



Tunnel Atmosphere Monitoring

TunnelCraft 3 - NO₂ Monitor

Nitrogen Dioxide

Low-cost Precision Tunnel Sensors

- High accuracy & stability
- High reliability
- Zero maintenance
- Simple operation - no moving components
- Auto zero calibration
- Low cost of ownership
- Output in ppb NO₂
- Span verification by span gas injection



TunnelCraft 3 - NO₂ Air Quality Monitor

The NO₂ Air Quality Monitor is a highly efficient transmissometer configured for the continuous measurement of nitrogen dioxide in road tunnel atmospheres. This extremely stable and reliable monitor incorporates a high-power blue LED to utilise the capacity of nitrogen dioxide to absorb UV and blue light to provide accurate readings in parts per billion.

The Problem

NO₂ is produced naturally by the combustion processes within the internal combustion engine and is emitted from the tail pipes of all types of vehicles. NO₂ is also particularly toxic and prolonged exposure to levels as low as a few hundred parts per billion will have a detrimental effect on human health. There is a growing international requirement to measure and limit the levels of NO₂ within road tunnels to reduce the exposure of tunnel users to this toxic gas.

Previous attempts to continuously measure NO₂ levels in tunnels have failed due to either insufficient accuracy of measurement or too great a complexity and cost of the measuring instrument, resulting in unacceptable levels of maintenance and measurement unavailability.

The CODEL Solution

The CODEL NO₂ Air Quality Monitor resolves these issues by means of a very simple but accurate measurement. NO₂ absorbs UV and blue light very strongly. The CODEL sensor is a precision transmissometer which measures the attenuation of UV and blue light by NO₂ in the tunnel atmosphere. The light source is a simple LED and the interfering effects of particulates in the atmosphere are eliminated by making the measurement within a 1m long diffusion cell into which the atmospheric gases, but not the particulates, can freely diffuse.

The result is a very accurate and stable sensor having no moving components and requiring no maintenance throughout its lifetime. Even the optics remain clean because they are contained within the diffusion cell which prevents the deposition of dirt on the optical surfaces. The filters through which the gas diffuses do not become blocked because the diffusion process exerts no forces on particulates to force them into the filter pores.

Fully configurable analogue and alarm outputs are generated inside the Station Control Unit (SCU) which are fully configurable via the supplied CODEL Wincom Software. In addition there is a choice of either RS232 or RS485 outputs which can be utilised to deliver MODBUS protocol to a SCADA system located in the tunnel control centre.

