

Volume Corrector EC 694



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Reliability in gas supply -
single-sourced across the board!

Method of operation

Irrespective of gas and temperature, a gas meter measures only the gas volume flowing through it, i.e. what is called volume at actual conditions. Since gas can be compressed, the amount of gas which has actually flowed through the gas meter has still to be calculated from the measured volume at actual conditions (correction). As a measure for this amount of gas, either what is called standard volume (related to the standard temperature of 0°C and the standard pressure of 1.01325 bar) or the mass of the gas concerned is used.

This conversion is made by the EC 694 compact corrector on the basis of the equation of state for ideal gases. Since this equation alone does not meet all the requirements for high-precision gas metering, it is also necessary to take account of the characteristics of the real gas by using a correction factor, i.e. the compressibility factor K.

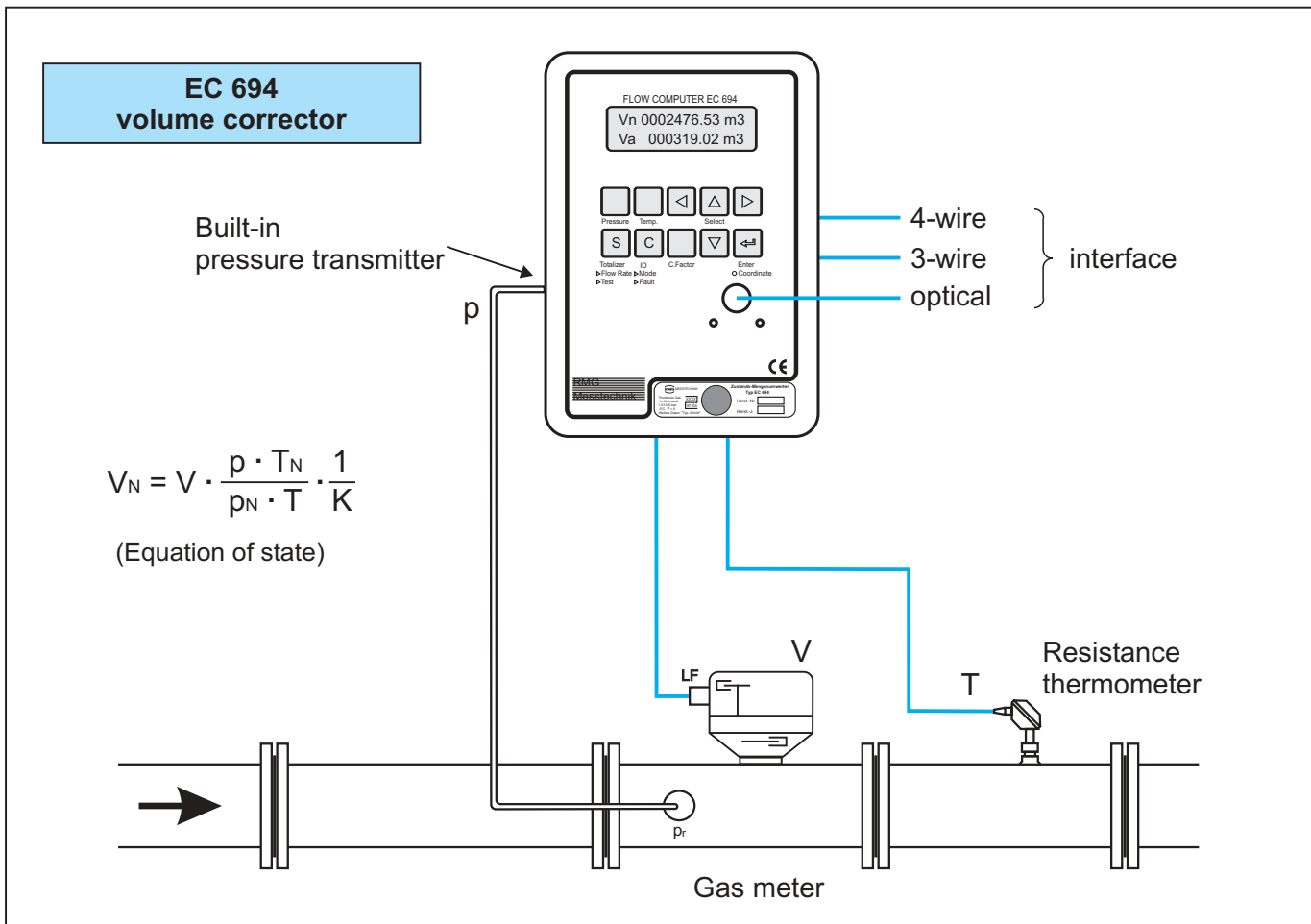
The EC 694 compact corrector can be used for custody transfer and secondary metering in conjunction with turbine meters and rotary displacement meters.

