

Hydrogen Analyzer Systems

Unrivaled safety and technical expertise
from the market leader in hydrogen measurement



- World leader in hydrogen analysis
- Triple range analyzers
- Fail-safe design
- Fully certified for intrinsic safety
- Simple to retrofit

instrumentation

Sustain^{IT}

Support^{IT}

Analyze^{IT}

Industrial^{IT}



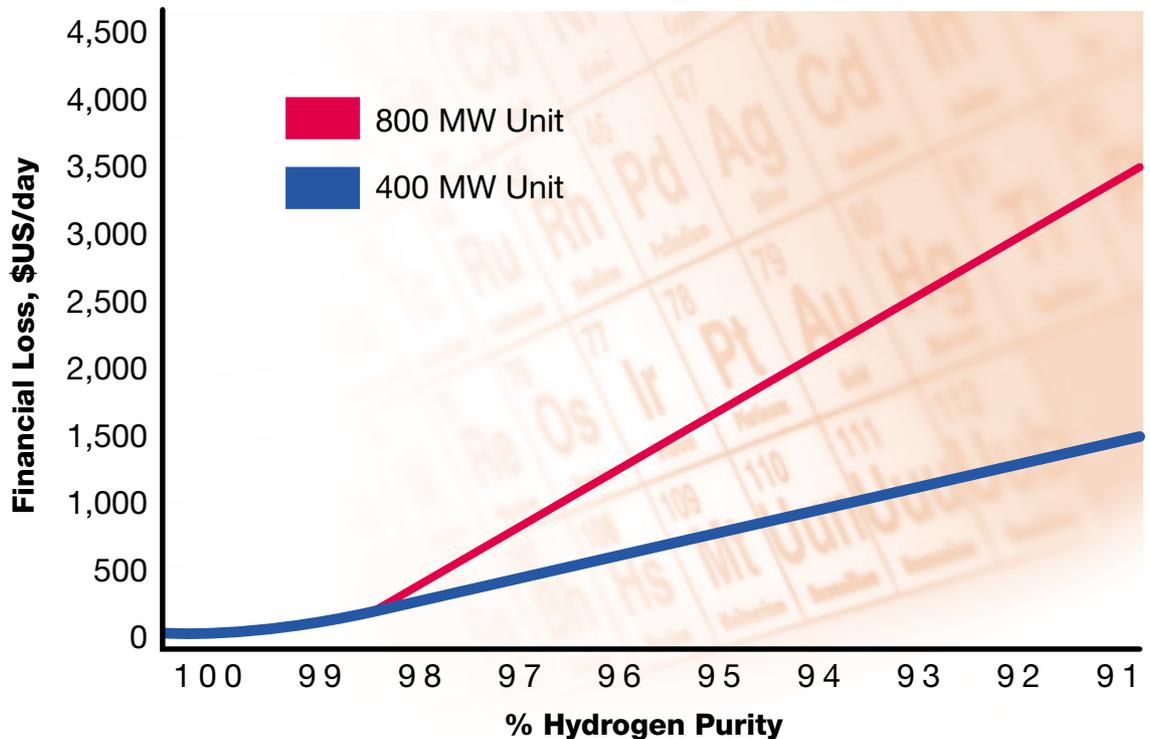
Superior **Technology, Quality** and **Reliability** from the **World Leader** in **Hydrogen Measurement**

Eighty years of experience, unparalleled safety and innovative design has positioned ABB as the world leader in hydrogen analysis. Our expertise in designing and manufacturing thermal conductivity analyzers for hydrogen cooled generators enables us to bring the most safe, the most flexible and the most cost effective solution to market. Like the entire family of ABB products, the range is manufactured to the highest level of quality, and is backed by ABB's world-class service and support organization.

Importance of Hydrogen Purity

To increase plant profitability and maintain foolproof conditions against explosions, turbine generators must perform with optimal efficiency. Efficiency is linked directly to hydrogen purity because a drop in the purity causes windage losses that subsequently reduce generator efficiency. For this reason, continuous, highly accurate hydrogen monitoring is vital for generator efficiency, for generator safety and for lowering operating costs per megawatt.

