



## MacBAT IV

gas volume and energy electronic conversion device



**MacBAT IV** gas volume corrector executing PTZ conversion is a device designed to measure volume, energy and flow of gas. It is battery operated device with possibility to connect external power supply. The device converts the volume of gas counted by the gas meter (turbine, rotary, ultrasonic) into the base conditions. Gas compressibility factor is calculated with the use of algorithms SGERG-88, MGERG-88, AGA8-92DC, AGA8-G1, AGA8-G2, AGA NX-19 mod or constant value of Relative compression factor. MacBAT IV is an intrinsically safe device ready to be installed at explosion hazard Zone 0.

## Main features of the MacBAT IV

- Industrial housing cooperate with any kind of gas meter like turbine, rotary, ultrasonic directly by LF, HF, Encoder
- 3 independent high-performance ports of the serial transmission (2xRS485 + OPTICAL INTERFACE IEC 62056-21)
- Large backlit graphic display
- 6 binary inputs, 2 binary NAMUR intrinsically safe inputs (working on battery mode)
- Eco power operation mode
- Second built-in pressure transducer available as an option
- MacBAT IV can simultaneously co-operate with up to four external pressure or temperature transducers
- Can store logged values with monthly sampling interval for more than 10 years

## Technical specification

Dimensions	210 x 170 x 90 mm
Weight	2,4 kg
Housing material	Aluminium casting
Relative humidity	max 95% at temp. 55°C
Ambience temperature range	-25°C up to 55°C (ATEX+MID), -40°C up to 65°C (ATEX)
Housing protection class	IP 65 (for outdoor installation)
Keyboard	18 pushbuttons
Display	LCD - graphic 320x240 pixels, with backlight
Ex classification	Ex II 1 G Ex ia IIA T4 Ga - certificate 15 ATEX 0116X (EN 60079-11)
Internal supply	Lithium battery size D 3,6V/17Ah, operating time: One battery: 6 years   Two batteries: 10 years   Three batteries: 14 years
External supply	<ul style="list-style-type: none"> <li>Intrinsically safe supply with transmission interface INT-S II RS 232, RS 485 (11÷30 V DC), INT-S3 RS 485 with an 2 x binary outputs</li> </ul>
Transmission ports	<ul style="list-style-type: none"> <li>2 independent transmission ports, speed up to 115 200 bps: COM1, COM2, standard RS-485</li> <li>Optical Interface IEC 62056-21</li> </ul>
Transmission protocols	MODBUS RTU,GAZMODEM3, GAZMODEM2,GAZMODEM2 (MASTER MODE).
Environment conditions class (Mechanical/Electromagnetic)	M2/E2
Base conditions	Fixed parameter set by manufacturer, available options: pb: 1,01325 bar, 1,01592 bar, 1,01325352987 bar (14,696 psi), 1,01559774734 bar (14,73 psi) Tb: 273,15K (0°C), 288,15K (15°C), 293,15K (20°C), 288,7055556K (60°F) T1: 298,15K (25°C), 273,15K (0°C), 288,15K (15°C), 288,7055556K (60°F) (T1 - reference temperature for combustion process)
The maximum permissible error (MPE) according to standard „EN 12405-1”	0,5 % at reference conditions 1 % at nominal operating conditions typical error < 0,13%
The maximum permissible error (MPE) according to standard „EN 12405-2”	ECD Class A
Used algorithms for calculations of compression factor	SGERG-88, MGERG-88, AGA8-92 Detailed Composition, AGA8-G1, AGA8-G2, AGA NX-19 mod constant compression factor K1
Registration periods	<ul style="list-style-type: none"> <li>Data registered periodically: logging interval from 1 up to 60 minutes – 24000 records</li> <li>Hourly data: more than 2 years</li> <li>Daily data: more than 3 years</li> <li>Monthly data: more than 10 years</li> <li>Events memory: approximately 2000 records</li> </ul>
Inputs	Meets the requirements specified in Standard 2004/22/WE (MID) <ul style="list-style-type: none"> <li>8 digital inputs (1xLF, 1xTS, 6xDI)</li> <li>1 LF input, potential free, frequency 0÷2 Hz, reed contact</li> <li>Tamper protection switch (closed by default)</li> <li>1 HF pulses input, NAMUR, frequency 0÷5000 Hz EN 60947-5-6 also can working on battery part time; 1x ENCODER</li> <li>2 Ex digital inputs, NAMUR type (one shared with HF pulses input)</li> <li>6 Ex digital inputs – to cooperate with potential free junctions</li> <li>Pressure sensor p1(internal)- measurement range in standard option - up to 7 bar abs. The sensor is finished with metric screw thread M12 x 1.5 (Ermeto), pressure ranges: 0.9÷2.5 / 0.9÷10.0 / 1.8÷7.0 / 4.0÷20.0 / 10÷100 / bar abs. Maximum permissible errors for measurements of p                20 °C (± 3 °C) (-25 ÷ 55) °C                ± 0,2 % of measured value ± 0,35 % of measured value</li> <li>Thermometer Pt100 class A, 4-wire with the cable lenght compensation, diameter 5,7 mm, Maximum permissible errors for measurements of t                20 °C (± 3 °C) (-25 ÷ 55) °C                ± 0,08 % ± 0,13 %</li> <li>Pressure sensor p2 (internal, optional) – absolute or gauge, ranges from 0÷100 mbar g to 10÷100 bar abs</li> <li>1 Ex analog input 0-5 V (for additional external pressure sensor)</li> </ul>
Control outputs	<ul style="list-style-type: none"> <li>2 Ex OC type digital outputs (separated): - 1x configurable - binary or frequency (0-5000Hz), Counters: V<sub>b</sub>, V<sub>m</sub>, E                - 1x configurable binary</li> <li>1 Ex analog output 4 - 20 mA</li> </ul>



