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Industrial Gas Meters

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[Volume converters](#)



ZENNER
All that counts.



- T, PT, PTZ volume conversion
- Conforms to European standard EN 12405
- MID approval
- Compressibility calculated in accordance with different methods
- Flexible, integrated data logging function
- High accuracy
- Mains-free operation
- Suitable for use in Zone 1 hazardous areas
- Three digital inputs
- Four freely programmable, sealable digital outputs
- Various communication protocols
 - IEC 62056-21
 - Modbus
 - IDOM
- Optical interface for parameterisation and readout (IEC 62056-21)
- Integrated serial interface can be used as RS232 or RS422/RS485
- Second pressure sensor for monitoring purposes (option)

EK220

Volume conversion device with flexible data logging function and configurable serial interface

The EK220 is a battery-operated volume converter. The device records the low frequency operating volume pulses of a gas meter, measures the operating pressure and temperature of the gas and calculates the compressibility K as well as the conversion factor C. The standard volumes, standard flow rates and operating flow rates can be calculated using this initial data.

The volume converter consists of a central unit with either an integrated or external pressure sensor and a temperature sensor. The sensors are permanently connected to the unit. The compressibility K can be programmed as a constant for all gases or calculated according to various methods of calculation.

The device is also available without a pressure sensor and can be used as a temperature conversion device. In this case the gas pressure for the volume conversion will be considered with a fixed value, which has to be configured during the commission of the device.

The EK220 can be used in many applications in the field of natural gas measurement and station monitoring thanks to four digital outputs, a flexible data logging function in conjunction with a freely configurable serial interface and different communication protocols.

Additional components for explosion-proof isolation of the interfaces and the intrinsically safe external voltage supply, and for data communication, extend the range of use of the volume converter.

Station monitoring

In addition to volume conversion and data logging, the EK220 may be used for the flexible data recording of different measurements and, in conjunction with either a modem or RTU, for system monitoring.

Two additional digital inputs can be used for registering and monitoring the signal sensors such as the safety shut-off valves on regulators, the differential pressure switches in filters or for a simple door contact. The signals from such sensors can be saved in an archive as an event and can also be sent as a spontaneous message by text message or by e-mail via a connected modem.

The volume converter may optionally be fitted with a second external pressure sensor, which allows to record the inlet or outlet pressure of the measuring system, or to monitor its limit values.

Applications

- Volume conversion for billing purposes
- Data logging for different applications
- Monitoring of measurement values and station functions

Display and operation

The current values and parameters can be shown on the two-line, alpha-numerical display and changed if required. The use of four arrow keys guarantees simple navigation of data arranged in lists. Each value is displayed with a clear description and the relevant unit.

For everyday operation, the most important values are combined in a configurable user list.

The display range can be limited to this list, which will guarantee simple operation of the volume converter at the metering point. At the touch of a few buttons, the current meter readings and the main operating parameters can be checked.

Data logging function

The integrated, event-triggered data logger supports different archive and logbook functions.

Six archives can be freely configured, i.e. the values that are to be recorded, the events triggering registration, as well as the recording interval (measuring period), can be selected as required. Depending on an archive's configuration, the data can be saved for up to one year, or longer.

Along with the data logging archives, the volume converter offers three logbooks, with which the volume converter's operation can be monitored constantly. The event logbook saves the last 500 messages for events and status changes. In the change logbook the last 200 setting changes are registered and up to 50 changes to parameters and values requiring official calibration are documented in the calibration archive (Certification data log).

Communication interface

The programming or readout of the device at the station is performed via the optical interface (IEC 62056-21) on the front panel. The unit's serial interface can be freely

configured and can be operated in RS232 or RS422/RS485 mode. It allows connection to modems and other communication components. In RS485 mode, bus operation is also possible, in order to read out two volume converters via a communication module (modem, RTU). In compliance with the specifications laid out in the ATEX approval, the interface may also be used in hazardous areas in any configuration.

Communications protocols

The EK220 supports various communication protocols. Invoice-relevant data or process and operating data for network management can therefore be used simultaneously in many established central call-up systems and EDM systems. Using the communication protocol in accordance with IEC 62056-21, all parameters can be read and changed and the archives can be read out. All protocol information is disclosed and is available on request for the development of own applications and call-up systems. As an alternative to the protocol in accordance with IEC 62056-21, the Modbus protocol can also be used for data communication via the internal interface, which allows connection to SCADA systems. For using the Modbus protocol the operating modes ASCII, RTU and TCP are supported. In order to guarantee the greatest flexibility as regards different requirements and applications, the data elements, associated Modbus addresses and data formats can thus be freely configured. In addition to the process data and simple parameter, also the content of the different archives can be read by using the Modbus protocol.