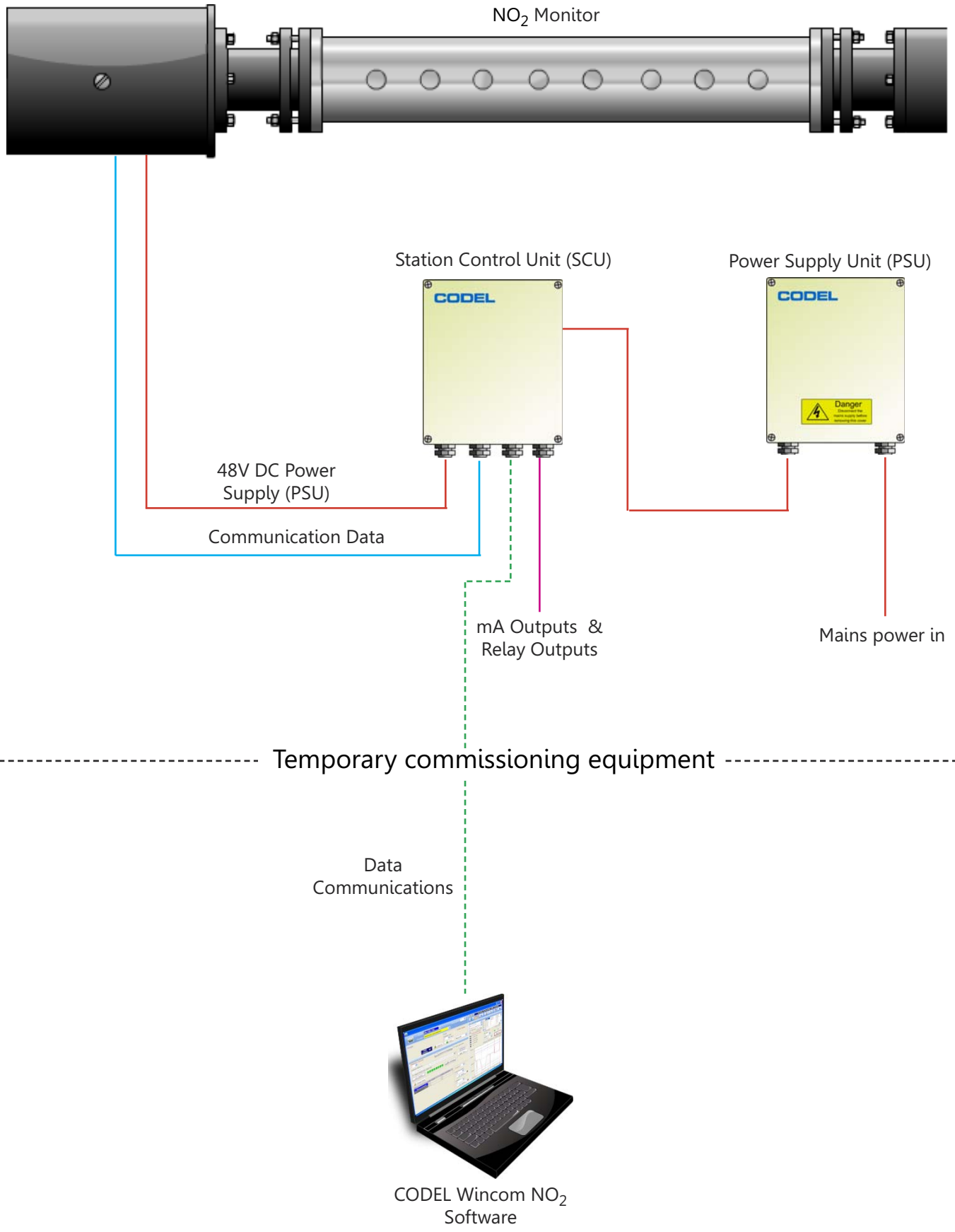
Over the last 15 years CODEL tunnel sensors have been supplied to more than 400 road and rail tunnels throughout the world. Our impressive reference list includes Eurotunnel France, Mont Blanc Tunnel France, Dartford Tunnel UK, Lane Cove Tunnel Australia, Snow Mountain Tunnel Taiwan and the SMART Tunnel in Malaysia, plus many others throughout China, Italy, Switzerland and South Korea placing CODEL as a world leader in tunnel atmosphere monitoring.

CODEL's tunnel sensor range is further extended by additional sensors for the measurement of CO, NO, Visibility and Wind Speed and Direction.

Please see additional product data sheets:-

- TunnelCraft 3 Air Quality Monitor
For the measurement of Carbon Monoxide, Nitric Oxide & Visibility.
- TunnelCraft 3 Air Flow Monitor
For the measurement of Wind Speed & Direction.

TunnelCraft 3 - NO₂ Monitor - System Arrangement



TunnelCraft 3 - WinCom NO₂ Monitor Software

- Easy installation and set-up
- Will operate on any Windows based operating system
- User friendly Alignment Mode to aid initial set-up and optical alignment
- Allows sensor's configuration settings to be adjusted
- Fault diagnostic logging for sensor troubleshooting

TunnelCraft 3 Software is supplied with all CODEL Tunnel Sensor's as standard for the purpose of commissioning and maintenance of the sensors. With simple installation and set-up routine to any Windows based laptop, the program takes only minutes to load and configure and comes with a comprehensive on-board help feature.