Correction is based on the state variables of pressure, temperature and compressibility of the gas concerned.

Approval

The EC 694 has been approved as a volume corrector for custody transfer metering of natural gas.

During operation, limits prescribed for custody transfer metering are being monitored. If these limits are exceeded, counting is performed using separate disturbing quantity totalizers.



Features

- **Ease of installation and start-up**

The EC 694 provides the following options for installation:

- directly on the gas meter
- on the wall
- on a stand
- on a pipe

If the EC 694 is ordered together with an RMG turbine meter, it can be delivered ready-installed.

- **Battery or mains supply**

The standard version of the EC 694 is powered by 2 lithium batteries for one-channel operation. The battery life extends to approx. 6 years at normal use and an input frequency below 1 Hz. Batteries can be changed without opening the case.

Using external voltage supply, two-channel operation is also possible.

- **Tariff-rate function**

Maximum and mean values for pressure and temperature, totalizer readings and events are registered as prescribed for custody transfer metering.

An additional data memory is available whose recording interval can be freely selected between 1 minute and 7 days.

- **Calculation of compressibility factor**

The EC 694 volume corrector calculates the compressibility factor K. For this purpose, one of the following methods can be selected:

- GERG 88S (standard)
- AGA-NX-19
- Beattie & Bridgeman

It is also possible to define the compressibility factor as a constant.

- **Explosion protection**

If battery-powered or supplied with 9.2 V/DC, the EC 694 is intrinsically safe and suitable for use in Area 1 applications.

- **Digital interfaces**

Three digital interfaces are available for exchanging data:

- optical interface for servicing or reading out data
- 4-wire interface, usable for M bus, for example
- 3-wire interface

The two electrical interfaces can be used as printer, MODBUS or RS 232 interfaces. An interface isolating stage is required for battery-powered devices and isolating devices installed in hazardous areas.

Pressure transmitter and resistance thermometer

A pressure transmitter is fitted into the case of the EC 694 as a standard feature. Special designs with external pressure transmitters are available on request.

The standard version incorporates a resistance thermometer of the type Sensycon PT 1000. In the event of mains-powered devices, it is also possible to use resistance thermometers of the type PT 500 or PT 100.

Operation

All configuration data as well as measured and calculated values are stored in an easy-to-survey table. All cells of this table can be reached and displayed by pressing arrow keys. Moreover, major quantities, such as pressure, temperature or totalizers, can be directly accessed by pressing a single key.

All data can be read out via the optical interface on the front panel.

Programming can be made using the keyboard or the optical interface on the front panel. Parameters for custody transfer metering are protected by a sealable switch, whereas all the other parameters are locked by a code number.

