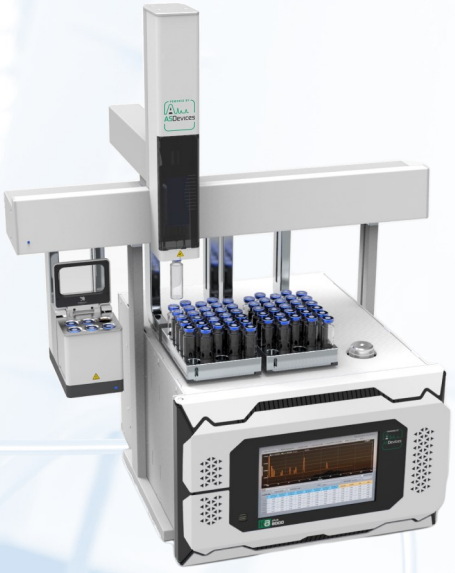
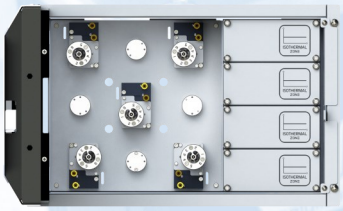
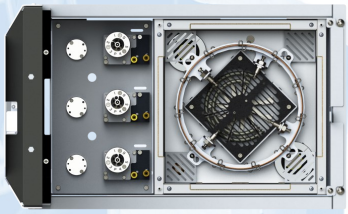
THE FIRST MODULAR GC OVEN* FOR GC INTEGRATORS



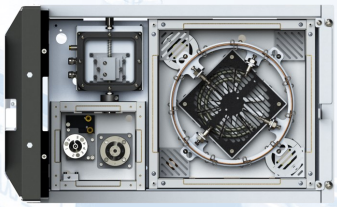
Auto Sampler



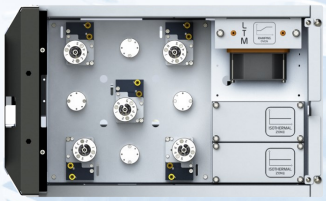
Isothermal column ovens



Ramping oven



Embedded trap and release system



LTM module

* Patent pending
** Patented

Why spending your time and money customising a GC platform instead of using that precious time to create more value for your customers. Save time and money by developing your GC application on our innovative GC platform. The iMOv platform has been designed to be modular and easy to configure with its modular thermal* zone and broad offering of standard modules.

FEATURES

- Quick and easy configuration, no mechanical work required
- Modular thermal zone concept*
  - ⇒ Up to 6 isothermal zones for columns or valves
  - ⇒ 1 convection ramping oven
  - ⇒ Up to 2 Low Thermal Mass modules
- Up to 6 chromatographic valves
  - ⇒ Pneumatic or electrical actuation
- Up to 5 Electronic Pressure Controllers
- Up to 3 gas detector
  - ⇒ Epd**, ePID*, eDID**, TCD, FID, others
- Designed for 19'' rackmount or benchtop
- Embedded robust GC software
  - ⇒ Designed based on system redundancy for reliability
- I/O modules
  - ⇒ Isolated 4-20 mA outputs, Relay board, RS-232, Ethernet, Modbus
  - ⇒ External sampling system control

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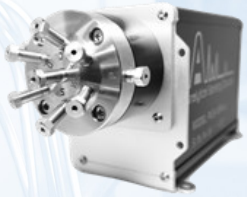
REAR SPACE VOLUME AND BACKPLATE

- Electronics flow and pressure controller
- Detectors
- Chromatographic Processing Module (CPM)
- Tubings and fittings

LipLok™ FITTING TECHNOLOGY

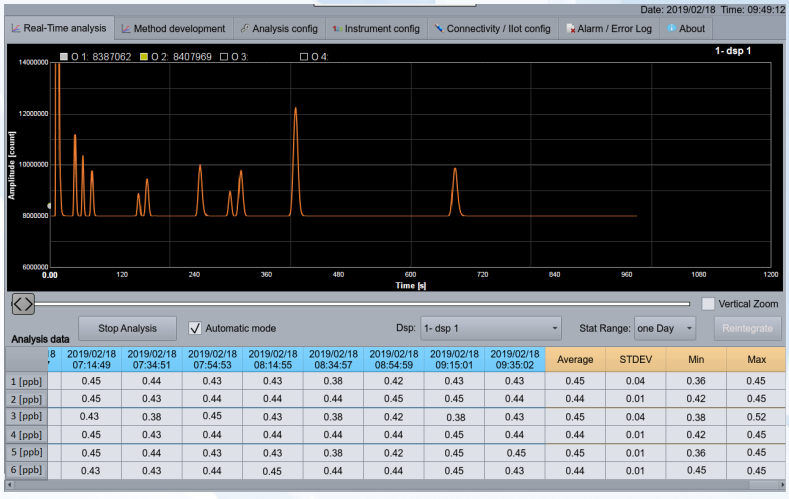


µInProve™

Purged EPC

FRONT PANEL

- ASDChrom Embedded GC Software
  - ⇒Industrial real-time operating system
  - ⇒Designed based on redundancy for reliability
  - ⇒Advanced signal processing
  - ⇒IIoT
  - ⇒Industrial grade touchscreen display
- Removable door for easy access
- USB ports



	2019/02/18 07:14:49	2019/02/18 07:34:51	2019/02/18 07:54:53	2019/02/18 08:14:55	2019/02/18 08:34:57	2019/02/18 08:54:59	2019/02/18 09:15:01	2019/02/18 09:35:02	Average	STDEV	Min	Max
1 [ppb]	0.45	0.44	0.43	0.43	0.38	0.42	0.43	0.43	0.45	0.04	0.36	0.45
2 [ppb]	0.45	0.43	0.44	0.44	0.44	0.45	0.45	0.44	0.44	0.01	0.42	0.45
3 [ppb]	0.43	0.38	0.45	0.43	0.38	0.42	0.38	0.43	0.45	0.04	0.38	0.52
4 [ppb]	0.45	0.43	0.44	0.44	0.44	0.44	0.45	0.44	0.44	0.01	0.42	0.45
5 [ppb]	0.45	0.44	0.43	0.43	0.38	0.42	0.45	0.45	0.45	0.01	0.36	0.45
6 [ppb]	0.43	0.43	0.44	0.45	0.44	0.44	0.45	0.43	0.44	0.01	0.45	0.45