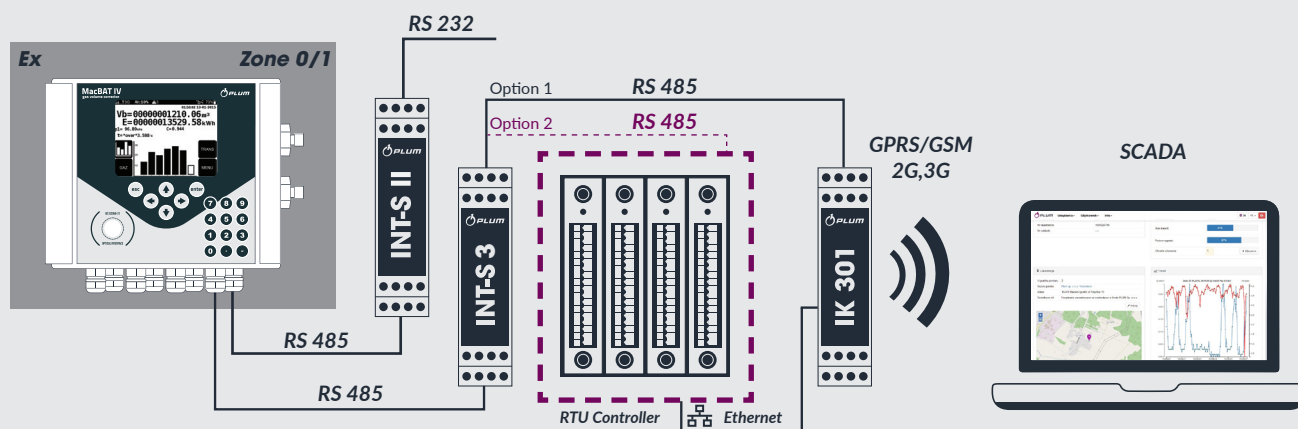


Gas

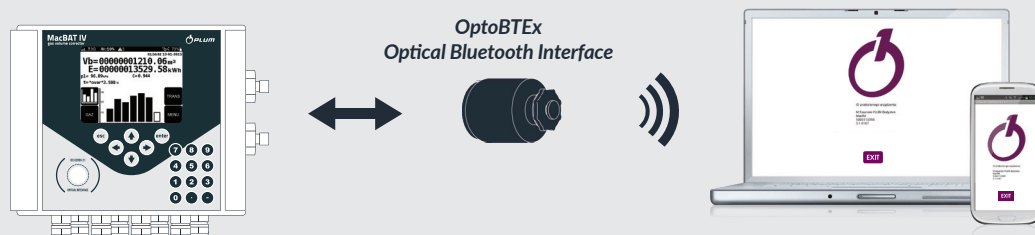


## Communication

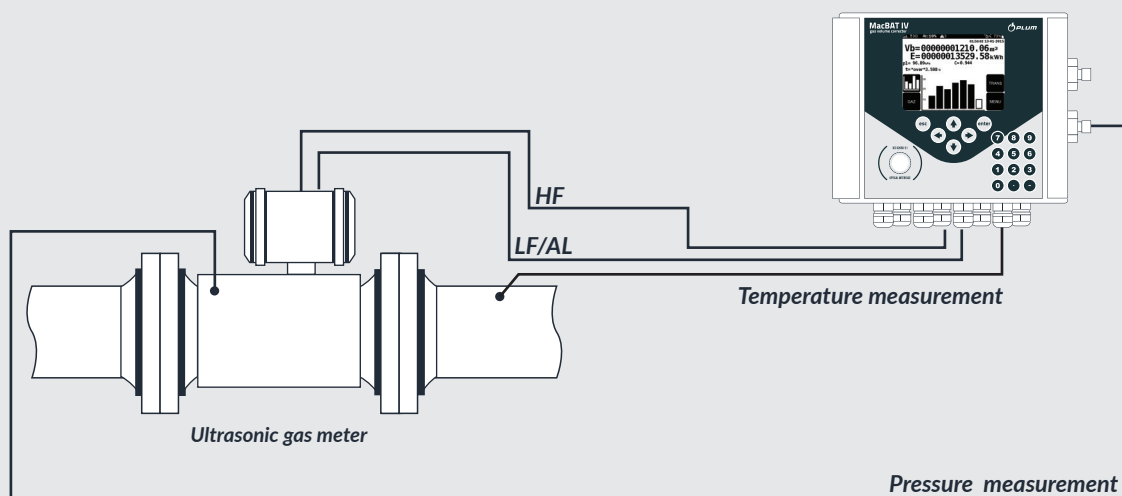
1. **Remote data read out** – connection through communication interfaces INT-S II, INT-S 3, IK-301 and RTU controller independently