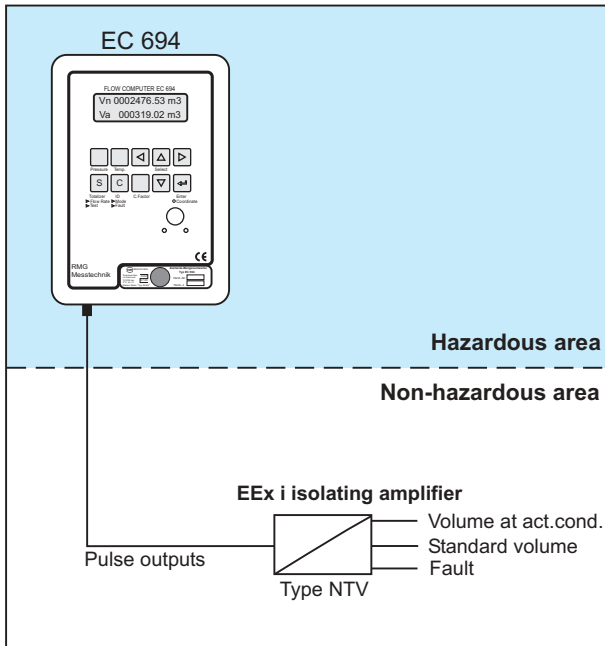
Accessories

- **EEx i power supply unit** in the wall-mounting case supplying the EC 694 with 9.2 V/DC, for use
 - in hazardous locations (Area 1): type EST 15
 - outside hazardous locations: type NST 15
- **EEx i supply unit** for analog output, required for using the analog output of mains-powered devices.
- **Isolating amplifier** for isolating pulse outputs in hazardous areas.
- **Infrared read head** as a transition element between the optical interface and a serial electrical interface.
- **Interface isolating stage** for battery-powered devices and devices installed in hazardous areas, for connection to electrical interfaces.
- **Read-out software** for reading out the data memory and extracting current values.
- **Thermowells** for resistance thermometers, G $\frac{1}{4}$ " or G $\frac{3}{4}$ " connecting threads.
- **Three-way test tap** for pressure transmitters.

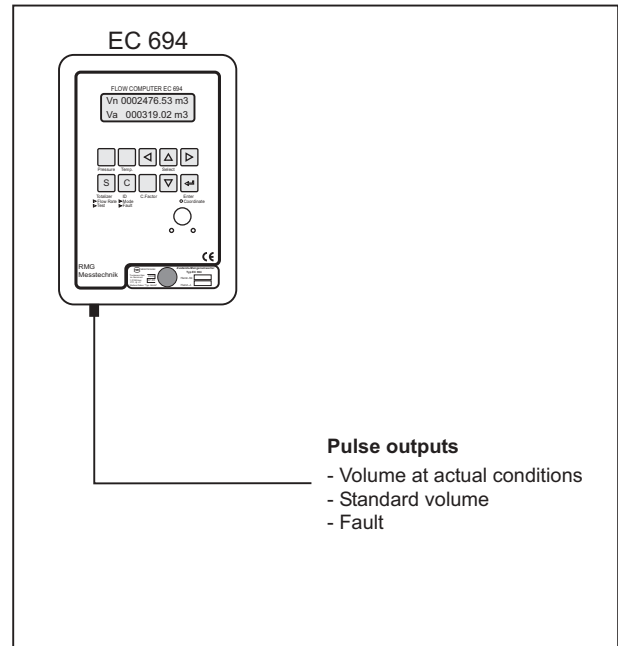
Examples of connection

1. Battery-powered devices

a. Ex design (explosion-protected)

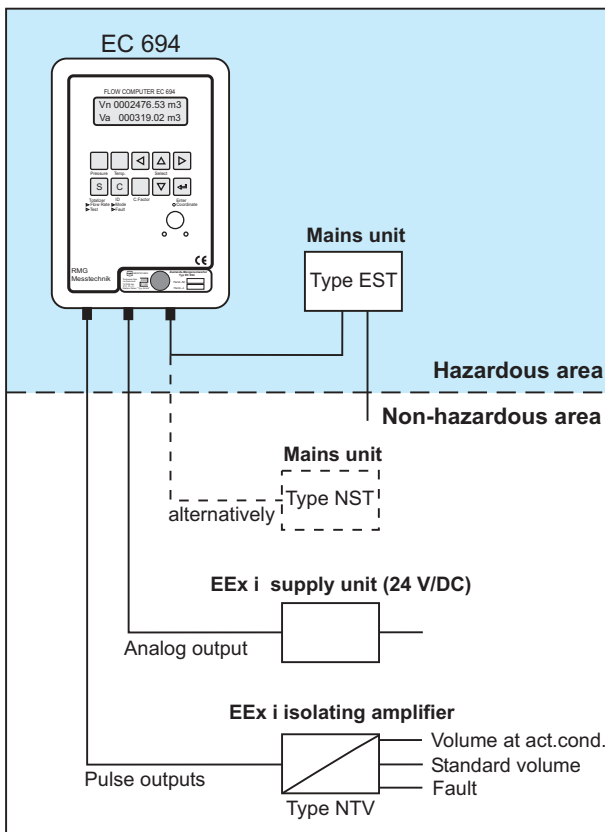


b. Non Ex design (not explosion-protected)

