



# G4 PHOENIX

- Determination of Diffusible Hydrogen

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## Reliable Product Monitoring

Mechanical properties of solids are defined and influenced by their chemical composition. Certain elements have positive or negative effects on the material's properties. Consequently the control of these elements helps to improve and maintain product quality. Today analytical instruments offer accurate and rapid methods to analyse and monitor element concentrations from the raw material to the finished product. Hydrogen, when absorbed in metal, may cause the embrittlement often encountered in steel making, parts processing, welding, etc. Cracks may result in catastrophic failures and critical concentrations should be closely monitored.

The light density and small size of atoms supports the interstitial effect and allows the hydrogen to be easily absorbed into the metal lattice.

Here, gathered in irregularities and lattice defects like pores and blow holes, the hydrogen may recombine again into molecular hydrogen gas and - due to the volume leap - produce pressures build-up to 1000 bar inside the defect! Thus, the hydrogen causes cracks and brittle failure in the material. Due to the relatively slow diffusion at room temperature, such cracks may also occur at a later date.

Regular monitoring of all relevant processes with G4 PHOENIX helps to avoid such effects preventively. This measurement will considerably simplify and reliably record your production control. Due to its universal application possibilities and its easy programming, this analysis system is also recommended for research purposes.



## G4 PHOENIX for Hydrogen

G4 PHOENIX helps to determine the diffusible hydrogen in different sample matrices. The analysis system comprises a quick heating infrared furnace with a quartz tube for the sample. The diameter of the tube is 30 mm so that even big sample pieces can be analyzed without problems. A simple and reliable calibration of the measurement system is guaranteed by a gas calibration unit with 10 different volumes. The heart of the system is a highly sensitive and longterm stable thermal conductivity detector that is able to read even the smallest hydrogen contents.

G4 PHOENIX is also available for the analysis of nitrogen and oxygen. Please inquire about our separate publication to learn more about this application!



With the infrared furnace all industry-standard welding samples can be analysed thanks to the 30 mm Ø furnace tube.

## ● Comprehensive yet Simple

### Software

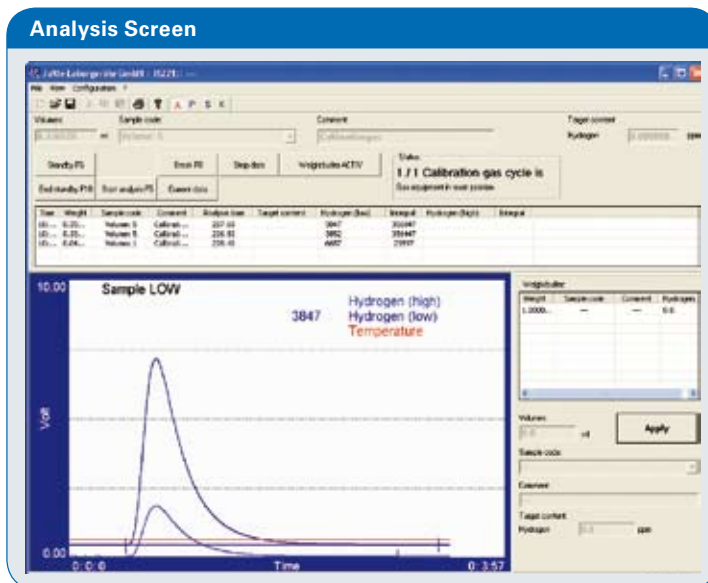
G4 PHOENIX' analysis software is clearly structured and easy to use. All tasks to be performed by the software are organised in four main screens.

### Control Screen

On the main screen, the control display, all analyses and signal performance tasks are executed. The weight may either be entered manually or directly imported via serial interface. The integrated weight buffer allows storage of as many weights as required. Current signal data will be presented in numbers and also as graphical waveform of the analysis. The analyzer can easily be controlled by push buttons. The results of the last five analyses are displayed simultaneously. It is also possible to re-load the signal waveform any time later.

### Statistics

The statistical evaluation of all analyses can be done on the statistics screen. From all selected analyses the average, standard deviation, variance, variance coefficient, minimum, and maximum value can be calculated. A print function concludes the documentation on a connected printer.



### Program Settings

On the screen for the program settings, all parameters like temperature, time, evaluation mode for one specific application can be stored as a configuration under a freely selectable name. Different configurations for each application can easily be loaded.

### Calibration

On the calibration screen different calibration methods can be selected. Single-point, two-point, or multivariate calibrations are possible with gas calibration or standard samples. By simply accepting the calibration data, they are applied to the next analyses.



### The furnace for your application

1 Infrared furnace for up to 900°C

2 Tube furnace for up to 1200°C

• External degassing device adaptable

# Technical data

## Measuring apparatus:

- **Measuring range**  
0.05 - 1000 ml/100 g
- **Analysis time**  
approx. 3 min to 2 hours,  
typically 15 to 20 min for welding samples  
depending on sample material and weight
- **Resolution**  
0.001 ml/100 g
- **Reproducibility**  
± 0.01 ml/100 g or ± 1% rel.,  
depending on sample material and weight
- **Carrier gas**  
nitrogen min. purity 99.999 %  
2 bar pressure
- **Cooling water (only for IR furnace)**  
approx. 1 l/min
- **Dimensions & Weight**  
460 x 750 x 500 mm (WxDxH),  
18.11 x 29.52 x 19.68 inches  
~ 50 kg, ~110 lbs
- **Electrical supply**  
Analyzer 230 V, 1 kVA  
Peripherals 230 V, 300 VA
- **System requirements**  
Operating system: Windows XP  
CD-ROM  
2 serial ports RS 232

G4 PHOENIX



## Outstanding Characteristics:

- Rapid analysis, automatic operation
- Fast heating infrared furnace up to 900° C,  
degassing tube Ø 30 mm
- Alternatively tube furnace up to 1200° C,  
degassing tube Ø 18 mm
- Highly sensitive and longterm stable thermal conductivity detector
- Exact gas calibration with 10 different volumes
- Data Report according to ISO 3690
- Result output in ppm or ml/100 g selectable
- Analysis time adjustable; up to more than 2 hours
- Use of big samples possible
- Weight of carrier material storable in advance
- Operation control and analysis via PC
- Data storage for retrieval and evaluation of all analyses
- Transfer via FTP or local network connection

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