Additional functions

Two additional digital inputs can be used either as pulse inputs or status inputs for various applications, such as station monitoring and pulse comparisons, for example.

Four freely programmable digital outputs enable a range of information to be transmitted.

When programmed as pulse outputs, they allow forwarding of the volume pulses determined for a measuring cycle in the form of pulse packets.

When used as status outputs, messages

and warnings can be signalled on the basis of different results (e.g. exceeding the minimum or maximum consumption values or measured values, sensor errors, time synchronisation signals, etc.). The outputs can either be secured against unauthorised changes by supplier lock or calibration lock.

The volume converter may also optionally be fitted with a second pressure sensor. Depending on the system configuration, the measuring system's inlet or outlet pressure can thus be registered in one of the flexible archives and the limit values can also be monitored there. The system's status can also be continuously monitored when it is connected to a SCADA system.

Power supply

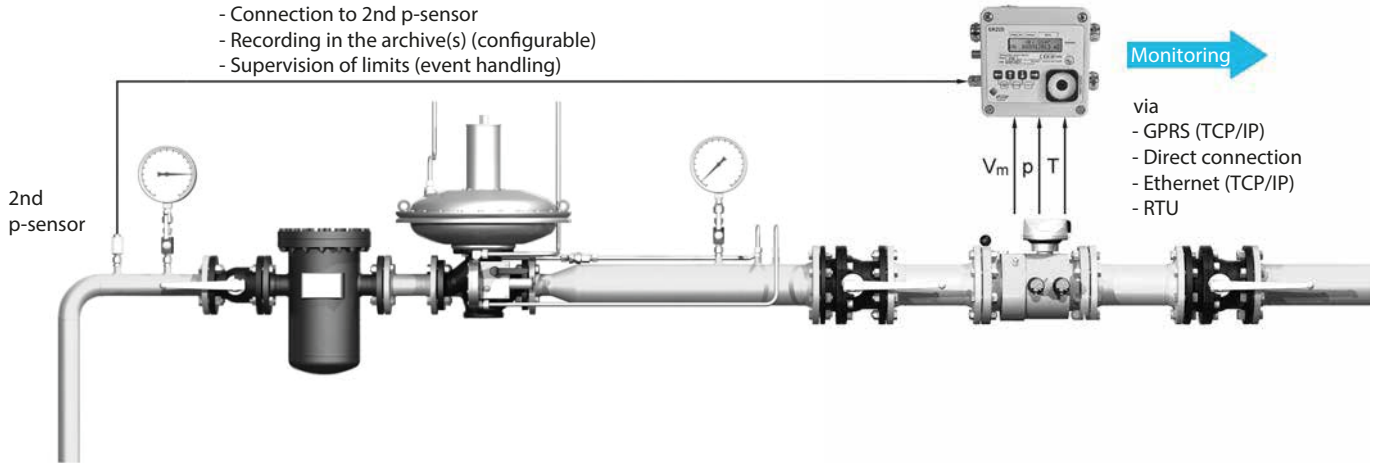
The power supply for the unit is provided by a lithium battery. In standard operation, the service life of the battery is 5 years. An optional additional battery can be used to double the battery life. The current operating status of the volume converter is taken into account when calculating the remaining battery capacity. If the battery life is 3 months or less, the corresponding indication appears in the display. In addition, this information can also be called up via the volume converter status register. The battery can be replaced without damaging the internal seals. All parameters are saved in a non-volatile memory.

In addition, it is also possible to use an external power supply. In this case, the battery remains in the unit and guarantees the unit functions, including if there is a failure of the external power source.

Version

For wall mounting, the housing of the EK220 is equipped with boreholes. It can also be fitted directly to the meter or gas pipe using an attachment bracket.

Second pressure sensor for station monitoring (option)



