Instromet News

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PROCESS GAS CHROMATOGRAPH
ENCAL 2000 PGC

Highlights

COMPLETE ANALYSIS UP TO C_{6+}
ACCURACY UP TO 0,1% FOR HEATING VALUE
REPEATABILITY < 0,05%
HIGHLY RELIABLE STAND-ALONE ANALYSER
APPROVED BY:
NMi - PTB - ATEX

The Company

Instromet®

The Instromet Group of companies is one of the world's leading manufacturers of gas measurement and control equipment. With over 20 manufacturing facilities and international sales offices, and with representation in more than 40 countries, Instromet can satisfy all the requirements of today's global gas sector with an extensive product range covering all areas of measurement, regulation, gas, supervision and control.

Since end of the year 2000 the Instromet Group is a part of Ruhrgas Industries. This Group of companies employs over 10500 people worldwide and is active in gas measurement and control and industrial furnaces.

Total Energy Measurement

The mayor importance in natural gas metering systems is the combination of quantity and quality of the gas. From the start this has been recognised by parties involved in exploration and transportation, but had a lower level of attention in distribution and with end-users. Only quantity, flow, played a key role in these measurement systems. The current, global natural gas market shows a shift towards quality. Reasons for this are:
- Environmental regulations; optimising combustion processes, e.g. power plants, to prevent pollution of the environment
- De-regulation and third party access; closed markets open up, transportation and distribution of natural gas is handled by different parties. Distributors and even end-users can choose the gas they will buy. This introduces competition in the market and a bigger variation of the gas quality
- Price increase of natural gas; the last decades show a strong price increase of natural gas. The price increase, especially in combination with the de-regulated energy market, requires a higher and different level of measurement.

The product range of Instromet covers the complete energy measurement system consisting of:
- Flow measurement; rotary, turbine and ultrasonic meters
- Analysers, from heating value to full analysis by a gas chromatograph
- From corrector units up to complete computer systems to implement and calculate all data

ENCAL 2000 PGC

The ENCAL is a state-of-the-art Process Gas Chromatograph (PGC) and measures the composition of natural gas.

The main difference between this PGC and laboratory GC is that the PGC is a dynamic, stand-alone process instrument, where a laboratory GC is often a static measurement operated by an analytical expert. Also in comparison the PGC has limited functionality as a laboratory analyser, but a high focus on this limited range. After analysis of the gas composition, the system calculates the heating value, (relative) density, compressibility and the Wobbe index. The system is designed to operate as a stand-alone unit with the highest level of reliability and accuracy, but with a minimum of maintenance. It is also designed to operate in hazardous areas under varying environmental conditions.

Diagram labels: OVEN COMPARTMENT, SAMPLE FLOW REGULATOR, MOISTURE FILTER CARRIER GAS, PRESSURE REGULATOR CARRIER GAS, Ex-d ELECTRONICS HOUSING, STREAM SELECTION SYSTEM, SAMPLE CONDITIONING SYSTEM, POWER SUPPLY BOX, CABINET HEATER

Operating Principle

The basis for any Process Gas Chromatograph is to take a sample from the process and to separate it into its individual components. After separation the level of each component is detected. The sample is transported through the analyser using a carrier gas.

The ENCAL 2000 PGC as a process instrument has added functionality. Examples are:
- backflush column to minimise the total time of analysis
- automatic calibration system to maintain system accuracy
- possibility for two individual sample streams
- integrated sample conditioning system
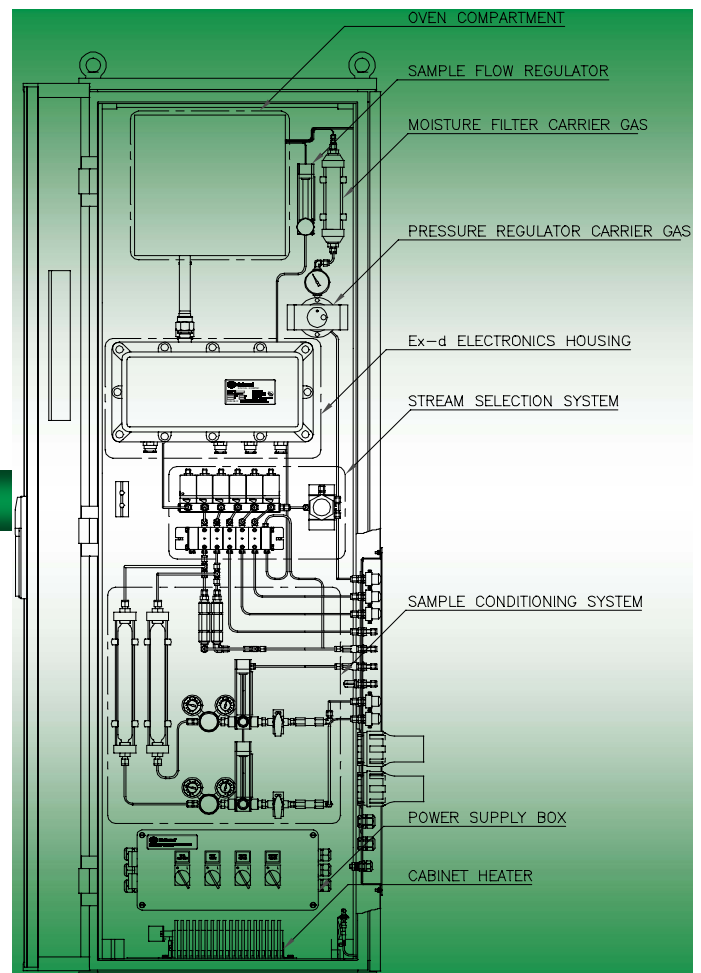
System Configuration

