KA SOLUTIONS — INTEGRATED TURNKEY ANALYTICAL SYSTEMS FOR END USERS BASED ON ASDevices TECHNOLOGIES

KA8000—LABORATORY OR PROCESS GC

KA6000—RACKMOUNT PROCESS GC

KA5000—COMPACT PANELMOUNT PROCESS GC

KA Solutions are fully integrated turnkey analytical solutions for end users. Based on ASDevices OEM components which comprise sampling system, sample pre-treatment system, calibration system, GC platforms, detectors, purifiers, fittings and valves, they are designed to deliver unsurpassed performance, quality and ease of use.

APPLICATIONS

- Permanents in argon, helium, hydrogen, nitrogen, oxygen, krypton and neon
- Ultra fast Crude argon
- Permanents in speciality electronics gases such as silane
- Light hydrocarbons in oxygen
- Sulfurs in hydrogen and other matrixes
- Permanents in UHP electronics bulk gases
- Trace moisture analysis
- Food and beverage
- Medical
- Many others possible

OVERALL TURNKEY SOLUTION FEATURES

- The most cost-effective solutions
- The most comprehensive features
- Based on high quality proven components
- Based on over 30 years of experience
- Powered by ASDevices unique technologies
- Industrial fail-safe GC software designed on system redundancy
- Industrial electronics design and components for long term reliability and parts availability
- RS-232, RS-485, Modbus, Ethernet
- Reduced carrier gas consumption, recirculation possible
- Control and monitoring of external accessories such as sampling system, calibration system, purifier, sample concentrator, etc...

SOLUTIONS ARE POWERED BY HIGH QUALITY AND INNOVATIVE OEM COMPONENTS FROM ASDevices.

Detectors

Available

SePdd™
- Scalable Enhanced Plasma Detector**
- Unique compound electrodes*
- Metal or ceramic discharge cell

Cubed™
- Entry level Epd detector
- Double wavelength

Differential FID*
- Low drift and noise differential collector and electrometer design

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

To be released

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

eDID
- Enhanced Discharge Ionisation Detector*
- Combine Plasma emission and universal ionisation detector
- Tunable photon energy

Capillary detector*
- Epd detector optimised for capillary columns*

PEID
- Pulse Electron Impact Detector
- Selective detector with tunable ionisation energy

Purifiers

ASDPure™
- Dual stage purification
- No H_2 release
- 300, 1000 and 5000 ml/min version

PAPS™
- First purifier with real time end of life detection*
- Optional extended life time*
- Dual stage purification
- No H_2 release
- 5000 ml/min version only

KnightGas
- Bulk gas purifier quality monitoring system

GC platform

MOv™
- Laboratory and process Modular GC Platform*
- Benchtop or rackmount

GCSense™
- Rackmount Process GC platform

µSense™
- Panelmount Process GC platform
- Ultra compact

miniMOv™
- Entry level benchtop GC plaform

CPM
- Chromatographic Processing Module
- Advanced signal processing

Valves and fittings

µInProve™

- Cross port leak impossible
- Constant pressure drop
- Long life time

µInProve™ T&R

- Trap and Release valve
- Concentrate permanents, VOCs, Sulfurs, etc
- Unique moisture measurement capability

Ppdv

- Pulse Purge Diaphram Valve*
- Static purge design*, Reduce integration cost
- Minimise purge gas consumption

LipTek™

- Backward compatible with standard Double ferrule fitting*
- Better leak integrity
- Innovative sniffing port feature

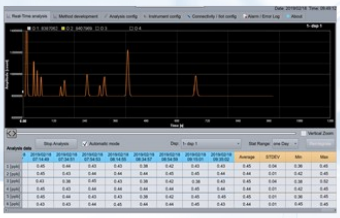
ArDSieve

- Ar/O2 separation column
- Improved durability with HydraGuard
- Plasma oxidation treatment

Software

ASDChrom

- Embedded GC Software
- Designed based on redundancy for reliability
- Real-time Operating System
- Peak remodeling method*
- AI Peak detection and filtering



ASDSense

- Windows OS platform
- Full Feature GC Software

ASDLab

- Laboratory GC Software package
- Data analysis
- Data tracability

Accessories

SCS™

- Sample Concentration System
- Use PLSV Trap and Release valve*

S4™

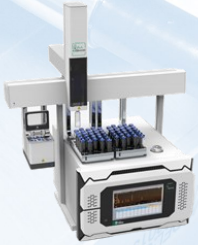
- 2,4,6,8 port sample streams
- Cross port leak impossible
- Based on PLSV technology*

GCS™

- Gas Calibration System
- Orifice or permeation tube
- No dead or unswept volume

Auto Sampler

- Static head space sampler
- Heated syringe
- Use ASDevices PLSV valve



Helium recycling*

- Recover and purify Waste helium
- Make one helium cylinder last up to 5 years

MEDICAL GRADE COMPONENTS

Gas chromatography is used for many medical applications. An example is cancer screening using trace VOC analysis in exhaled breath. For such applications, product quality and reliability is of outmost importance.

Those products are available with a medical grade certification. Those components are intended to be used in medical devices.

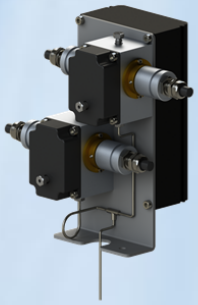
They are tested and certified under very strict rules and quality control procedures.

Those components are used by various companies such as eTraceMedical for its Exhaled Breath Analysis medical cart.

Detectors

SePdd™

- Scalable Enhanced Plasma Detector**
- Unique compound electrodes*
- Metal or ceramic discharge cell



ePID

- Electrical Field Enhanced Photo Ionisation Detector*
- No UV source replacement
- Tunable photon energy

Purifiers

ASDPure™

- Dual stage purification
- No H_2 release
- 300, 1000 and 5000 ml/min version

ASDevices medical grade components have been selected by eTrace Medical inc for their cancer diagnostic equipment.

POWERED BY ASDevices

GC platform

MOv™

- Laboratory and process Modular GC Platform*
- Benchtop or rackmount

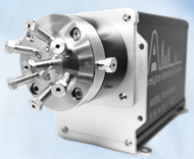
Valves and fittings

µInProve™

- The most reliable GC valve based on PLSV*
- Cross port leak impossible
- Constant pressure drop
- Long life time

µInProve™ T&R

- Unique trap and release valve design*
- Sample concentration
- Matrix removal



LipLok™

FITTING TECHNOLOGY

- Backward compatible with standard Double ferrule fitting*
- Better leak integrity
- Innovative sniffing port feature

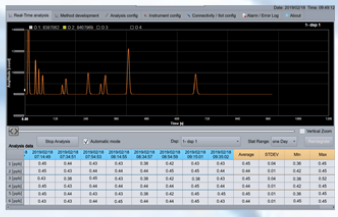
ArDSieve

- Ar/O2 separation column
- Operate above ambient temperature
- Improved durability with HydraGuard
- Plasma oxidation treatment

Software

ASDChrom

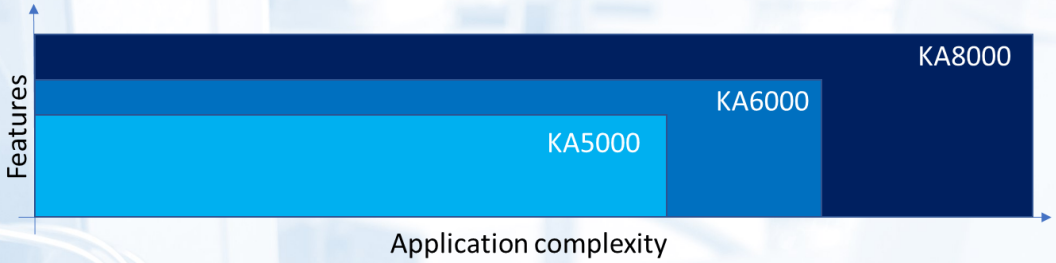
- Embedded GC Software
- Designed based on redundancy for reliability
- Real-time Operating System
- Peak remodeling method*
- AI Peak detection and filtering



*patent pending

**patented

SYSTEM SELECTION VERSUS COMPLEXITY OF APPLICATION



KA8000 - LABORATORY OR PROCESS GAS CHROMATOGRAPH

THE KA8000 SERIES, BASED ON THE iMOv PLATFORM, IS OUR MOST ADVANCED SOLUTION. ITS MODULAR OVEN DESIGN ALLOWS TO INTEGRATE 6 GC VALVES, 2 DETECTORS AND MULTIPLE PARALLEL CHROMATOGRAPHIC CHANNELS. IT ALSO OFFERS A HEATED VALVE BOX AND RAMPING OVEN.

FEATURES

- Up to 2 gas detectors and up to 4 with SePdd Quattro
- Up to 6 thermal zones, Isothermal and ramping oven capability
- Ambient or heated valve capability
- Up to 6 chromatographic valves
- All key GC components accessible from front panel for easy maintenance
- Rackmount or benchtop configuration
- Auto-sampler option

KA6000 - RACKMOUNT GAS CHROMATOGRAPH

THE KA6000 SERIES, BASED ON THE GCSENSE PLATFORM, IS AIMED FOR MEDIUM COMPLEXITY APPLICATIONS WHERE UP TO 5 VALVES ARE REQUIRED AND UP TO 2 DETECTORS.

FEATURES

- Rackmount configuration
- Cost-effective
- Up to 4 isothermal zones
- Up to 5 chromatographic valves
- Up to 2 gas detectors and up to 4 with SePdd Quattro

KA5000 - COMPACT PANELMOUNT GAS CHROMATOGRAPH

THE KA5000 SERIES, BASED ON THE µSENSE PLATFORM, IS OUR ENTRY LEVEL PROCESS GC. BASED ON HIGH QUALITY COMPONENTS, IT IS DESIGNED FOR SIMPLE APPLICATIONS THAT REQUIRE A MAXIMUM OF 3 CHROMATOGRAPHIC VALVES AND ONE DETECTOR. ITS DESIGN MAKES IT THE MOST COST-EFFECTIVE SOLUTION WITHOUT COMPROMISING ON QUALITY.