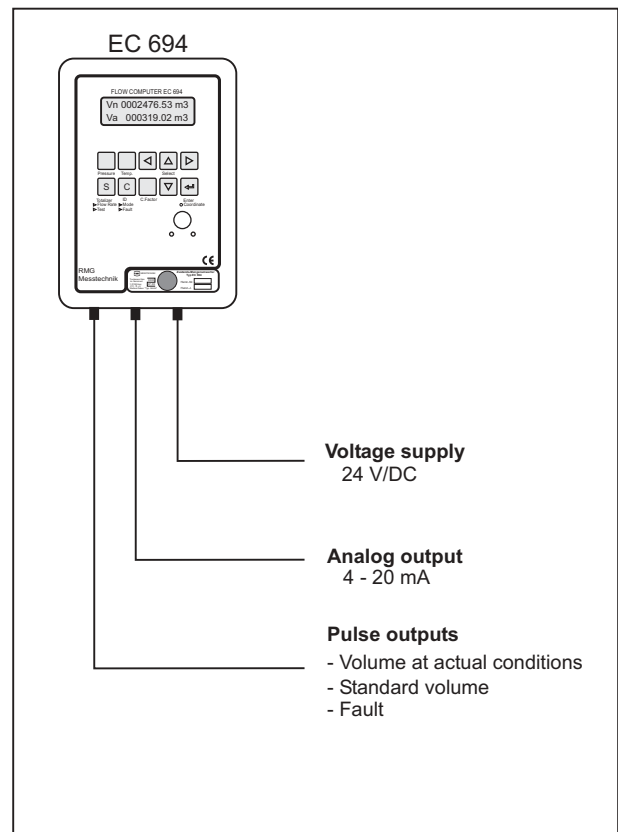


2. Mains-powered devices

a. Ex design (explosion-protected)



b. Non Ex design (not explosion-protected)



Data memory

All in all, the following values can be registered in the data memory:

Tariff memory for custody transfer metering

Registered are:

- Daily and monthly peak values of the volume at actual conditions and standard volume for 1 year
- Hourly mean values of pressure and temperature and hourly totalizer readings for 6 months
- Daily and monthly mean values of pressure and temperature and associated totalizer readings for 1 year
- 400 events (e.g. fault messages) with current totalizer readings and mean values for pressure, temperature, compressibility factor, volume correction factor and flow rate

Additional data memory

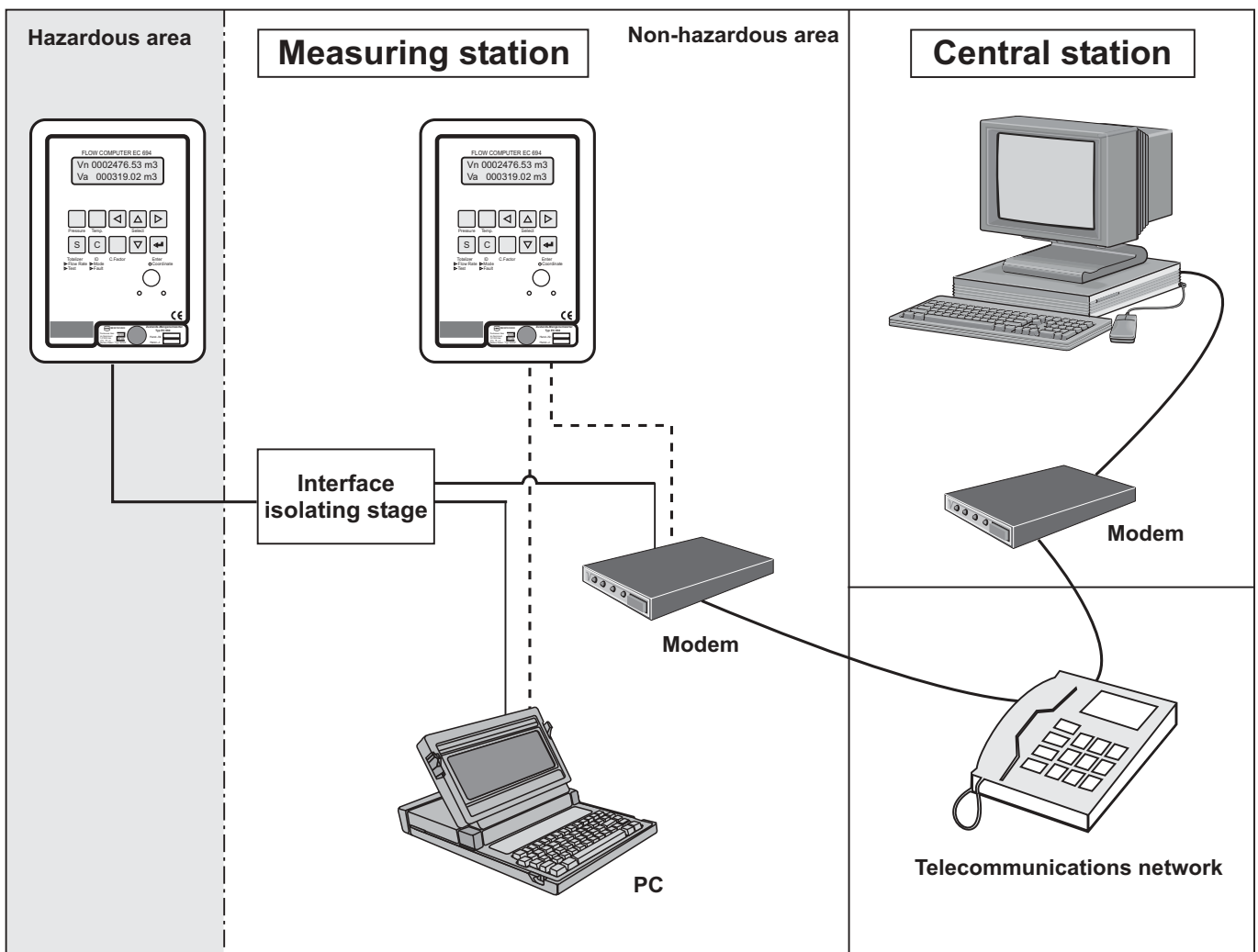
Option for entering 720 totalizer readings (volume at actual conditions and standard volume) and mean values (pressure, temperature, compressibility factor, volume correction factor, volume flow rate at actual conditions and standard volume flow rate). The recording interval is freely selectable between 1 minute and 7 days.

