



UNION Instruments. Competence in gas monitoring

UNION Instruments GmbH is a Germany based manufacturer of devices and systems in gas measurement technology with a global approach. The company specialises in determining the energy content (calorimetry) and composition (analysis) of gases for industrial purposes covering a broad range of applications. The modular design of the devices makes them especially suited for custom solutions.

UNION Instruments offers our customers flexibly configurable standalone devices as well as complete solutions (systems) designed for individual needs including planning and engineering.

The characteristic feature of such a complete solution is the combination of different measuring methods to form a complete system. This tailor -made offer includes all measures from counselling, planning, engineering and installation to commissioning on site. This includes as well the correct documentation according to ISO and/or CSA/UL.

Our service performance



Support

The UNION-hotline helps to solve all inquiries and urgent issues fast and easy. Device specific concerns can be solved worldwide within minutes by direct communication via TEAMVIEWER.



Training

UNION offers individual in-house training or on-site seminars for installation, use and maintenance of our devices even at the customer's premises. Training is individually adapted to the client's requirements.



Repair service

A global service for inspection, maintenance and repair of our devices and systems is provided directly by UNION and via its distributors.



Original spare parts

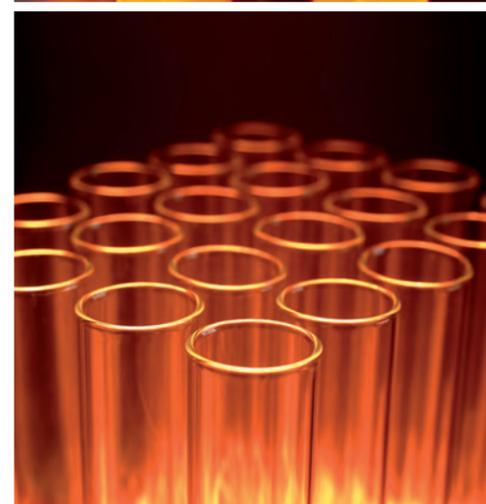
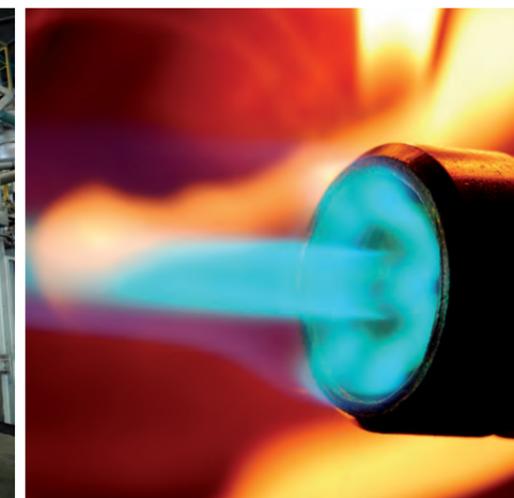
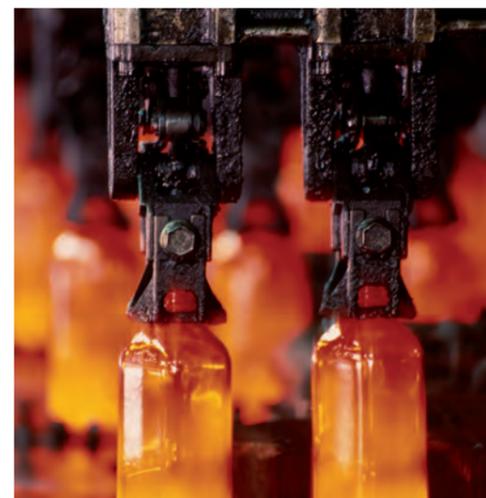
Original spare parts for the majority of UNION's products are on stock directly at site and ready for dispatch within a few hours.



±um[®]
UNION
Instruments
**COMPETENCE
IN GAS
MONITORING**

The INCA gas analyzer supports a new closed-loop control concept for compensation of gas property variations in a container glass factory

The glass industry must take into account the increasingly unstable combustion gas qualities in their closed-loop control concepts. A cooperative effort between gas analysis and glass technology specialists has produced an innovative and cost-effective solution for this.



**COMPETENCE
IN GAS
MONITORING**



COMPETENCE IN GAS MONITORING

Varying gas properties

The undeniably positive effects of the liberalization of the gas market have been accompanied by problems as well. This applies specifically to industry sectors for which the production and quality of their products requires stable and defined firing processes with high temperatures, specified air ratios, and even defined flame shapes. We are talking here about the thermal processes characteristically found in the glass, ceramics, and metallurgy industries. Nowadays these industry sectors are confronted with the fact that the composition and energy-related characteristic values of the combustion gas delivered via the gas network are subject to fluctuation. The era of largely constant L- and H-gases from a few supply sources has been replaced by a growing number of suppliers and infeeds from predominantly renewable sources with variable gas composition that necessitates stabilization through controlled additions for thermal processes.