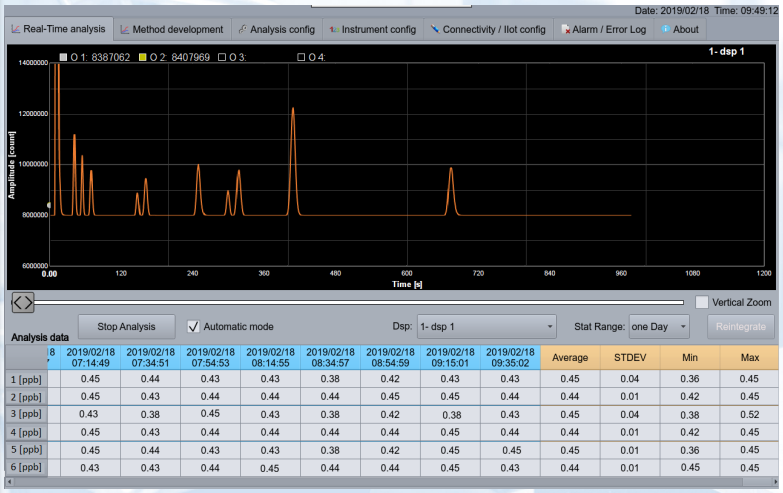
FEATURES

- Panelmount, fit two KA5000 in the space of a 19'' rack instrument
- Ultra compact
- Cost-effective
- Up to 3 isothermal zones
- Designed for simple chromatographic applications without compromise on quality
- Up to 3 chromatographic valves
- 1 GC detector, the Epd can be configured in a twin version, providing 2 detectors

GC SOFTWARE ARCHITECTURE

ALL GAS CHROMATOGRAPHS ARE DESIGNED USING THE SAME ROBUST SOFTWARE, INDUSTRIAL GRADE ELECTRONIC MODULES AND QUALITY COMPONENTS

ASDChrom—EMBEDDED INDUSTRIAL AND FULL FEATURES GC SOFTWARE



	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

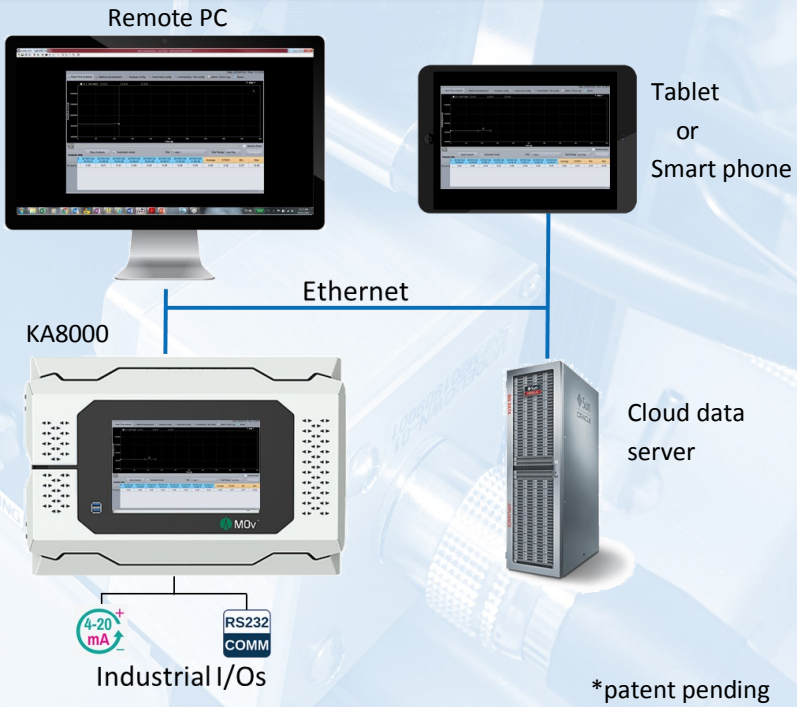
Software robustness is of the outmost importance for process chromatograph. This is something we understand very well.

- 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
- Touch screen enable
- Automatic alarm and error monitoring
- Internal and external data storage
- IIoT ready
- External sampling system control

IIoT (INDUSTRIAL INTERNET OF THINGS) READY

The software architecture has been designed for the future with the IIoT communication in mind. Standard communication is also supported.

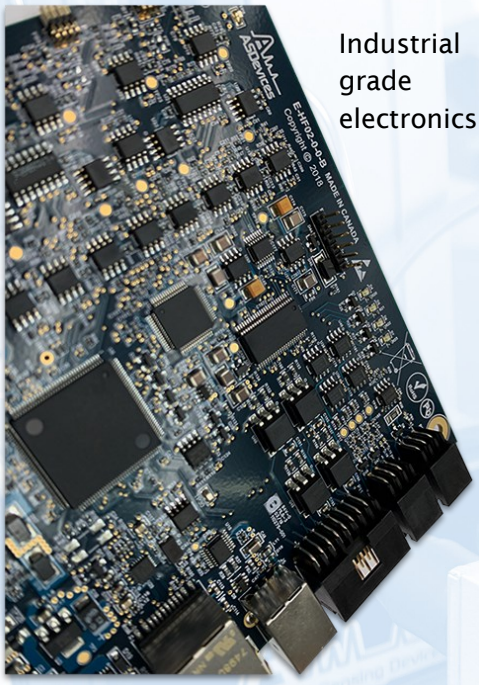
- BigData
- Remote alarm notification
- Remote monitoring
- Support MQTT protocol
- RS-232, RS-485
- Modbus
- Isolated 4-20 mA outputs
- Digital dry contact relays



*patent pending

GC ADVANCED SIGNAL PROCESSING

CPM (CHROMATOGRAPHIC PROCESSING MODULE)

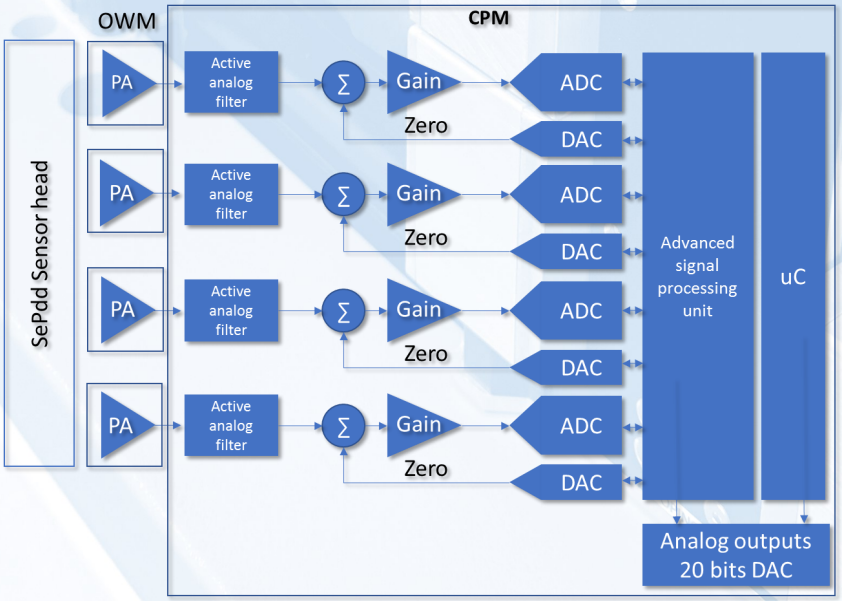


Industrial grade electronics

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
- Resistor values minimised and optimised to reduce Johnson noise
- Offset cancellation circuit, automatic or manual
- Analog and digital signal filtering
- Industrial grade components
- ROHS and CE compliant

ADVANCED SIGNAL PROCESSING

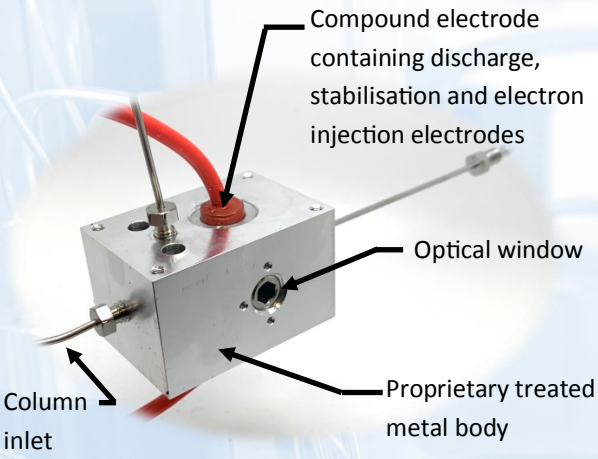


- Adjustable second order filter
- On demand zero offset cancellation
- Learning algorithm that improves SNR from previous analysis
- Peak remodeling* processing software
- Arithmetic unit
  - ⇒Enable spectral compensation proprietary algorithm
  - ⇒Baseline drift cancellation

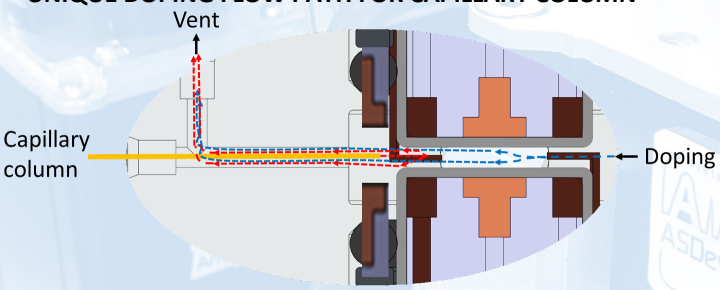
PA: Pre-Amplification
OWM: Optical Wavelength Module