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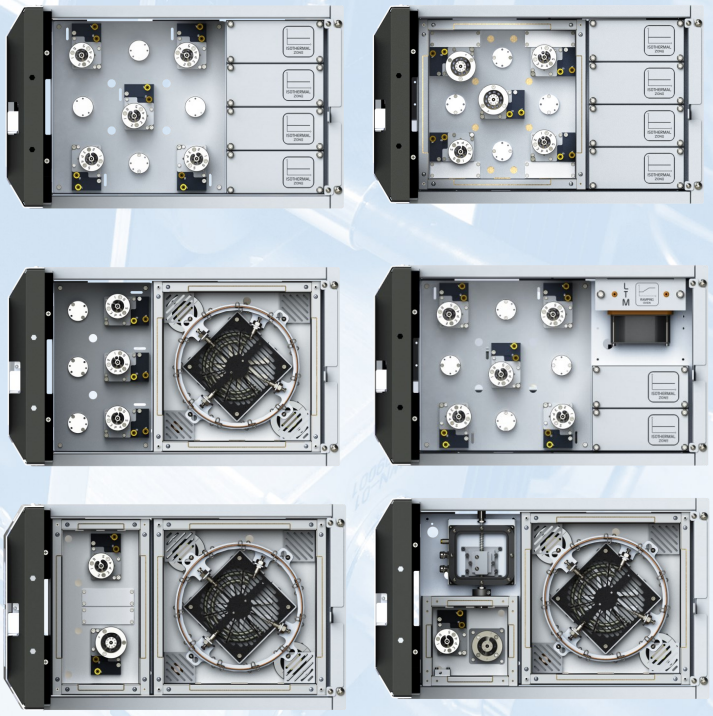
COVER AREA

- Chromatographic inlet
- Autosampler
- Detector (Lab version only)
- Leak detection system

MODULAR THERMAL ZONE*

- Up to 6 independent zones
- Isothermal ovens for columns
- Isothermal ovens for valves
- Convection ramping oven
- Up to 2 Low Thermal Mass (LTM) module



* Patent pending
** Patented

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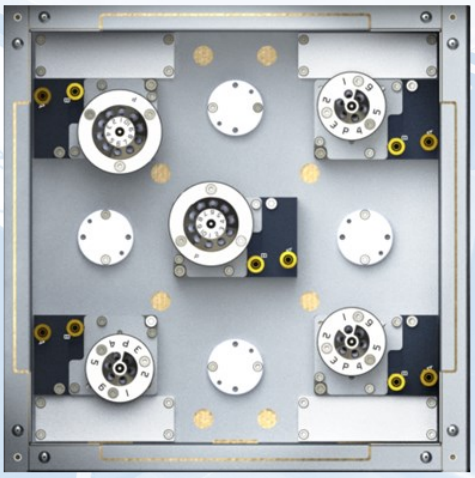
MODULAR

ADAPT THE MODULAR THERMAL ZONE* TO SUIT YOUR APPLICATION AND DESIGN A ROBUST AND COST-EFFECTIVE SOLUTION.

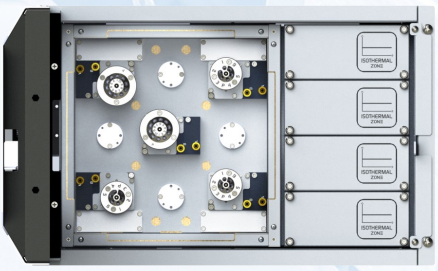
1x2 isothermal oven

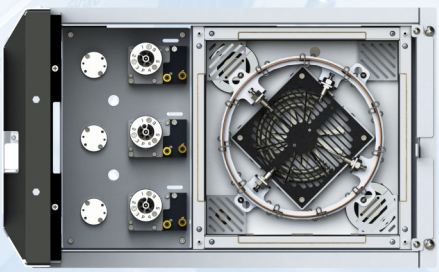


2x2 isothermal oven

* Patent pending
** Patented

CONFIGURATION EXAMPLES. MANY MORE POSSIBLE.





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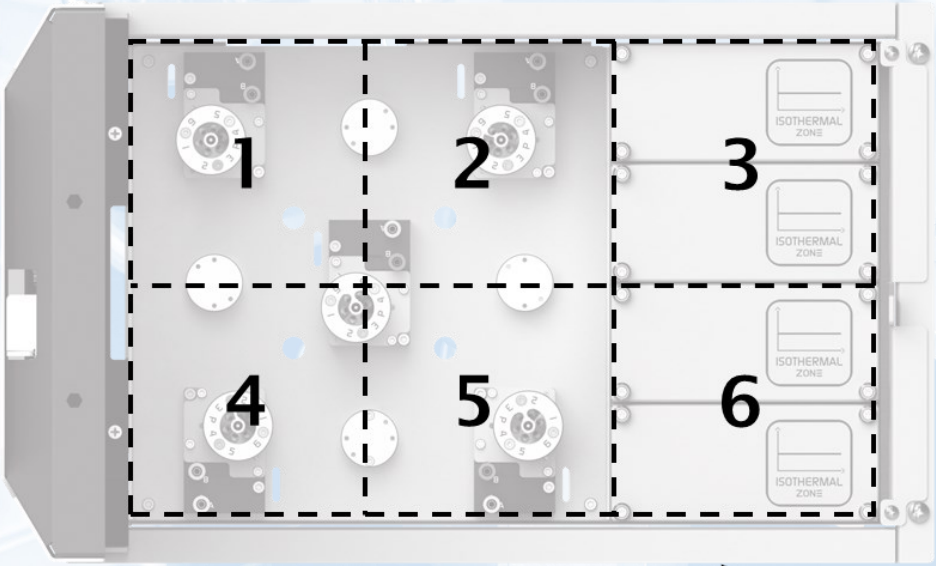
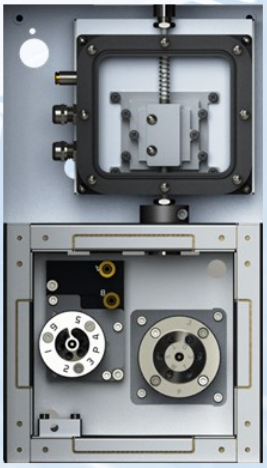
1x0.5 isothermal oven

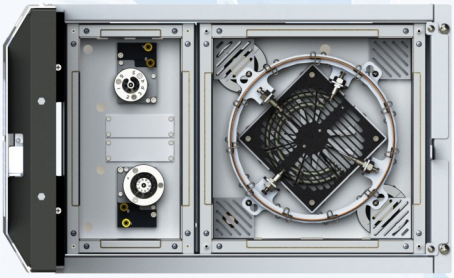
2x2 ramping oven

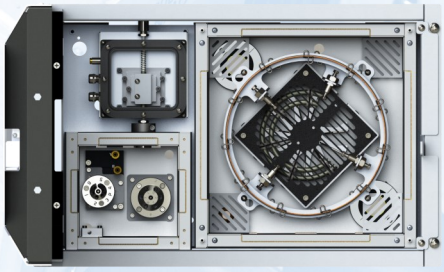


LTM module



Trap and Release module





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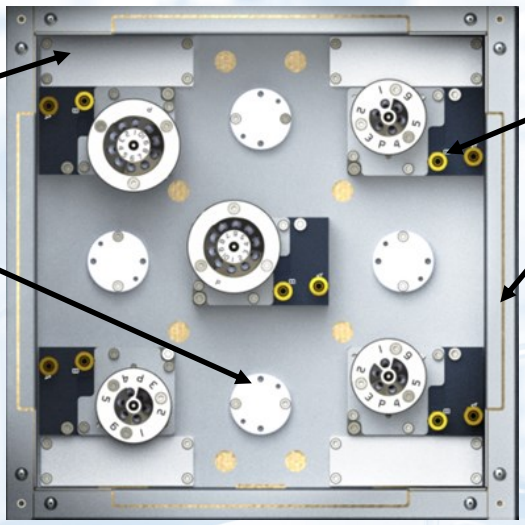
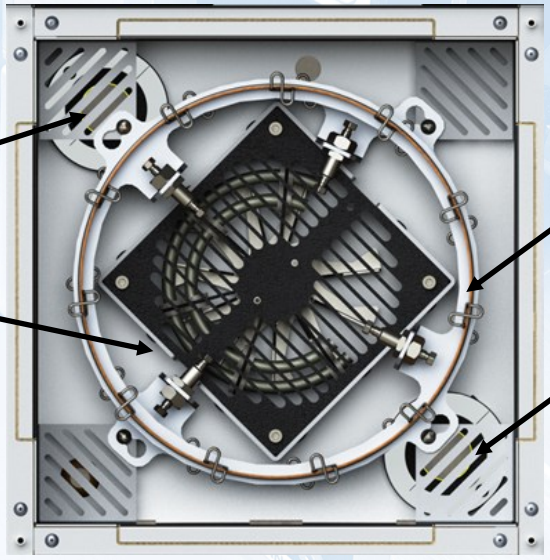
ISOTHERMAL OVEN