Cost of Decreased Hydrogen Purity



Data based on typical power station operating conditions.





Turbogenerator Application

Hydrogen gas is an ideal coolant for today's high capacity turbine generators. Hydrogen's thermal conductivity rate, seven times that of air, gives the gas excellent heat transferring properties. Another benefit comes from its natural low-density state, which greatly promotes cooling efficiency and helps to optimize generator performance.

ABB's complete system for hydrogen measurement involves a total of five products. A display and control monitor, which is incorporated in the turbogenerator purge control cubicle, indicates all measurement results with fail-safe reliability. Two thermal conductivity analyzers and two power supply units complete the system. While the power units must be installed in a safe area, the current they output is transmitted to the hazardous area, where the thermal conductivity analyzers – the heart of the system – are located.

Operating Principle

ABB's thermal conductivity analyzers continually measure hydrogen purity during normal turbine operations. They also provide the reliable, safe measurement of hydrogen in carbon dioxide during the initial purge and the measurement of carbon dioxide in air during the final purge. Hydrogen can be highly explosive when mixed with air, so this function is essential for maintaining ranges that are within acceptable safety limits. It also helps you to achieve optimum hydrogen purity levels and to maximize operational efficiency.

The thermal conductivity analyzers operate on the principle of a Wheatstone bridge. A pair of glass coated, platinum filaments – one pair for reference and one pair for measurement – are located on each arm of the bridge. A constant current is passed through the bridge network and in doing so, any difference between the thermal conductivity rates of the reference gas and the measurement gas will cause an imbalance of the bridge. This imbalance signals the difference in the thermal conductivity of the two gases, thus identifying each gas and how much of it is present in the mixture. The display unit can be calibrated directly in terms of the percentage of one gas with another gas.



Customizable Hydrogen Panels

ABB offers flexible solutions to best meet your operational needs. For example, the hydrogen analysis panel can be configured as a single hydrogen in air measurement, with a separate panel for the carbon dioxide reference e.g., hydrogen in carbon monoxide and air in carbon monoxide. Or, the hydrogen analysis panel can be configured with all three measurements on a single panel, which is ideal for applications that require triple range analysis.

ABB addresses the most critical safety issues with our optional redundant systems. In using this type of panel configuration, you will always have a backup for the crucial measurement of the three gas ranges.

Here are the hydrogen panel options in detail:

System A is the most cost effective solution. It consists of one measurement panel that provides all three gas ranges. This indicates hydrogen purity 80%–100% or 85%–100% (fail-safe) hydrogen in air, as well as 0%–100% hydrogen in carbon dioxide and 0%–100% air in carbon dioxide.

- Triple range analyzer
- Retransmission output for each measurement
- LCD display for easy reading



System B is ABB's traditional offering, and serves as the upgrade system for existing generators and new installations. This configuration employs one panel to measure 100%–85% or 85%–100% (fail-safe) hydrogen in air and is accompanied by a dual range analyzer panel for 0%–100% hydrogen in carbon dioxide and 0%–100% air in carbon dioxide.

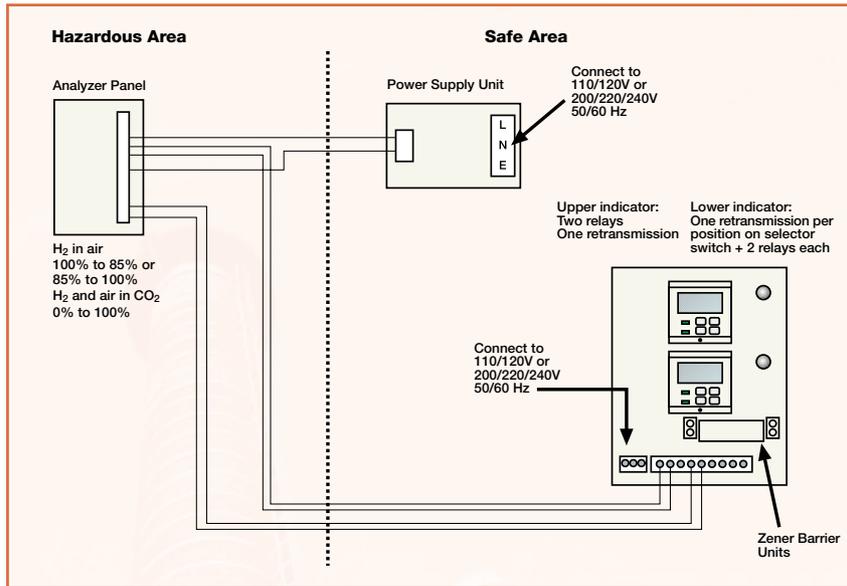
- Low maintenance and installation costs
- Easy to retrofit
- 4 mA – 20 mA display output enables data transfer to DCS or central control room