GC AVAILABLE DETECTORS

ENHANCED PLASMA DISCHARGE DETECTOR*



UNIQUE DOPING FLOW PATH FOR CAPILLARY COLUMN*

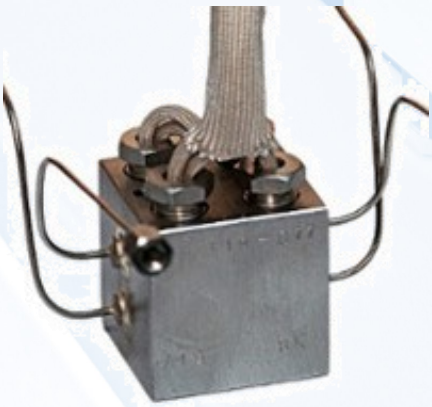


A QUANTUM LEAP FOR GAS CHROMATOGRAPHY SENSING

- 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*

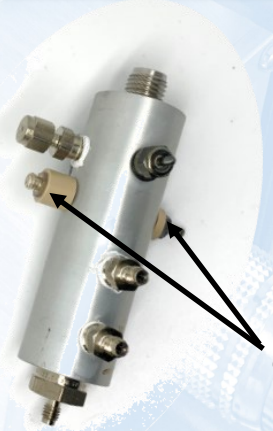
ASDevices TCD

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



ASDevices DIFFERENTIAL FID

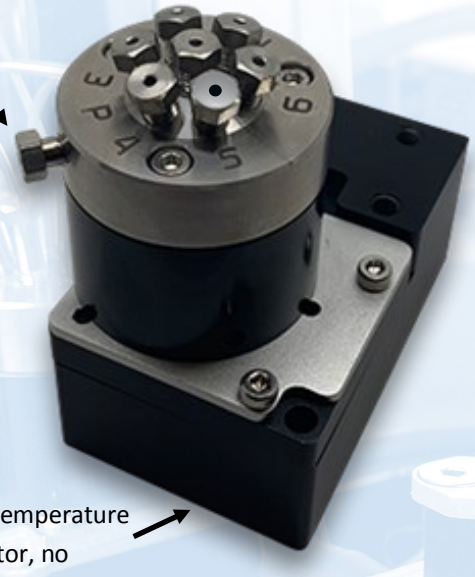
- Low drift and improved noise with differential collector and electrometer design*
- Low noise and low drift logarithmic current electrometer



*patent pending

GC AVAILABLE CHROMATOGRAPHIC VALVES

µInProve™ 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

GC HIGH LEAK INTEGRITY COMPONENTS

PURGED ELECTRONICS PRESSURE CONTROLLER (EPC)

REDUCE CARRIER GAS CONSUMPTION WITH OUR LEAK FREE EPC

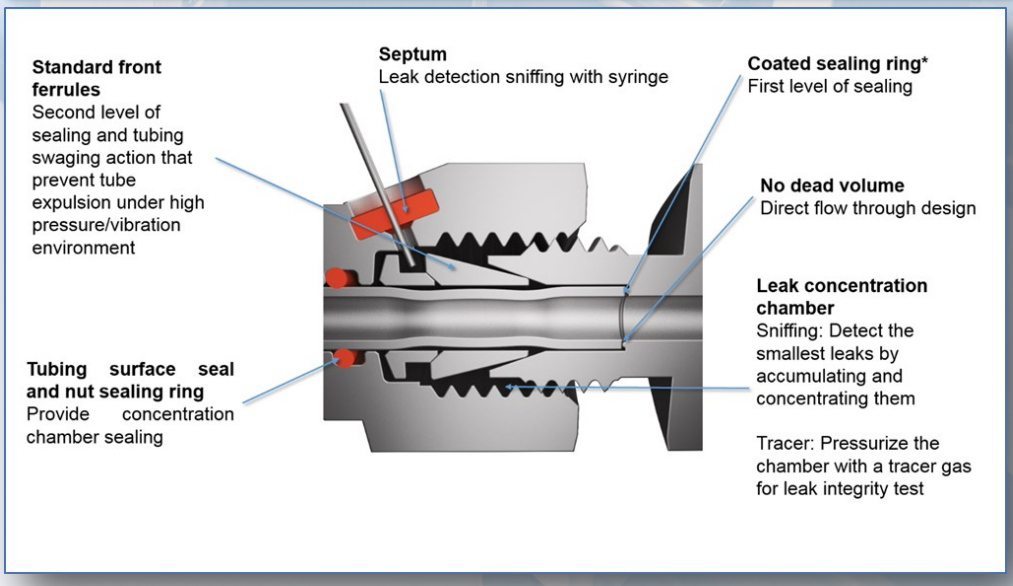
- **No leak** - Inboard/outboard with purged enclosure design
- Reduces carrier gas consumption
- Reduces by as much as 50% carrier gas consumption with inline pressure control
- The leak proof design allows to use inline pressure control for UHP applications instead of bypass control mode.
- Temperature compensated
- No dead or unswept volume
- All stainless steel wetted parts construction

LEAKPROOF DOUBLE FERRULE FITTING*

LipLok™ FITTING TECHNOLOGY

- **Backward compatible industrial/instrumentation fitting with the finess of an analytical one**
- **Better sealing integrity with sealing ring design**
- **No need for welding like face seal fitting**
- **Sniffing port through the nut having a septum for leak detection purpose**
- **Leak concentration chamber**

Combine analytical performance and robustness of legacy industrial design, with improved leak detection capability while maintaining existing system compatibility.



*patent pending

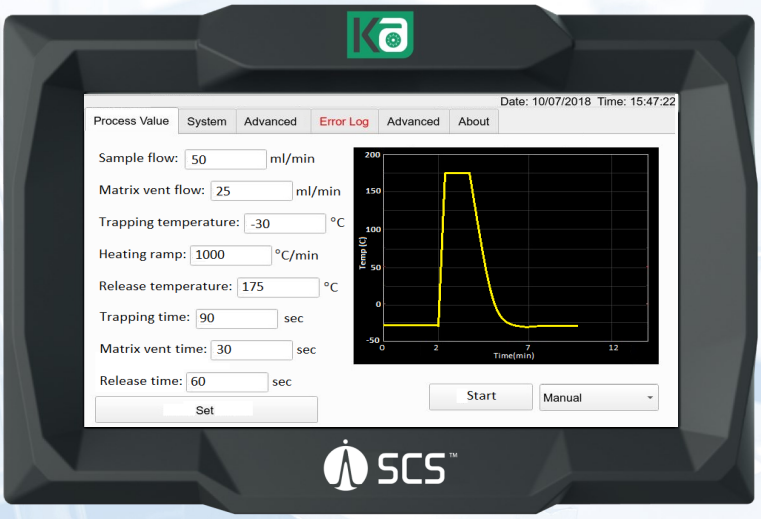
kontrol analytik

SOLUTIONS SAMPLE PRE-TREATMENT

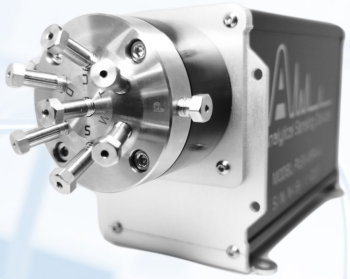
SCS™ INTELLIGENT SAMPLE CONCENTRATION SYSTEM

APPLICATIONS

- Permanents
- VOCs
- Sulfurs
- Moisture
- Hydrocarbons

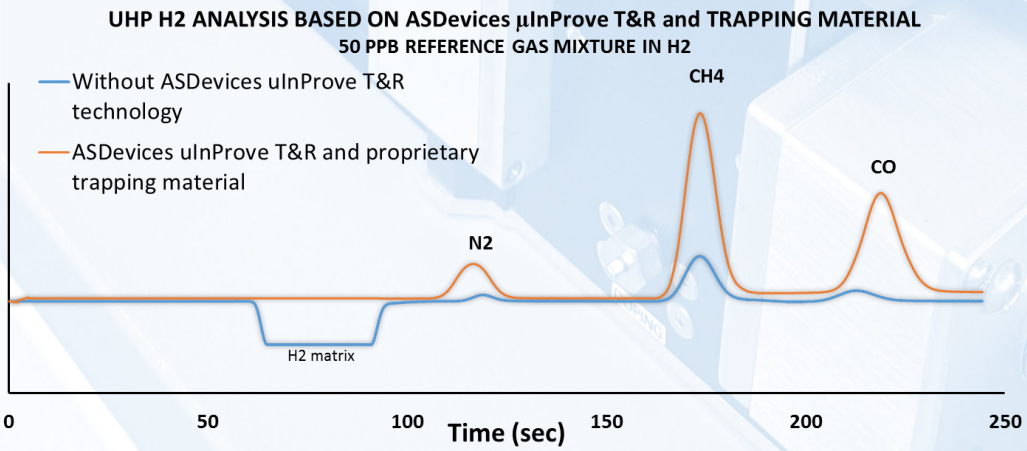


µInProve™
Trap and Release



SIMPLIFY AND IMPROVE PERFORMANCE WITH SAMPLE PRE-TREATMENT

- Enhanced sensitivity (up to 100 times) by concentrating the impurities in your sample
- Reduce application complexity by eliminating the sample matrix
- Concentrate: permanent gases, VOCs, Sulfurs, Moisture, Hydrocarbons, etc…
- Powered by ASDevices PLSV Trap and Release valve technology
- Fully automated and self-diagnostics system
- Stand alone or embedded version (iMov only)
- Trapping temperature down to –30 ˚C and Release temperature up to 300 ˚C
- IIoT ready, communicate with ASDevices architecture



UHP ANALYSIS

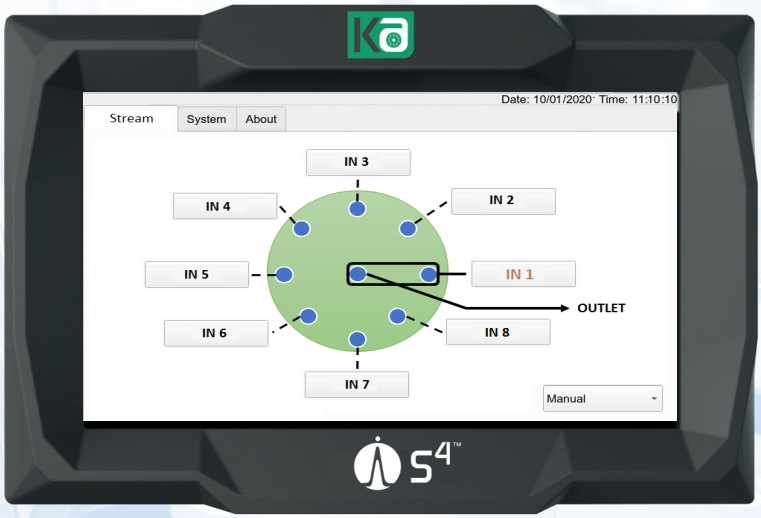
- < 1 ppb LDL
- Argon carrier gas
- Simplified chroma-tography