- Designed to fit chromatographic valves, fittings and chromatographic columns
- Maximum temperature: 250 ˚C
- 4 dimensions available: 1x0.5, 1x1, 2x1, 2x2
- Integrated mounting holes

CONVECTION RAMPING OVEN



- Designed to fit capillary, micropacked and packed column
- Maximum temperature: 300 ˚C
- Maximum ramping rate: 50 ˚C/min
- Fast cooling design with high performance blower

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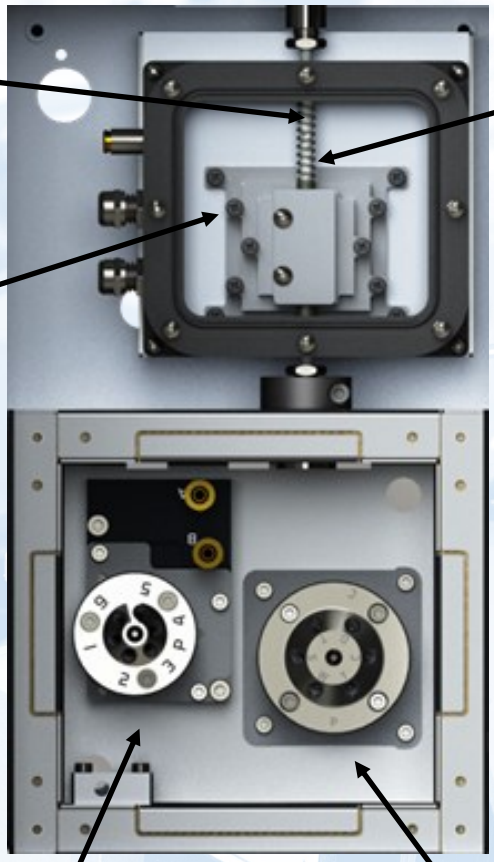
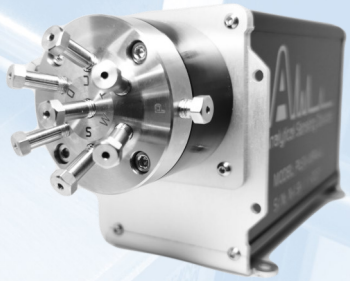
TRAP AND RELEASE MODULE



µInProve™
2 positions valve

µInProve™
Trap and Release



- High performance trap and release system based on uInProve T&R valve*
  - ⇒ Unique 4 steps sequence
  - ⇒ Cross port and inboard leak impossible
- Minimum cooling temperature: -30 ˚C
- Fast heating system design

- No cold spot between cold trap and valve
- Embedded valve heating enclosure
  - ⇒ 1x uInProve T&R valve
  - ⇒ Optional uInProve 2 positions valve
- Focusing trap available with different materials

* Patent pending
** Patented

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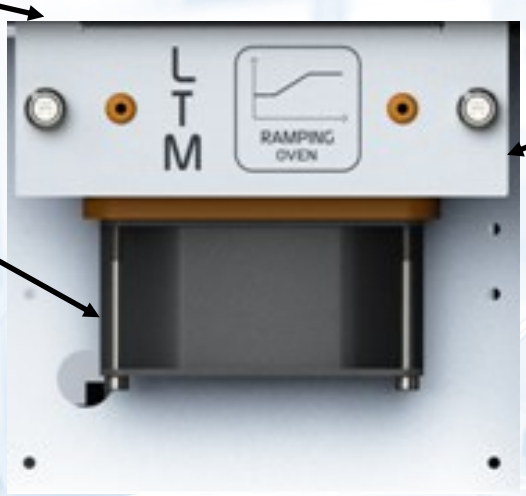
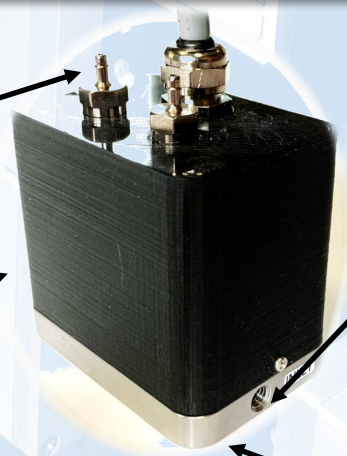
LTM MODULE



- Low Thermal Mass (LTM) column module.
- Fast heating and cooling design
- Compact column ramping solution
- iMOv chassis can support up to 2 LTM modules
- Maximum temperature: 300 ˚C

PURGED ELECTRONICS PRESSURE CONTROLLER (EPC)



- No leak - Inboard/outboard with purged enclosure design
- Inline or bypass control configuration
- 30 PSIG or 100 PSIG sensor version
  ⇒ Temperature compensated
  ⇒ Stainless steel diaphragm construction
- No dead or unswept volume
- Unique purged inline configuration
  ⇒ Reduces by as much as 50% carrier gas consumption with inline pressure control compared to bypass control
  ⇒ The leak proof design allows to use inline pressure control for UHP applications instead of bypass control mode

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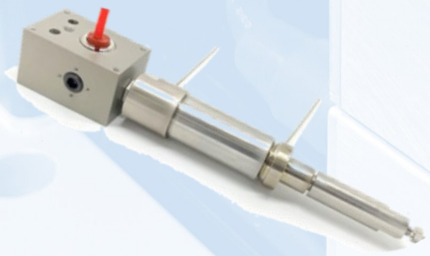
DETECTORS

ASDevices SePdd Detector**

- Duo, Quattro and Twin versions available.
  ⇒With Twin version, you have 2 detectors for the price of one
- Replaces DID, PDHID, ECD, FPD, SCD, FID, TCD, Mass Spectrometer and former PED technologies
- Unique compound electrode that can withstand high temperature and high pressure
- ppt to % measurement range
- Selective or universal
- Compatible with argon, helium, nitrogen, oxygen, hydrogen carrier
- Works also at sub-atmospheric pressure
- Unique doping flow path optimised for capillary columns*