System C is targeted to applications where readings are so critical that they require a backup system. It provides the same configuration of the triple range thermal conductivity analyzer panel (System A), with the extra insurance of a duplicate panel for backup.

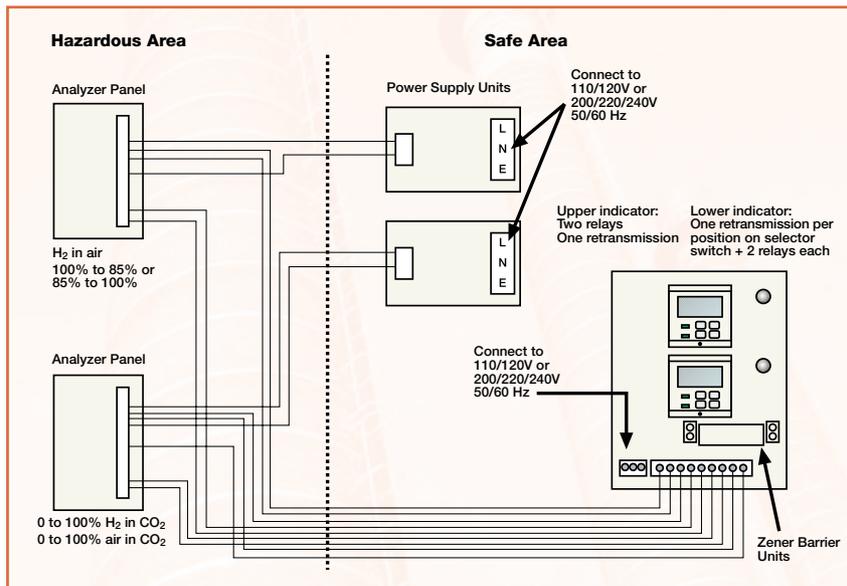
- Redundant system
- Fail-safe design
- Fully CENELEC certified



