TEC-II

Volume Conversion Device

TANCY 天信

Tancy Instrument Group Co.,Ltd.

Application Introduction:

The TEC-II electronic volume corrector is a secondary device used in conjunction with gas flow meter, which is designed and manufactured according to the European standard EN12405 and can be used for gas trading and commercial metering.

Product Introduction:

The TEC-II EVC can convert the measured volume and flow rate to the reference volume and flow rate. According to the needs, it can be set to conversion as function of the pressure , the temperature with constant compression (PT conversion) or conversion as function of the pressure, the temperature and taking into account the compression factor(PTZ conversion). For PTZ corrections, K value calculations can be based on SGERG-88, AGA8-G1, AGA8-G2, AGA NX-19, and be selected by the settings. At the same time, the device has the function of energy metering.

Working Principle:

The corrector receives the flow pulse signal output by the flow meter and calculates according to the set flow meter coefficient to obtain the volumetric flow and the total volume of the flow meter under the measurement conditions. The corrector reads out the values of the pressure sensor and the temperature sensor to obtain the pressure and temperature of the flow meter under the measurement conditions, and convert them into the volumetric flow, total volume and conversion factor, etc. under the reference conditions according to the selected compression factor model and volume conversion model. At the same time, the corrector completes corresponding operations, such as monitoring alarms and data communications, according to the other functions set.
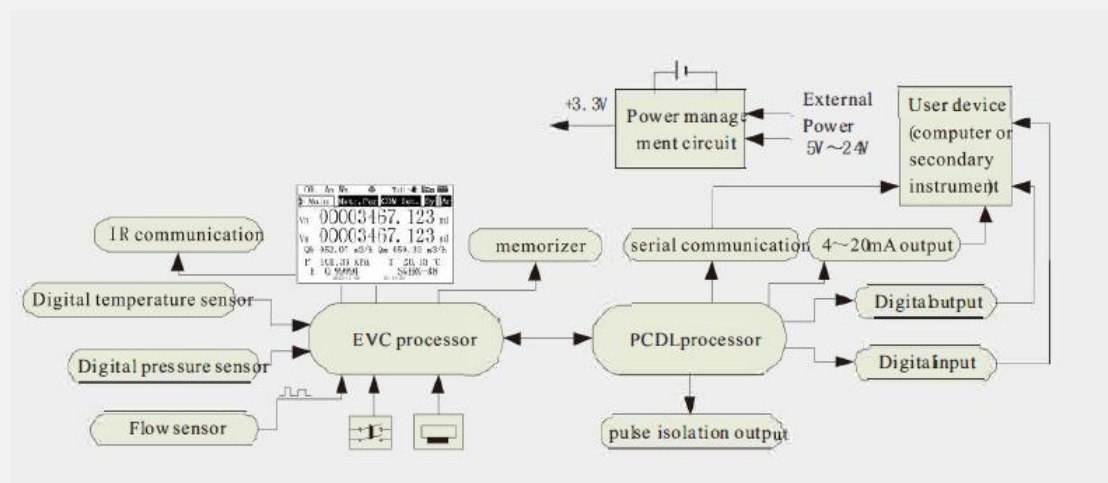

Corrector block diagram

Functional Features:

- The product configuration is 256x160 graphic dot-matrix LCD screen with black text on white background, its display content and operation method are intuitive and generous, and the display content can be allocated according to the needs.
- Low-power technology design, and the power supply of the built-in lithium battery under the required operating mode is more than 5 years.
- Multi-level safety measures: independent metering switch, meter seal, factory password, and user password.
- Various data has independent access permission and can be input through the interface (keyboard or communication).
- With one flow signal input, and the input interface can be configured to be two-wire (REED CONTACT) LF and NAMUR.
- A magnetic interference detection interface is designed for each channel, which is used to detect whether or not there is any magnetic interference added by a person, and record relevant information.
- There are two digital input interfaces, which can be set as switching input for monitoring relevant signal input, such as the status of the protective box cover, safety latch, etc.
- There is an optocoupler-isolated pulse output that can only be used in the safety zone.
  The output pulse frequency can be set to be the same as the frequency of the input flow signal, or proportional to the volumetric flow under reference conditions, or proportional to the calibrated volumetric flow.
- There are four channels of freely programmable open collector (OC) digital output with isolation, which can be arbitrarily set as various types of alarm/error output or the pulse output corresponding to relevant volume.
- It has periodic log files, daily log files, monthly log files, maximum load files, interference files, load files and event files.
- It has event notebook, parameter change notebook, gas composition parameter notebook and calibration notebook.
- It has serial communication interfaces RS485/RS422 and RS232; on the panel, there is an infrared photoelectric communication interface, which can be used for local configuration or data reading (IEC62056-21). It has a variety of communication protocols for users to choose, and can be easily connected to the SCADA system.

