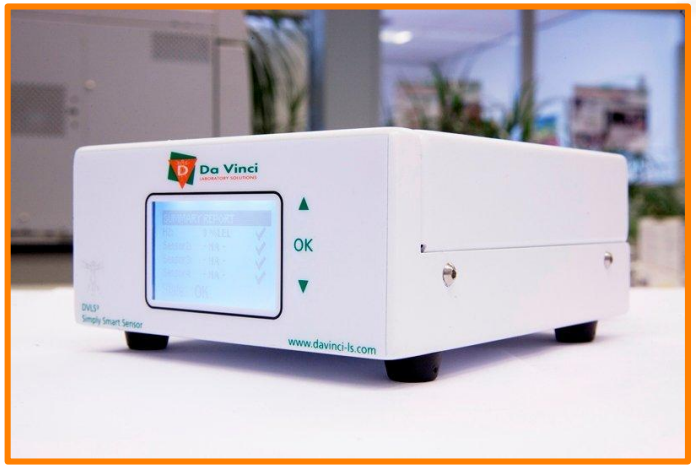
Da Vinci
LABORATORY SOLUTIONS

IngenieríaAnalítica
Chromatography & Spectrometry

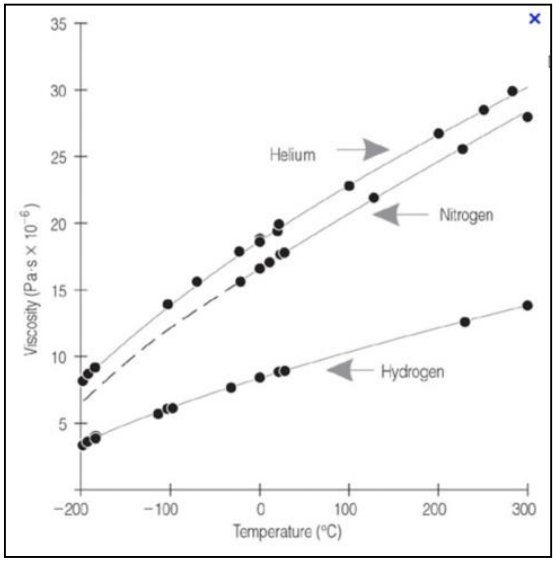
DVLS³ Simply, Smart, Sensor

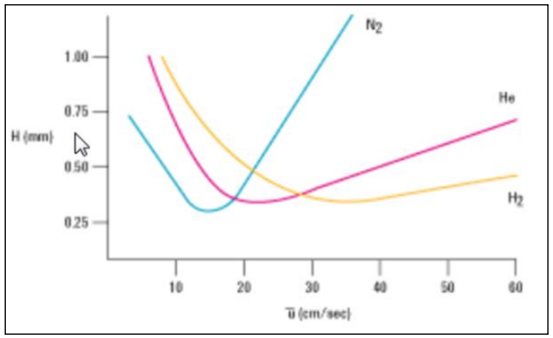


ensures safety when using Hydrogen as a carrier gas in GC systems

Reasons for using H_2 as a Carrier Gas

1. **Fast Analysis:**
   - Viscosity of H2
   - Low oven temp programming
2. **High Efficiency:**
   - H2 Flattest Van Deemter curve





IngenieríaAnalítica
Chromatography & Spectrometry

Da Vinci
LABORATORY SOLUTIONS

Reasons for using H_2 as a Carrier Gas

3. **Prolonged Column Life:**
   - Due to lower oven temperature

4. **Cost effective:**
   - 3x less expensive than its helium equivalent

   - Bottle or generator supply

Reluctant to use H_2 as a Carrier Gas?

