



Life Extension Services (LES) Generator Cooling Gas Purity Thermal Gas Analyzers

LES WR Series Thermal Gas Analyzers systems are the perfect choice if you're looking at upgrading the complete H2 Gas control system, or just the Gas analyzer portion of the gas control system. The LES Gas Analyzer is standard equipment on fossil and nuclear powered H2 cooled generators worldwide.

The LES Gas Analyzers have been designed to simplify the installation into any H2 control panel.

The system has two parts, a control panel and the sensing cell block. This simplifies the installation by allowing the sensing cell block to be mounted in the gas section of the cabinet and allows the control panel to be installed in the electrical section of the control panel.

The H2 Gas Control panel is a Class 1 Div 1 Group b system that is completely explosion proof. The system is designed to operate as a stand-alone system or can be operated remotely by the customer control system. The system has two sensing cells and two Gas analyzers to provide redundancy.

The system also includes gas purifiers, moisture indicators, control valves, solenoid control valves, differential pressure readings, and gas flow meters. The standard LES Gas Analyzers have also been designed for simple installation, if just the analyzer portion of the system needs to be upgraded. The system has a standard sensing cell block in a NEMA 4X enclosure. The sensing cell block is also available in a explosion proof enclosure

version. This option is appropriate if only the sensing cell block is placed in an H2 gas environment and the control panel is mounted in a separate electrical compartment. This arrangement would be recommended if a complete explosion proof system is not needed. The standard NEMA 4X sensing cell block is used to upgrade systems that do not have to have the explosion proof rating.

The WR Series Gas Analyzer family ranging from a single channel portable unit to a three channels multiple redundant units (see chart below). Along with the additional safety and security that these devices provide is the advantage of being able to run a generator at its peak efficiency by accurate monitoring of the gas purity.

Operating at reduced hydrogen purity can be costly. The friction and windage losses for a 907 MW, 2-pole generator, operating at 75 psi and with a 3% reduction in hydrogen purity (from 98% to 95%), can increase losses

Series #	No. of Cells	No. of Displays	Redundancy
WR-100	2	1	Yes
WR-200	3	3	Yes
WR-300	2	2	Yes
WR-400	1	1	No
WR-500	1	1 <small>Portable Unit</small>	No

from friction and windage by about 32%, or about 685 kW.



Explosion Proof H2 Gas Control Panel

The microprocessor-based design provides accuracy to $\pm 1\%$ by using two reference gasses: Nitrogen and Helium and comparing their readings to the calibration curves in the microprocessor.

The LES Hydrogen monitor is also the only system on the market that can read zero to 100% full scale. Other systems will only read in the 70% to 100% range and operate with outdated technology.

A function selector switch permits the operator to have the purity reading of either "Hydrogen in Air", "Hydrogen in Carbon Dioxide", or "Carbon Dioxide in Air".

Solenoid valve selector switches can be used to provide a variety of functions, such as re-routed the gas to provide a variety of functions, such as re-routing the gas sample to another cell block for verification or redundancy.

Principle of Operation

The gas density detection uses the principle of Katharometry (gas thermal conductivity). The thermistor is a resistor with a very non-linear resistance relative to temperature, so that small changes in temperature greatly change its resistance. The two reference cell thermistors will have constant voltage drops and the sensing cell thermistor will have a variable voltage drop depending upon the gas mixture.

The voltage to maintain the constant electrical current through the thermistor in the cell block



WR-200 Gas Analyzer

changes greatly as the extent of cooling changes. This voltage is compared to calibration curves in the processor so that data is converted to a measurement of thermal conductivity.

During the routine maintenance process of passing pure gas through the cell blocks, the processor obtains reference values for the three calibration gasses: Carbon Dioxide, Nitrogen, and Hydrogen, which are used to correct for small variations in the temperature of the cell block.

The voltage of the thermistor is converted to digital signal. That signal is compared by interpolation to the digital readings in non-volatile memory obtained during calibration.

Benefits Of Analyzers

- Microprocessor-based design
- High degree of accuracy $\pm 1\%$
- Two reference gasses used
- Redundancy: two and three cell blocks models
- Replaceable Sensing



NEMA 4X G1 Cell Block



NEMA 4X G2 Cell Block



Explosion Proof Cell Blocks



WR-500 Portable Gas Analyzer



Hydrogen Control Panel

Hydrogen Control Panel is designed for new unit installations or can be used to updating old H2 control panels. The system is designed to work on generator units utilizing scavenging seal oil systems.

The HCP continuously analyzes gas from each seal drain enlargement and is also used to periodically monitor the generator casing gas. The panel has two independent gas analyzers to monitor gas purity. The panel also controls the rate of scavenging and monitors the fan differential pressure.

In the unlikely event of an analyzer fault, the other working analyzer can be set up to read the gas purity at any of the two seal drains or at the generators gas casing tap. An optional remote H2% display is also available.

Specification	Hydrogen Control Panel: Class 1 Div 1 G B
Measurement	
Characteristics:	
Case Purity	0 to 100% H2/Air
Purge	0 to 100% H2/CO2 0 to 100% Air/CO2
Hydrogen Flow Rate	1 to 2.5 cf/hour
Electrical	
Characteristics:	
Power	115/230 VAC,50/60 Hz
Output Relays	Alarm, NO Warning, NO Trouble, NC Normal, NC
Output Signals (all signal outputs 4-20 mA)	Analyzer #1, TE Analyzer #2, CE Fan Differential
Mechanical	
Dimensions:	
Panel:	64"Hx36"Wx18"D 163cmx91cmx46cm
Temperature	32 to 125°F/0to52°C
Hydrogen Pressure	100 psi max(6.8atm)
Gas Connections	1/4" female NPT

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