KK650 Hydrogen and Chlorine Analyser

Hydrogen analysis throughout the chlorine manufacturing process

- **Proven technology from the katharometer experts**
- **Unique dual sensor technology**
- **Works during start-up**
- **Benign, surrogate gas calibration**
- **Wet and dry sample systems**
- **Low cost of ownership**

APPLICATIONS

- **'Wet' chlorine**
- **'Dry' chlorine**
- **'Sniff' or tail gas**
- **Hypo plant outlet**

The KK650 is designed specifically for the chlor-alkali industry. Chlorine is usually manufactured by the electrolysis of brine (sodium chloride) or potassium chloride. This process also produces hydrogen and a small quantity is found in the chlorine stream. Larger quantities can indicate failure of a mercury cell, diaphragm or membrane and lead to potentially fatal explosive mixtures of hydrogen and chlorine.

Hydrogen measurement is Eaton's field of expertise but this application is not straightforward. Hydrogen levels are low and the mixture is not a binary one. In addition to the hydrogen and chlorine there is also oxygen, nitrogen and carbon dioxide (referred to as the 'inerts'). At start-up the mixture will be mainly nitrogen purge gas with a gradually increasing percentage of chlorine. The old attempt at using a 'flowing reference' does not work in the latter scenario.

The Eaton solution is to use two measurement sensors together with a third, sealed reference sensor. The process gas is passed across the first measurement sensor, then through a small heater where hydrogen is reacted, then across the second measurement sensor. With two discrete measurements, known thermal conductivities of the gases present and complex algorithms, the KK650 can accurately display both hydrogen and chlorine values.

Two versions are available offering a hydrogen range of 0-5% or 0-10%. The 0-5% version is designed for measurement in 'wet' and 'dry' chlorine where hydrogen levels vary between 0.01% and 1.00% depending on the type of plant and point in the process. The 0-10% version is designed for the tail gas applications where hydrogen levels are typically in the 1-4% area but can rise above 5% in exceptional (and dangerous) instances.

'Dry' chlorine requires no special sample conditioning. Pressure and flow need to be optimised and a calibration port is a useful addition. This can be engineered by the user or, alternatively, Eaton can supply a system, including the sensor assembly, in a weatherproof GRP enclosure.

Sample conditioning is required for 'wet' chlorine applications. The Eaton system has no consumables or annual spares making it both easy to maintain and inexpensive to own. Pumped or aspirated versions are available to take account of the negative pressure usually found in 'wet' chlorine streams. The system cleans and dries the process gas, presenting it in optimum condition for the sensor, also included are a calibration port, flowmeter and needle valve.

The weatherproof GRP enclosure for the electronics enables external mounting. With space in analyser shacks usually at a premium and the cost of a new shack being several times that of an analyser, this is a great advantage. The katharometer/reactor assembly is supplied on a small backplate for versatility. In the event of an exceptional occurrence, such as chlorinated liquid being released through the analyser, no lasting damage is usually done. Add to these features the low maintenance and zero consumables and then compare with competing optical or GC technologies.

Established technology, unique design, easy, low cost installation and low maintenance – a great combination.

Powering Business Worldwide

Eaton Electric Limited,
Great Marlings, Butterfield, Luton
Beds, LU2 8DL, UK.
Tel: + 44 (0)1582 723633 Fax: + 44 (0)1582 400901
E-mail: mtlgas@eaton.com
www.mtl-inst.com

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SPECIFICATION

Gas measurement ranges
Hydrogen: 0 - 5.00% or 0–10.00%
Chlorine: 0-100.0%

Stability
< 1% f.s.d. over the operating temperature range.
< 1% f.s.d./month

Accuracy
±1% f.s.d. or ±2% f.s.d. depending on calibration method

Repeatability
< 1% f.s.d.

Speed of response
T90: 30 seconds (typ.)

