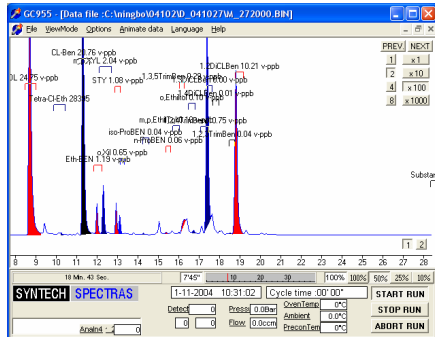
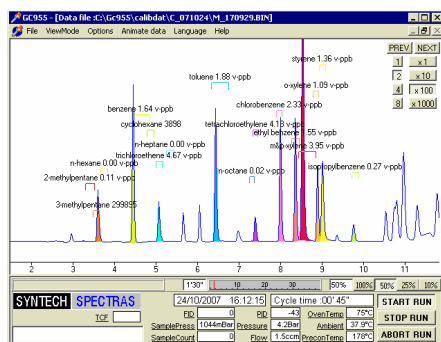


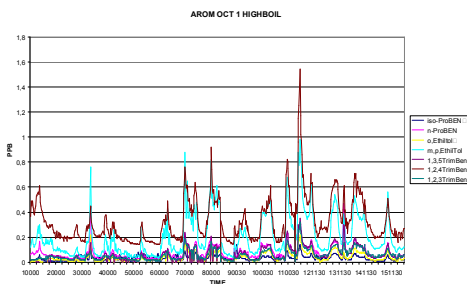
SYNTECH SPECTRAS 615 TOXIC HYDROCARBON ANALYSER



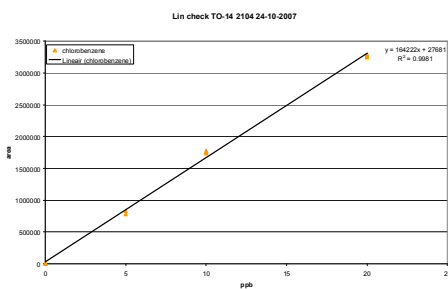
Ambient measurement



Calibration with USA EPA mixture



Results of 14 days ambient measurements



Calibration test: chlorobenzene 0-20 ppb

HYDROCARBON SELECTION: 50 TO 250 °C

The hydrocarbons monitored in this analyser are toxic and/or carcinogenic and some of them are also contributing to the formation of ozone.

For carcinogenic hydrocarbons there is no lower limit below which safety is guaranteed. For toxic hydrocarbons such a limit can be set. Toxic hydrocarbons can have short term as well as long term effects. This often leads to two sets of exposure limits: higher STEL for short term exposure as well as a long term exposure value. The Synspec alarm setting allows for that.

The list contains four carcinogenic compounds, acrylonitrile, trichloroethene, tetrachloroethene and benzene. A few of the compounds are researched as suspect carcinogenics, while some compounds can cause long term damage to liver or brains.

A TYPICAL LIST OF COMPOUNDS

<i>FID measurement:</i>	1,2-Dichlorobenzene
Acrylonitrile	Benzene
Chloroform	Toluene
Tetrachloromethane	Ethylbenzene
1,2-Dichloroethane	M,P-Xylene
Trichloroethane	O-Xylene
Hexane	Styrene
Heptane	Isopropylbenzene
Octane	N-Propylbenzene
	1,2,4-Trimethylbenzene
<i>PID measurement:</i>	1,3,5-Trimethylbenzene
Trichloroethene	1,2,3-trimethylbenzene
Tetrachloroethene	O-Ethyltoluene
Epichlorohydrine	M,P-Ethyltoluene
Chlorobenzene	M,P-Diethylbenzene

SYNTECH SPECTRAS GC955 615 TOXIC HYDROCARBON ANALYSER

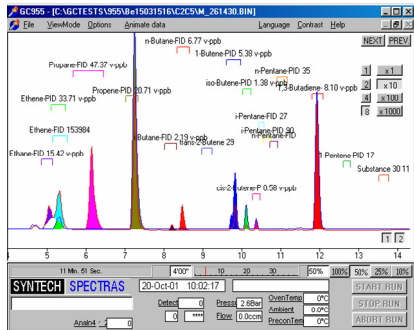
Online measurements show concentrations from the detection limit (<0.1 ppb) up to over 200 ppb. Daily concentration variation is enormous and depends very much on wind direction, process changes and possible emergencies, as toxic hydrocarbons are not only emitted by traffic, but mainly by industry.

The hydrocarbons are concentrated inside the system to reach a low detection level.

