

HERACLES Electronic Nose

Technical Specifications



HERACLES is an electronic nose based on dual flash gas chromatography technology dedicated to smell and aroma analysis.

It allows manual injection and can also be used with an autosampler. In this case, the system is composed of:

- An autosampler for automated sample handling and injection
- A dual fast GC electronic nose unit to detect and analyze the volatile compounds in the sample
- A computer for system monitoring , data acquisition and processing with AlphaSoft software



Autosampler

Two configurations of the PAL RSI autosampler delivered with HERACLES electronic nose are available:

- ✓ Headspace injection only (upgradable to headspace + liquid)
- ✓ Headspace and liquid injection

Element	Headspace only	Headspace and liquid
PAL RSI robot	✓	✓
Headspace vial tray	60 vials (20mL or 10mL in option) and up to 180 vials in option	60 vials (20mL or 10mL in option) and up to 180 vials in option
Liquid vial tray		3 x 54 vials (2mL)
Agitator oven	6 positions (20mL)	6 positions (20mL)
Syringes	2 pcs 5mL (gas)	2 pcs 5mL (gas) + 2 pcs 10µL (liquid)
Wash station		✓
Dimensions (cm)	105 x 82 x 93 (L x W x H)	105 x 82 x 93 (L x W x H)
Mass (kg)	20.9	22.7

Power

- Voltage :100-240 V
- Pmax Power: 200 W

Certifications

- Europe : CE
- Canada : CAN/CSA std
C22.2 n° 61010-1
- US: ETL listed
UL GST 61010A-1

HERACLES dual flash GC electronic nose

Injection & sampling

- Liquid & headspace injection modes
- Manual or automated injection
- Integrated solid adsorbent trap (10mg Tenax adsorbant) thermo-regulated by Peltier cooler (5-260°C)
- Possible use of gas sampling bags with internal pump

Columns & Oven

- 2 metal capillary columns with different polarities (standard column: length 10 meter – internal diameter: 0.18mm)
- Carrier gas: Hydrogen
- Oven temperature: 35°C to 300°C
- Heating rate up to 600°C/min

Detectors

- 2 Flame Ionization Detectors (FID)
- FID Ignition monitored by software
- Operating temperature: up to 320°C FID
- Sensitivity: 10^{-9} to 10^{-12} A/mV
- FID dynamic linearity $> 10^8$

Performance

- Start up in less than 15 minutes
- RSD $< 3\%$ on peak areas
- RSD $< 0.3\%$ on retention times
- Sensitivity < 50 ppb of nC_{12} in liquid mode
- nC_7 - C_{17} analysis in less than 60s
- Average cycle time: 7 minutes

Maintenance

- Fully monitored by software (FID ignition, pressure and flow rates settings temperature programs)
- Easy daily maintenance (septum replacement)

General Features

- Dimensions: 230 x 320 x 440mm (LxHxW)
- Voltage: 115 / 230 VAC
- Consumption: Hydrogen: 100mL/min – Air: 500mL/min
- Computer connection by USB port
- Operating conditions: 0°C to 35°C - 0 to 90% humidity (non condensing)
- Storage: -20°C to 60°C



AlphaSoft Software

Compatible with Windows® 7. This software controls and monitors the instrument and includes a full chemometrics package for data processing.

System monitoring

- Autosampler parameters and sample sequence monitoring
- Chromatograph E-nose settings, maintenance & spare parts monitoring

Chromatograms data acquisition and storage

- Peaks retention time and peaks area
- Data manipulation: creation of libraries prior to statistical data computing

Gas chromatography functionalities

- Immediate chromatogram visualization, customizable display
- Manual or standard automated integration modes
- Compensation of Drift & Retention Time Alignment
- Batch reprocessing
- Numerous calibration modes
- Alarm set-up on concentration range
- Global model for fast comparison of entire chromatograms

Statistical & chemometrics data processing

- Data pre-processing: chromatograms loading, chromatograms superimposition, reporting
- Multivariate statistics :
 - ✓ Libraries loading
 - ✓ Retention Times selection
 - ✓ Models building and identification of unknown samples
 - ✓ Qualitative and quantitative tools
 - PCA (Principal Components Analysis): discrimination between samples
 - DFA (Discriminant Factorial Analysis): qualitative model and unknown sample identification
 - PLS (Partial Least Square): quantification and sensory panel score prediction
 - SIMCA (Soft Independent Modeling Classification Analogy): acceptability prediction (good/bad)
 - SQC (Statistical Quality Control): qualitative results to check conformity by comparing to a reference
 - ✓ Multiple extractions possible for sample trapping or regression sampling
 - Data traceability with logbook and operating condition history
 - Data validation by electronic signature

AroChemBase Software Option



Library of molecules and related sensory attributes for chemical and sensory characterization based on Kovats indices matching.

- Integrated within AlphaSoft to help identify the chemical compounds corresponding to the integrated peaks
- Kovats indices for nearly 84,000 compounds on several GC columns including HERACLES columns
- Sensory features for around 2,000 compounds
- Human sensory odor thresholds for more than 1,800 compounds
- Sorting of chemical compounds candidates thanks to a unique recognition accuracy index
- Ability to enrich the database by including user's data and to extract tailored sub-library
- Numerous search options based on one or several criteria (name, application area, keyword, etc)

Specifications for hydrogen generator

- Flow Rate : min 150 mL/min
- Purity: 99.99999% (5.0) with outlet pressure up to 4 bar
- Outlet Port 1/8" Compression
- Unique (NM) no maintenance palladium membrane prevents baseline drift unlike auto drying technologies
- Environmental protection. The generator water tank should be fitted with vent filters to prevent contamination from the surrounding atmosphere.
- Explosion Protection: System for ultimate safety.
- Certifications IEC 1010-1; CSA UL 3101; CE Mark.

Specifications for zero air source

- Maximum Zero Air Flow Rate: 1 L/min
- The air purity should respect the following specifications:
 - ✓ $O_2 + N_2 > 99.95\%$
 - ✓ $H_2O < 5\text{ppm}$
 - ✓ $C_nH_m < 5\text{ppm}$
 - ✓ $O_2 = 20 \pm 1\%$
- Min/Max inlet Pressure 2.8 bar/8.6 bar
- Pressure drop at maximum flow rate: 0.27 bar
- Maximum Inlet Air temperature: 25°C (78°F)
- Inlet connection 1/4" NPT Female
- Outlet Port: 1/8" Compression
- Startup time for specified Hydrocarbon Concentration : 45 minutes