Infrared Data Association
REV	Revolution (Rotation).
SCADA	Supervisory Control And Data Acquisition
SCFH	Standard Cubic Feet Per hour (Corrected)
TCP/IP	Transmission Control Protocol/Internet Protocol
TEG	Thermoelectric Generator

1 GENERAL

1.1 Overview of Electronic Volume Corrector (EVC)

Most meters measure actual (uncorrected) flowing volume. The actual flowing volume varies with pressure/temperature and needs to be corrected to reflect standard conditions (corrected). The value the flowing volume would assume at standard conditions is calculated per the gas laws, as covered in section 1.6 of this document. The corrected volume calculation can be performed by an electronic volume corrector (EVC) using one or more methods specified in reports AGA-7, AGA-5, AGA-8, and NX-19.

In addition to the live volume correction function, an EVC can provide benefits that older mechanical technologies could not, such as increased accuracy, easy calibration, configuration flexibility, simplified maintenance, data storage, and local/remote data communication.

The installation of an EVC vs a flow computer may depend on meter type, customer type (residential/ commercial /industrial), power availability, and cost.

1.2 Basic Components

An EVC typically consists of an enclosure, a pulse-input device (for volumetric input), a line pressure transducer, a temperature transducer, a display, electronic circuit boards, communication port(s), and a power supply. An EVC may contain other optional components such as a secondary pressure transducer, status/alarm inputs from other devices, keypad, pulse outputs, communication devices (phone modem, cell modem, etc.). The EVC may be mounted directly to the gas meter (integral mount), directly mounted on the instrument drive of a gas meter, pipe-mounted, pole-mounted, or wall-mounted. Figure 1 shows a typical EVC installation on the instrument drive of the turbine meter and Figure 2 shows a typical installation of integral mount EVC on the rotary.