Sample flow
100 - 400ml/min
(~350ml/min for optimum performance)

Sample temperature range
0°C to +60°C (non-condensing)

Sample pressure
Atmospheric, set by vent pressure

Sample connections
Inlet and outlet: Captive seal compression suitable for 0.25inch (or 6mm) o.d. tube

Analogue output ranges (4/20mA)
Hydrogen: 1.00 to 5.0% (adjustable)*
2.00 - 10.00% (adjustable)*
Chlorine: 100% (fixed)
Minimum load 600 ohms
* depending on model chosen (see above)

Concentration alarms
One programmable alarm for each gas
Volt-free contacts

Fault indicators
1) Instrument status
2) Reactor temperature status
Volt-free contacts

Ambient operating temperature range
Sensor: +5°C to 55°C
Electronics: +5°C to 45°C

Storage temperature range
0°C to 55°C
(0-90% R.H. non-condensing)

Power
110V or 220V AC (nom.), 50/60Hz
80 VA requirement

Mechanical details
Electronics: GRP wall-mount enclosure
Protection: IP66
Net weight: 20 kg (nom.)
Dimensions: (mm) 650h x 450w x 250d
Katharometer/reactor: Wall-mount panel
Net weight: 3 kg (nom.)
Dimensions: (mm) 150h x 240w x 115d
Connecting cable length: 2 metres

ORDERING INFORMATION

Part no	Description
802-9412	KK650 Hydrogen (0-5% or 0-10%) and chlorine analyser (0-100%), 110V or 220V Customer to specify hydrogen range and supply voltage
131-0051	Sample conditioning system for 'wet' chlorine, aspirated
131-0052	Sample conditioning system for 'wet' chlorine, pumped
Consult Eaton	Sample conditioning system for 'dry' chlorine, pressure regulated

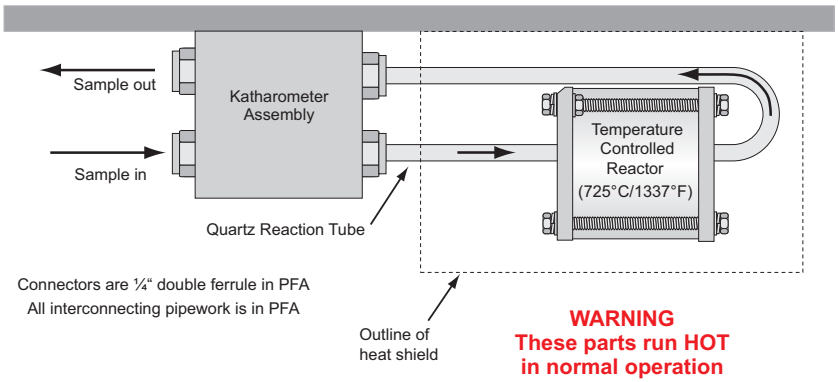

Figure 1 - Remote katharometer sensor

The katharometers sensor comprises two thermal conductivity measurement sensors and a sealed reference sensor. These are mounted together in one encapsulated assembly - see Figure 1 - which ensures that the sample gas comes into contact only with materials that are chemically inert. The katharometer assembly is mounted on a PVC panel along with its associated temperature controlled reactor.

Each sensor assembly is supplied with a **Katharometer Identity Module (KIM)** - see Figure 2. The KIM attaches to the analyser electronics and uniquely identifies the sensor and its calibration curves. This enables fast replacements to be made with no need for extended analyser downtime or lengthy calibration procedures.

Figure 2 - KIM

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Eaton Electric Limited,
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Beds, LU2 8DL, UK.
Tel: + 44 (0)1582 723633 Fax: + 44 (0)1582 400901
E-mail: mtlgas@eaton.com
www.mtl-inst.com

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EUROPE (EMEA):
+44 (0)1582 723633
mtlenquiry@eaton.com

THE AMERICAS:
+1 800 835 7075
mtl-us-info@eaton.com

ASIA-PACIFIC:
+65 6 645 9888
sales.mtlsing@eaton.com