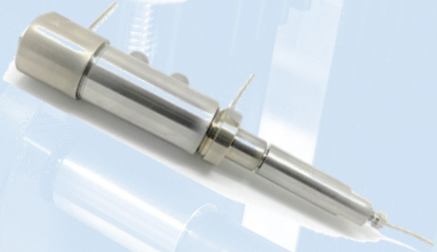
ASDevices eDID**

- Enhanced Discharge Ionisation Detector**
- Combine plasma emission and universal ionisation
- Tunable photon energy



ASDevices ePID*

- Electrical Field Enhanced Photo Ionisation Detector*
- No UV source replacement
- No lamp maintenance

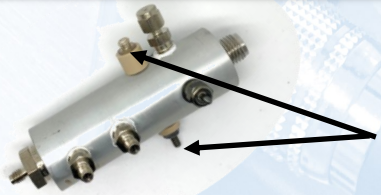


ASDevices TCD

- Differential TCD design
- Temperature controlled
- Highly stable electronics conditioning circuit

ASDevices DIFFERENTIAL FID

- Low drift and improved noise with differential collector and electrometer design*
- Low noise and low drift logarithmic current electrometer
- Temperature controlled



* Patent pending
** Patented

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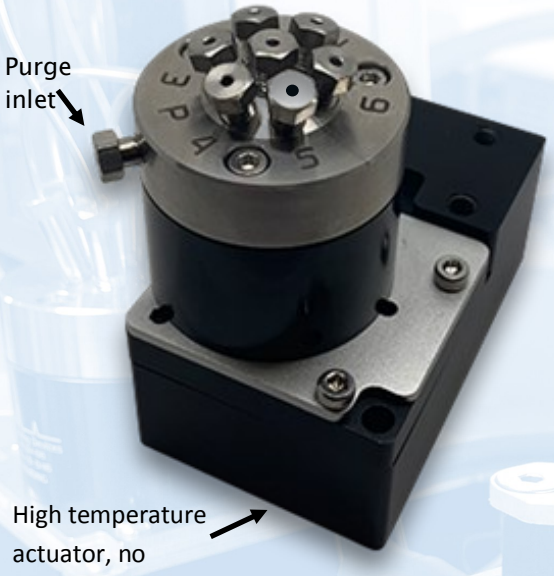
VALVES

PLSV VALVE TECHNOLOGY*



THE MOST RELIABLE AND DURABLE ANALYTICAL VALVE TECHNOLOGY

- **No leak** - Inboard/outboard and cross port leaks are impossible
- **Long lifetime** - Over 1 million actuations
- **Constant pressure drop** - No change in pressure/flow drop characteristic
- **No dead volume** - Internal flow path contains no unswept volume

Ppdv DIAPHRAGM VALVE *

From the inventor of the first purged diaphragm
Lowest cost on the market (including integration)

THE LATEST INNOVATION IN THE DIAPHRAGM VALVE TECHNOLOGY

- **STATIC PURGE DESIGN**
  - ⇒ Minimises purge gas consumption, reduces operation cost especially when helium is used.
  - ⇒ No extra plumbing hardware required to supply the purge gas. Reduces overall integration cost.
  - ⇒ Always keeps inert atmosphere inside the valve.
- **NEW PLUNGER DESIGN**
  - ⇒ Free compressible plunger
  - ⇒ Pushes over the entire surface area
  - ⇒ Grooved plunger to allow easy purge flow around them.
- **LONG TERM STORAGE PRESSURE RELIEF MECHANISM**
  - ⇒ Avoid diaphragm deformation when the valve is at rest.
- SS300 SERIES TREATED VALVE HEAD
  - ⇒ Eliminates surface adhesion problem of diaphragm.

* Patent pending
** Patented

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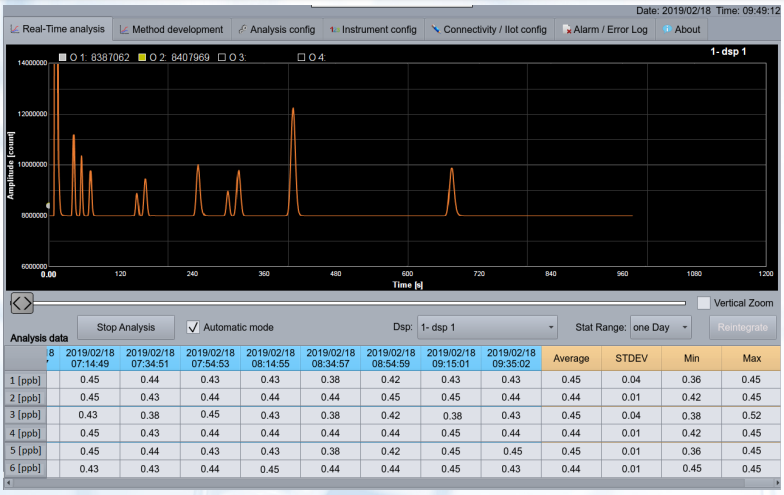
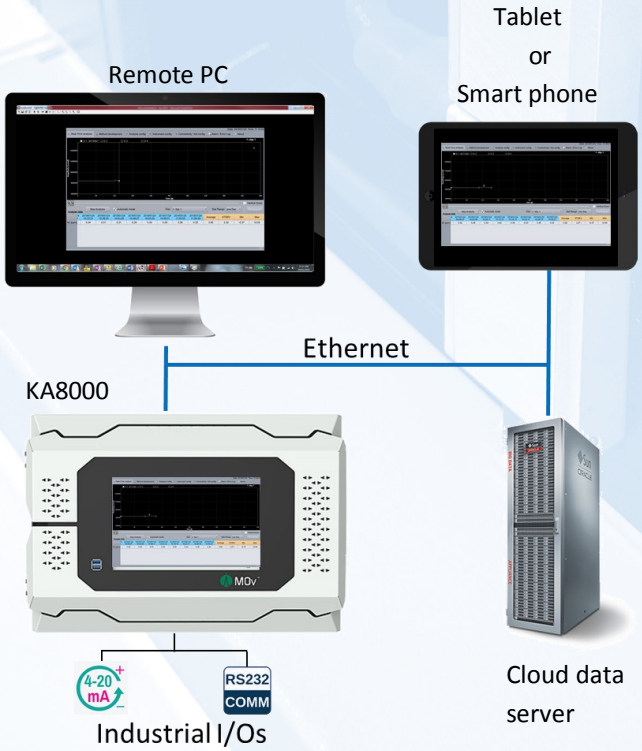
ASDChrom EMBEDDED GC SOFTWARE

RELIABILITY

EMBEDDED PROCESS GC SOFTWARE

- Industrial Real-time operating system
- Designed based on system redundancy for reliability
- Multi-method capability
- Advanced signal processing
  - ⇒ Peak remodeling*
  - ⇒ Enhanced LOD algorithm based on noise pattern learning
- Touchscreen enable
- Automatic alarm and error monitoring
- Internal and external data storage
- IIoT ready
- External sampling system control

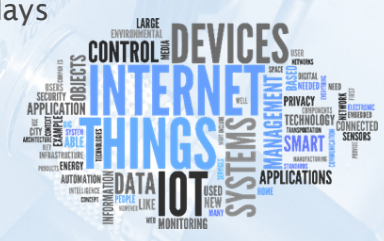




CONNECTIVITY

INTERNET OF THINGS READY

- BigData
- Remote alarm notification
- Remote monitoring
- Support MQTT protocol
- RS-232, RS-485
- Modbus
- Isolated 4-20 mA outputs
- Digital dry contact relays