- **Hydrogen is an Explosive Gas**: Undetected gas leaks can lead to an explosion in the GC oven

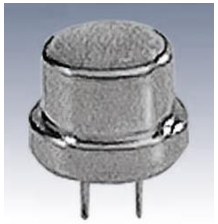
- **LEL of hydrogen in Air is at 4%**

Safety measures

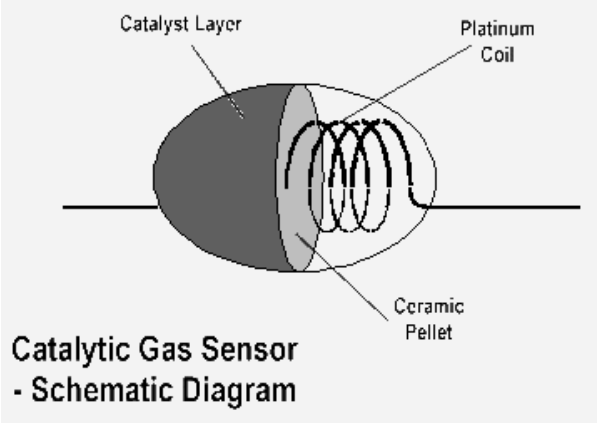
- **Monitor hydrogen usage**

- **Existing measures in most GC models**
  - Safety Shutdown in case of pressure loss
  - Flow Limiting Frit EPC
  - Explosion Test: GC designed to contain parts in case of explosion [6890exp.avi.MPG]
  - Valve box or column compartment need additional measures

Sensor principle of operation (1)

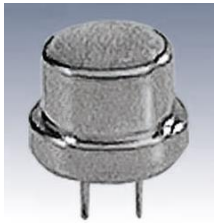


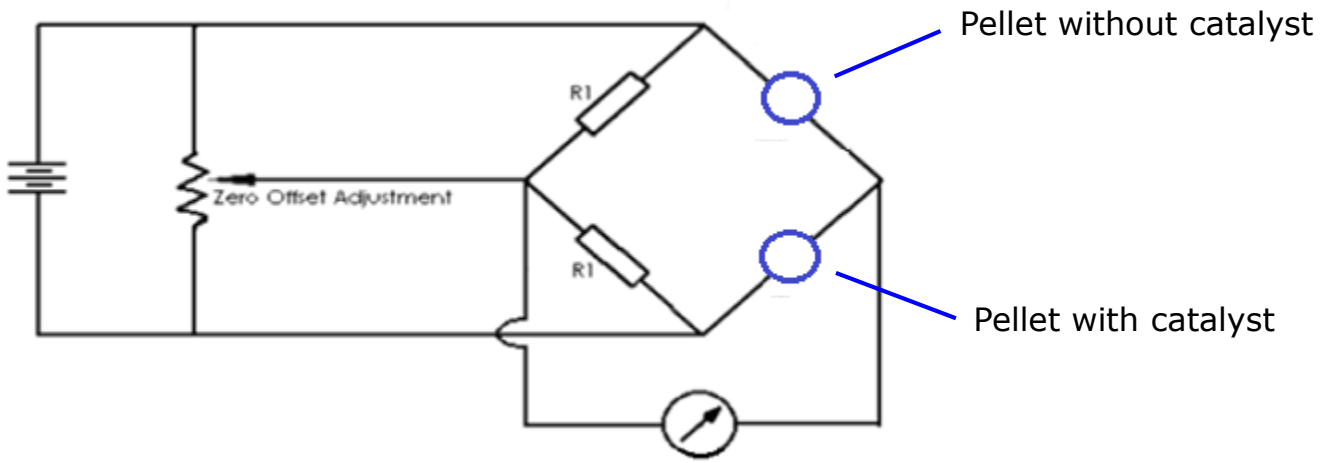
- Catalytic reaction on the surface of a pellet
- Exothermal oxidation of combustable gas
  ($2H_2 + O_2 \rightarrow 2H_2O(g) + heat$)
- A platinum coil inside the pellet
- The Platinum coil resistance is affected by temperature change



Sensor principle of operation (2)