*patent pending

SOLUTIONS SAMPLE HANDLING AND CALIBRATION

S4™ INTELLIGENT SAMPLE STREAM SELECTION SYSTEM

UNSURPASSED SAMPLE STREAM SELECTION WITH OUR INNOVATIVE DROP-IN SOLUTION

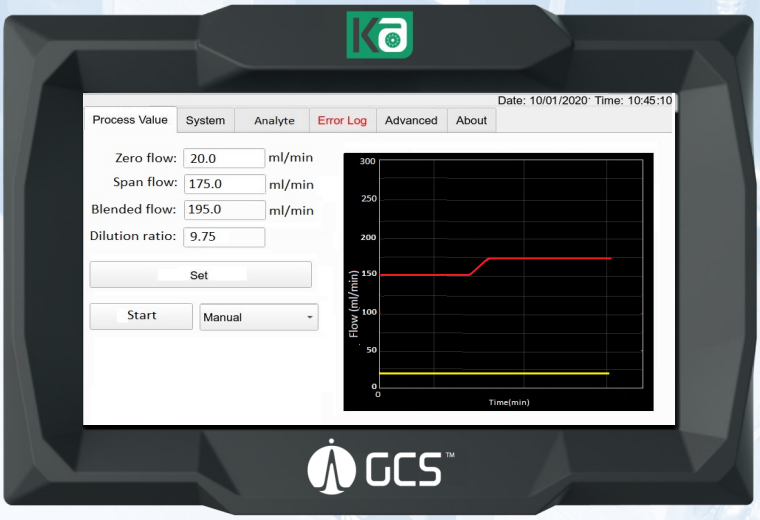


µInProve™
Sample Stream*

- Cross port leak impossible with µInProve PLSV valve technology*
- 2, 4, 6 and 8 sample inlet versions available
- Manual, Automatic or remote control
- No dead or unswept volume
- Stand alone or integrated with GC platform

GCS™ INTELLIGENT GAS CALIBRATION SYSTEM

Purged EPC

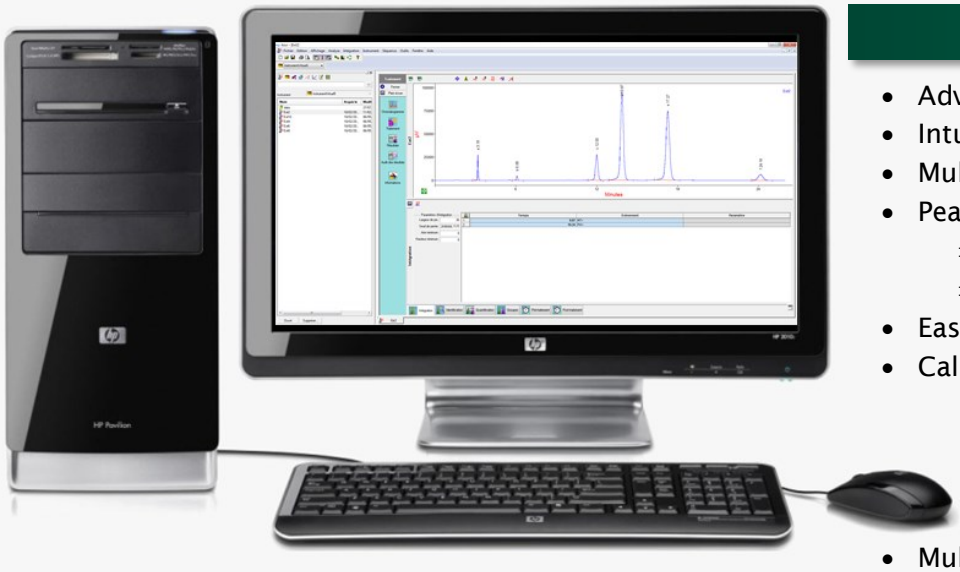


ACCURATELY DILUTE A REFERENCE CALIBRATION GAS WITH OUR HIGH SAMPLE INTEGRITY CALIBRATION SYSTEM

- Pre-calibrated orifice or permeation tube version
- No dead or unswept volume
- Inboard leak impossible with purged Electronics Pressure Controller (EPC)
- Low gas consumption with inline purged EPC
- IIoT ready

*patent pending

ASDLab—LABORATORY CHROMATOGRAPHIC SOFTWARE PACKAGE

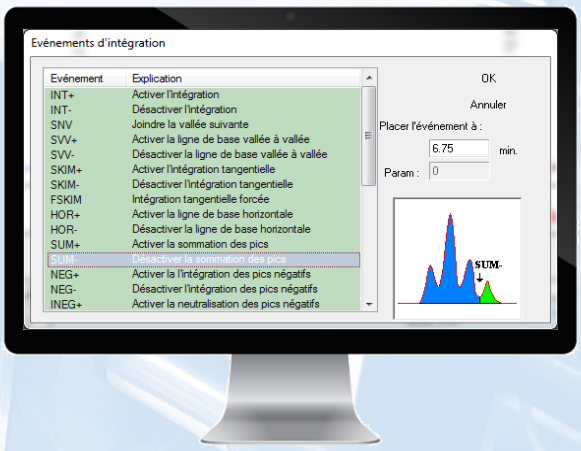


FEATURES

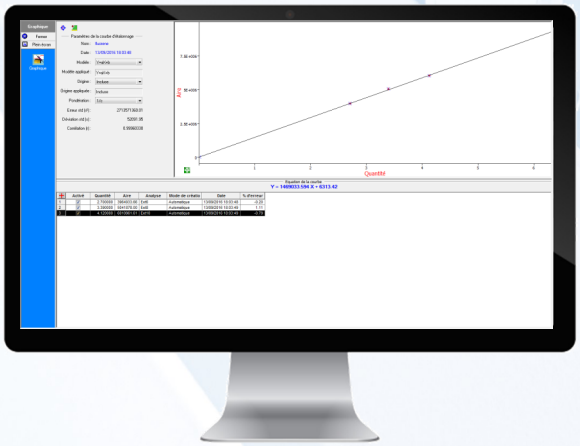
- Advanced chromatography data station
- Intuitive user interface
- Multi method
- Peak integration
  - ⇒ Multiple methods available
  - ⇒ Graphical integration
- Easy chromatogram overlay
- Calibration
  - ⇒ Individual
  - ⇒ Reference peak
  - ⇒ Internal and external standard calculation
- Multiple signal filtering methods
- French and English version

INTUITIVE GRAPHICAL USER INTERFACE

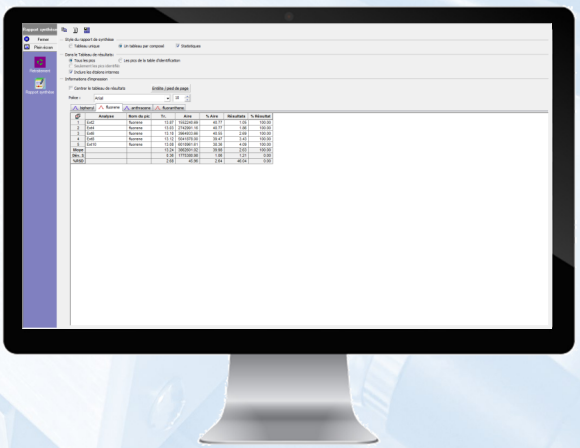
GRAPHICAL PEAK INTEGRATION



MULTIPLE QUANTIFICATION METHODS



INTUITIVE REPORT WIZARD



SOLUTIONS—PURIFICATION

ASDPure—QUANTUM LEAP IN GAS PURIFICATION

ASDPure™

FEATURES

- Purifier for He, Ar, Ne, Xe, Kr
- Impurities removed: H_2O, H_2, O_2, N_2, CH_4, CO, CO_2, THC
- No H_2 released with proprietary dual vessel design
- Available in 300 ml/min, 1 L/min and 5 L/min
- Life time: 2 years at nominal flow with 5N gas
- < 1 ppb impurity at output

APPLICATIONS

- Carrier gas purification
- Zero gas for calibration
- Reference for TCD
- Mass spectrometer
- Any other application that require purified noble gas or N_2.

iPaps—FIRST PURIFIER WITH REAL-TIME END OF LIFE DETECTION

PAPS™

FEATURES IN ADDITION TO THE ASDPure

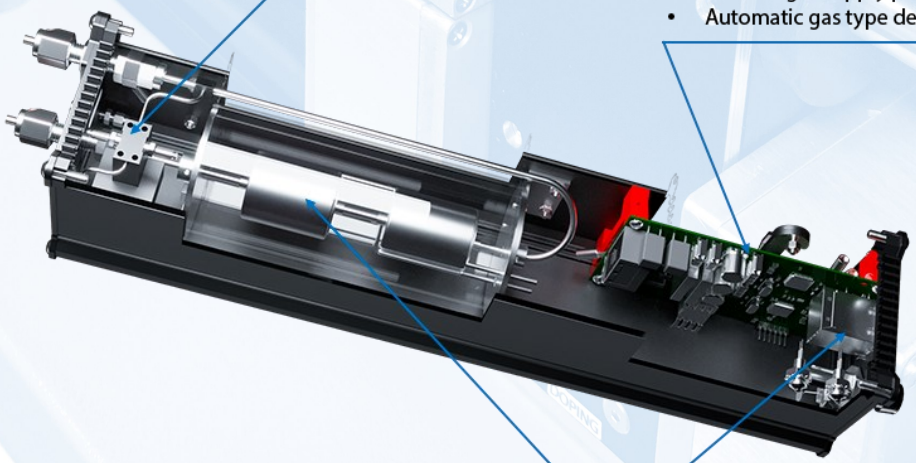
- Built-in real-time end of life detector*
- Extended life time option*

Real-time end of life (EoL) detector *

- Based on our Pulse Discharge Optical Feedback Detector (PDOFD)

Advanced diagnostic

- End of life detection
- Automated start-up procedure
- Automatic shut down in case of system pollution
- Monitor gas supply pressure to detect low pressure bottle
- Automatic gas type detection



Proprietary dual stage purification design for better purification

- High temperature (400°C) first stage to remove all the main impurities such as O_2, N_2, HCs, CO, CO_2, H_2O, VOCs
- Lower temperature (180°C) second stage to remove H_2