*patent pending

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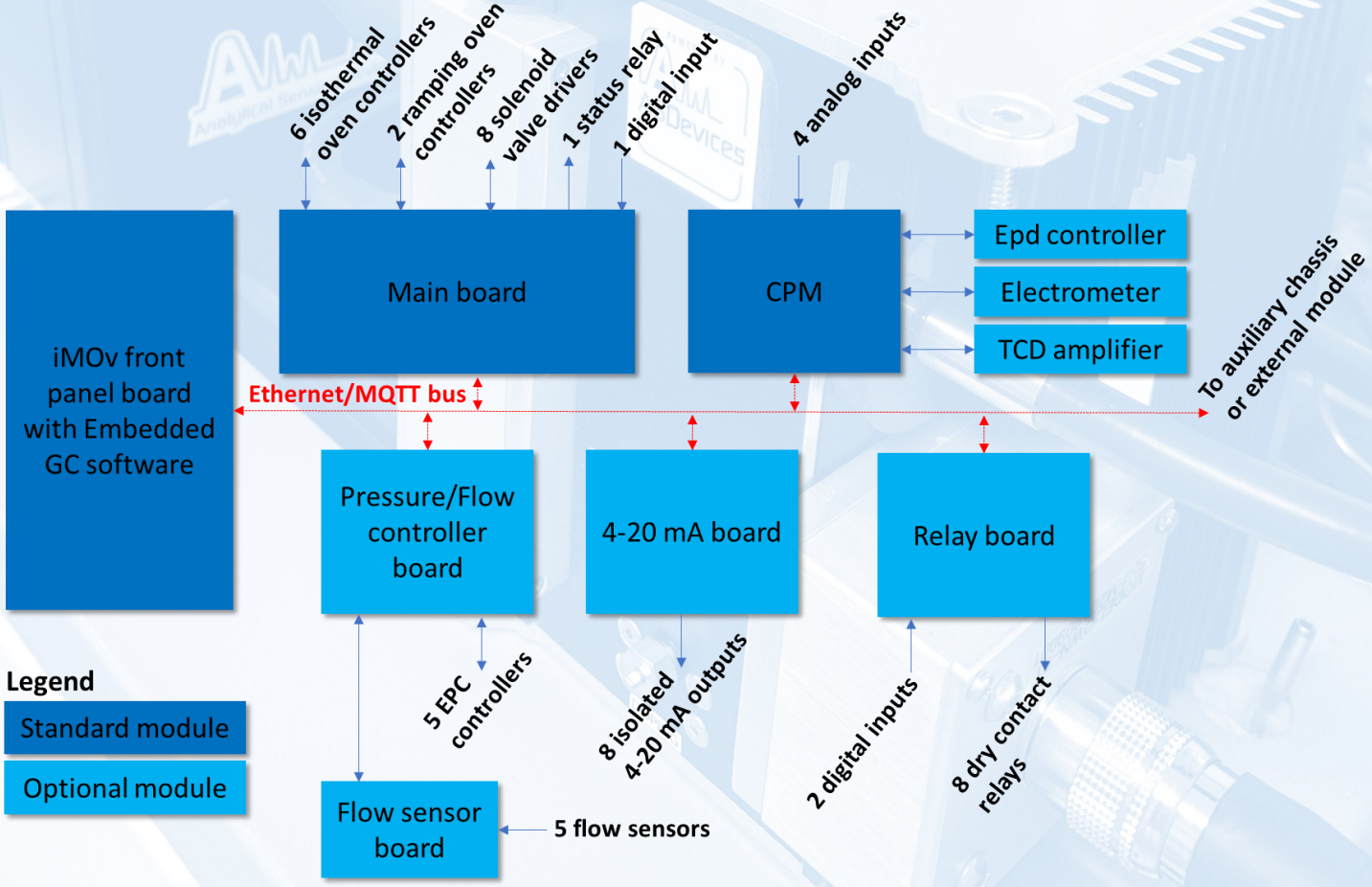
MODULAR HARDWARE ARCHITECTURE CONCEPT

MODULARITY

MODULAR HARDWARE ARCHITECTURE CONCEPT

The modularity is not only in the modular oven, the entire architecture is modular. The plug and play philosophy allows you to plug-in the modules that you need. You only need to select from our list of standard modules.

- Connect an auxiliary iMov chassis (up to 4) for complex GC applications
- Pressure/Flow controller module
- Chromatographic Processing Module (CPM)
- Oven and valve controller
- Dry contact relay modules
- Isolated 4-20 mA output modules
- Connect and control an external sampling system
- Connect and control an external dilution system
- Auto-sampler
- Other custom modules available



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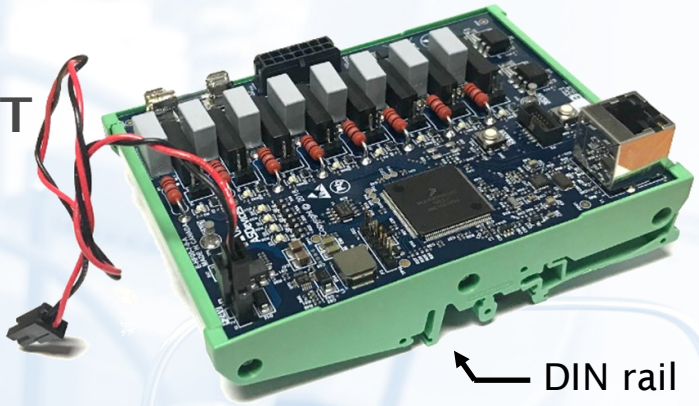
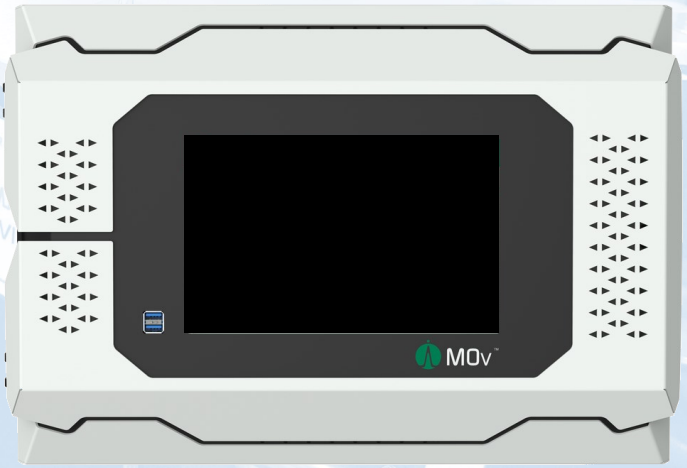
PLUG AND PLAY