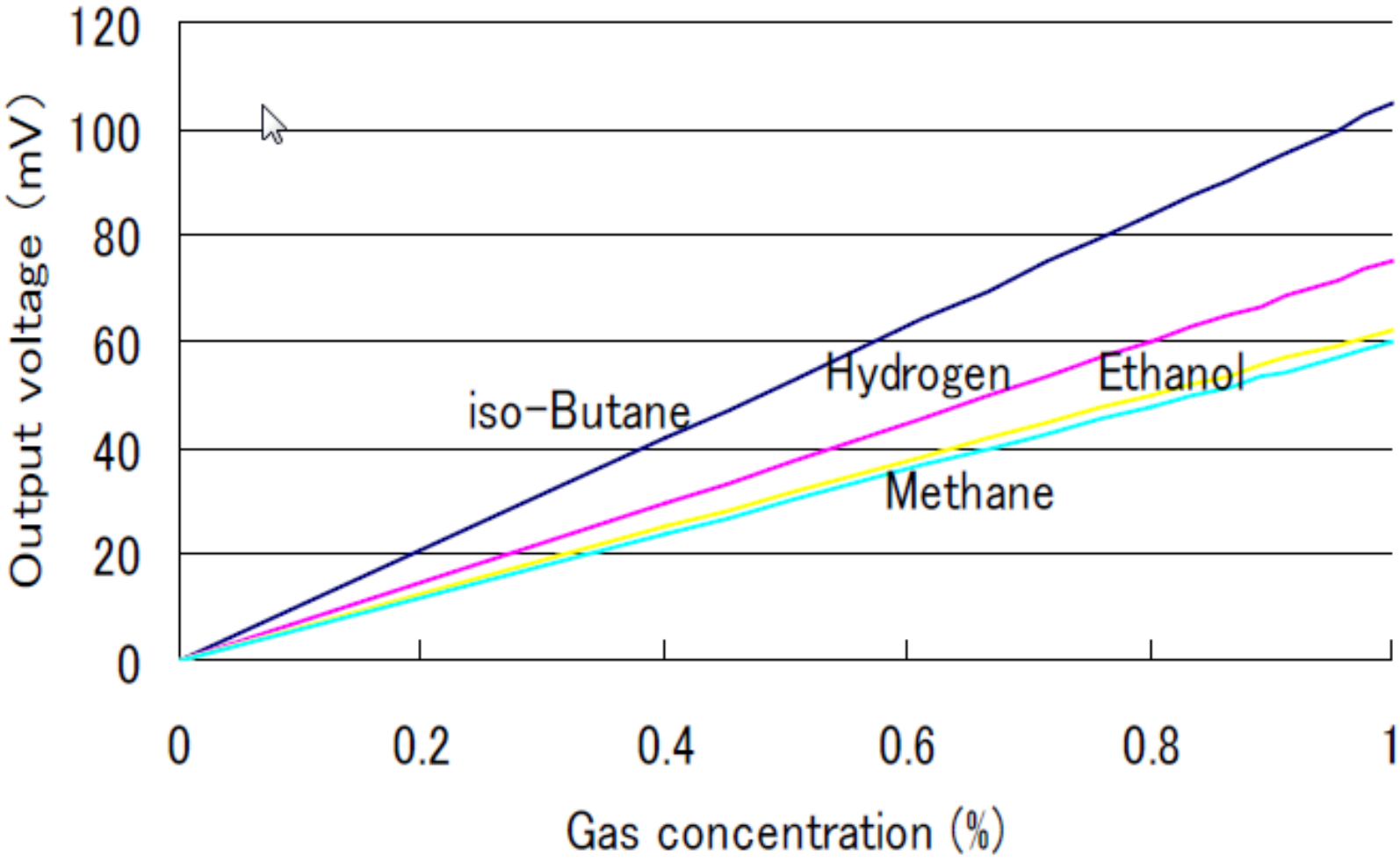
- A second pellet, without catalyst, is used to compensate in a Wheatstone Bridge
- Current change between resistances is translated into an electronic signal