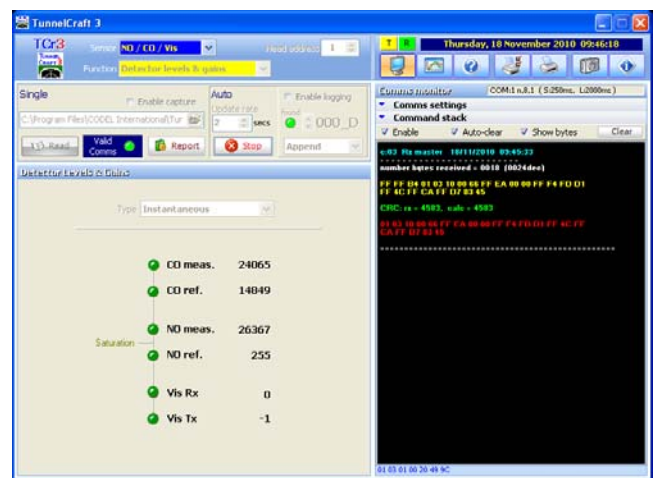
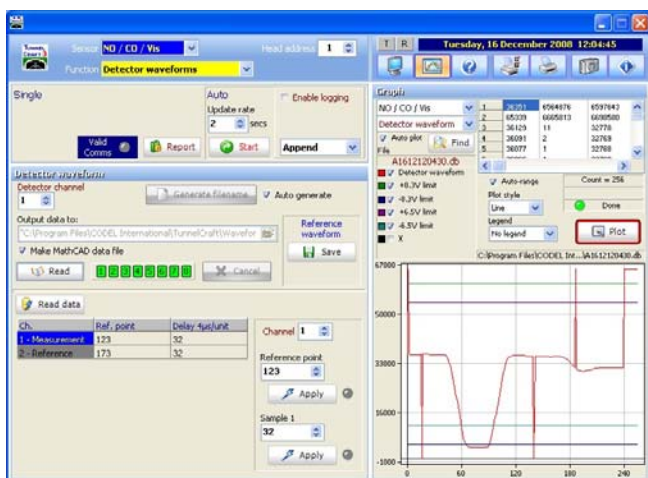
The software enables the sensor's complete data and control functions to be accessed via the laptop from the Station Control Unit (SCU) using an RS232 cable supplied with the sensor.

A built-in alignment feature aids the initial set-up and commissioning routine by giving a display of the detector signals to the engineer to ensure that optical alignment is maximised and the sensor operates to its optimal performance

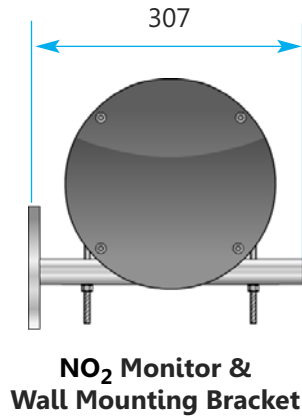
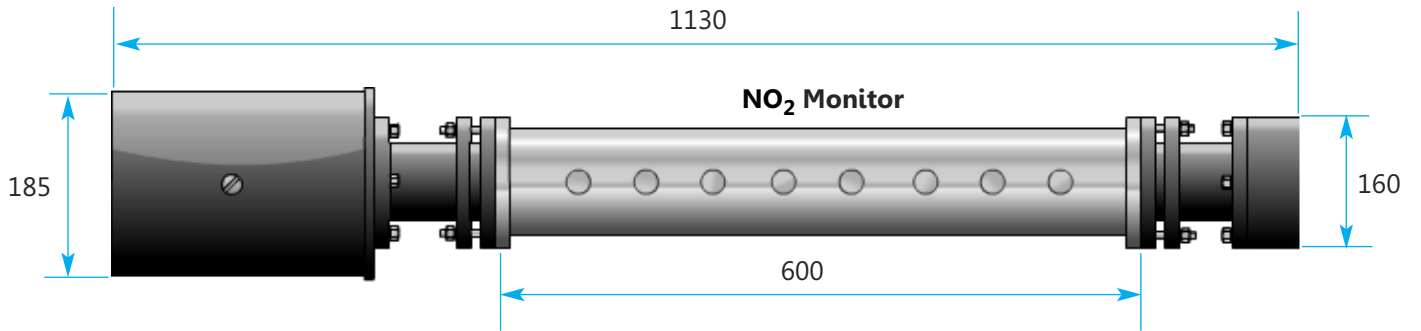
Zero calibrations and span checking (using a CODEL flow through check cell and span gas bottle) can be initiated via the software after commissioning or a maintenance period. Should it be necessary to alter the initial factory-set current and relay output configuration then this can also be carried out with ease via the SCU.

For maintenance the software includes short-term logging and trending of diagnostic data for fault analysis.