DIN RAIL HARDWARE MODULE DESIGN FOR EASY AND ROBUST CONFIGURATION

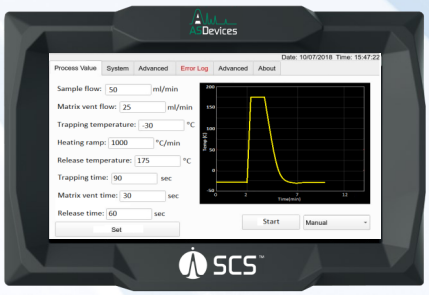


iMOv main chassis

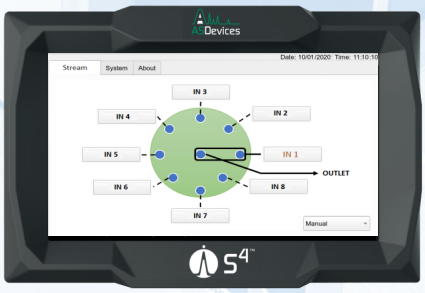
iMOv auxiliary chassis (up to 4)



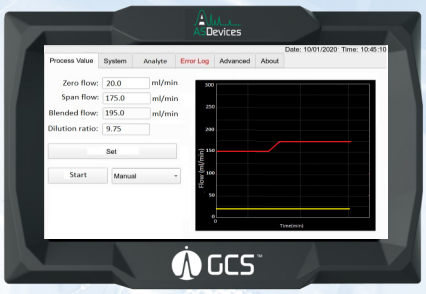
Ethernet / MQTT Bus



Sample concentrator



Sample Stream Selection



Calibration system

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AUTOSAMPLER

OUR AUTOSAMPLER IS DESIGNED FOR ANALYTICAL LABORATORY APPLICATIONS. DUE TO ITS FLEXIBLE DESIGN, IT CAN EASILY BE DEPLOYED IN A MULTITUDE OF APPLICATIONS.

FEATURES

- Autosampler controlled by iMOv GC
- Static Head space, heated syringe and gas rinsing of syringe
- General purpose liquid autosampler
- With or without sub-ambient cooled tray
- Designed for robustness
  - ⇒ Reliable positioning
  - ⇒ Industrial motors and electronics
- Syringe size: 2 ul to 5 ml

APPLICATION

- Transformer oil analysis
- Forensic analysis
- Boar taint compounds
- Residual solvent in packaging
- Environmental analysis

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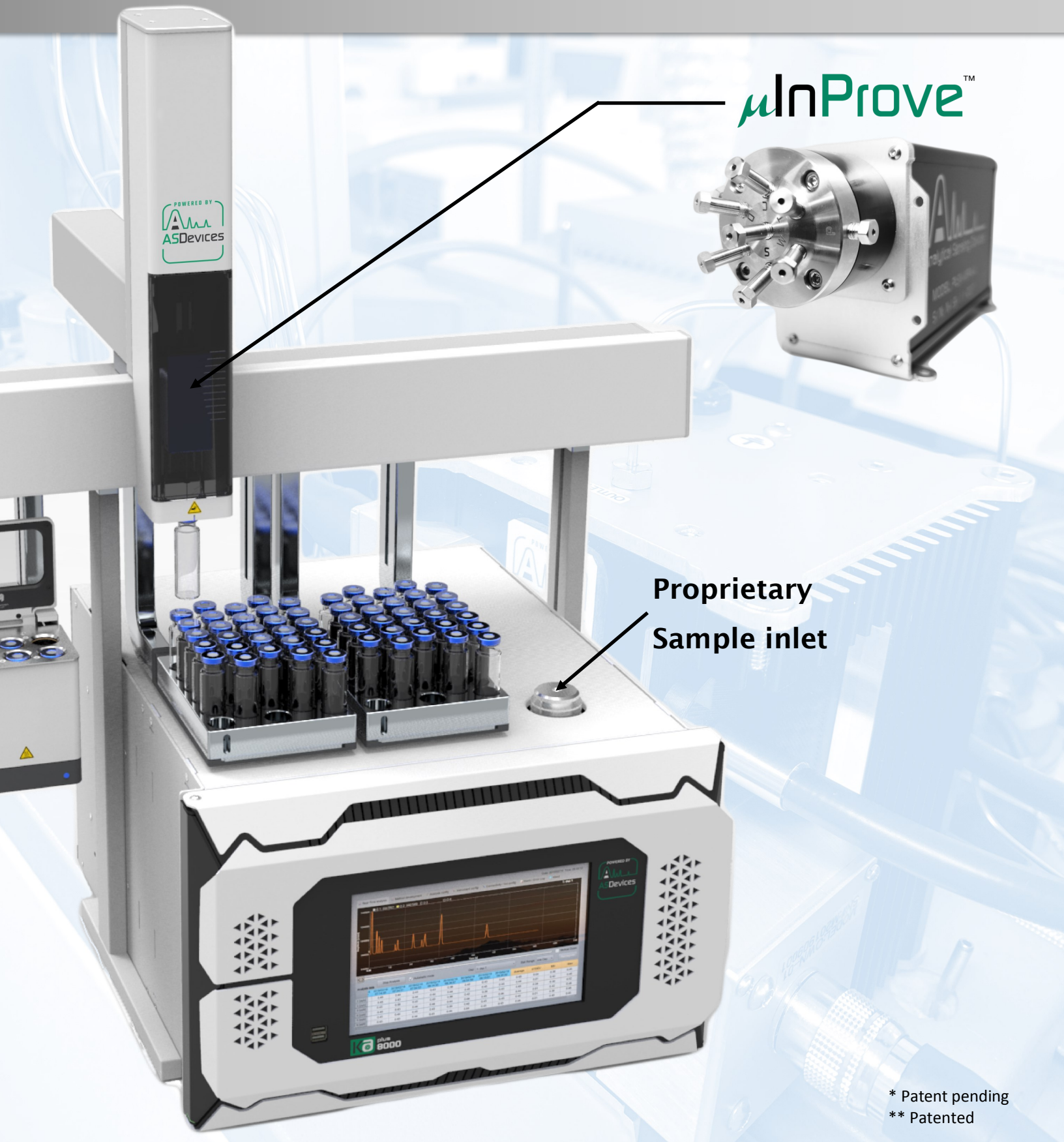

* Patent pending
** Patented

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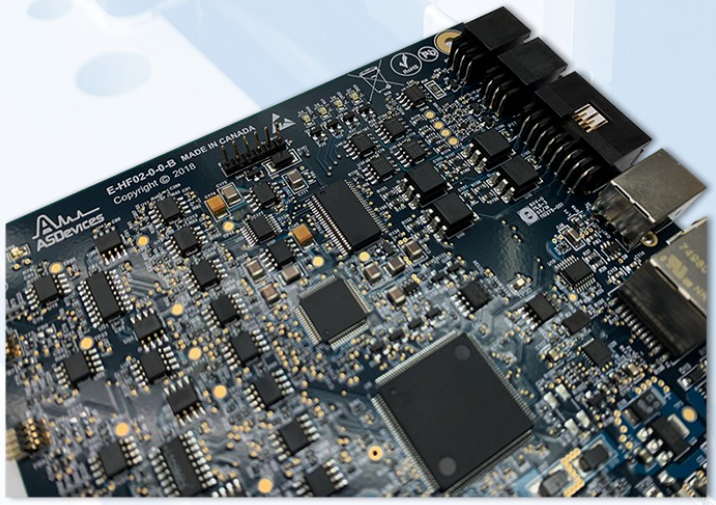
STATE-OF-THE-ART ELECTRONICS

PERFORMANCE

THE MOST ADVANCED GC SIGNAL PROCESSING PLATFOM

We have over thirty years of experience in electronics design. This platform is the combination of our expertise with the latest advanced in electronics design. The best electronics components have been carefully integrated in this innovative state of the art design. All components are industrial grade and consequently available for the long term.