1% H2 = 80 mV

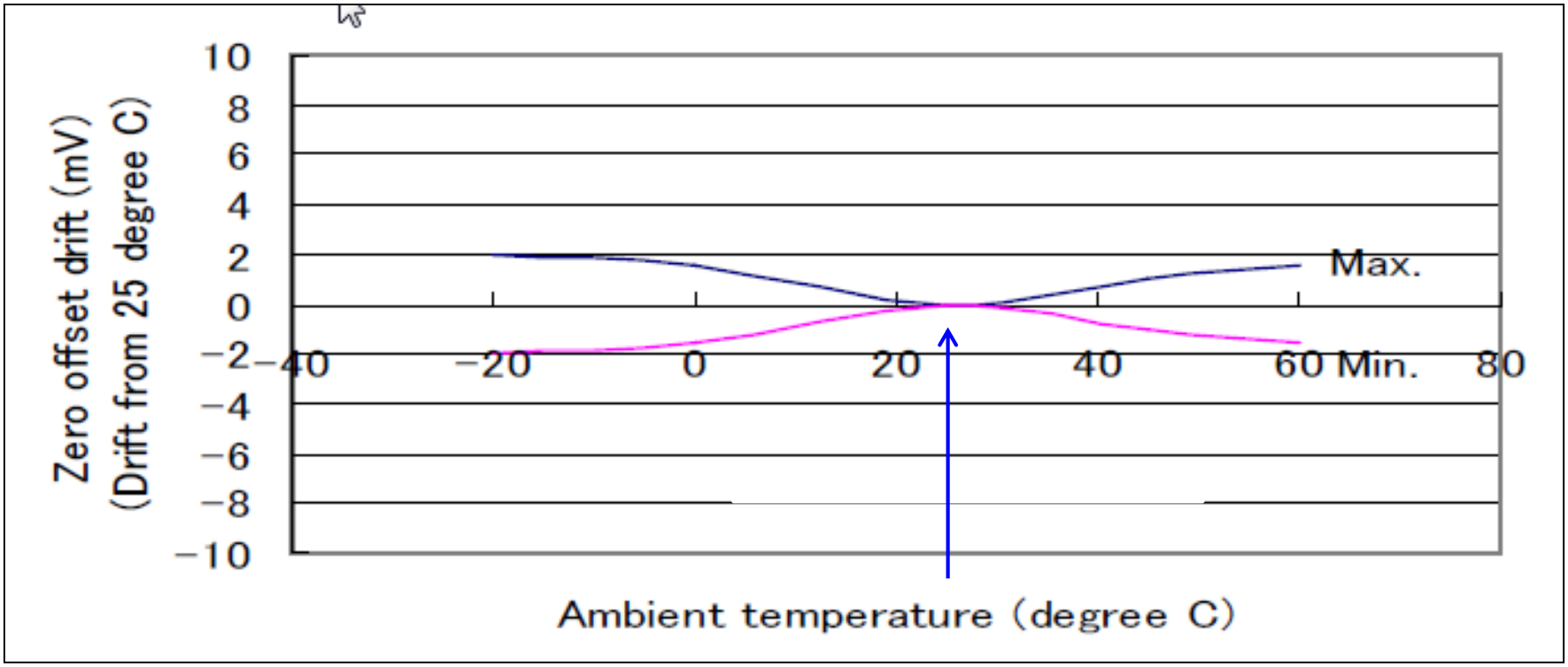
Gas Sensitivity
Hydrogen Sensor