The picture shows the implementation of an EN-CAL 2000 PGC in a complete
energy measurement system.

The ENCAL continuously analysis the gas composition and calculates (according to ISO 6976) heating value (Hs) and relative density (d) with the cycle time interval. This data is transferred from the control unit to a flow-computer (e.g. Model 2000).

The flow computer can calculate the compressibility (Z) according to the ISO 12213 algorithms using the complete gas composition (AGA 8), or using the superior heating value (Hs), relative density (d), and CO_2 concentration (SGERG).
Several other algorithms are available.

The gas flow (Q_{line}) through the pipeline is measured by a turbine or ultra sonic flow meter connected to the flow computer.
The flow computer calculates the volume flow at base conditions using line pressure (p) and temperature (t) as input
parameters. Using the flow at base conditions, the heating value (Hs) and the
compressibility (Z) the flow computer calculates the total energy flow (Q_E)
going through the pipeline.
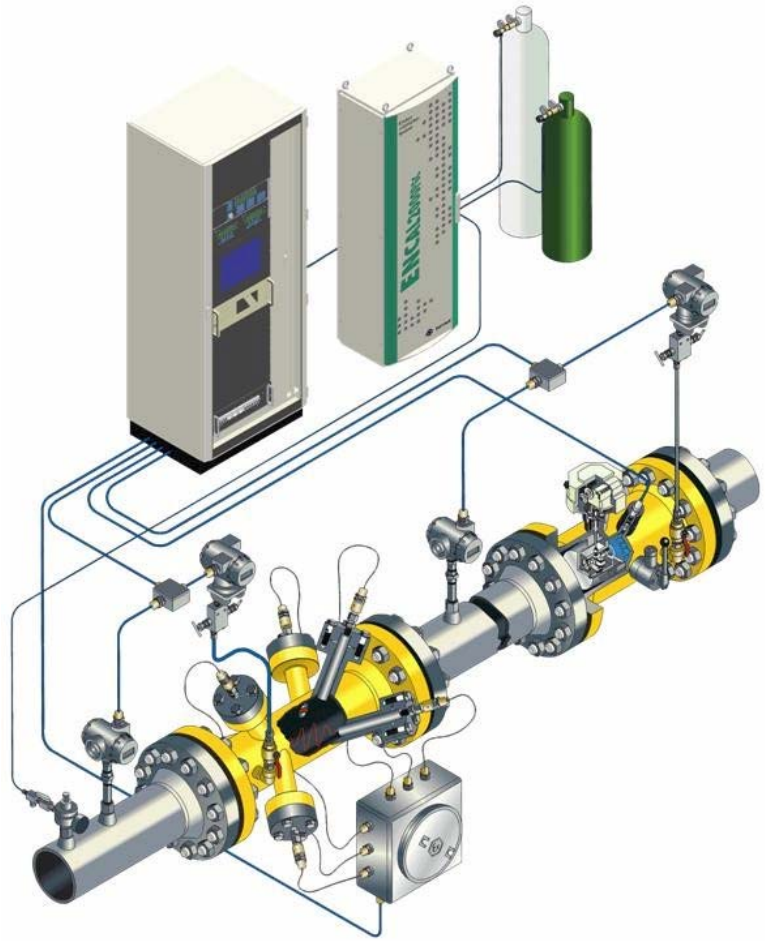
RGC 2000 Software
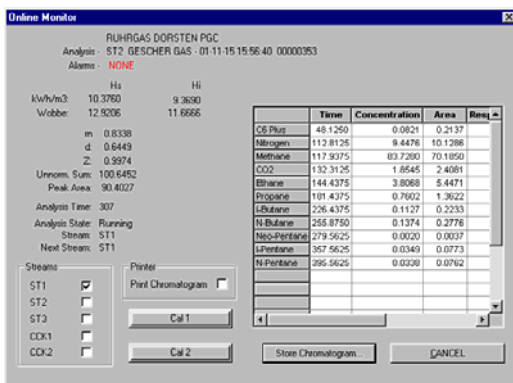
The RGC 2000 software (Remote Gas Chromatograph) is an application program that runs under the Microsoft Windows Operating Environment. RGC 2000 is the primary means of creating energy reports and performing routine maintenance and operational integrity checks of remote and local ENCAL 2000 PGC Analysers. From a single PC running RGC, an operator may support several remote ENCAL 2000 Analysers.