Flexible data logging and logbook function

Archive	Content Standard configuration	Interval	Capacity	Flexible	LIS-200 compatible
Monthly 1	Data, time, $V_{b'}$, V_{bTr} , $MP_{maxVb'}$, $daily_{maxVb'}$, $V_{m'}$, V_{mTr} , $MP_{maxVm'}$, $daily_{maxVm}$	monthly	24 months	-	x
Monthly 2	Data, time, $Q_{min'}$, $Q_{bmin'}$, $Q_{mmax'}$, $Q_{bmax'}$, $p_{max'}$, $p_{min'}$, $p\emptyset$, $T_{max'}$, $T_{min'}$, $T\emptyset$, k-value \emptyset	monthly	24 months	-	x
Daily	Data, time, $V_{b'}$, V_{bTr} , $V_{m'}$, V_{mTr} , $p\emptyset$, $T\emptyset$, k-value \emptyset , C factor \emptyset , status	daily	18 months	-	x
Measurement 1	Data, time, $V_{b'}$, V_{bTr} , $V_{m'}$, V_{mTr} , $p\emptyset$, $T\emptyset$, k-value \emptyset , C factor \emptyset , status	1 min. – 1 month	1 month	-	x
Measurement 2	Data, time, $V_{b'}$, V_{bTr} , $V_{m'}$, V_{mTr} , $p\emptyset$, $T\emptyset$, k-value \emptyset , C factor \emptyset , status	1 min. – 1 month * ³	6 months	x	x* ²
Process data	Data, time, $V_{b'}$, V_{bTr} , $V_{m'}$, V_{mTr} , $p\emptyset$, $T\emptyset$, k-value \emptyset , C factor \emptyset , status	1 min. – 1 hour * ³	* ¹	x	-
Additional 1 - 4	Flexible	2 s – 1 month * ³	* ¹	x	-
Logbooks					
Event	Data, time, event	every event	500 record	-	x
Audit trail	Data, time, parameter address, old value, new value, information on all locks	every event	200 record	-	x
Certification data log	Data, time, parameter address, old value, new value, information on all locks	(every event * ⁴)	50 record	-	x

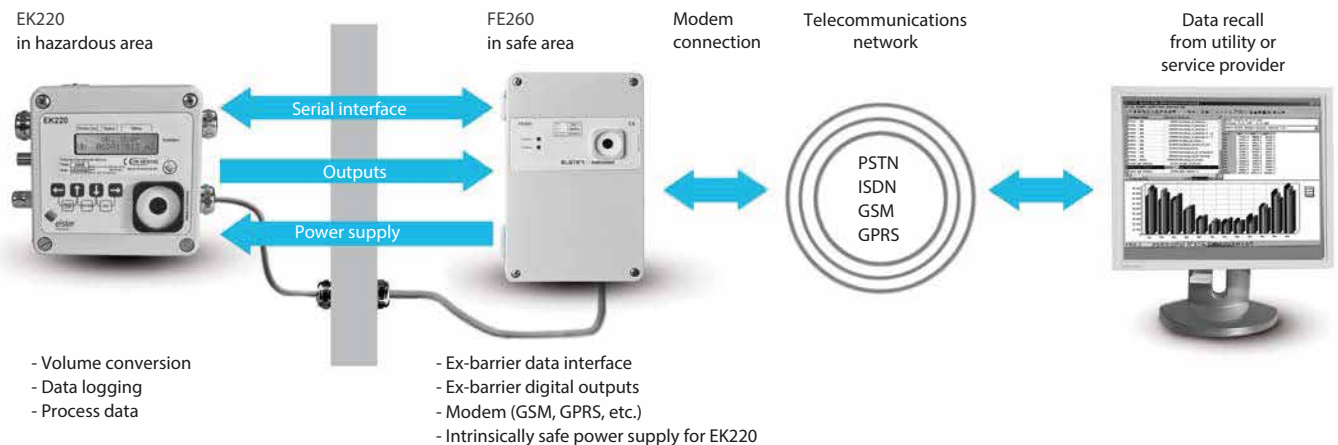
*¹ depends on configuration of archive (interval, content)

*² by using the standard configuration

*³ besides periodic recording specific events can be selected to trigger recording

*⁴ records only the changes of certain parameters, which are under the access right of the calibration lock (function can be switched off)

FE260 function extension unit – a flexible interface between EK220 and energy data management



The Ex-barrier of the serial interface and the pulse outputs of the volume converter is provided by function extension unit FE260. In addition, the intrinsically safe power supply of the volume converter is guaranteed. The unit's modular concept allows the use of a modem for data communication or an interface for connection to other devices.