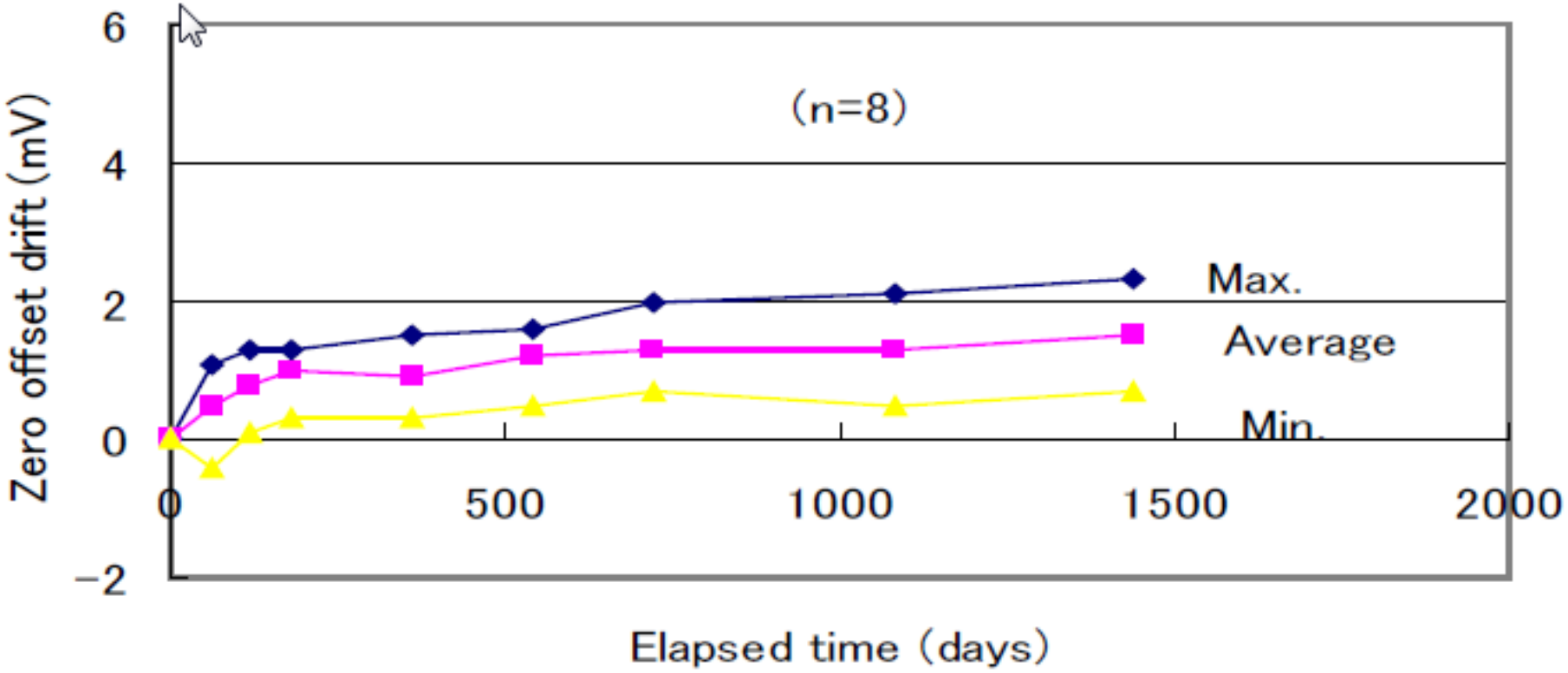
IngenieríaAnalítica
Chromatography & Spectrometry