- 4x simultaneous and synchronous 24 bits, 50 kHz ADC
- Configurable analog gain
- High-speed ARM processor with RTOS
- Ultra stable ADC voltage reference
- Low temperature coefficient components
- Adjustable second order filter
- On demand zero offset cancellation
- Learning algorithm that improves SNR from previous analysis
- Digital Signal Processing unit
  - ⇒Enable spectral compensation proprietary algorithm
  - ⇒Baseline drift cancellation
  - ⇒Peak remodeling algorithm*



QUALITY

ROBUST AND HIGH QUALITY ELECTRONICS DESIGN

Industrial grade components

- Long-term supply chain availability
- Designed to meet international electronic standards
- CE and ROHS compliant

* Patent pending
** Patented

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APPLICATIONS

< 1 ppb LDL PERMANENT GAS ANALYSIS WITH ARGON CARRIER

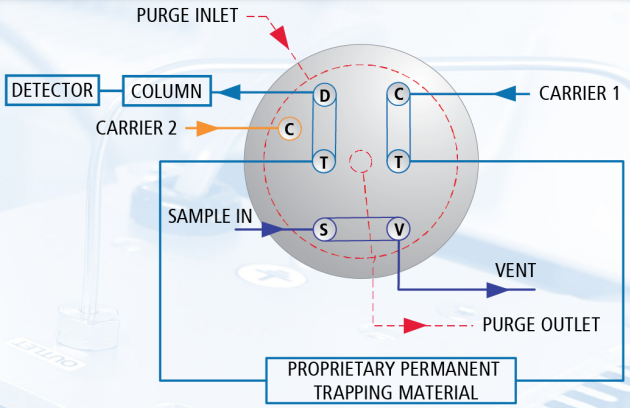
Helium is the carrier gas of choice for most chromatographic systems that need to measure permanent gases to below 1 ppb limit of detection. Unfortunately, helium is expensive.

With ASDevices innovative uInProve T&R technology in combination with a proprietary trapping material that can concentrate permanent gases and Epd sensing technology, it is now possible to achieve ultra-low limit of detections in chromatographic systems that are simpler and more economical to operate.

Below is an example where N_2, CH_4 and CO are measured using our technologies. The unique sample matrix venting feature of the uInProve T&R allows the hydrogen matrix to be vented while our unique trapping material allows permanent gas concentration and hence < 1 ppb limit of detection.

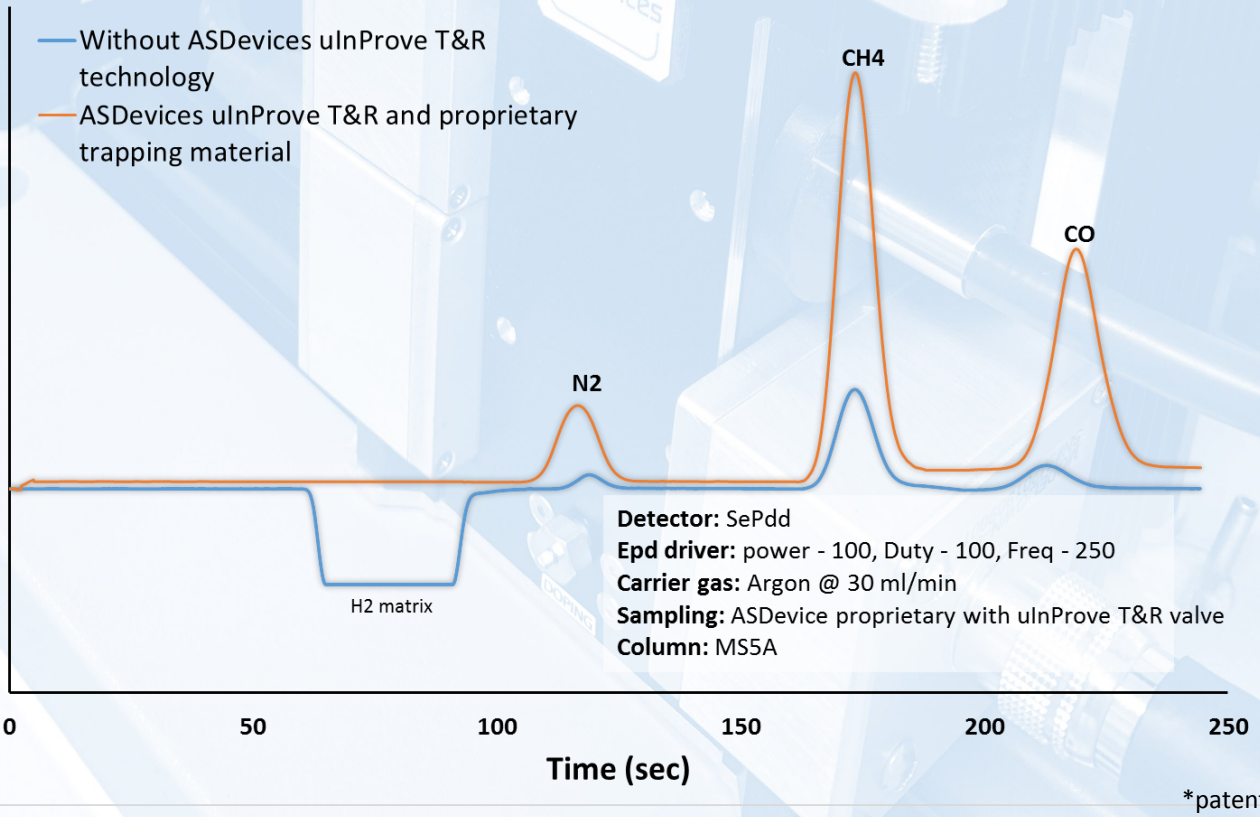
FEATURES

- Uses low cost argon carrier instead of expensive helium
- Uses uInProve T&R valve technology*
- Uses ASDevices proprietary trapping material