Data transfer

In order to read out the data memory of the EC 694, it is practical to transfer the stored data via one of the digital (serial) interfaces. Both the electrical interfaces and the optical interface are suitable for this purpose. Data can be directly read out either by a PC or by the central station via long-distance data transmission using a modem.

For this purpose, a read-out software is available for reading out all data and storing them in a format which makes it easy to further process and evaluate them.

A printer or a MODBUS system (for use as a MODBUS slave) may also be connected to the electrical interfaces, with an option for also connecting an M bus to the 4-wire interface. An interface isolating stage is required for isolating devices installed in hazardous locations.



Volume Corrector EC 694

Technical data

Explosion protection	IIC G EEx ia IIC T3/T4
Display	2 lines, 16 characters per line, alphanumeric
Dimensions	220 x 195 x 90 mm
Weight	approx. 2.5 kg
Degree of protection	IP 65
Ambient temperature range	-20°C to +60°C
Measuring temperature range	-10°C to +60°C (with GERG 88S)
Pressure ranges	0.7 - 2 bar(a) 0.8 - 5 bar(a) 2 - 10 bar(a) 4 - 20 bar(a) 8 - 40 bar(a) 14 - 70 bar(a)
Pressure transmitter connection	Screw connection M12 x 1.5 for ERMETO 6L (6 mm tube), for other diameters an adapter is required
Voltage supply	2 lithium batteries of 3.6 V (standard) each or external 9.2/24 V/DC supply
Inputs	<ul style="list-style-type: none"> • one channel: reed contact with $f_{max} = 1$ Hz or two channels (with external voltage supply only): signals up to 400 Hz • switching contacts for <ul style="list-style-type: none"> - totalizer stop - reversal of direction
Outputs	<ul style="list-style-type: none"> • 3 transistor outputs: <ul style="list-style-type: none"> - totalizer } programmable for volume at actual conditions or - dispatcher } standard volume - fault $U_{max} = 20$ V, $I_{max} = 60$ mA, $P_{max} = 160$ mW • 4 - 20 mA analog output (with external voltage supply only), electrically isolated, load resistance: max. 700 Ω
Interfaces	<ul style="list-style-type: none"> - optical interface for infrared read head - 4-wire interface (usable for M bus) - 3-wire interface

All inputs and outputs are protected against overvoltage.

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