Da Vinci
LABORATORY SOLUTIONS

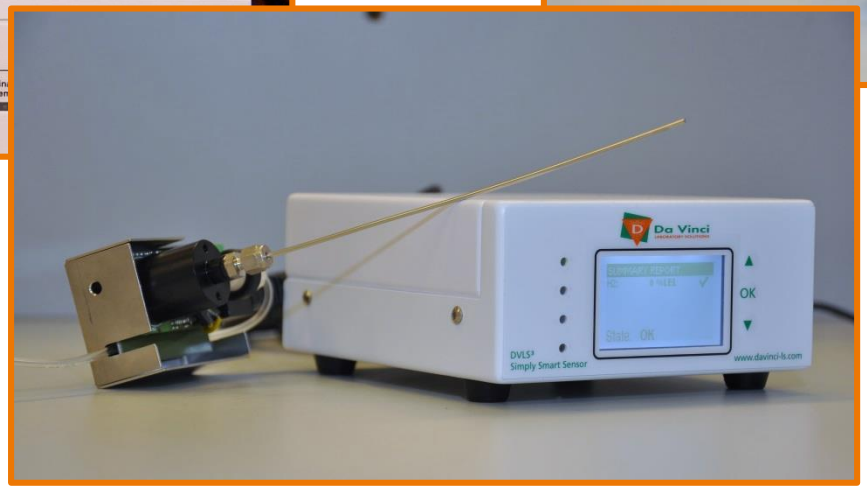
Drift specs vs sensor temperature



Typical long term zero offset drift



Hardware overview of a Hydrogen Sensor for GC applications



IngenieríaAnalítica
Chromatography & Spectrometry

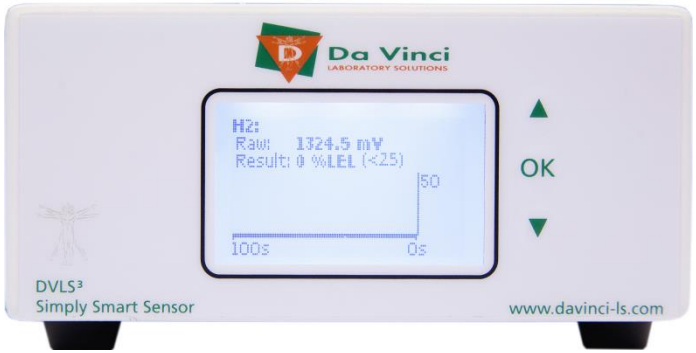
Da Vinci
LABORATORY SOLUTIONS

Four Sensors - One Controller

Multiple Sensor Setup

Hydrogen GC sensor

Temp

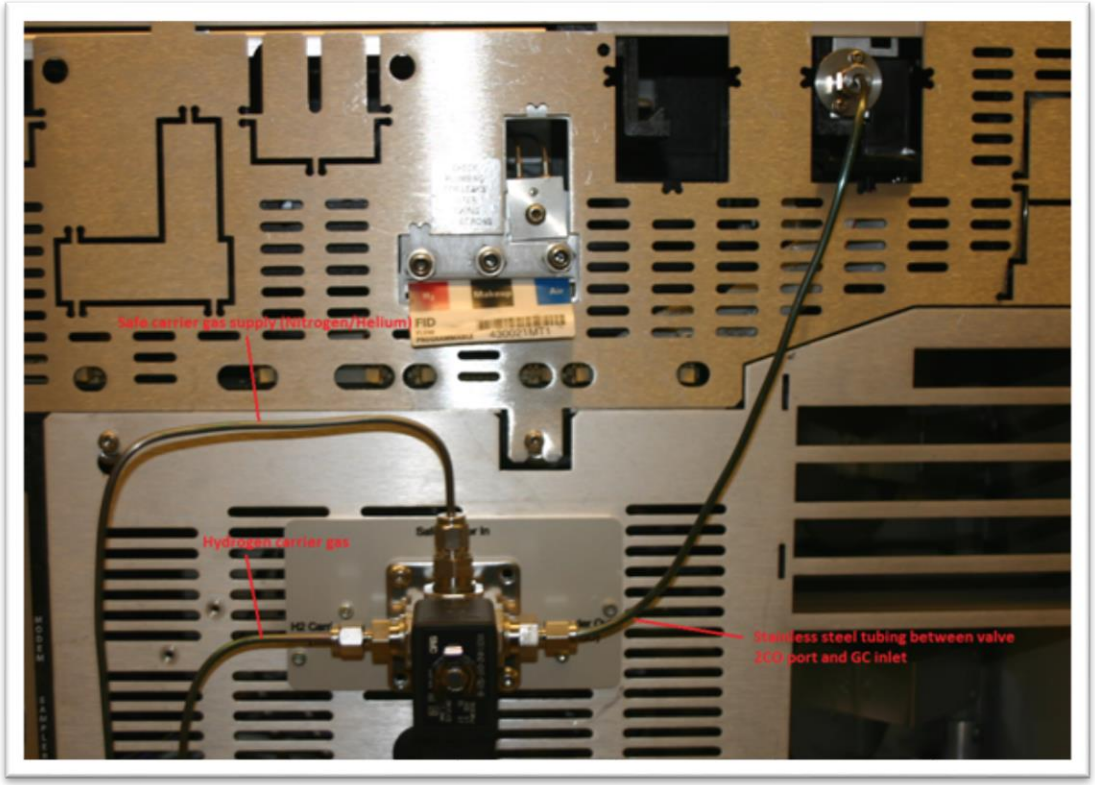


