

NEW

# S4 QUASAR

Heated vacuum chemiluminescence NOx analyser



Chemiluminescent Detector (CLD) for NOx measurement in engine emissions, combustion studies, process plant, CEMS and medical gas production.

## Flexible

- Very high vacuum with dry vac pump or atmospheric pressure versions
- 'Hot' and 'Cold' versions

## Easy to Use

- Totally automatic operation
- Wireless tablet
- Software suite for use over ethernet or RS232

## Accurate

- Dual detectors for continuous NO<sub>2</sub>, NO and NO<sub>x</sub> readings
- Trace PPM measurements standard
- High range % available



**Non-screen version**  
available for system  
integrators

**SIGNAL**  
**GROUP** 

# S4 QUASAR

## A new analyser platform for high-performance and ease-of-use

Heated vacuum chemiluminescence is the reference method for monitoring NOx (combined NO and NO<sub>2</sub>). Chemiluminescence under vacuum offers higher sensitivity with minimal quenching effects, and a heated reaction chamber facilitates the processing of hot, wet sample gases without condensation. The reaction of NO (Nitric Oxide) and O<sub>3</sub> (Ozone) to produce the chemiluminescence is much improved under vacuum, with a greater signal to noise ratio and with less quenching from CO<sub>2</sub> and H<sub>2</sub>O. The detection method is continuous with a fast response time making it ideal for real-time reporting applications. It is specified in many standards, such as EN 14792 and Method 7E.

The Signal Group range of chemiluminescence NOx analysers are the latest 4th generation design and have many unique characteristics.

To get the most accurate measurements from engine or combustion gas exhausts, it is important to measure the NOx in its entirety within the total exhaust gas. This means that the exhaust gas has to be transported to the analyser in heated sample lines. The inlet of the analyser must also be heated with adequate particulate filtration within the heated area. The sample flow to and within the reaction chamber must be kept under vacuum. This vacuum prevents water condensation (without any need to remove it) so that NO<sub>2</sub> (Nitrogen Dioxide) cannot dissolve in water. The vacuum also increases the signal to noise ratio significantly. Quenching effects from high concentrations of CO<sub>2</sub> and H<sub>2</sub>O become almost zero in a vacuum, making the vacuum based analyser the ideal choice.

Another important characteristic with the Signal Group Quasar analyser is the unique design of the ozonator. This instrument uses a neon tube running at high voltage. Unlike simple corona discharge ozonators or ultra violet lamps, the neon tube does not produce NO from any nitrogen in the air used as the feed gas. This can also cause nitrogen to be oxidised to NO which becomes Nitric Acid with moisture, resulting in corrosion and non-linearity. Some other manufacturers of chemiluminescence NOx analysers require the use of pure oxygen to avoid these effects.

The NO<sub>2</sub> to NO converter within the analyser is used so that NO<sub>2</sub> can be added to the NO reading to give NOx values, and the NO<sub>2</sub> reading is derived through subtraction of NO from NOx. The Signal Quasar analyser uses a carbon material for this conversion. It runs at approx. 400 °C and the carbon is housed in a quartz vessel, consequently there is no risk that other reactions would occur from stainless steel at high temperatures. The carbon material is slightly sacrificed and needs refilling every 2 years of regular use.

Helping to ensure reliable performance, Signal's vacuum pump is corrosion resistant, and the analyser utilises a catalyst to destroy any ozone prior to the vacuum pump.

For applications where high levels of CO<sub>2</sub> and H<sub>2</sub>O are not a concern, and the sample gas is approximately at ambient temperature, Signal offers a non-vacuum and moderately heated Chemiluminescence analyser. Typical applications include processes where trace NOx needs to be measured, for measuring dilute vehicle exhausts from CVS (constant volume sampler) systems and RDE (Real-world Driving Emissions) on-board vehicle testing (for which a 24VDC version is available). Signal also recommends this analyser for CEMS (Continuous emissions monitoring) applications, however flue gas should be cleaned and dried before the analyser in order to maximise maintenance intervals.

Every analyser is supplied with a memory stick loaded with a full suite of software to operate the analyser remotely using LAN/RS232.

**NEW: Every S4 gas analyser can now be supplied with a rugged, wireless tablet which connects wirelessly to the analyser via an inbuilt 802.11 wifi that can connect up to 50 metres away. This provides users with the ability to view live data in a different location, and even manage data logging, alarms and calibration.**

## A wide range of user-set alarms are available for conditions such as:

1. Concentration limit (user set)
2. Sample flow (outside limits)
3. Pump failure
4. Heater failure
5. Voltage outside limits
6. Thermocouple failure
7. EHT outside limits
8. Config. error
9. Options incorrectly set
10. Calculations bad (no calibration set)



## GASES

- NOx
- Nitric Oxide
- Nitrogen Dioxide
- Ammonia

## APPLICATIONS

- CEMS
- Research
- Compliance
- Gas Purity
- Automotive
- Air Quality
- Process
- Combustion

## There are four different configurations of analysers in the Quasar product line:

1. **Single detector heated, vacuum type, manual switching for NO, NOx and by subtraction, NO<sub>2</sub>.** This design utilises dual matched sample capillaries so that both NO and NO<sub>x</sub> gas streams flow continuously. Thus, when switching from NO to NO<sub>x</sub> there is no time delay in the reading. The unit comes with a separate vacuum pump and a bypass pump. The analyser is heated to 150 °C and various lengths of heated sample line can be ordered.
2. **Dual detector heated, vacuum type, continuous measurement of NO, NO<sub>x</sub> and NO<sub>2</sub>.** This design has two reaction chambers and PM tubes, with one stream flowing through the NO<sub>x</sub> converter and the other flowing directly to the reaction chamber. The NO<sub>2</sub> reading is a real-time subtraction of NO from NO<sub>x</sub>. The unit comes with a separate vacuum pump and a bypass pump. The analyser is heated to 150 °C and various lengths of heated sample line can be ordered.
3. **Single detector, 50 Deg C detector, non-vacuum type.** This design is for process plant and CEMS. No heated line is necessary if water vapour in the sample (but NOT NO<sub>2</sub>) is removed by a dryer (such as the Signal 200 series).
4. **Ammonia measurements** are made with the Signal Group Quasar line of chemiluminescence analysers together with a Signal Group 400 series Ammonia converter, which can be fitted within the analyser or in a separate enclosure (consult factory for details).

