

# S4 QUASAR Gas Analyser



Chemiluminescent Detector (CLD) for NO<sub>x</sub> 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
- Optional touch screen colour front panel with logging facility

## Easy to Use

- Totally automatic operation
- Comes with Windows VB software for remote operation

## 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

## Signal Series 4 QUASAR Chemiluminescence detector (CLD) NOx gas analysers

### 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 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

### 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

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.

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

1. **Single detector heated, vacuum type, manual switching for NO, NO<sub>x</sub> 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 Quasar line of chemiluminescence analysers together with a Signal 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
- A wide range of communications options
- Programmable contact closures

## Signal Series 4 QUASAR Chemiluminescence detector (CLD) NO<sub>x</sub> gas analysers

Type	Detector Temperature	Ranges are user-defined Examples...
Heated Vacuum, Single Detector	150°C	0-1ppm, 0-5ppm, 0-10ppm, 0-50ppm, 0-100ppm, 0-500ppm, 0-1000ppm
Heated Vacuum, Dual Detector	150°C	0-1ppm, 0-5ppm, 0-10ppm, 0-50ppm, 0-100ppm, 0-500ppm, 0-1000ppm
Non-heated, Non-vacuum, Single Detector	50°C	0-10ppm, 0-50ppm, 0-100ppm, 0-500ppm, 0-1000ppm

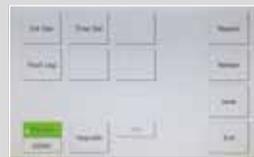
## Signal Series 4 QUASAR analyser screens

### MAIN SCREEN



Shows up to 3 channels of information (error condition, measure state, gas type, concentration, range in use, unit in use). Has links to further detail for each channel. Buttons for menu and logging measure state (sample, zero, span, pause, standby and sleep), calibration, abandon calibration, whether to apply calibration to a single range or every range, alarm clearance and user lockout. Also gives general analyser details (time/date/serial number/software versions/etc).

### MENU SCREEN



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.

### CAL GAS SETUP



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

### DATE/TIME SET SCREEN



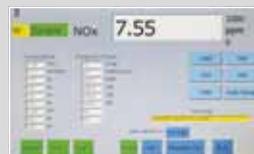
Set current date/time. Exit returns to Main screen.

### DATALOGGING SCREEN



Set log rates and choose data location (USB or SD card), start and stop logging. Exit returns to Main screen.

### CHANNEL DETAIL SCREEN



This gives channel specific details such as controlled temperatures, pressures and flows, and allows individual selection of controls for this specific channel, i.e. measurement modes (sample/zero/span/pause), calibration, abandon calibration, errors and choice of range or autorange. Exit takes you to Main screen.

# S4 QUASAR

## SPECIFICATIONS

### MEASUREMENT TECHNIQUE

Chemiluminescence Detector (CLD)

### MEASURING UNITS

PPM or mg/Cu.Mtr. user selectable

### MEASURING RANGES

Range A: 0-1000ppm. User settable to e.g. 0-1ppm, 0-5ppm, 0-10ppm, 0-50ppm, 0-100ppm, 0-500ppm, 0-1000ppm. Resolution: 0.01ppm  
Range B: 0-10000ppm. User settable to e.g. 0-10ppm, 0-50ppm, 0-100ppm, 0-500ppm, 0-1000ppm, 0-5000ppm. Resolution: 0.1ppm  
Range C: 0-100,000 ppm. User settable, with resolution of 1ppm

### RESPONSE TIME

T90 1.0 sec for vacuum analysers  
T90 2.0 sec for non-vacuum analysers

### REPEATABILITY

<1% FSD

### QUENCHING EFFECT

CO<sub>2</sub> and H<sub>2</sub>O Quenching.  
2% of reading per 15% CO<sub>2</sub>  
and 2% reading per 2% H<sub>2</sub>O

### LINEARITY

+/- 0.5% FSD or 2% of point  
EN14181 - dc rel : <0.5  
R2 : >0.99

### ZERO DRIFT

< 2% FS/24hrs

### TEMPERATURE EFFECT ON ZERO

<0.15% per °C

### TEMPERATURE EFFECT ON SPAN

<0.3% per °C

### SAMPLE INLET PRESSURE

With sample pump option:  
-0.5bar to +0.5bar.  
Without sample pump option:  
Max +0.5bar

### ZERO NOISE

0.01 ppm vacuum analysers.  
0.1 ppm non vacuum analysers

### SPAN NOISE

<0.5% FSD

### ACCURACY

<0.2% FSD  
Precision  
EURO VI - <1%

### DETECTION LIMIT

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

### BYPASS FLOW SENSITIVITY

Less than 2% from 1 to 3 L/min

### SAMPLE FILTER

Removable 0.4 micron PTFE  
7um non removable stainless steel filter  
for CFID

### DISPLAY BLANK

panel or 7" colour display

### SAMPLE CONDITION

150°C  
vacuum version  
room temperature for non-heated  
version

### INLET PRESSURE

for vacuum versions.  
+0.3 bar for non-vacuum versions

### OPERATING CONDITIONS

5-40°C ambient temperature

### AIR SUPPLY

Ozone air Consumption.  
Vacuum analysers draw in from  
atmosphere Ozone Air feed gas.  
Non vacuum analysers require  
500mL/min of dry air.

### 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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