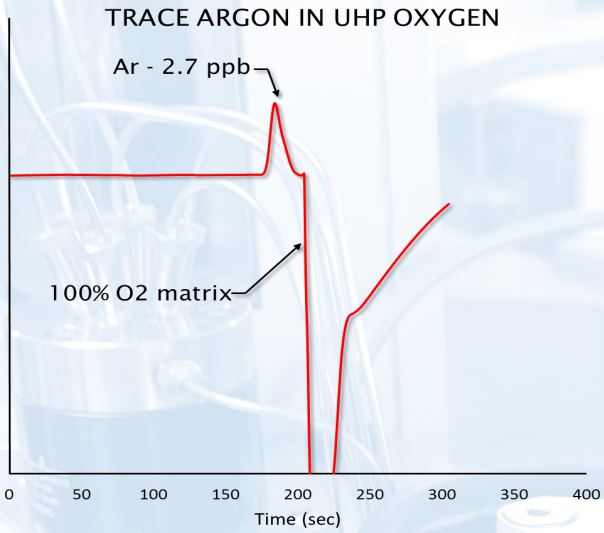
IIoT ready

- Event notification by emails and texts
- Store purifier's performance on the Cloud
- M2M communication

*patent pending

CHROMATOGRAPHIC COLUMNS

ArDSieve—Ar/O_2 SEPARATION COLUMN

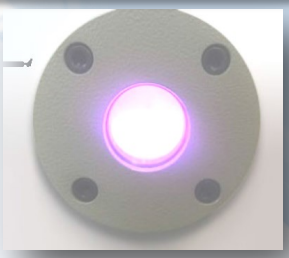


NEW BREAKTHROUGH IN MATERIAL SCIENCE WITH THE ArDSieve CHROMATOGRAPHIC COLUMN THAT SEPARATES ARGON AND OXYGEN.

PROPRIETARY ARDSIEVE MATERIAL

The material used in the ArDSieve column is the outcome of an intensive R&D program and decades of experience. The material is a combination of clinoptilite, an ion exchanged chabazite and proprietary treatments.

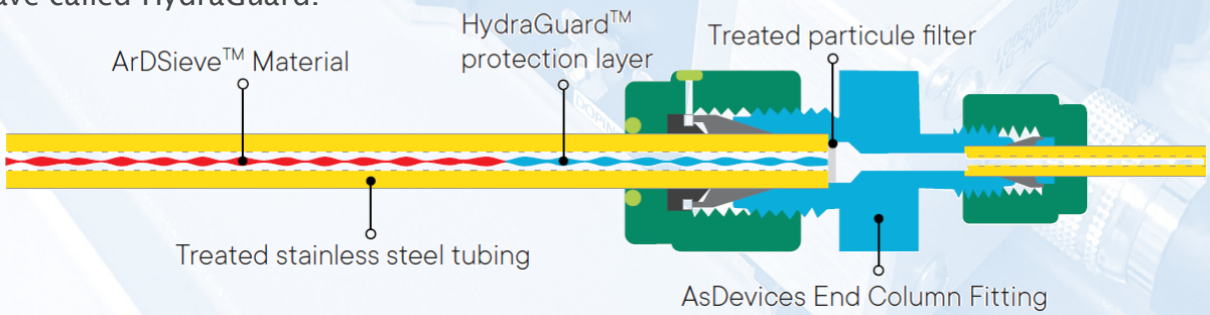
OXIDATION TREATMENT



Recent advances in material science have allowed ASDevices to better oxidise its solid phase material. This is made possible with a proprietary mixture containing O_2 which is introduced into a plasma chamber.

DEHYDRATION AND HYDRAGUARD LAYER

With our decades of experience, we have developed an enhanced dehydration process which further improves the column performance. We have also introduced a moisture protection layer which we have called HydraGuard.



AUTOSAMPLER

OUR AUTOSAMPLER IS DESIGNED FOR ANALYTICAL LABORATORY APPLICATIONS. DUE TO ITS FLEXIBLE DESIGN, IT CAN EASILY BE DEPLOYED IN A MULTITUDE OF APPLICATIONS ON OUR KA8000 SOLUTION.

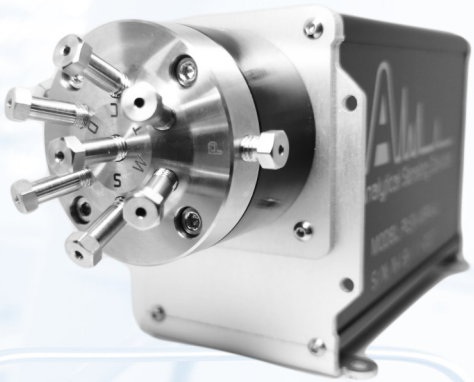
FEATURES

- Autosampler controlled by KA8000 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

μInProve™



Proprietary
Sample inlet

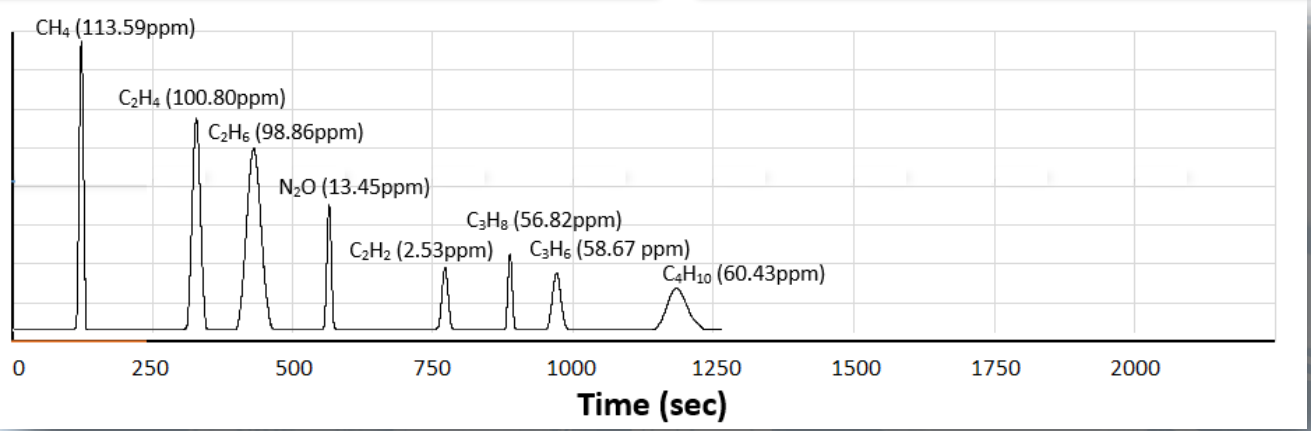
SOLUTION APPLICATION EXAMPLES

C_1-C_4 AND N_2O IN OXYGEN

The analysis of light hydrocarbons and N_2O is a very common application in the air separation industry. This application can now all be done using ASDevices Epd technology and nitrogen carrier gas with high sensitivity for the critical measurement of C_2H_2 and N_2O. Limits of detections of 20 ppb were obtained for those two components while other impruties were measured at higher ranges as per application requirement.

FEATURES

- High sensitivity for C_2H_2 and N_2O
- Nitrogen carrier gas
- No FID and associated hazardous hydrogen fuel required
- Based on K6000 platform

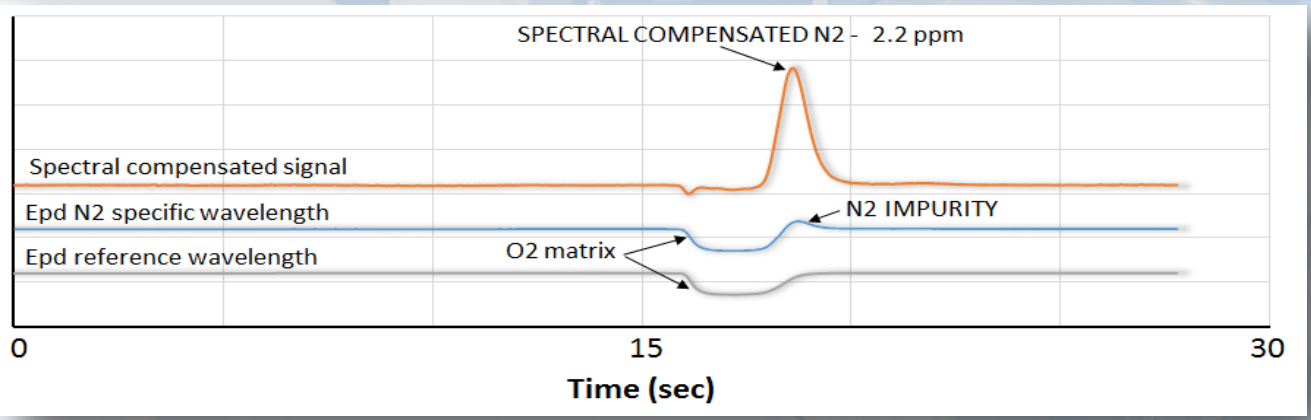


ULTRA FAST CRUDE ARGON ANALYSIS

Crude argon is a very common application for air separation plant optimisation. Current gas chromatograph requires 3 to 5 minutes to do this application and the use of a consumable oxygen trap. With the ASDevices Epd and unique spectral compensation mode, it is now possible to do this application in 30 seconds. This greatly improves process control efficiency.