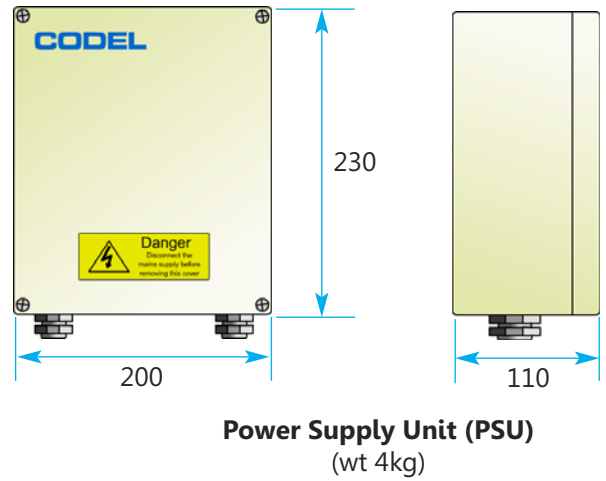
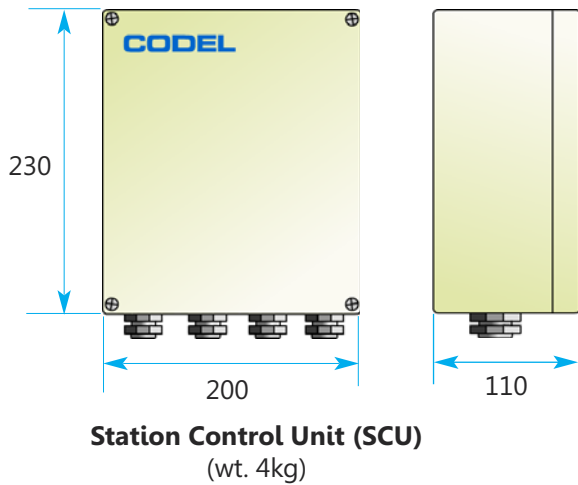
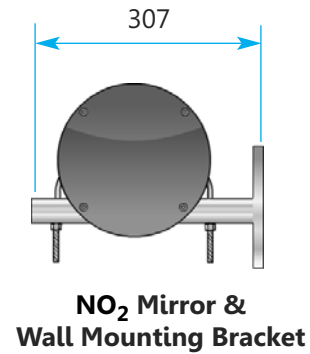
Wincom NO₂ Software



Tunnel Craft 3 - Overall Dimensions - NO₂ Monitor

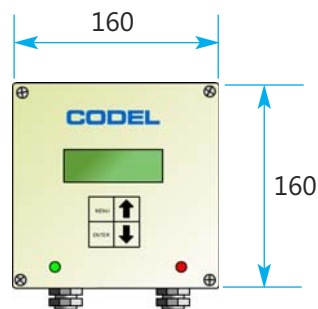


Total wt. 40kg



Note: All dimensions are in mm

Overall Dimensions - Tunnel Display Unit (Optional)



Tunnel Display Unit
(TDU) (wt 2kg)

Note: All dimensions are in mm

TunnelCraft 3 NO₂ - Technical Specification

Sensor Unit

| | |
|-----------------------|---|
| Measurement | NO ₂ - Nitrogen Dioxide |
| Measuring units | ppb (Parts Per Billion) |
| Measurement Principle | Specific absorption of blue light |
| Light Source | Blue LED |
| Measurement Path | 1m Chamber (2m folded beam) |
| Measurement Range | 0 - 1ppm standard, configurable up to 0 - 2ppm |
| Accuracy | +/- 0.04ppm |
| Detection Limit | +/- 0.01ppm |
| Response Time | 10 minutes standard, fully configurable |
| Data Refresh | 1 second |
| Ambient Temperature | -20 to +50°C |
| Power Supply | 48V DC, 50VA from Station Control Unit (SCU) |
| Construction | Measurement Chamber - 316L stainless steel, Sensor - Epoxy coated aluminium |
| IP Rating | IP67 |

Compliances

| | |
|-------------|--------------------------------|
| EMC | 89/336/EEC directive compliant |
| Low Voltage | 73/23/EEC directive compliant |

Communications & Outputs

| | |
|---------------------|---|
| Analogue outputs | 2 x 4-20mA, 200V common made isolation, max. load 500Ω |
| Logic | 2 x volt-free contacts SPCO, 0.25A @ 125V AC, 1A @30V DC, 0.25A @ 100V DC |
| Communications Port | Via CODEL serial digital data bus |

Services

| | |
|-------|---|
| Power | Mains 110/230 VAC single phase 50/60 hz |
|-------|---|

Optional Items

| | |
|-------------------------|--|
| Flow Through Check Cell | NO ₂ span check using bottled audit gases |
| Tunnel Display Unit | For local display of sensors outputs |
| Serial Data | RS485 Modbus Protocol |

CODEL International Ltd
Station Building
Station Road
Bakewell
Derbyshire
DE451GE
United Kingdom

Tel : +44 (0)1629 814351
Fax : +44 (0)8700 566307
Web : www.codel.co.uk
Email : sales@codel.co.uk

Distributor