Technical data	
Order number	83462550
Housing	Cast aluminium, wall or meter mounting
Dimensions	H 126 mm x W 120 mm x D 90 mm (not including connections)
Weight	Approx. 1.5 kg (including batteries)
Metrological approval	Conforms to the European standard EN 12405-1:2005 +A2:2010 MID DE 17-MI 002-PTB 002 volume conversion device (PTZ-conversion) MID DE 17-MI 002-PTB 003 temperature volume conversion device (T-conversion)
Ex Certification	ATEX Zone 1, II 2 G Ex ia [ia] IIC T4 (with Elster battery type 73015774) or IEC Ex Zone 1, II 2 G Ex ia [ia] IIC T4 (with Elster battery type 73020663)
Protection class	IP 66 (suitable for outdoor installation)
Ambient conditions	Temperature: -25 to +55 °C
Battery power supply	1 lithium battery 3.6 V, size D (service life > 5 years under standard operating conditions) Optional additional battery to double the service life
External power supply	5 – 10 V DC, I < 30 mA mains power supply unit (in conjunction with a serial interface)
Control panel	Keypad with 4 buttons
Display	2-line dot-matrix display with plain-text description of the values displayed. All parameters, settings and archived values can be displayed.
Inputs	3 digital inputs for connecting LF pulse generators and message signals (e.g. manipulation contact)
Pressure sensor for volume conversion	Absolute sensor, Type ENVEC CT30*, integrated in housing or, as an option, provided as an external sensor (if two pressure sensors will be used, then one as internal and one as external version), connection for precision steel pipe (Ermeto 6L) or flexible pressure tube, M12 x 1.5 thread Pressure ranges 0.7 – 2 bar / 0.8 – 5 bar / 1.4 – 7 bar / 2 – 10 bar / 2.4 – 12 bar / 4 – 20 bar / 6 – 30 bar / 8 – 40 bar / 14 – 70 bar / 16 – 80 bar *alternative Absolute sensor, Type 17002 provides as an external sensor (cable length 2.5 m) Connection 1/4 " NPT male thread Pressure range 0.9 – 7 bar / 0.9–10 bar / 4 – 20 bar / 4 – 60 bar
Pressure sensor for monitoring purposes (option)	Absolute or gauge sensor, Type ENVEC CT30, provided as an external sensor, fixed connection to the central unit, 10 metres fixed cable length connection for precision steel pipe (Ermeto 6L) or flexible pressure tube, M12 x 1.5 thread Absolute pressure ranges between 0.7 – 80 bar (see above) Gauge pressure ranges: 1.4 – 7 bar / 4 – 20 bar / 16 – 80 bar
Temperature sensor	Pt-500 (or Pt-1000 as an option) resistance thermometer to DIN 60751 with protective tube, Fitting length 50 mm Ø 6 mm, length of supply cable 2.5 m
Compressibility	Calculation in accordance with S-GERG 88, AGA 8 DC, AGA 8 (GC1 or GC2), AGA NX-19, AGA-NX19 following Herning & Wolowsky or fixed
Archives	2 monthly archives, 1 daily archive, 1 measurement archive (content and recording interval are fixed) 1 process data archive, 1 measurement archive, 4 additional flexible archives (content, recording interval and additional events which cause a record can be selected)
Logbooks	Event logbook (Storage capacity 500 records) - Recording of non-periodic events (e.g. time changes with time stamp) Change logbook (audit trail, Storage capacity 200 records) - Recording of all parameter and value changes (time stamp, old and new values) Certification data log (Storage capacity 50 records) - Recording of changes of certain parameters and values (time stamp, old and new values), which are normally under the access rights of the calibration lock
Signal outputs	4 digital transistor outputs, freely programmable and protectable via calibration lock as - Pulse output for all operating or standard volume meters - Signal output for alarm and/or warning status information
Data interface	Optical interface in accordance with IEC 62056-21 Internal serial interface usable as RS232 or RS422/RS485
Communication protocols	- IEC 62056 21 (IEC 1107) - Modbus ASCII / RTU / TCP - IDOM-Protocol - SMS



- Conforms to European Standard EN 12405
- Conforms to Italian Standard UNI-TS 11291
- Conforms to Italian resolution ARG 155/08
- MID approval
- ATEX approval for use in Zones 0, 1 (including GPRS modem)
- Designed to be easily mounted onto Elster BK-G10 – BK-G25
- Compressibility calculated in accordance with different methods
- Integrated data logger with tariff functions
- Mains-free operation
- Three digital inputs (2 x LF, 1 x status)
- Two digital outputs
- Integrated battery-operated GSM/GPRS modem
- CTR communications protocol
- Remote firmware update (WELMEC 7.2)
- Optical interface for parameterization and readout (IEC 62056-21)
- Separate batteries for volume conversion and data communication

EK155

Volume conversion device with tariff and data logging function and integrated GPRS modem

The EK155 is a battery-operated volume conversion device for pipe or wall mounting to be connected to all kinds of meters, both commercial and industrial. It is specially designed to be easily mounted onto Elster diaphragm meters of size G10 to G25. The device calculates the volumes and flow rates under standard conditions on the basis of the consumption data supplied by flow-proportional pulses from the connected meter and the analogue measurements of gas temperature and gas pressure.

The EK155 consists of a central unit with an external pressure sensor as well as a temperature sensor. The sensors are permanently connected to the unit. The compressibility K can be programmed as a constant for all gases or calculated according to various methods of calculation.