FEATURES

- 30 seconds analysis (15 sec possible)
- No consumable oxygen trap required
- Only requires one GC valve and one column
- Based on K5000 platform



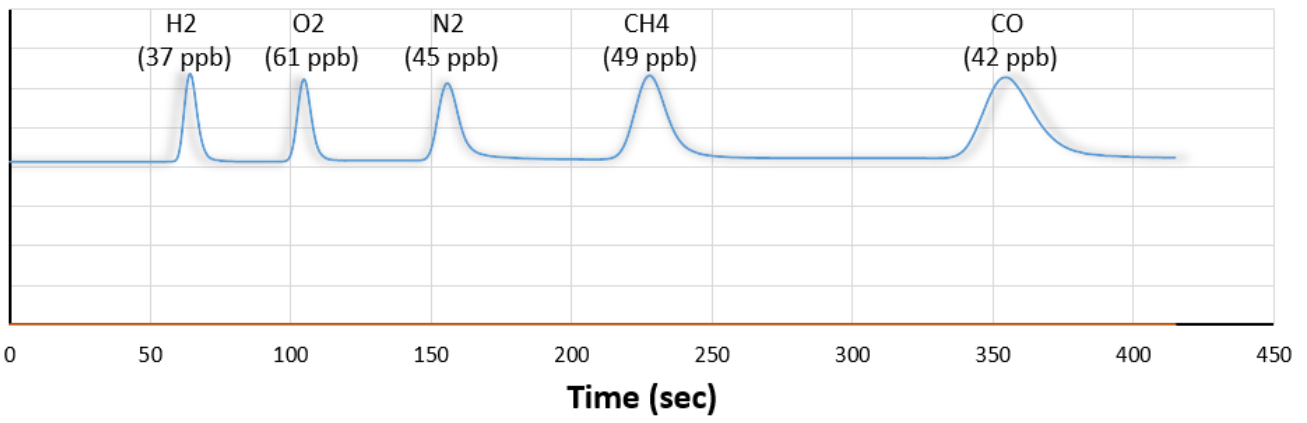
SOLUTION APPLICATION EXAMPLES

IMPURITIES IN ELECTRONICS BULK GASES

Permanent gas analysis in electronic bulk gases is not a simple application due the required limit of detection. This can only be accomplished with the most sensitive detectors and the highest quality chromatographic valves. With ASDevices Epd and PLSV valve, this package offers the best performance in the industry.

FEATURES

- < 1 ppb limit of detection for H_2, O_2, N_2, CH_4, CO, CO_2, NMHC, Ar
- Helium or argon carrier gas
- Multiple backgrounds version available
- Easy maintenance with KA8000 platform

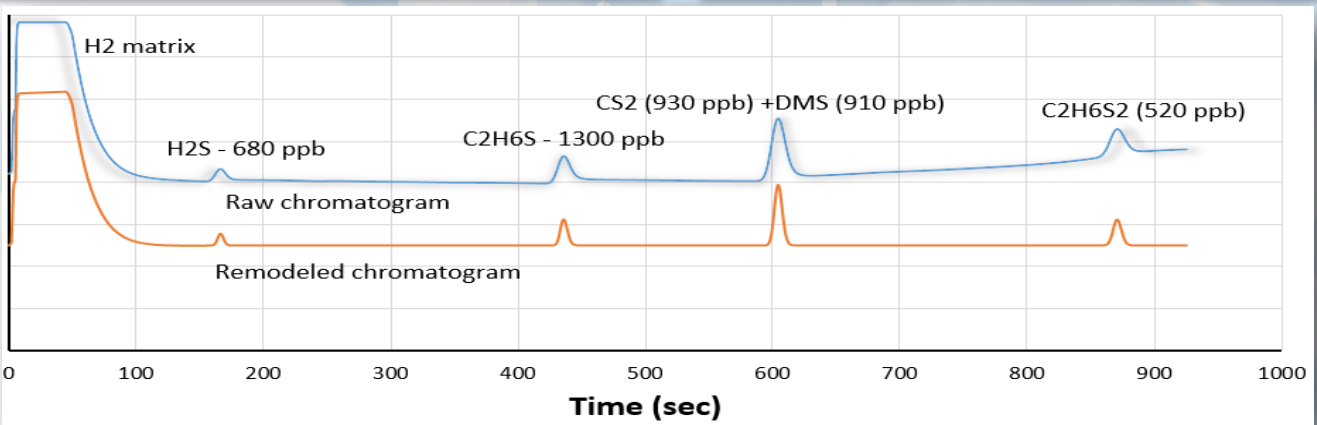


SULFURS IN HYDROGEN FOR FUEL CELLS

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



—SEE OUR APPLICATION CATALOGUE FOR MORE APPLICATIONS—

SOLUTION APPLICATION EXAMPLES

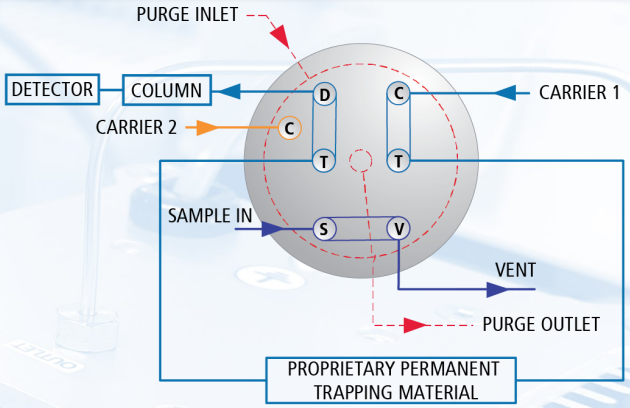
< 1 ppb LDL PERMANENT GAS ANALYSIS WITH ARGON CARRIER

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. No other technologies can do it. Thanks to the combination of all our innovative technologies.

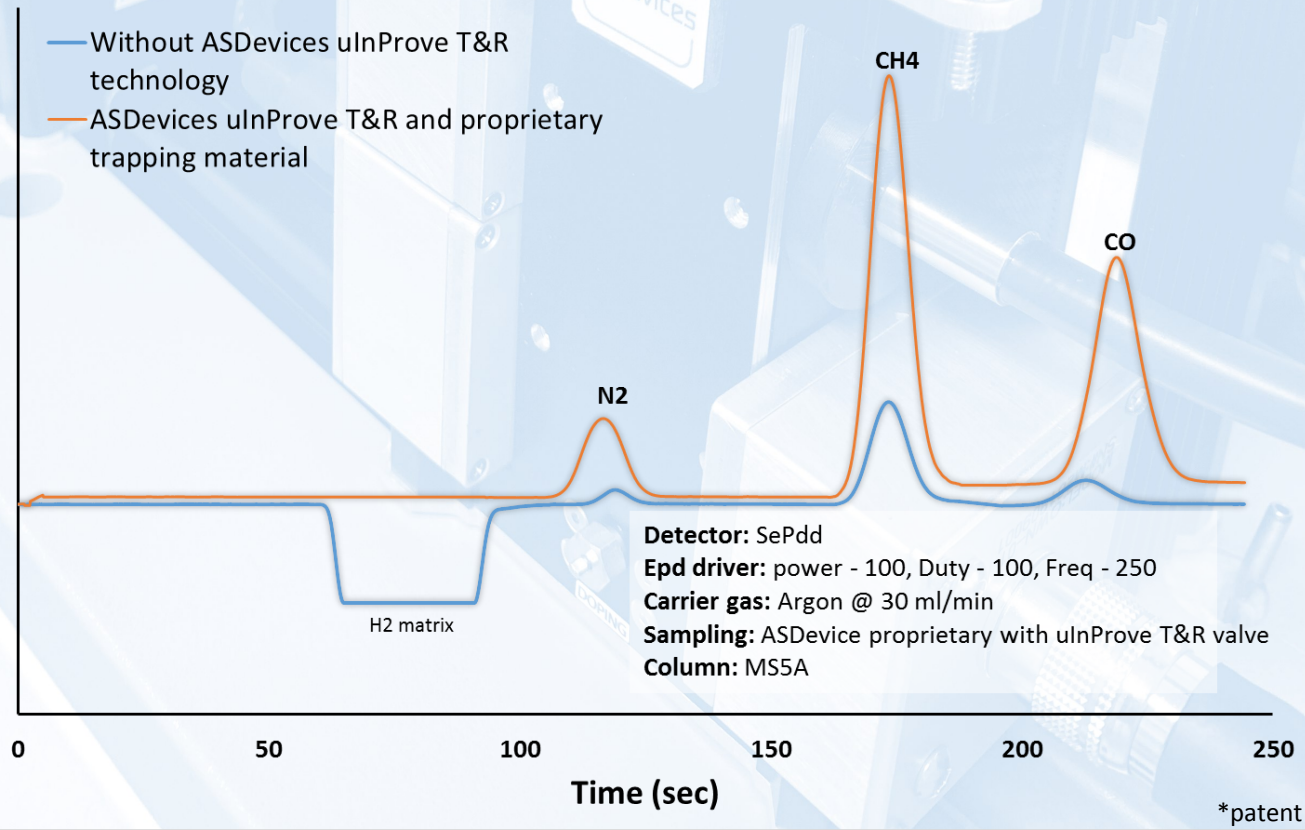
FEATURES

- Uses low cost argon carrier instead of expensive helium
- Uses uInProve T&R valve technology*
- Uses ASDevices proprietary trapping material
- < 1 ppb limit of detection



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

APPLICATIONS LIST EXAMPLES

THIS TABLE CONTAINS APPLICATION EXAMPLES, ASSOCIATED SPECIFICATIONS RANGE AND CHROMATOGRAPHIC PLATFORM.