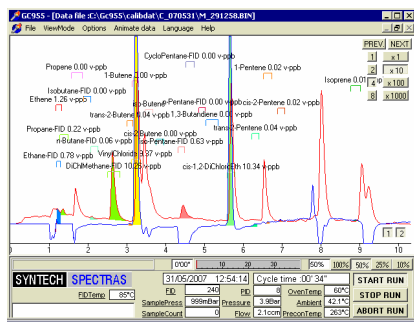
The system uses two detectors for easy identification, the compounds in bold on the typical list are measured by FID, the other compounds by PID.

Hydrocarbons with a boiling point range from 50 to 250 °C

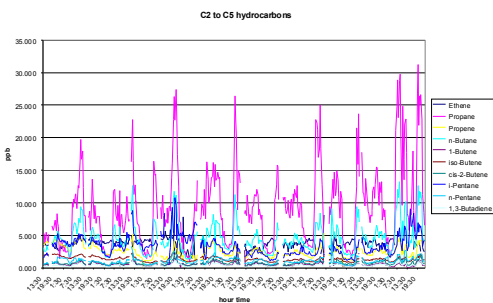
SYNTECH SPECTRAS 615 / 815 TOXIC HYDROCARBON ANALYSER



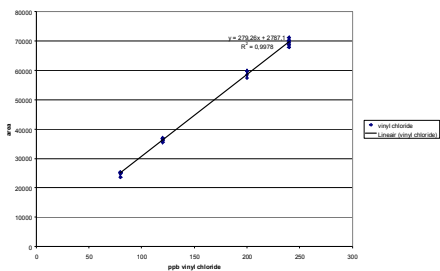
Ambient measurement with high butadiene



Calibration with USA EPA mixture



Results of 7 days of ambient measurements



Vinyl chloride multi point calibration

HYDROCARBON SELECTION: -70 TO 250 °C

Synspec proposes as default to use the system 615 for toxic hydrocarbons and will furnish you with a list of hydrocarbons that can be measured on that system. However, certain toxic hydrocarbons have low boiling points and cannot be analyzed with ease at low levels with only one GC 615. In those cases either the high boiling compounds cannot be analyzed, or a double system is necessary: the system 615 / 815.

The list of low boiling hydrocarbons contains two carcinogenic compounds, 1,3-butadiene and vinyl chloride. It contains also several very toxic compounds, either leading to problems with short term damage at high exposure, or to long term damage at lower concentrations. If such compounds are used in an industrial area it is necessary to monitor them.

Once such a system is in use, several major ozone precursors, like butenes, butanes and propane can also be monitored on the same system. The only requirement is that they are calibrated.

All the compounds of the previous page will be monitored on the system 615. A typical additional compound list for the 815 is the following. A selection of low boiling toxic and carcinogenic hydrocarbons is listed on the left, but the system will also analyze other hydrocarbons in the same run.

A TYPICAL LIST OF COMPOUNDS

- | | |
|------------------------|-------------------------------------|
| Vinyl Chloride | |
| 1,2-Dichloroethene | <i>And additional for instance:</i> |
| 1,1-Dichloroethene | 1-Butene |
| Dichloromethane | Iso-Butene |
| Methyl chloride | Ethyn |
| 1,3-Butadiene | Propane |
| Isoprene | 1-Pentene |

FID measurement

PID measurement

SYNTECH SPECTRAS GC955 615/815 TOXIC HYDROCARBON ANALYSER

Online measurements show concentrations between the detection limit (<0.1 ppb) up to over 30 ppb. Daily concentration variation is often at least a factor 4. On many locations the hydrocarbons are not only emitted by traffic, but also by industrial or household processes.

The semi continuous analyser of Synspec can follow these changes easily with the 30 minute cycles.

The hydrocarbons are concentrated inside the system to reach a low detection level. The system uses two detectors for easy identification, FID and PID

Hydrocarbons with a boiling point range from -70 to 250 °C

TECHNICAL DETAILS OF THE TOXIC HYDROCARBON ANALYSER

The system 615 is a gas chromatograph with a built-in preconcentration system. Hydrocarbons are pre-concentrated on Tenax GR, desorbed thermally and separated on an DB1 equivalent column, for optimal separation from interfering hydrocarbons. Analysis is done by a photo ionization detector and a flame ionization detector.

The system 815 is a gas chromatograph with a built-in cooled preconcentration system. Hydrocarbons are pre-concentrated on Carbosieves SIII at 5 °C, desorbed thermally and separated on a combination of two columns, a capillary film column and a capillary PLOT column. In this way the low boiling hydrocarbons can be separated. Analysis is done by a photo ionization detector and a flame ionization detector.

A standard industrial PC with Windows is used. The user-friendly software stores all the chromatograms on the hard disk and data can be interpreted easily with this intuitive software. Data can also be transferred by network and modem connection. Besides this, analog and digital output options are available to communicate with other data logging systems.