- The pressure and temperature sensors adopt high-stability piezoresistive pressure sensor and PT1000 platinum resistance. Inside the pressure sensor, there is a -20°C to $+70^{o}$C digital temperature compensator, and both of them are equipped with a communication serial port, which conforms to the MODBUS specification and directly outputs pressure value and temperature value.
- Configurable with Rotary Gas Meter and Turbine Gas Meter to convert the gas at measurement condition to reference condition.

Technical Specification:	
Housing material	Aluminum alloy
Dimensions	223mm (length) x 181mm (width) x 70mm (depth)
Weight	**2.5kg**
Conform to standards	EN 12405-1:2005+A2:2010, EN 60079-0:2012, EN60079-11 :2012, IEC60079-0: 2011 and IEC60079-11: 2011
Comprehensive error	≤0.5% under reference conditions
Explosion-proof type	(Ex) II 1G Ex ia IIC T4 Ga
Protection level	IP65
Ambient temperature	-25°C-+55°C
Battery and service life	Lithium thionyl chloride batteries, 3.6V/1.2Ah plus 3.6V/19Ah or 3.6V/17Ah, service life is more than 5 years; standby battery's service life is more than 1 year
External power supply	**(8-24)x(1** ±15%)V d. c., 3W
Keyboard	Up button, down button, left button, right button, confirm button, return button
Display	Dot matrix LCD: 256*160 with backlit display
Password type	User password, supplier password, manufacturer password, calibration password, user lock, supplier lock, manufacturer lock, calibration lock
Pressure sensor	a. Model: SRP-01 (built-in form) or SRP-02 (external form); b. Pressure measurement range: 25% Pmax- Pmax; c. Scale: 0.2, 0.5, 1.0, 2.0, 5.0, 10.0MPa. a.
Temperature sensor	a. Model: SRT-C; b. Measurement range: -25°C - +70°C.
Compression factor formula	SGERG-88/AGA NX-19/AGA8-G1/AGA-G2/fixed value
Parameter record	Cycle record of 4500 pieces, daily record of 700 pieces, monthly record of 24 pieces, interference record of 600 pieces, event record of 600 pieces, and load record of 600 pieces
Event record	Alarm record of 600 pieces, change record of 600 pieces, and component change of 200 pieces
Digital signal input	3-channel digital signal input (LF, HF)
Digital signal output	1-channel pulse signal output and 4-channel (OC) digital signal output with isolation
Analog signal output	1-channel 4mA-20mA output
Data interface	RS485/422, RS232, 1.2-38.4kbps; photoelectric interface: 9.6kbps
Communication protocol	MODBUS RTU

Power Supply:

The device has a group of built-in 3.6V lithium batteries. Under the specified working mode, the service life is more than 5 years; a 3.6V backup battery is mainly to ensure that some important functional data is not lost when the main battery BT1 is dead or disassembled. Under the specified operating mode, its service life can reach 10 years. Under frequent operating conditions or other functions with large battery consumption, the device requires an external 8-24V d.c. ±15% 3W power supply.

Communication and Interface:

The device can be connected to the SCADA system and can select RS232 or RS485/RS422 communication interface or external matching PTE-01 optical connector through the internal configuration. It supports MODBUS RTU protocol, and complies with IEC62056-21 standard. Special epistasis software can be used to initialize the device and read the historical files and current data.

Interface: RS232, RS-485/RS-422

Photoelectric interface (PTE-01, IEC-1107)

Pressure Sensor

a. Silicon piezoresistive sensor

a. SRP-01 (built-in form) or SRP-02 (external form) pressure sensor;

b. Pressure measurement range: 25% Pmax- Pmax;

c. Connection thread: 1/4 NPT

Measurement accuracy: ±0.2%

Overload capacity: 1.5Pmax full scale

d. Operating temperature range: -30 ° C - +90 ° C;

e. Compensation temperature range: -20 ° C - + 70 ° C;

f. Optional scale: 0.2, 0.5, 1.0, 2.0, 5.0, 10.0MPa. a.

Temperature Sensor

a. PT-1000 probe

b. Model: SRT-C type;
   Sensor outer diameter: 6mm

c. Measurement range: -25°C to +70°C.
   Measurement accuracy: ±0.5° C

Digital Input

3-channel digital input:

A) 1-channel flow signal input:
   LF low-frequency signal: reed switch signal input, with maximum frequency of 15Hz;
   Standard NAMUR signal: maximum frequency is 5kHz (special configuration); external power supply is required.

B) 2-channel non-metering input can be configured as alarm/error switching output or volumetric pulse signal.

Digital Output

Channel high-frequency pulse output:

Amplitude: VOL≤1.0V, VOH≥20V (under 24VDC power supply);

The frequency corresponding quantity can be programmed as: condition pulse, calibration pulse, correction pulse.