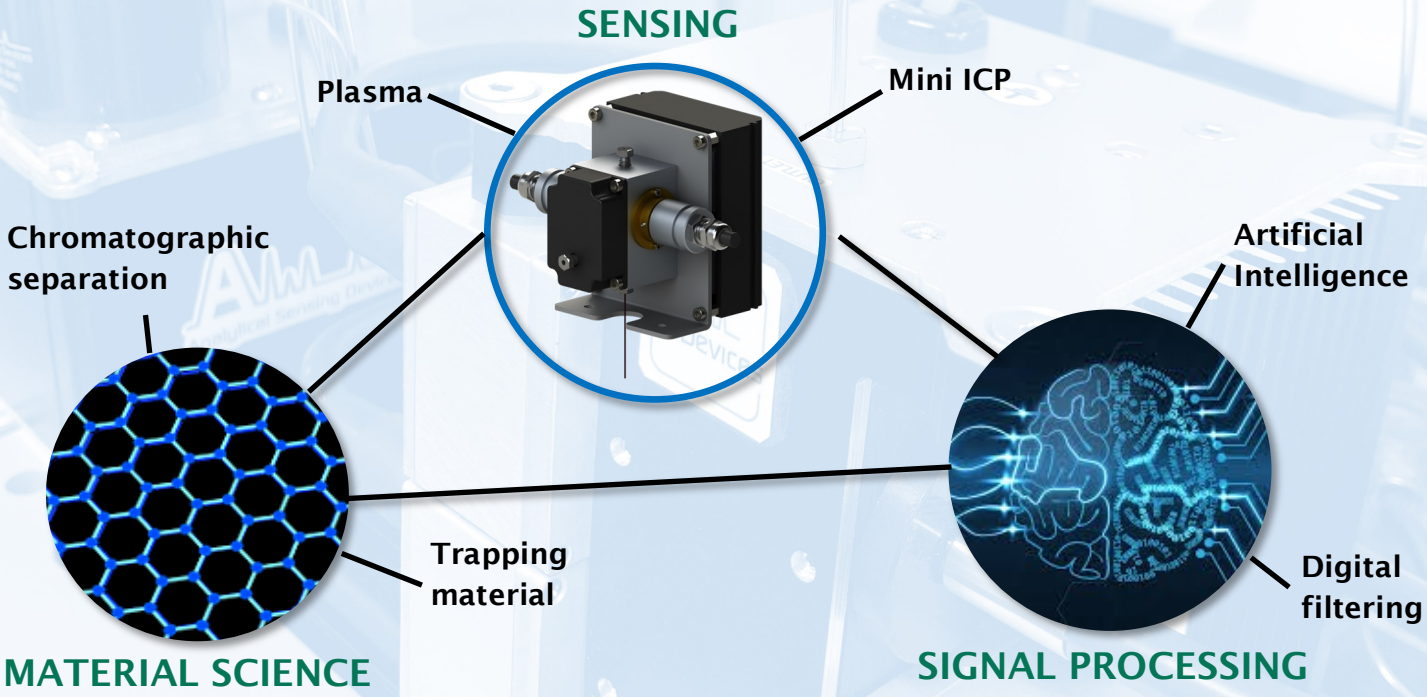
Name	Impurities	Lowest LDL	Carrier gas	Platform	Sensing technology	Range
Air separation,bottling centre and other industrial gases applications						
Crude argon	N2	25 ppb	Argon	KA5000	Epd	10 to 1000 ppm
Argon purity	N2	25 ppb	Argon	KA5000	Epd	10 to 1000 ppm
Argon purity	H2,O2,N2,CH4,CO	25 ppb	Argon	KA5000	Epd	10 to 1000 ppm
Argon purity	H2,O2,N2,CH4,CO,CO2	25 ppb	Argon	KA5000	Epd	10 to 1000 ppm
Argon purity	H2,O2,N2,CH4,CO,CO2,NMHC	25 ppb	Argon	KA6000	Epd	10 to 1000 ppm
Hydrogen purity	N2	25 ppb	Argon	KA5000	Epd	10 to 1000 ppm
Hydrogen purity	N2,CH4,CO	25 ppb	Argon	KA5000	Epd	10 to 1000 ppm
Hydrogen purity	N2,CH4,CO2	25 ppb	Argon	KA5000	Epd	10 to 1000 ppm
Hydrogen purity	N2,CH4,CO2,Ar	25 ppb	Argon/Helium	KA6000	Epd	10 to 1000 ppm
Hydrogen purity	N2,CH4,CO2,Ar,NMHC	25 ppb	Argon	KA6000	Epd	10 to 1000 ppm
Hydrogen purity	Speciated Sulfurs	1 ppb	Helium	KA8000	Epd	100 ppb to 1000 ppm
Helium purity	N2	25 ppb	Helium	KA5000	Epd	10 to 1000 ppm
Helium purity	H2,O2,N2,CH4,CO	25 ppb	Helium	KA5000	Epd	10 to 1000 ppm
Helium purity	H2,O2,N2,CH4,CO,CO2	25 ppb	Helium	KA5000	Epd	10 to 1000 ppm
Helium purity	H2,O2,N2,CH4,CO,CO2,NMHC	25 ppb	Helium	KA6000	Epd	10 to 1000 ppm
Helium purity	Ne,H2,O2,N2,CH4,CO,CO2,NMHC	25 ppb	Helium	KA6000	Epd	10 to 1000 ppm
Helium purity	Ne,H2,O2,N2,CH4,CO,CO2,NMHC,Ar	25 ppb	Helium	KA6000	Epd	10 to 1000 ppm
Oxygen purity	N2	25 ppb	Argon	KA5000	Epd	10 to 1000 ppm
Oxygen purity	H2,N2,CH4,CO	25 ppb	Argon	KA5000	Epd	10 to 1000 ppm
Oxygen purity	H2,N2,CH4,CO,CO2	25 ppb	Argon	KA5000	Epd	10 to 1000 ppm
Oxygen purity	H2,N2,CH4,CO,CO2,Ar	25 ppb	Argon	KA6000	Epd	10 to 1000 ppm
Oxygen purity	H2,N2,CH4,CO,CO2,NMHC	25 ppb	Argon	KA6000	Epd	10 to 1000 ppm
Oxygen purity	H2,N2,CH4,CO,CO2,NMHC,Ar	25 ppb	Argon/Helium	KA6000	Epd	10 to 1000 ppm
Oxygen purity	CH4,NMHC	25 ppb	Argon	KA5000	Epd	10 to 1000 ppm
Oxygen purity	C1-C4	20 ppb	Argon	KA6000	Epd	2 to 1000 ppm
Oxygen purity	C1-C4, N2O	20 ppb	Nitrogen	KA8000	Epd	2 to 1000 ppm
Nitrogen purity	H2,O2,CH4,CO	25 ppb	Argon	KA5000	Epd	10 to 1000 ppm
Nitrogen purity	H2,O2,CH4,CO,CO2	25 ppb	Argon	KA5000	Epd	10 to 1000 ppm
Nitrogen purity	H2,O2,CH4,CO,CO2,Ar	25 ppb	Argon/Helium	KA6000	Epd	10 to 1000 ppm
Nitrogen purity	H2,O2,CH4,CO,CO2,Ar,NMHC	25 ppb	Argon/Helium	KA6000	Epd	10 to 1000 ppm
Electronics and speciality gases						
Argon purity	N2	0.1 ppb	Argon	KA5000	Epd	250 to 1000 ppb
Argon purity	H2,N2,CH4,CO,CO2,NMHC	0.1 ppb	Helium/Argon	KA8000	Epd	250 to 1000 ppb
Helium purity	N2	0.1 ppb	Helium	KA5000	Epd	250 to 1000 ppb
Helium purity	N2,Ar	0.1 ppb	Helium	KA8000	Epd	250 to 1000 ppb
Helium purity	H2,N2,CH4,CO,CO2,NMHC,Ar	0.1 ppb	Helium/Argon	KA8000	Epd	250 to 1000 ppb
Hydrogen purity	N2	0.1 ppb	Helium/Argon	KA5000	Epd	250 to 1000 ppb
Hydrogen purity	N2,Ar	0.1 ppb	Helium	KA8000	Epd	250 to 1000 ppb
Hydrogen purity	N2,CH4,CO,CO2,NMHC,Ar	0.1 ppb	Helium/Argon	KA8000	Epd	250 to 1000 ppb
Oxygen purity	N2	0.1 ppb	Helium/Argon	KA5000	Epd	250 to 1000 ppb
Oxygen purity	N2,Ar	0.1 ppb	Helium	KA8000	Epd	250 to 1000 ppb
Oxygen purity	H2,N2,CH4,CO,CO2,NMHC,Ar	0.1 ppb	Helium/Argon	KA8000	Epd	250 to 1000 ppb
Nitrogen purity	Ar	0.1 ppb	Helium	KA5000	Epd	250 to 1000 ppb
Nitrogen purity	H2,CH4,CO,CO2,NMHC,Ar	0.1 ppb	Helium/Argon	KA8000	Epd	250 to 1000 ppb
Silane	H2,O2,N2,CH4,CO,CO2	25 ppb	Argon	KA8000	Epd	1 to 100 ppm
Environmental monitoring						
Air	Sulfurs	0.5 ppb	Argon	KA8000	Epd	1 to 100 ppm
Air	BTEX and other VOCs	0.5 ppb	Argon	KA8000	Epd	1 to 100 ppm
Medical applications						
Nitrogen Essay	N2	0.50%	Helium	KA5000	TCD	100%
Cancer screening	VOCs	0.1 ppb	Helium/Argon	KA8000	Epd	100 ppb to 10 ppm

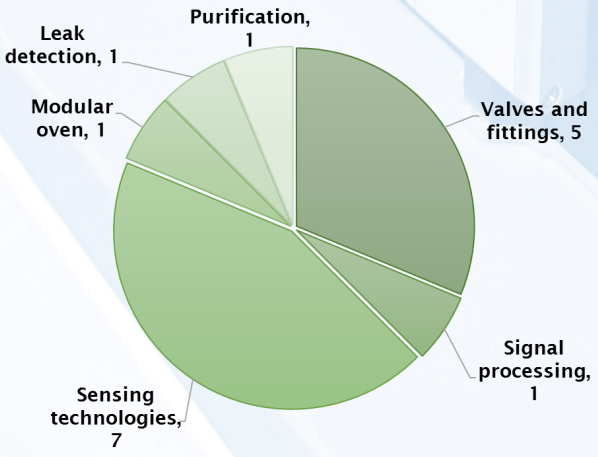
INTELLECTUAL PROPERTIES AND RESEARCH

ASDevices, which provides components to Ka Solutions, is continuously investing heavily in R&D and Intellectual Property protection. This is why we have the most innovative solutions in our field and the highest quality components.

We believe that by **pre-treating** the sample to simplify chromatography, **sensing** the signals with state-of-art technologies and enhancing signals recovery with **advanced signal processing** powered by **artificial intelligence**, we will disrupt the world of chromatography. To achieve this vision, we are focusing on **material science**, **artificial intelligence** and **sensing technologies** research activities at our dedicated Innovation Centre.

- Improved stability divinylbenzene (DVB)*
- Mini portable ICP based on plasma discharge*
- Nano structure trapping and separation materials*
- Deep learning peak detection algorithm*
- Deep learning predictive maintenance algorithm*
- MEMS micro detectors and valves*
- Harmonic based plasma discharge detector*





INTELLECTUAL PROPERTIES

ASDevices is proud of its intellectual properties portfolio which is continuously growing. It is now made of 16 patent topics.

Our IP strategy consists of filing patents in countries where we have competition or a large market. We are always filing patents, as a minimum, in Canada, USA, Europe, China and Japan.