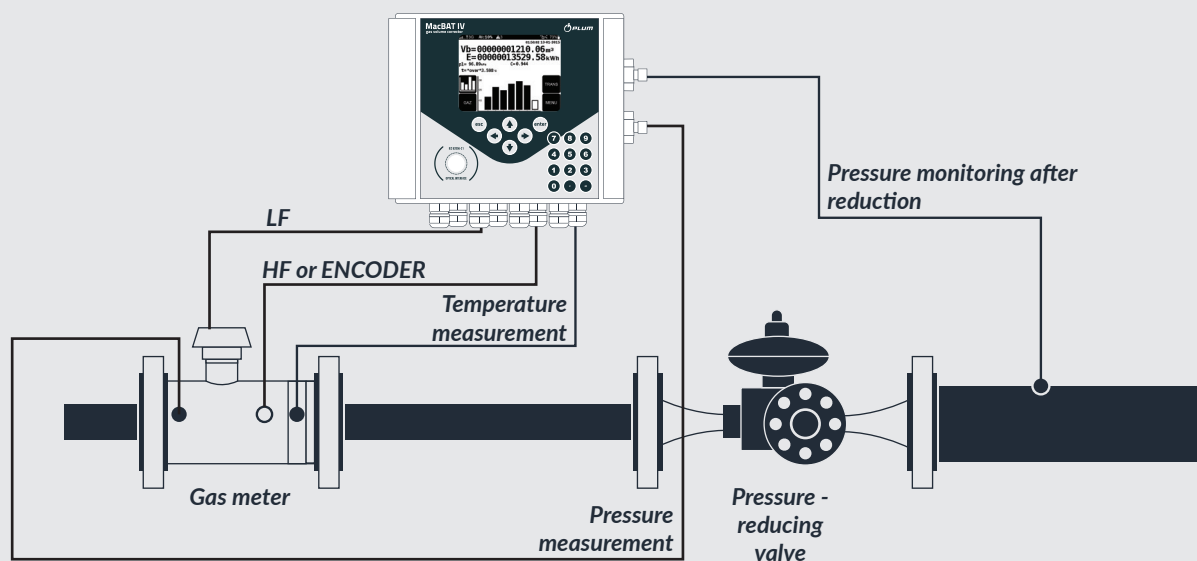
2. **Local readout and configuration**



3. **Measurement scheme with MacBAT IV and Ultrasonic gas meter**



#### 4. Measurement scheme with MacBAT IV and Turbine gas meter



## Accessories of MacBAT IV



### INT-S 3 | Transmission interface

Interface enables supply and separation of connected intrinsically safe measurement devices in stationary telemetric systems supplied from 230V mains or a battery. It is possible to transmit data to computers or other devices with battery or mains supply equipped with RS485 port. It enables data readout from devices located 1st and 2nd explosion-hazard areas. READOUT DEVICES: MacBAT IV, MacBAT III resolvers, MacBATe, MacREJII recorders, MacRP, MacR2 peak logger, MacPII/D, MacTII/D pressure and temperature transducers.



### OptoBTeX | Optical-bluetooth interface

OptoBTeX interface is used for wireless transmission of data from devices equipped with optical communication interface compatible with IEC 62056-21 standard for configuration and read out software installed mainly on mobile devices with MS Windows, Android (tablet, smartphone, laptop) operation system. OptoBTeX does not modify transferred data and wireless communication is performed in Bluetooth 2.1+EDR Class 2 standard.



### IK-301 | 3,5G industrial modem

Transmission interface IK-301 is a device, which allows to use functionality of 2G/3,5G networks for realization of telemetric read outs. Device is adapted to be installed in telemetric boxes. Interface can operate in industrial environment conditions. It is equipped with internal and configurable by user systems of auto-control and auto-restart after detection of interruption during its operation. IK-301 interface allow to create connection in 2G/3,5G mode (TCP/IP, UDP, FTP protocols).