Gas measuring technology provides assurance

An effective remedy is the integration of suitable gas analysis measuring technology such as the INCA multicomponent gas analyzer in the open- and closed-loop control systems of the gas feed. This allows timely detection of changes in the combustion gas composition so that measures for assuring processes based on closed-loop control of gas additions can be taken. Combustion gases are defined by their chemical composition as well as state variables, such as density, pressure, and temperature. Key indices such as combustion value, heating value, methane number, and air requirement are derived from this. Terms for gas properties in Europe are the Wobbe index, which is the ratio of the combustion value to the square root of the relative density of the gas, and the air ratio lambda, which is an important process-related control value for many thermal processes. For example, this is influenced significantly by the content of higher hydrocarbons (C₂H₆, C₃H₈ etc.) in the combustion gas because these gases require more air for combustion compared to the usual CO.

1. **Concentration measurement** of CH₄ and of the C₂₊ fraction of hydrocarbons in the delivered Natural Gas by NDIR spectrometry at different spectral ranges
2. **Calculation of heating value and density of the gas** from the results of step 1 and using confirmed table and average values of NG
3. **Calculation of the Wobbe number of the gas** from the results of step 2
4. **Volume flow measurement of the gas** using the differential pressure method
5. **Calculation of the required control values** using the results of steps 3 and 4

From concentration values to control values

High control performance using just 2 measuring values

Optoelectronic NDIR measuring principle

Considerable reduction of investment costs

Correlation principle used to determine CH₄ and C₂₊



Successful operation in container glass factory

INCA in standard version (Natural Gas Analyzer)

Two-stage closed-loop control model from the technology specialists

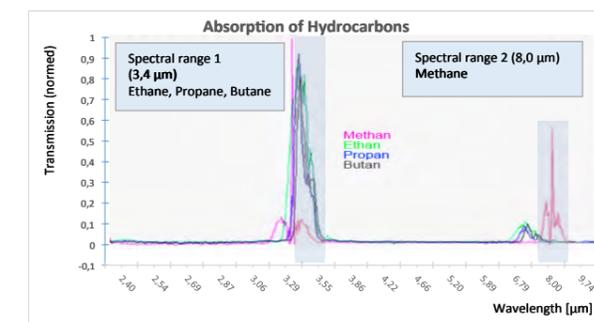
A new closed-loop control model for taking into account varying combustion gas properties developed by the technology-oriented engineering company STG Combustion Control GmbH & Co. KG (focus: glass manufacturing) is based on two levels, which can be used independently of one another and at melting furnaces as well as feeding channels:

- The first level is used for closed-loop control of the fuel input via an energy setpoint instead of the classic fuel setpoint. In so doing, the fuel quantity is automatically corrected for closed-loop control of the furnace temperature and for compensation of fluctuating gas properties (thus the heating value) in order to keep the conditions for the firing as constant as possible (constant energy impact).
- The second level is used for automatic correction of the air-to-fuel ratio, in which the stoichiometric air requirement of the actual gas is used as the basis of closed-loop control. The "stoichiometric air requirement" variable varies indirectly in proportion to the heating value of the gas. Using the STG in-situ oxygen probe the conventional air/fuel relation-based control principle is replaced by a model-based LAMBDA control. By measuring the actual heating value and the actual combustion results, changes in the gas properties can be detected and corrected before they are noticeable to a significant degree in the process, which ensures stability and efficiency.

Successful use of INCA in a container glass factory

The combination of the new STG closed-loop control approach with the INCA gas analyzer of UNION Instruments GmbH provides an innovative solution that has already proven itself in a container glass factory. Noteworthy here is that the utilized INCA device is the INCA 1050 "Natural Gas Analyzer" that has been in proven use for many years and measures only the concentration values of CH₄ and the C₂₊ fraction. From these two measurements, the analyzer calculates the heating value and density of the gas by using table values and correlation approaches and finally the Wobbe number. From the Wobbe number and the measured pressure difference value Δp of the assigned volume flow measurement (according to the differential pressure principle, not the vortex principle!), the control system determines the necessary control variables. The success of this closed-loop control approach "Stabilization of the Wobbe index using closed-loop air addition" is demonstrated in the constancy of the drop temperature in the feeder of the glassworks at 0.1%.

Due to the limited investment costs for the INCA gas analyzer compared to other analysis methods this successful solution could significantly affect future closed-loop control concepts and instrumentation in the glass industry.



Used spectral ranges