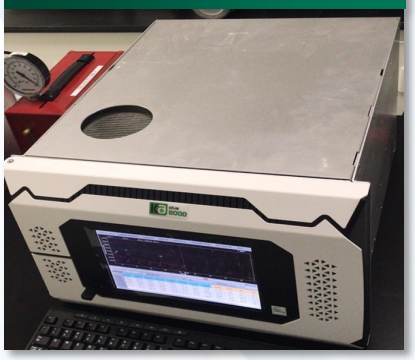
*patent pending

SPECIALITY GASES ANALYSIS

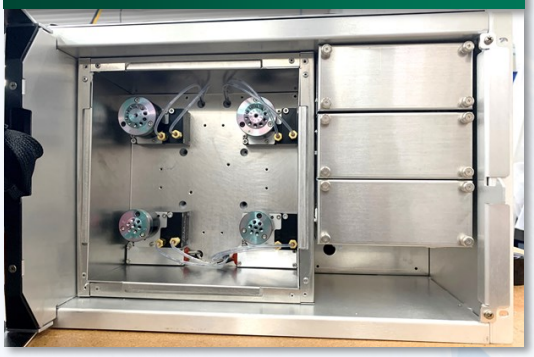
LABORATORY RESEARCH APPLICATIONS

ELECTRONICS GAS CQC WITH SAMPLING SYSTEM CONTROL

KA8000 BTEX ANALYSIS WITH LTM RAMPING MODULE



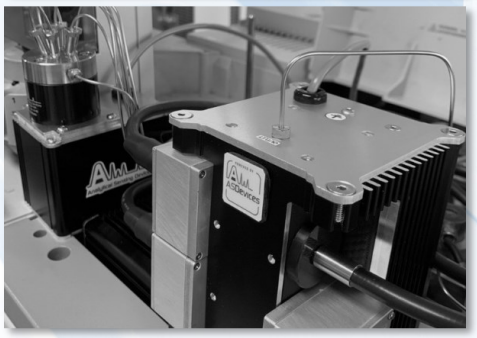
MANUFACTURING OF KA8000 FOR SULFUR ANALYSIS IN H2



A GLOBAL BUSINESS WITH CANADIAN ROOTS

Innovation centre

Innovation is what drives ASDevices. We have one dedicated facility which purely focuses on creating tomorrow's technology that will make life easier to our customers.



Manufacturing centre

Delivery quality products is very important to us. This is why we have dedicated manufacturing sites located in Canada. Those sites are responsible to deliver products to our standards following state of the art manufacturing processes.

Business centre

Those offices are located all around the world. They take care of sales, local marketing and local customer support. They are there to offer an outstanding customer experience.

ASDEVICES INNOVATION CENTRE AND HEAD QUARTER

233 Jalbert street
Thetford, Quebec, Canada
G6G 7W1
Tel.: 1-418-338-0299
info@asdevices.com

ASDEVICES EUROPE BUSINESS CENTRE

Rudolf Diesel Strasse 12 A
D-65760 Eschborn Deutschland

Tel.: +49 6173 362 00 78
mmauntz@asdevices.com

ASDEVICES ASIA BUSINESS CENTRE

No. 298 JinChi Road
BaoShan District, Shanghai

Tel.: +86 138 1765 1588
fzhu@asdevices.com

OUR COMPANY, A STORY OF DISRUPTION AND INNOVATION

Founded in 2017, **ASDevices** is based in Thetford Mines, Québec, Canada and has its roots in a long history of innovation for the gas chromatography and gas analysis world. **ASDevices** is proud to be the only entirely own Canadian company to design and manufacture this type of technology. This history dates back to 1992, when Yves Gamache, the CEO, developed the K2000, the first digital trace nitrogen analyser for the air separation industry. The analyzer was not affected by moisture in the sample or calibration cylinder, a common problem at this time. Thanks to a novel method invented by Gamache, the use of a permeation tube to add a specific level of water to the plasma in order to reach an operating plateau, combined with the use of a molecular sieve 3A trap, reduced substantially H_2O interference. Later on, this method was refined and a patent filed for. This first revolution in terms of performance and reliability brought Yves Gamache and André Fortier, his long-term associate, to start Contrôle Analytique. This company developed between 1995 to 2007, the K2001, a nitrogen analyser that became an instant world success and is still considered a standard for the air separation industry.

It also developed the K2002, an improved design of the K2001, for the semiconductor industry and the K3000, which was the first reliable crude argon analyser. Finally, a complete process GC R&D program led by André Lamontagne, now president of ASDevices, has given birth to the K4000. The K4000 was the first plasma emission detector-based process gas chromatograph offering a complete graphic interface and parallel real-time chromatography with built-in industrial I/Os, built-in sampling system, and remote Ethernet connectivity. Almost two decades of innovation later, the team pursued their goal to revolutionise the industry by founding Analytical Flow Products in 2007. This company developed the most reliable and the most efficient chromatographic valves on the market. From 2007 to 2017, AFP has become the leading brand of GC valves. All those decades of experience have provided a whole lot of new ideas, know-how and experience to start **ASDevices**, which will have once more a disruptive effect in the industry.

1992

Under the Contrôle Logique operations, the first digital trace N2 analyser on the market was developed to respond to the poor performance of existing analyser.

K2000,
the first digital trace N2 analyser on the market was developed.

1995

Following this success, I was joined by André Fortier in 1995 to form C.Analytique, the company that would produce many disruptive technologies in the future.

With many breakthroughs, the K2001 was a quantum leap in the domain and became a world standard. After more than 30 years, it is still the market reference.

1997

A new design led to the K2002 in 1997. With our reputation and track record, it became an instant success in the semiconductor industry.

K2000,
unsurpassed limit of detection.

1998

The K3000 was released and again revolutionized the industry. The K3000 have found its niche in many semiconductor plants.

K3000,
first realible crude argon analyser.

2000

The K4000 was the first plasma emission detector based process chromatograph offering a complete graphic interface and parallel real time chromatography.

K4000,

First fully integrated process GC.

2007

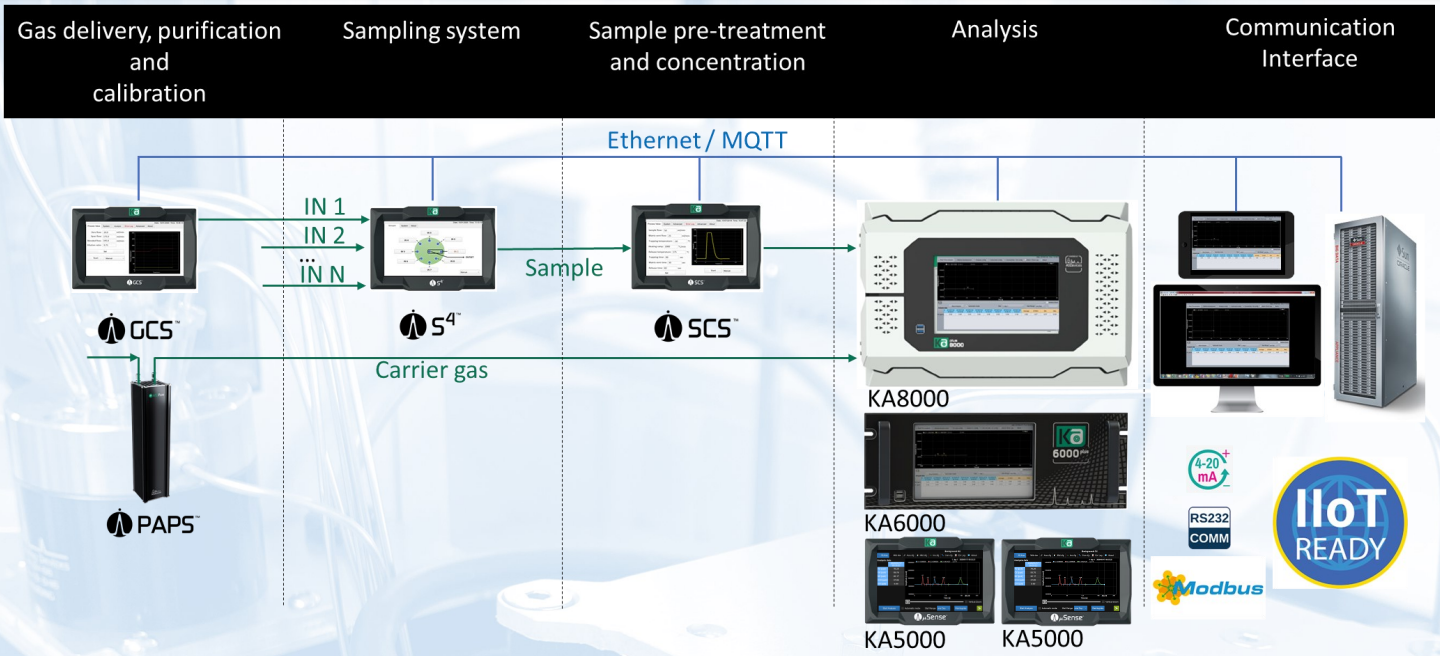
As passionate inventors, this move gave us the opportunity and resources to focus fully on our new venture and provide better products for chromatographers.

These new innovations gave birth to a new company named Analytical Flow Products (AFP). AFP products became number one on the market in term of performance.

2017

After the sale of AFP, a new division was born, Analytical Sensing Devices and founded by the original team behind the success and revolution of KA and AFP.

TURNKEY SOLUTIONS—A FULLY INTEGRATED ECOSYSTEM



ANALYTICAL SOLUTION SPECIFICATIONS

Detector type	Epd, FID, TCD, others
Carrier gases type	Argon, helium, nitrogen
Limit of detection	As low as 100 ppt, impurity and application dependant
Chromatographic valves	µInProve PLSV
Carrier gas pressure control	Inline low flow design Electronics and temperature compensated
Sample flow pressure control	Bypass or Inline Electronics and temperature compensated
Valve actuation	Pneumatic or electric
Fittings	1/8 Liplok, other available
Standard IOs	RS-232 Relay status Remote start digital input Ethernet, IIoT
Optional IOs	4-20 mA outputs Digital relays Modbus
Mounting type	19'' Rackmount, panel mount or bench top
Accessories	External sampling system, Sample concentration system, Internal or external dilution system
Voltage	120 VAC or 220 VAC
Compliance	CE and ROHS compliant