	615 TOXIC HYDROCARBONS : BOILING POINT RANGE 50 TO 250 °C.	815 TOXIC HYDROCARBONS : BOILING POINT RANGE -70 TO 80 °C .
Components	For instance dichloroethane, acrylonitrile, benzene, trichloroethylene, trichloroethane, tetrachloromethane, chloroform, tetrachloroethylene, xylenes, epichlorhydrine, styrene	For instance vinylchloride, 1,3-butadiene, chloromethane, dichloromethane, dichloroethylene, isoprene, etc.
General	SERIES 600, cycle time 30 min, temp program 50-100 °C	SERIES 800, cycle time 30 Min, temp program 50 -100 °C
Detector	PID and FID detector. Lowest detection level for benzene 0.4 µg/m ³ (0.15 vppb). Range: up to 300 ppb.	PID and FID detector. Lowest detection level for butadiene 0.04 µg/m ³ , for other hydrocarbons 0.4 –1 µg/m ³ . Range: up to 300 ppb.
Column	DB1, 30m, 0.32 mm ID, 1.0 µm film	AT624, Al ₂ O ₃ , 5+10m, 0.32 mm ID, 1.8 µm film
Reproducibility	typical <3% at 1 ppb (benzene, with capillary column)	typical <3% at 1 ppb (1,3-butadiene, with capillary column)
Dimensions	19" rack, 10 standard Height Units, depth 39 cm net	19" rack, 10 standard Height Units, depth 39 cm net
Consumption of gas	Instrument air: dry and clean, 3 bar, 250 ml/min Nitrogen: quality 5.0, 4 bar, 25 ml/min Hydrogen: quality 5.0, 3 bar, 20 ml/min	Instrument air: dry and clean, 3 bar, 250 ml/min Nitrogen: quality 5.0, 4 bar, 25 ml/min Hydrogen: quality 5.0, 3 bar, 20 ml/min
Power demand	220 V AC, 300 VA (110 V AC available)	220 V AC, 300 VA (110 V AC available)
Included hardware	Computer Pentium class, harddisk >3 Gb, 10 " full colour LCD display, I/O 4 x RS232, 2 x USB, Ethernet, PS2 key/mouse	In a 615/815 combination, shares the computer of the 615. Can be provided with its own computer
Included software	WindowsXPe, PC Anywhere host, Synspec gaschromatography package	WindowsXPe, PC Anywhere host, Synspec gaschromatography package
Communication	Control of instrument: direct control via keyboard or mouse, or via remote host (RS232/Ethernet/modem), data exchange protocols available on demand	Control of instrument: direct control via keyboard or mouse, or via remote host (RS232/Ethernet/modem), data exchange protocols available on demand
Certification	CE approval for EMC conformity: EN 61010-1, EN 61000-6-2 and EN 60111-6-3	CE approval for EMC conformity: EN 61010-1, EN 61000-6-2 and EN 60111-6-3

EXTRA EQUIPMENT NEEDED	For the application 815 dryer included For the application 615 no extra
Instrument gases	Nitrogen best provided from a bottle, optional from generator. Hydrogen and zero air: from a generator, optional from bottles.
Calibration gases	A multi component mixture, advised Spectra Gases at 1 ppm combined with a dilutor or NPL at 5 ppb without dilutor.

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Synspec bv

SYNTECH SPECTRAS TOXIC HYDROCARBON ANALYSER



Syntech Spectras 615/815 system in a station

CONTENTS

Synspec provides two different modules for the monitoring of toxic hydrocarbons:

- The Syntech Spectras GC955 615 and
- The Syntech Spectras GC955 615/815

In this data sheet we provide background information about toxic hydrocarbons and a description of the Synspec solution for measuring these hydrocarbons. The technical details are found at the back of this leaflet along with additional equipment needed.

WHY MEASURE TOXIC HYDROCARBONS?

Industrial activity may lead to the emission of toxic hydrocarbons in the air. These can be emitted by quite different processes, like producing polymers, refining oil, synthesizing pharmaceuticals etc. In general, industries emit as little as possible, yet for some chemicals a persistent background of a few ppb or lower must be monitored. Unwanted spills can happen due to transport, explosions, leaks etc. These can lead to short term concentrations rising to ppm level.

Monitoring can be done by one industry, by a group of industries or by the local authorities. If a limit is exceeded the measurements should trigger an alarm. The results must also be saved for long term evaluation. Monitoring can either be done outdoors or indoors, in both industrial or domestic buildings. For this a mobile GC is practical.

HYDROCARBONS TO MEASURE

Depending on the area only a few up to fifty different hydrocarbons can reach problematic concentrations. Toxicity to humans can have quite different forms: from short term skin or lung effects to long term brain, kidney or liver damage. Separate from the toxic group is the group considered carcinogenic.

The hydrocarbons consist of 3 main groups: monomers used for polymer production, chlorinated compounds used as solvents and aromatic hydrocarbons from refineries or from use as solvents. These hydrocarbons are listed in the USA TO-14 and in the Japanese JHAP lists.



Syntech Spectras 615 system for mobile use