4-channel digital output:

Can be configured as alarm/error switching output or volumetric pulse signal output; Maximum frequency is 4Hz, pulse width is 125ms.

Analog Output

1-channel 2-wire 4mA-20mA standard current output:

The output can be configured as gas absolute pressure P, volumetric flow rate Q under measurement conditions, and volumetric flow rate Qb or cycle accumulation under reference conditions.

Compression Coefficient Formula

SGERG-88, AGA NX-19,

AGA8-G1, AGA8-G2, or fixed value

Data Protection

By using a four-level password:

The four-level passwords are the calibration password (C), the manufacturer password (M), the supplier password (S), and the user password (K).

Through the switch set in the device:

Switches are service switch and metering switch, respectively

Logbook

There are event logbook, parameter change logbook, gas composition parameter logbook and calibration logbook.

a. Event logbook: record the recent 600 status changes (such as alarms, error messages).

b. Parameter change logbook: record the recent 600 parameter setting changes and change time.

c. Gas composition parameter recent: record the recent 200 changes to gas composition parameter settings.

d. Calibration logbook: record the recent 200 parameter changes related to calibration.

Data Archives

This product has data archives and logbook recording function, with periodic archive, daily archive, monthly archive, maximum load archive, interference archive, load archive, and event archive.

a. Periodic archive: record the volume of Vm, Vb, etc., and the average value of the flow Q, pressure P, and temperature T of each cycle. The recording cycle can be selected from 5min

to 600min. There are 4,500 pieces of record data.

b. Daily archive: record the volume of Vm, Vb, etc.; the average value of flow Q, pressure P, and temperature T of the day; the cumulative maximum cycle value of the current day and the time stamp. There are 700 pieces of record data.

c. Monthly archive: record the volume of Vm, Vb, etc.; the average value of flow Q, pressure P, temperature T, etc. of the current month; the cumulative maximum cycle value of the current month and the time stamp, the cumulative maximum cycle value of the day and the time stamp. There are 24 pieces of record data.

d. Maximum load archive: record the cumulative maximum cycle value of the day and the time stamp; the cumulative maximum cycle value of the current month and the time stamp; the cumulative maximum daily value in the current month and the time stamp; the cumulative value in current cycle and the remaining time of the cycle; the current daily cumulative value and the remaining time of the day.

e. Interference archive: record VmD, VbD, and ED when alarm/warning events occur or are eliminated, or when the date and time are adjusted. There are 600 pieces of records.

f. Load archive: record the volume of Vm, Vb, etc., and the average value of flow Q, pressure p, and temperature t for each load cycle. The load cycle can be selected from 5min to 120min. There are 600 pieces of record data.

g. Event archive: record Vm, Vb, and other volume, and record flow Q, pressure P, and temperature T, etc. when alarm/warning events occur or are eliminated, or when measurement related parameters are modified. There are 600 pieces of records.

Certification and Specification

According to the European standard EN 12405-1:2005+A2:2010, it has passed CE certification.

According to the directive 94/9/EC, it has obtained ATEX explosion-proof certificate and IECEx explosion-proof certificate.

And it meets the following specifications.

1994/9/EC Equipment and protective systems for use in potentially explosive atmospheres;

2004/108/EC Electromagnetic compatibility

2004/22/EC Directive on measuring devices

99/05/EC Radio equipment and telecommunications terminal equipment

The product strictly complies with relevant intrinsically safe explosion-proof standards such as EN60079-0, EN60079-11 and EN60079-26. The housing is IP65 rated and complies with the EN60529 standard.

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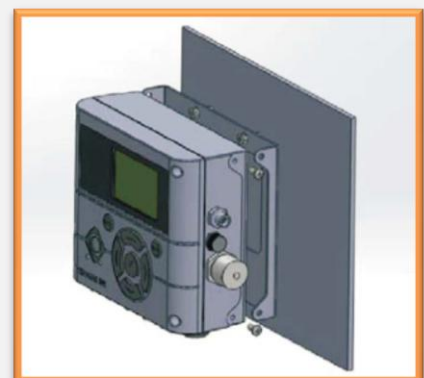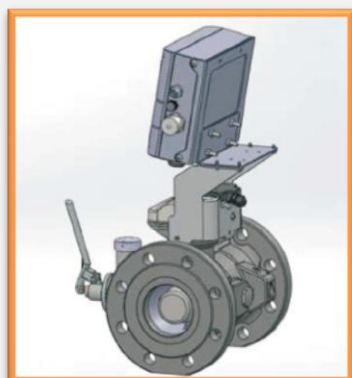
Your contacts:

Tancy Instrument Group Co.,Ltd.
198 Hualian Rd
Cangnan Industrial park, Wenzhou, Zhejiang,
China

Telephone : +86-577-68858028
Fax : +86-577-68858061
Email : info@tancy.com

www.tancy.com