INDUSTRIAL DIAPHRAGM GAS METER BK-G 100 WITH TC 210

# *Industrial diaphragm gas meter with temperature volume corrector*

**Anyone who has seen Heinrich Spoerl's famous German film from the 40's, "Die Feuerzangenbowle", surely remembers the famous phrase "Well, we just gotta pretend t'be stupid..." when Professor "Schnauz" explains the steam engine. The physical laws on the basis of which a steam engine functions are based, amongst other things, on the findings published in 1662 by Robert Boyle and in 1676 by Edme Mariotte.**

A steam engine uses the thermodynamic law that an increase in temperature causes an increase in volume. Gas molecules really heat up and they need a great deal of space. The gas or the steam on the steam engine is, however, locked in a pressure vessel. So it is unable to expand. Consequently,

*BK-G 100 and TC 210*

the medium of gas attempts to search for a different form of energy to restore an equilibrium, and the pressure increases. The steam engine had thus been invented and the industrial age had found one essential driver.

**And so what does the steam engine have to do with the gas meter?**
In principle, measurement of natural gas involves the same interrelationships: when gas is heated, it expands and when the gas cools down, the gas molecules move closer together. The same mass of gas molecules consequently requires less space and has less volume (less cubic meterage).

The effect on volumetric measurement is known: less gas volume is measured at lower temperatures. The law that a temperature increase results in a volume increase, applies to the pressure of gas in reverse: if the pressure is increased, the gas molecules move closer together. Any similarities between the behaviour of gas and the behaviour of we humans is purely coincidental...

Temperature measurement at low pressure
Industrial diaphragm gas meters such as the new BK-G 100 are used in low-pressure installations where the pressure is kept in a narrow, constant range by a pressure regulator. The influence of the operating pressure on volumetric measurement can consequently be precluded.

And what about the gas temperature? In most applications, natural gas has a constant temperature. However, besides gas temperature, the ambient temperature of the meter is also important. The diaphragm gas meter, viewed technically, is also a heat exchanger that transfers the room temperature relatively well to the medium to be measured, in particular at low flow rate.

For practical reasons, a temperature of 15°C has been agreed on in Germany and other countries, for use as the basis for billing (DVGW Code of Practice G 685). This temperature is a representative value that applies very well to many applications. Temperature measurement is not required in this case.

If the mean temperature at the gas meter does, however, differ from the billing temperature of 15°C, it is necessary to check whether the temperature has been measured accurately and the volume converted. Investment costs for an electronic temperature volume corrector are quickly amortised since even a deviation of 3°C results in a 1% measurement error. In such cases, the TC 210 compact temperature volume corrector from Elster-Instromet is the right choice. The pressure is allowed for as a fixed value and the temperature is measured with a Pt-500 temperature sensor. This volume corrector is approved for use with meter sizes G 10 to G 250. The meter readings $V_b$ and $V_n$ can be saved monthly, and programming and readout are performed conveniently via an optical interface. Two freely programmable digital outputs can be used for transmitting consumption

data or for message signalling. These outputs can be connected to a tariff device, e.g. the DL 240 data logger, in order to record the load profiles.

The new BK-G 100 is a typical „base station" in the sector of low-pressure measurement, which rounds off the series of industrial diaphragm gas meters at the top of the range. Meter size BK-G 100 now incorporates eight measuring units that operate very quietly and are well known for their quality, as is the entire BK Series. The "big brother" of the familiar BK-G 40 and BK-G 65 Series can be ordered with thermowells on request. These allow simple attachment of a TC 210 electronic temperature volume corrector.

Together, the two make a great pair ... or, as Professor "Schnauz" in the film "Die Feuerzangenbowle" would have said: "BK-G 100 with TC 210 ... dey a real a crazy machine ..."

***Michael Franz*** *m.franz@elster-instromet.com*

*BK-G 40 with TC210*