## Many further options are also available...

- A colour touch screen front panel with a built-in SD card and a USB connector for data logging and software upgrades
- Span/zero/sample gas selector valves
- NEW: optional front panel display, detachable for wireless use up to 50 metres distance from the analyser
- Programmable contact closures

## Signal Group S4 QUASAR Heated vacuum chemiluminescence detector (CLD) NO<sub>x</sub> gas analysers

Type	Sample Temperature	Ranges are user-defined Examples...
Heated Vacuum, Single Detector	190°C	0- 1ppm, 0-5ppm, 0-10ppm, 0-50ppm, 0-100ppm, 0-500ppm, 0-1000ppm
Heated Vacuum, Dual Detector	190°C	0-1 ppm, 0-5ppm, 0-10ppm, 0-50ppm, 0-100ppm, 0-500ppm, 0-1000ppm
Non-heated, Non-vacuum, Single Detector	50°C non-condensing at ambient temperature	0-10ppm, 0-50ppm, 0-100ppm, 0-500ppm, 0-1000ppm

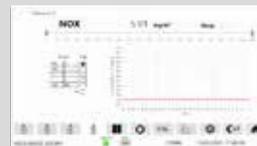
## S4 QUASAR analyser screens

### MENU



Has links to calibration gas setup, time set, error log, display restart, display refresh, local/remote mode selection and software upgrade. Exit returns to Main screen.

### CHANNEL DETAIL



Control and calibration of individual gas measurement channel. Contains chart for visual trace of concentration. Range selection and other channel specific information.

### GRAPHS



A visual log of recent concentration measurements for all channels, shown as percentage of range.

### DATALOGGING



Enable and set log rates and file title. Allows for exporting to external memory.

### ALARMS SETUP



User selectable settings for concentration and flow alarm limits. Useful for safety or process control.

### PROGRAMMABLE CONTACT CLOSURE SETUP



Select contact closure output actions, used for alarm outputs, range indication, external calibration gas switching per range or external sample valve selection.

### DIAGNOSTICS



Shows current analyser condition (pressures, temperatures and flows).

### CAL GAS SETUP



Use this page to set span gas concentrations. Users may set one concentration for each range on each measurement channel.

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## SPECIFICATIONS

### MEASUREMENT TECHNIQUE

Chemiluminescence Detector (CLD)

### MEASURING UNITS

PPM or mg/Cu.Mtr. user selectable

### MEASURING RANGES

*Range A: 0-1 to 0-1000ppm.*

User selectable

*Range B: 0-10 to 0-10,000ppm.*

User selectable

*Range C: 0-100 to 0-100,000 ppm.*

User selectable

### RESPONSE TIME

<2.0s

### REPEATABILITY

<1% FSD

### QUENCHING EFFECT

<2% of reading per 15% CO<sub>2</sub>

<2% reading per 2% H<sub>2</sub>O

### LINEARITY

± 0.5% FSD or 2% of reading

### ZERO DRIFT

<0.5% FSD/24hrs

### TEMPERATURE EFFECT ON ZERO

<0.15% per °C

### TEMPERATURE EFFECT ON SPAN

<0.3% per °C

### ZERO NOISE

<0.1ppm

### SPAN NOISE

<+/-0.1%FSD for vacuum version

<+/-0.3%FSD for non-vacuum version

### DETECTION LIMIT

0.05mgC/m<sup>3</sup>

### BYPASS FLOW SENSITIVITY

Less than 0.5% from 1 to 3 L/min

### SAMPLE FILTER

Removable 0.4 micron PTFE

### DISPLAY

Blank or Detachable Screen

### SAMPLE CONDITION

Max temp 190°C

Pressure -0.3bar to +0.5bar

### OPERATING CONDITIONS

5-40°C ambient temperature

### AIR SUPPLY

Air for Ozone (O<sub>3</sub>) flow 140ml/min

Pressure 0-1bar max dewpoint 12°C

Stable O<sub>2</sub> concentration >20%

### CONVERTER EFFICIENCY

NO<sub>x</sub> >95%

NH<sub>3</sub> >85%

### OUTPUTS

0-10 Vdc

RS232

Ethernet

TCP/IP

Optional 4-20 mA

### POWER REQUIREMENTS

220-240 V AC

110-120 V AC

24 V DC

600 W max.

### REMOTE CONTROL

AK protocol via RS232 port,

Ethernet

Comes with S4i remote software operating system.

### SIZE AND WEIGHT

19" (w) x 133.5 (h) x 530 mm (d)

Apx. 30Kg



### NOXGEN NO<sub>x</sub> Converter tester

Irrespective of manufacturer, it is extremely important to check the efficiency of the NO<sub>x</sub> converter. It is recommended that this should be undertaken every 6 months of use. The Signal NOXGEN converter tester is the ideal tool for this because it allows operators to simply use the standard NO calibration gas and convert it to NO<sub>2</sub> with the NOXGEN.

The NO<sub>2</sub> is then converted back to NO in the NO<sub>x</sub> converter with an efficiency of at least 98%.

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