The integrated sophisticated data logging function records the consumption data by different tariff levels. An event logbook is used to store all significant events such as clock synchronization, component failures, modification of parameters or tariff programs, etc.

The current meter readings, measured values and parameters are shown on an alphanumeric LCD display, combined with icons indicating the device status. The keypad with two buttons enables intuitive operation of the device.

EK155 comes equipped with a battery-operated GSM/GPRS modem. The communications session can be initiated by the device by connecting to a head end (INBOUND mode) or by the head end system itself (OUTBOUND mode). The CTR communications protocol complies with UNI-TS 11291-3. The communications channels can be configured as GSM CSD, GPRS or SMS channels, or any combination of these. The device supports both short (140 bytes) and long (1024 bytes) data frames according to the CTR specification.

Message authentication and data encryption are based on the symmetric Advanced Encryption Standard (AES-128) algorithm with a key management mechanism. As required, the device supports five different user groups (Administrators, Maintenance, User 1, 2, 3), each with specified access rights, including 10 access codes per group. In combination with AES encryption, this ensures excellent data protection. The device supports remote firmware upgrades in accordance with the WELMEC Guide 7.2. The EK155 is powered by two separate and independent lithium batteries. One battery is dedicated to the volume conversion device itself and the second one provides the power supply for the GSM/GPRS modem. The battery life of the device battery is > 5 years; for the modem battery this depends mainly on the frequency of data communication.

Applications

- Volume conversion for billing purposes
- Data logging by different tariffs
- Automatic data transfer to head end system

Technical data	
Housing	Plastic polycarbonate, for meter or wall mounting Designed to be mounted onto Elster diaphragm meters BK-G10 to BK-G25
Dimensions	H 178 mm x W 233 mm x D 47 mm (including cover for the connections)
Weight	Approx. 1.3 kg (including batteries)
Metrological approval	MID Approval Conforms to the European Standard EN 12405-1:2011-04
ATEX approval	Zone 0, 1, II 1G Ex ia IIA T3 with integrated modem
Protection class	IP 65 according to EN 60529
Ambient conditions	Temperature: -25 °C to +70 °C
Device battery	1 lithium battery module, 3.6 V, type LP-08, capacity: 17 Ah (service life > 5 years under standard operating conditions)
Backup battery	1 lithium battery, 3.6 V, size ½ AA, capacity: 1 Ah (service life > 10 years under standard operating conditions)
Modem battery	1 lithium battery module, 3.6 V, type LP-07 (service life > 5 years under standard operating conditions) LP-07D (38 Ah) can be optionally used for doubled battery life.
Control panel	Keypad with 2 buttons
Display	Alphanumeric LCD display
Inputs	3 digital inputs: - 2 for connecting LF pulse generators - 1 for status signals (e.g. tampering)
Signal outputs	2 digital transistor outputs
Pressure sensor	Type KP070, pressure-ranges 0.8 – 5.2 bar / 2.0 – 10 bar / 4 – 20 bar absolute* external version, cable length 0.75 or 2.5 m Connection for precision steel pipe (Ermeto 6L) or flexible pressure tube, M12 x 1.5 thread * Other pressure ranges on request
Temperature sensor	Type TR115, Pt-1000 - two wire resistance thermometer according to EN 60751, Class A Temperature range: -25 °C to +60 °C With protective tube for use with thermo well Installation length: 50 mm, Ø 6 mm, cable length 0.75 m or 2.5 m
Compressibility	Calculation in accordance with AGA-NX19 mod, AGA 8 (GC1 or GC2), AGA 8 DC-92, S-GERG 88 or fixed
Archives	- Archive for monthly values, capacity: 25 records - Archive for daily values, capacity: 400 records - Archive for measuring period values (interval 1 s – 1 h), capacity: 14,300 records - Archive for values of current and previous billing periods (acc. to UNI TS 11291)
Logbooks	- Status archive – recording of all monitored events, capacity: 500 records - Settings archive – recording of changes of parameters and values, capacity: 500 records - Gas composition archive (Audit Trail), capacity 150 records
Data interface	Optical interface in accordance with IEC 62056-21
Communication module	GSM/GPRS modem (quad band 850/900/1800/1900 MHz) for wireless point-to-point communication, even if the volume conversion device is installed in a Zone 0, 1 hazardous area
Communication protocol	- CTR in accordance with UNI TS 11291-1 and -3 - Data encryption based on AES-128 using the Galois/Counter Mode (GCM). - Firmware downloads in accordance with WELMEC Guide 7.2 Other communication protocols on request



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