## Technical specification:

## The Goods are Electronic gas volume measurement converters (PTZ) with an integrated modem specified below (hereinafter also as "Goods" or "converters" or in the single number "converter").

## 1. General requirements

The construction design of the electronic gas volume measurement converters (PTZ)with an integrated modem and their technical and metrological features must meet the requirements as specified in the “Regulation of the Government of the Slovak Republic No. 145/2016 Coll. on making measuring instrument available on the market as amended (hereinafter referred to as “Government Regulation No. 145/2016 Coll.”) and DIRECTIVE 2014/32/ EU of the European Parliament and of the council of February 24th, in STN EN 12405-1 and this Annex the required “Technical specification”.

The Applicant submit to the Buyer valid documents on assessment of the conversion match of the gas volume measurement converters (PTZ) – the assessment has to be performed using methods in line with the modules B+F, or B+D, or H1 of the government Regulation No. 145/2016 Coll.

All gas volume measurement converters (PTZ) must be delivered with marks for the ES approved type and the ES initial verification in terms of the government regulation No, 145/2016 Coll.

All gas volume measurement converters (PTZ) (Goods) must be placed on the market in line with the “Regulation of the Government of the Slovak Republic No. 149/2016 Coll. on equipment and protective systems intended for use in potentially explosive atmospheres”, as amended (hereinafter referred to as Government Decree No. 149/2016 Coll.) and DIRECTIVE 2014/34/ EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on equipment and protective systems intended for use in explosive atmospheres. In his offer, to the converters and to all parts forming part of the delivery which will be located in an explosive atmosphere “Zone 2”, the applicant must provide valid certificates on safe operation issued by an authorised test room (ATEX – minimum of EX II 2G Ex *ib* IIB T3).

The Seller shall submit to Buyer Manufacturer’s Declaration of Conformity according to Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonization of the laws of the Member States relating to the making available on the market of radio equipment (RED) and Directive 2011/65/EU of the European Parliament and of the Coundil of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) where they are applicable.

Converters must meet the constructional and functional requirements as specified in STN EN 12405-1, article 6 and 8, respectively they must meet the technical and metrological requirements as specified in Attachment No. 27, article 2 and 3 to the Decree of the UNMS SR No. 210/2000 Z.z..

Construction and design of the converter, including the measuring conversion units and connecting cables, must be such as to set off or to record an alarm in case of each interference which could have an effect on the measurement accuracy, and/or could cause visible damage to its protection and verification marks.

Following testing of converters shall be performed periodically every 5 years. Until the period of verification ceases, converters, including conversion units of variables of state, must retain their declared metrological parameters.

## 2. Technical requirements

The gas volume measurement converters, including the measuring conversion units, must meet at least the IP 65 protection level (STN EN 60529) and enable a standard safe operation within the areas with potential explosive danger classified to Zone 2 in line with the “Regulation of the Government of the Slovak Republic No. 149/2016 Coll. and DIRECTIVE 2014/34/ EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on equipment and protective systems intended for use in potentially explosive atmospheres” and STN EN 50020, STN EN 60079-0 as well as STN EN 60079-11.

The external power supply source as specified in “Part 1 – Technical specification” must enable a standard safe operation with the converter that is located in the area with an explosion potential, classified into Zone 2.

If the converter includes a battery, it must be freely exchangeable during the gas volume measurement converters operation. The applicant has to specify the type of battery source in this offer as well as to define the technical conditions for its replacement in the manual. **The Goods must allow the possibility to use various alternative types of replaceable batteries, recommended by the producer and (freely) available on the market. Similar conditions are required also for the battery powered integrated modem.**

Converters need to be, apart from the integrated 4G LTE-CAT1 modem, equipped with the RS-485 or RS-232 serial communication interface, or an interface that can be converted to RS-232 in order for connecting it to the telemetric device via the MODBUS communication protocol (RTU transmission mode, communication hierarchy - SLAVE), and another independent interface to connect it to the service PC.

The conversion device must enable reliable data transmission via the integrated GSM / GPRS modem to the customer's server by at least one of the communication protocols listed in Section 6 of this Annex "Technical Specifications".

Converters have to be equipped with minimum one electronic indication device that meets the requirements as specified in article 6.3.1 of STN EN 12405-1 as a counter of gas volume flow under the basic conditions and indication of other information (values of input measured quantities, pre-set parameters, variable of state, fault signs, etc.).

Under operation conditions the possibility for setting the initial value on the counter of gas volume flow identically with the state of the connected gas meter in the user mode is required without breaking the metrological sealing.