RGC 2000 features:
- Remote analyser control using a modem connection
- Configure the ENCAL 2000 PGC
  (method tables, time sequence tables, etc.)
- Initiate calibrations and analysis runs
- Print chromatograms and analysis reports
- Tune integration parameters
- Enable data storage on PC's hard disk
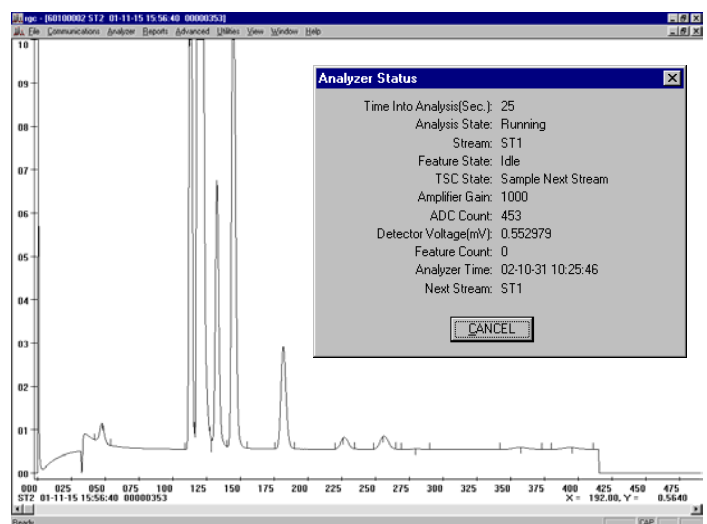
ENCAL 2000 PGC Technical Specifications

Analytical section

- Micro packed column with silicon oil as stationary phase
- Column specially designed to separate:
  - N_2 (nitrogen)
  - CH_4 (methane)
  - CO_2 (carbon dioxide)
  - C_2H_6 (ethane)
  - C_3H_8 (propane)
  - $i\text{-}C_4H_{12}$ (iso-butane)
  - $n\text{-}C_4H_{12}$ (normal-butane)
  - $neo\text{-}C_5H_{12}$ (neo-pentane)
  - $i\text{-}C_5H_{12}$ (iso-pentane)
  - $n\text{-}C_5H_{12}$ (normal-pentane)
  - $C6+$ (hexane plus)
- Accuracy better than 0,2% for heating value. Better than 0,1% with an optimised calibration
- Reproducibility better than 0,05%
- Time of analysis less than 7.5 minutes, for highest accuracy on specific gasses approx. 12 minutes
- 10 port diaphragm valve for simultaneous sample injection and backflush switching

Sample Handling and Selection System

- Maximum of two sample streams
- Stream inlets equipped with filter, shut off ball valve, Pressure reducer, Moisture filter, sample bypass.
- Sample Inlet pressure max. 7 barg
- Sample selection using three way solenoid valves or pneumatically actuated double block and bleed valves
- Maximum of two calibration gas connections
- Possibility for one extra reference gas connection
- Maximum inlet pressure calibration gas 1 barg
- Optional heating elements for calibration gas bottles

Carrier gas

- He (helium)   : N 4.5 quality (99,995% purity)
- Pressure   : approx. 10 barg, precision pressure regulator
- Flow   : 20 ml/min without valve actuation, 5 ml per valve actuation.
- Consumption   : approx. 10 nm3 He per year

Analyzer housing

- Ambient conditions   : -20 to +55°C (PTB +5 to +40°C) 0..100% relative humidity
- Housing protection   : IP 56
- Mains   : 240/115 Vac, 50/60 Hz
- Power consumption   : 0,75 A @ 240 Vac , 50/60 Hz
- Weight   : 175 kg
- Size   : 1800 x 600 x 400 mm
- Optional   : Cabinet heating element

Analyzer Control Unit

- Local display through which all the analysis data and alarms can be retrieved
- Alarm indications through LED's on the front
- RS-232 connection to fibre optic converter unit for connection to the ENCAL 2000 PGC
- Up to two RS-232 Modbus communication ports for connection of external equipment
- Internal and external printer facilities
- Up to 6 analogue outputs (4..20 mA)
- Solid state alarm outputs
- Security key protection
- 19" rack 3HE housing

Analyzer Software

- Designed for monitoring and controlling the ENCAL 2000 PGC
- Operating under Microsoft® Windows®
- Remote operation and automatic dial-up system
- Automatic start-up after power shut-down, with optional initial calibration
- Capability of automated storage of all analytical data on hard disc through a personal computer (PC)
- All data available in spreadsheet compatible format
- Calculations according ISO 6976
- System alarms: high/low limits for total peak area, heating value, (relative) density and concentrations, alarms on unknown components and response factor variations
- Input of non-measured components and relative response factors

INSTROMET Products & Offices

Products

**Rotary Flow Meters - Turbine Flow Meters - Ultrasonic Flow Meters - Flow Computers
Gas Chromatographs - Filters, Valves & Regulators - Calibration Equipment & Systems
Metering & Regulator Stations - Supervisory Systems & Software**

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Information

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