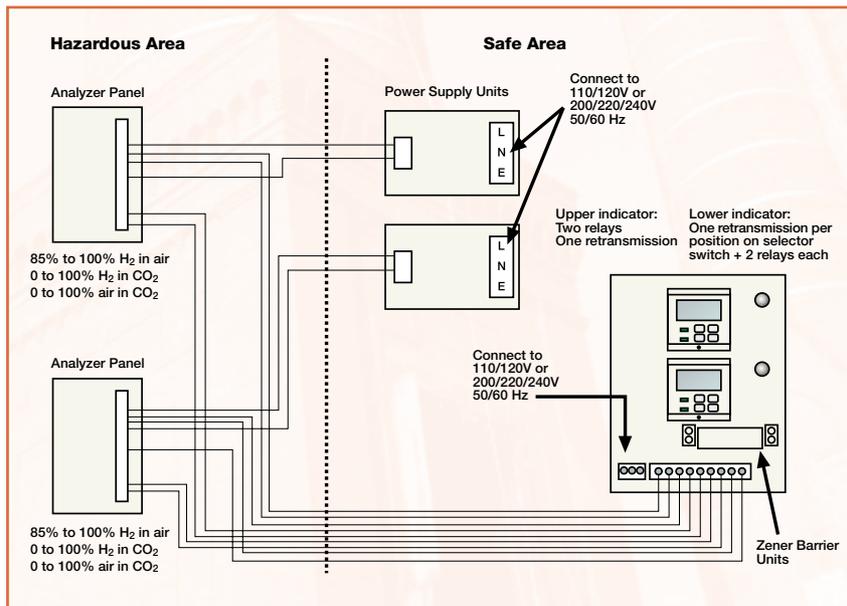
System A



System B



System C



Uncompromising Safety



As operational demands continue to increase, the one area that cannot be compromised is safety. Safety will always be a paramount concern for turbogenerator operations, due to potential explosions caused by air mixing with hydrogen. The ABB hydrogen analysis system eases the stress of working in hazardous environments by providing continuous, reliable monitoring of hydrogen purity without fail.

Should your input signals become open circuited, the system's display and control monitor will automatically protect you from unsafe indications. In such cases, two-step alarms will immediately alert the operator to failing hydrogen purity or to faulty purge sequences, and a device will drive the instrument downscale – to the low purity, purge zero end of the scale – to provide the appropriate warning and ensure urgent corrective action by the operator.



- Continuous monitoring of hydrogen purity
- Certified for intrinsic safety to EExia IIc
- Two-step alarms for indicating immediate danger
- Optional independent redundant systems for enhanced measurement security



Hydrogen Purity Selector Chart

System Type	Thermal Conductivity Panels	Auxiliary Equipment	Services Required	System Characteristics
A	6540 203/K panel 100%-85% or 85%-100% hydrogen in air, 0%-100% hydrogen in carbon dioxide and air in carbon dioxide Certified EExia IIc (Zone 0)	4234 power supply for each panel Certified [EExia] IIc 6553/6131/201/102 display unit Certified [EExia] IIc	115/230 VAC sample filters	4-20 mA output for each range Two relay alarm contacts Intrinsic safety approval to CENELEC
B	6540 203/K panel 100%-85% or 85%-100% hydrogen in air, 6540 203K panel 0%-100% hydrogen in carbon dioxide and 0%-100% air in carbon dioxide Certified EExia IIc (Zone 0)	4234 power supply for each panel Certified [EExia] IIc 6553/6131/201/102 display unit Certified [EExia] IIc	115/230 VAC sample filters	4-20 mA output for each range Two relay alarm contacts Intrinsic safety approval to CENELEC
C	6540 203/K panel 100%-85% or 85%-100% hydrogen in air, 0%-100% hydrogen in carbon dioxide and 0%-100% air in carbon dioxide Certified EExia IIc (Zone 0) 6540 203/K panel 100%-85% or 85%-100% hydrogen in air, 6540 203/K panel 0%-100% hydrogen in carbon dioxide and 0%-100% air in carbon dioxide Certified EExia IIc (Zone 0)	4234 power supply for each panel Certified [EExia] IIc 6553/6131/201/102 display unit Certified [EExia] IIc	115/230 VAC sample filters	4-20 mA output for each range Two relay alarm contacts Intrinsic safety approval to CENELEC

The 6540 203/K panels are intended for use where the sample is vented to atmosphere. An alternative panel 6548000 is available which is pressure tested to 10 barG.





**For additional information, visit us
on the Internet at www.abb.com**



ISO 14001
U.K.
Cert. No. Q05907



ISO 14001
U.K.
Cert. No. EMS 40882



Stonehouse, U.K.

The Company's policy is one of continuous product improvement and the right is reserved to modify the information contained herein without notice.

© ABB 2001

Printed in UK (12.01)



ABB Ltd
Oldends Lane, Stonehouse
Gloucestershire, GL10 3TA
UK
Tel: +44 (0)1453 827 661
Fax: +44 (0)1453 827 856

ABB Inc
125 E. County Line Road
Warminster, PA 18974
USA
Tel: +1 215 674 6000
Fax: +1 215 674 7183

ABB has Sales & Customer Support expertise
in over 100 countries worldwide

www.abb.com