Changes of calculation parameters in the converter can be performed only in a separate record regime that can be activated either with HW – turning on a separate switch and at the same time with SW – entering an access password using the converter’s keyboard, or through its communication interface for setting the registers of selected parameters (such as time synchronisation and change of winter time to summer time and vice versa, change of gas qualitative parameters).

Any HW record regime activation must be preceded by breaking the converter’s protection, but not the verification marks.

When the record regime is SW activated, the converter has to record automatically every change in parameters in a separate memory, stating the date and time of performed changes, identification of the changed parameter, its new and initial value. When finished, the converter has to switch to its protection mode.

In case of an active failure of a converter, excluding the indication of a nearing life-span of the battery, the gas flow counter has to be blocked keeping the basic conditions. The quantity of gas that flows through during the failure has to be recorded by a separate counter activated during failure states.

A PTZ converter has to perform calculation of compressibility coefficient values in line with the STN EN ISO 12213-3 (SGERG-88), STN EN ISO 12213-2 (AGA-8 92DC) and eventually also in line with the AGA NX19 mod3 – without correction for combustion heat of measured gas (using the method according to the modified norm VDI/VDE 2040 part 2). The converter must make it possible to enter the qualitative gas parameters in order to determine the delivered volume of gas in m3 and the gross calorific value in kWh/m3 or in MJ/m3 under following conditions:

* basic temperature for expressing the volume 15°C;
* basic pressure for expressing the volume 101,325 kPa;
* relative humidity of dry natural gas φ = 0;
* reference combustion temperature 25 °C.

**The converter must be able to process the calculation of the volume with at least 10% Hydrogen (H2) admixture, in the qualitative parameters of the gas´s composition.**

The converter must be equipped with minimum one impulse output allocated to the flown-through gas under basic conditions, with an optional impulse number.

The customer programme tools (SW) for setting the parameters and for working with the converter’s archives, as well as the calibration procedure for the measuring conversion units, including the programme equipment (if necessary for calibration) needs to meet the following criteria:

* installation in Win10 environment;
* SW must be installed in such way it will be functional without requesting any admin authorisations and access to system registers;

Licences for parameterization programme have to be valid for all delivered SW and the number of application installations for the clients/users must not be restricted. Delivery of the software´s operation and installation guide is required to be in Slovak language.

**Pursuant to MID (Directive 2014/32/EU of the European parliament and the council) Annex no.1 point 7.6-**

**The converter must be designed to allow control of its metrological functions since being placed on te market and also from the start of its use. If needed, also a special device or a software programme, designed for this control, must be a part of the converter. The trial procedure must be listed in the operation instructions guide.**

**If the converter is equiped with a software, which has other than measuring functions, the software crucial for the metrological characteristics must be identifiable and the added software must not affect it in a non-permissible manner.**

Training of selected workers of Buyer’s shall be an inherent part of the SW delivery in the range:.

* At least 45 delegated staff of the Buyer ( measurement mechanics and telemetery) in the range 3x8 hours
* The place of training will be determined by the Buyer
* Training on setting up, installation, assembly and maintenance of converters, including modem, in entirety
* Training on setting up the converter and all its parameters necessary for proper functioning and communication, including the modem
* Training on setting via the keyboard and through the configuration SW

## 3. Delivery

Converters shall be delivered including the conversion units for pressure and temperature, according to the below technical specification stated in section 6.

In line with “Section 1 of the Technical Specification”, the delivery of converters shall include an external power supply source and a back-up battery which can form a part of either the external power supply source, or the converter.

Safe separation of a converter, that will be located in the Zone 2 area, from the external power supply source within the area where there is explosion danger can be solved also with a separating device which in such case shall become a part of the delivery and shall be included in the converter’s price.

A Seller shall present a technical documentation of the separating device and a certificate issued by an authorized test room.

A description of a converter’s communication protocol for communication with the superior system via the integrated 4G LTE-CAT1 modem shall be a part of the delivery of converters, as well as a description of the communication protocol for connecting with the telemetric equipment, the technical documentation for assembly, operation and maintenance (Instruction manual), client programme tools (SW) for setting the parameters and working with the converter’s archives, as well as the calibration procedure for the measuring transducers, including the programme tools (if necessary for the calibration). **Seller also commits to provide cooperation ( HW and SW needed) for the following verification or metrological examination of the converters , in a case of a claim so that the examination is possible to provide by the metrological authority in the Slovak Republic.**

## 4. Service ( warranty, post-warranty)

As a part of the warranty service, the Seller will provide service for delivered equipment in Slovak republic and in case of a faulty converter guarantees the takeover of the converter for the repair in the Buyers´s central warehouse, which will be stated in the notice of failure, within 5 working days from the delivery date of the notice of failure.