Chromatographic configuration with µInProve T&R valve

UHP H2 ANALYSIS BASED ON ASDevices µInProve T&R and TRAPPING MATERIAL
50 PPB REFERENCE GAS MIXTURE IN H2



*patent pending

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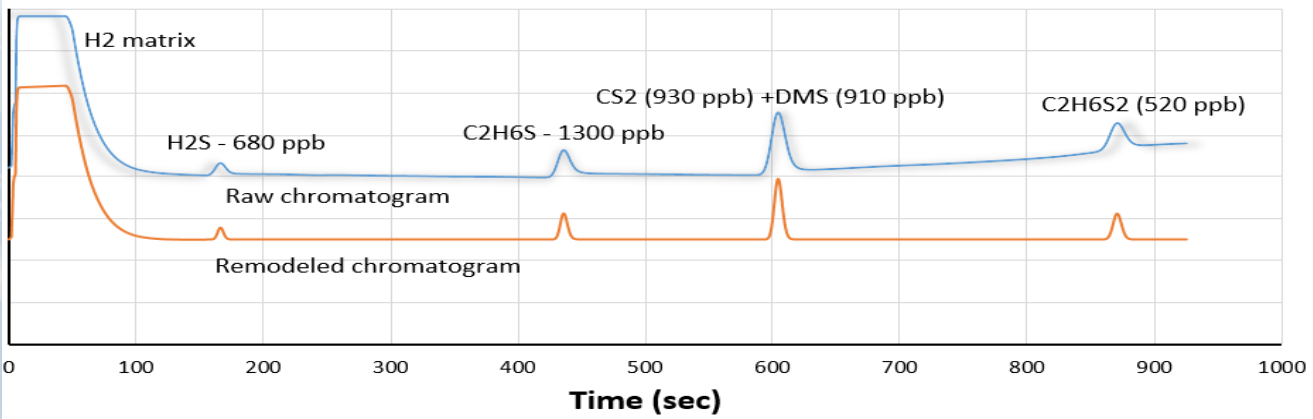
APPLICATIONS

SULFURS IN HYDROGEN FOR FUEL CELLS

Sulfurs are known to be poisonous for fuel cell. It is consequently necessary to measure many sulfurs at trace levels with limit of detections of below 4 ppb. This is now possible with ASDevices technologies.

FEATURES

- < 4 ppb limit of detection for H_2S
- No sample concentrator required
- No combustible gas required to operate the detector, only carrier gas



ANALYSIS OF BTEX IN AMBIENT AIR

BTEX are known polluants that need to be measured in ambient air. This measurement is often perform for fence line monitoring. FIDs are traditionally used but they require hazardous hydrogen fuel and air for combustion. This application is now performed on an iMOv chassis with SePdd sensing technology.

FEATURES

- < 0.5 ppb limit of detection for BTEX
- No combustible gas required to operate the detector, only carrier gas

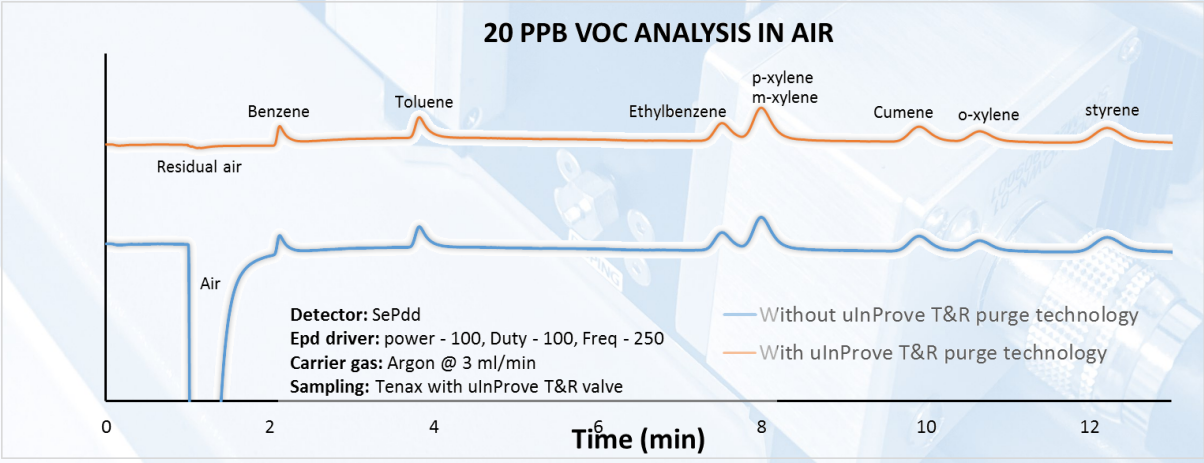


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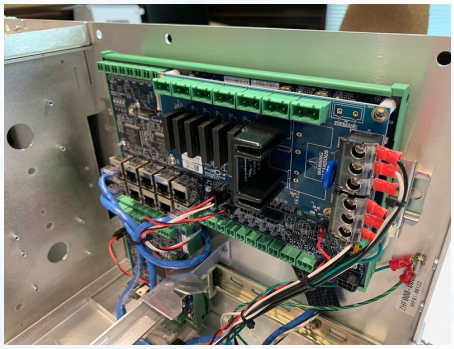
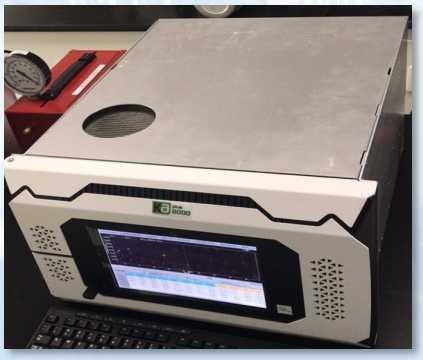
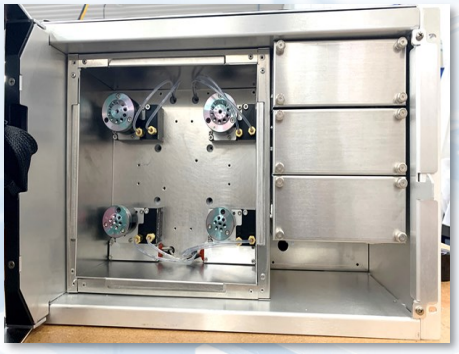
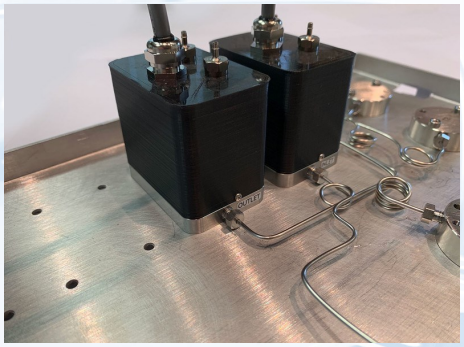
PHOTO GALLERY









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SPECIFICATIONS

Modular thermal zone*	• 6 Configurable and independent thermal zones • 4 types of isothermal ovens • Convection ramping oven • LTM module • Embedded Trap and Release module • Sample line heating capability
Number of detectors	Up to 3
Detector type	SePdd**, eHid**, ePid*, TCD, FID
Number of chromatographic valves	Up to 6 Designed for PLSV* and Ppdv* technologies
Fittings	Up to 9 Liplok* bulkhead (Double ferrule backward compatible)
Electronics Pressure Controller	Up to 5
Chassis configuration	Rackmount 19'' or benchtop
Standard I/Os	RS-232 1x Digital input 1x Digital output Ethernet (Remote control, IIoT)
Optional I/Os	Modbus Isolated 4-20 mA outputs Dry contact relays
Embedded GC Software	• Industrial Real-Time Operating System • Designed based on system redundancy for reliability • Multi-methods capability with automatic sequencing synchronised with sampling system • Advanced signal processing • Touchscreen interface
Optional modules	• Autosampler • SCS: Sample Concentration system • S^4: Intelligent Sample Stream Selection System • GCS: Intelligent Gas Calibration System • Internal dilution system • Optional external laboratory software package
Voltage	120 / 220 VAC
Compliance	CE and ROHS compliant

* Patent pending
** Patented

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