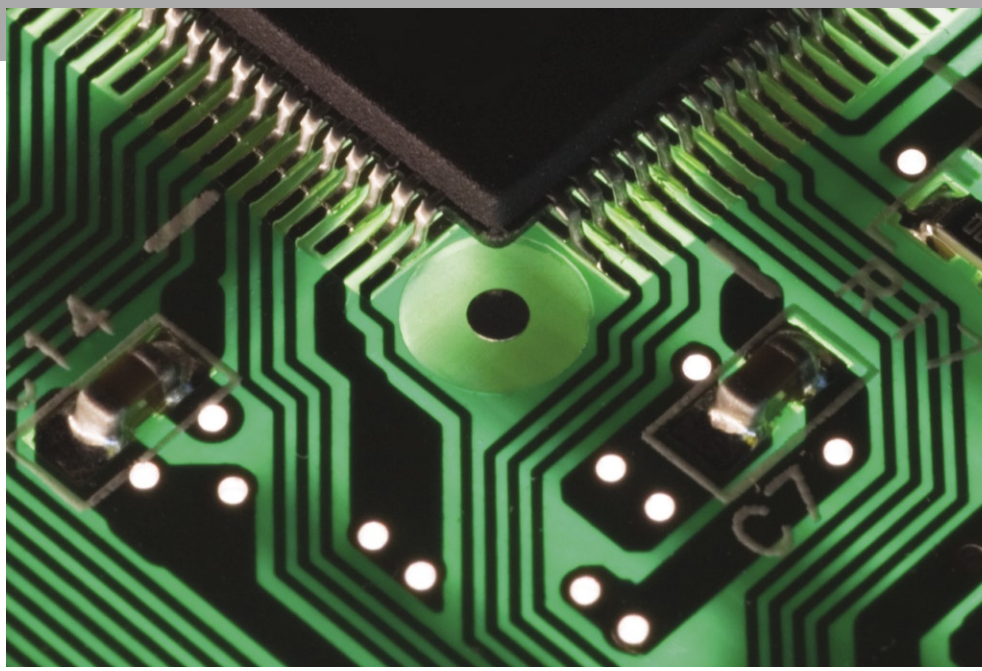
labom
MEASUREMENT TECHNOLOGY

Temperature measurement for hydrofluoric acid production

Application:

Production of hydrofluoric acid for the semiconductor industry

The GA 2600 clamp-on resistance thermometer with replaceable Pt 100 sensor



The semiconductor industry employs an etching process using hydrofluoric acid (HF) to create the minute conductive pathways or 'traces' on printed circuit boards (PCBs). This acid is corrosive to most metals, except gold and platinum. To measure the temperature of hydrofluoric acid, LABOM came up with a simple and reliable solution not requiring the use of these expensive precious metals.

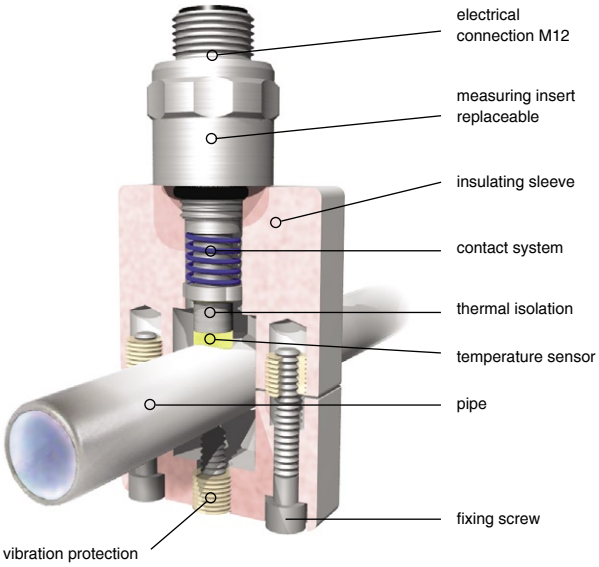
"Smart" temperature measurement of corrosive acids

Risk of contact with hydrofluoric acid during production endangers personnel and materials

In computers, they complete up to six billion calculations per second; in solar cells, they convert the sun's rays into energy; and in digital cameras, they perform the calculations necessary to transform millions of color impulses into a clear, crisp picture. Nowadays, small integrated circuits taking up only a few square millimeters of space on a semiconductor base – generally referred to as a "chip" – control and regulate complex functions in many electronics applications. To accurately cut the minute circuits on these chips, the semiconductor industry employs an etching process using hydrofluoric acid, a highly corrosive substance that can dissolve materials such as glass, stainless steel, stone and porcelain. In some cases contact with this acid can even be fatal to humans. Despite these difficult preconditions, LABOM came up with an innovative, safe solution for a manufacturer of hydrofluoric acid, one that allows the temperature of the acid to be measured without any interference in the production process and without having to resort to expensive acid-proof metals.

The task: Hydrofluoric acid is the etching agent most commonly used to create recessed conductive pathways in the production of computer chips. In this process, a special coating protects the areas not to be etched. High-purity hydrofluoric acid is a very poisonous and corrosive acid. For this reason, it is produced in super-clean rooms, and depending on its concentration, flows through PTFE pipes. In addition to dissolving glass, hydrofluoric acid can dissolve most metals, including stainless steel. Only gold and platinum are 100 % resistant to it. In light of this, a device to measure the temperature of hydrofluoric acid within the PTFE pipes would normally have to be made of expensive gold or platinum, substantially increasing costs. In addition, production of hydrofluoric acid would have to be regularly stopped for the removal, cleaning and reinstallation of these internal measuring devices. This requirement would pose an additional hazard to maintenance personnel since hydrofluoric acid is highly poisonous on contact. In fact, even a palm-sized acid burn can be fatal.

The solution: For a manufacturer of highly purified hydrofluoric acid, LABOM installed its GA 2600 standard thermometer, consisting of a Pt 100 resistance thermometer and a plastic sleeve that allows the thermometer to be mounted directly on the outside of a PTFE pipe. This means that



Author: Ulf Denker
Fon: +49 4407 - 7 16 98 30
e-mail: u.denker@labom.com

Additional information on this topic is available directly from LABOM (Export Manager Thomas Tempel Fon: +49 4408 804-460) or from our local office near you (see **www.labom.com**).

temperatures can be measured by an external device that is easily and quickly installed on any pipe system. The installation, which is readily accomplished by clamping on a two-piece collar, requires no opening of the pipe system and no welding. This innovative new approach led the customer to choose LABOM's solution over other ones proposed by three competitors.

The customer benefits: By using LABOM's clamp-on temperature sensor, the customer never has to halt the production process. Since there is no contact with the hydrofluoric acid, the sensor does not need to contain any expensive precious metals. Similarly, since the system does not need to be opened for maintenance, the risk of human contact with highly toxic hydrofluoric acid is completely avoided. What's more, LABOM's solution, which is easy to handle and operate, can be retrofitted to existing systems at any time.

DEVICE DESCRIPTION

Clamp-on resistance thermometer Pt 100, model series GA 2600

- No 'dead pockets' (inaccessible/restricted device areas such as nooks and crannies) created by temperature measurement device
- Can be retrofitted on already existing piping systems
- Suitable for use with all standard nominal pipe widths
- Optimum temperature sensing with a metallic clamping system
- Insulating sleeve made of heat-resistant plastic, easy-to-clean exterior design
- Measuring range: -20 °C to +200 °C
- Replaceable Pt 100 measuring insert; no need to remove and reinstall entire measuring device
- Explosion protection: II 2G EEx ia IIC T4/T6
- Can be calibrated
- Optional transmitter (4 to 20 mA)