As a part of the warranty service, the Seller will ensure the repair of the converter, including verification if necessary, or its replacement with a new one and return of the converter to the place of collection within 30 days from the delivery date of the notice of failure.

## 5. Estimated quantity number of converters

Electronic gas volume measurement converters (PTZ) should be delivered in the following designs and quantities:

|  |  |  |
| --- | --- | --- |
| **Part** | **Name** | **Quantity** |
| **Part 1** | Electronic gas volume measurement converters (PTZ) with an integrated modem with an external power supply source and a back-up battery | **570 pcs.** |

**6. Technical specification (required parameters)**

**Part 1 – Electronic gas volume measurement converters (PTZ) with an integrated modem with an external power supply source and a back-up battery**

Electronic gas volume measurement converters (PTZ) with an integrated modem **with an external power supply source and a back-up battery** – enable processing of output signals from conversion units of the flow-through volume, pressure, and temperature, including calculation of compressibility coefficient.

|  |  |
| --- | --- |
| *Basic conditions for which the conversion of the gas volume and of the gross calorific value shall be performed :* | *Pb = 101,325 kPa; tb = 15 °C; ϕb = 0 %;*  *tc = 25 °C;* |
| *Service life of a back-up rechargeable battery :* | *minimum of 5 years,*  *whereas in case of the external power supply blackout, it must ensure a gas volume converter’s functionality, including communication, for the period of at least 10 days;* |
| *Impulse input circuits:* | * *minimum for one NF signal from the gas meter with a frequency up to 10 Hz;* * *minimum for one VF signal from the gas meter with a frequency from 1 Hz to 5 KHz;* |
| *Extent of the absolute pressure measurement :* | ***( 80 to 7000 ) kPa, max. in 3 measurement extents;***  ***via conversion units with a measuring extent of Pmax : Pmin = 5 : 1 or greater;*** |
| *Extent of the temperature measurement :* | *min. ( -25 to +55 )°C*  *eventually even extended in one or both directions;* |
| *The greatest permitted error (MPE) of a converter with attached variable of state conversion units under reference conditions (ambient temperature 20°C ± 3°C, relative ambient humidity 60% ± 15% and the nominal values of the power source) :* | *less than ± 0,5 %;* |
| *Working conditions :* | *The usual extent – class 3, i.e. ( -25 to +55 )°C;*  *at relative humidity of max. 93%* |
| *The greatest permitted error (MPE) of a converter with attached state values’ conversion units under working conditions :* | *less than ± 1,0 %;* |
| *SW requirements :* | *Converter’s SW must enable correction of a gas meter error curve, set by at least 7 points, using the VF signal from the gas meter;* |
| *Read-out collection interval from converters :* | *Every 5 minutes;* |
| *Required archive extent :* | * ***reports of error occurrences with capacity of at least 200 records;*** * ***changes’ memory with a capacity for at least 500 records;*** * ***operating parameters recorded in an hourly interval or shorter, with a capacity for at least 365 days;*** * ***operating parameters recorded in a daily interval with a capacity for at least 2 years;*** |
| *External network power supply :* | *The network power source in a separate casing with a lock and a sealing possibility, with minimum IP 54 protection level, including a separation part for the converter’s communication interface and an indication of switching to the back-up rechargeable battery.*  *From the point of view of the safe operation, the power supply source, located in an environment without any explosion danger, must be certified for usage with a gas volume converter located in the Zone 2;* |
| *Communication interfaces :* | * *serial interface RS-232 / RS-485;* * *optical interface IEC-1107;* * 4G LTE-CAT1 *modem;* |
| *Communication protocols for* 4G LTE-CAT1 *modem – minimum requirements :* | * *DLMS/COSEM (IEC 62056)* * *MODBUS* * ***ELGAS*** * ***GAZmodem*** |
| *Record of operation parameters (it must include these data at least) :* | *Current read-out of the flow-through meters Vb, Vp, Va ( b – basic requirements, p – working requirements, a – basic requirements in case of error occurrence ).*  *Average values of the Qb and Qp flow-through, pressure and temperature, including their minimum and maximum values in the given interval record, stating the time they were reached.* |
| Mounting accessories of Converter | mounting plate including bolds and ladders, three-way valve including tuber required for connection and quick coupling for each Converter separately |