Pressure

Hydrogen Portable leak detection

Automatic Carrier Gas Switch

After 1% Hydrogen detection, the carrier gas supply is switched to Nitrogen, ensuring continuous gas flow through the analytical columns



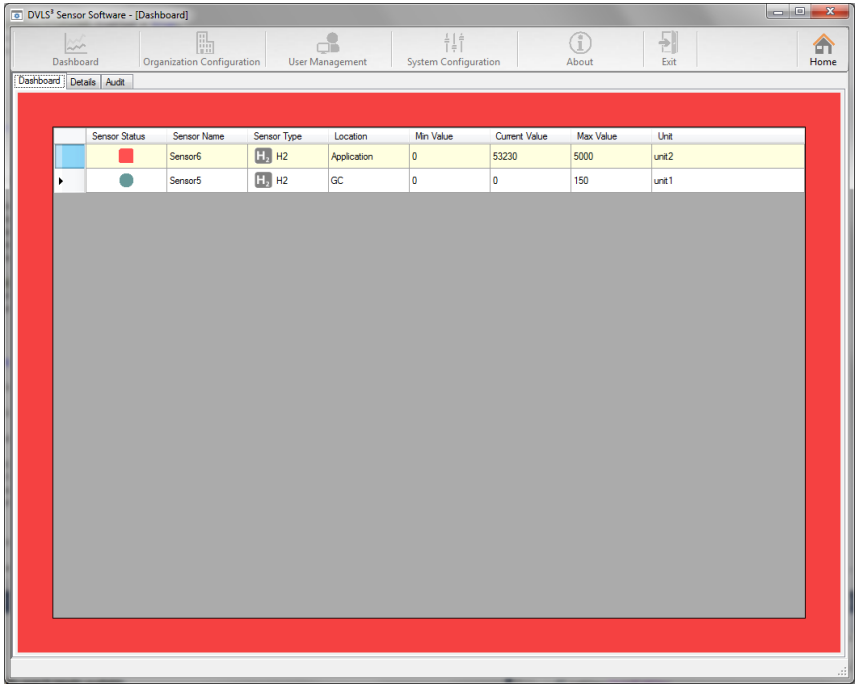
Automatic Stop Signal to GC

After 1% Hydrogen detection, a running sequence will stop, preventing waste of subsequent samples and analysis time

Software Control

New optional DVLS^3 Sensor software controls:

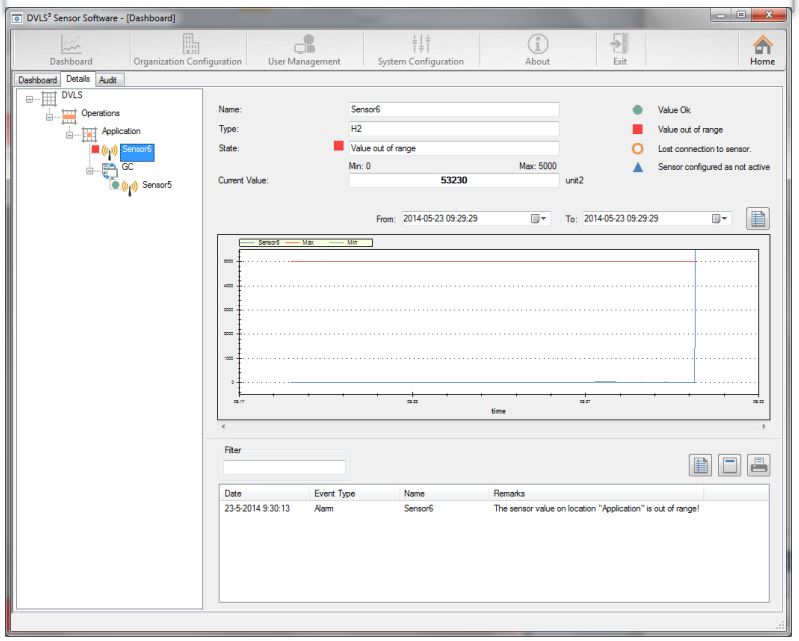
- System configuration
- User management and creation of an audit trail
- Definition of alarm settings:
  - show a red status on dashboard
  - send an alarm message by:
    1. e-mail
    2. text (SMS)
    3. Growl
    4. Prowl



Alarm Messages

After 1% H_2 detection the sensor alerts the staff by:

- **Acoustic** alarm
- **Optical** alarm (blinking display)
- **Red Status** of software dashboard
- **Text (SMS)** messages
- **Growl**
- **Prowl**



IngenieríaAnalítica
Chromatography & Spectrometry

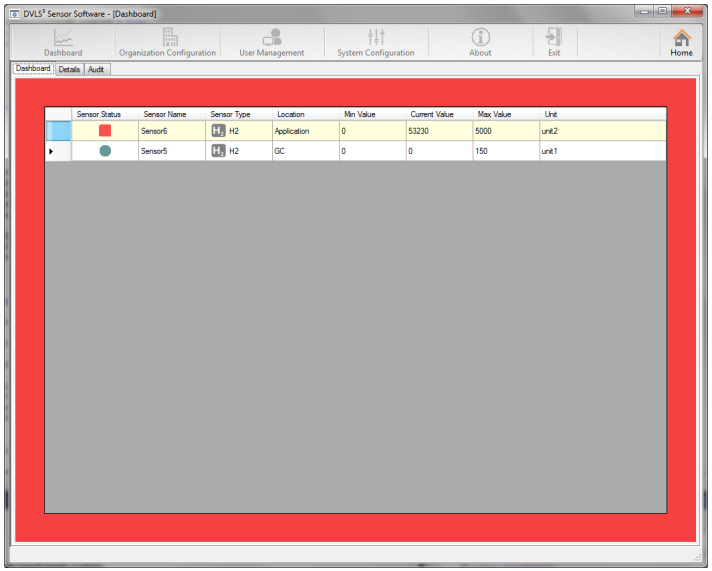
Da Vinci
LABORATORY SOLUTIONS

Calibration & Maintenance

- Zero Point Calibration Using Air
- Alarm level Calibrated using Hydrogen in Air Mixture
- Yearly frequency (or according to lab practices)
- Special Silicon-free calibration hose comes with the sensor

Features

- Safe technique to constantly monitor hydrogen leaks
- Automatic alarm transmission through:
  1. Optical and acoustic alarms
  2. Red status of Dashboard
  3. E-mail messages
  4. Text (SMS) messages
  5. Growl
  6. Prowl
- Dedicated optional software controls the alarm settings per sensor & user



Features

- Automatic carrier gas switching from Hydrogen to Nitrogen
- Leak detection indicates analysis is compromised
- Automatic stop signal sent to the GC
- Easy calibration and installation
- Compatible with all GC brands
- Versatile design supports up to 4 sensors:
    1. Hydrogen
    2. Hydrogen as Leak Detector
    3. Temperature
    4. Barometric Pressure
    5. Level (liquid) weight

Da Vinci
LABORATORY SOLUTIONS

IngenieríaAnalítica
Chromatography & Spectrometry

Questions?