



Tunnel Atmosphere Monitoring

TunnelCraft 3 - Air Flow Monitor

Windspeed & Direction

Low-cost Precision Tunnel Sensors

- Single point ultrasonic measurement technology, uninterrupted by traffic flow and sound reflections
- No moving components providing maintenance free operation
- Designed to withstand the harshest of tunnel environments.
- Measurement precision of +/-0.2m/sec



TunnelCraft 3 - Air Flow Monitoring in Road Tunnels

The TunnelCraft 3 Air Flow Monitor (AFM) is CODEL's industry proven tunnel air flow monitor.

Tunnel ventilation systems are designed to enable a sufficient throughput of air to be maintained to ensure a safe operating environment. These systems consume large amounts of power and need to be operated as efficiently as possible. To do this it is necessary to know the effectiveness of the system in terms of air flow and direction developed in the tunnel.

Three decades of development, knowledge and practical experience have been utilised to produce this advanced technology tunnel sensor that combines the reliability of ultrasonic technology whilst delivering superb accuracy and reliability at a very competitive price.

An ultrasound transmitter and four receivers are contained in a single compact unit that can be mounted on a wall of the tunnel.

Sound waves from the transmitter Tx are received by the four receivers Rx1,2,3 and 4 as shown in figure 2. With no air flow the sound transmission time to the complementary pairs of receivers Rx1 and 4 and Rx2 and 3 will be equal. The sound wave received at Rx1 will be exactly in phase with that at Rx4. Similarly Rx2 will be in phase with Rx3. When an air flow exists however the air flow as shown in figure 2 opposes the sound transmission to receivers 1 and 2 along paths A and B thereby increasing the sound transmission time, while sound transmission to receivers 3 and 4 along C and D is enhanced thus reducing transmission time. The result is that a phase shift develops between Rx1 and Rx4, and between Rx2 and Rx3.

This phase shift is directly proportional to air velocity and direction. These phase shifts can be measured extremely accurately to provide a continuous and very reliable measurement of air velocity.

Two pairs of receivers are used in order to achieve a working air velocity range up to 20m/sec. The outer pair of sensors is used for low velocities and the inner pair for high velocities.

The sensor contains no moving components and requires no routine maintenance.

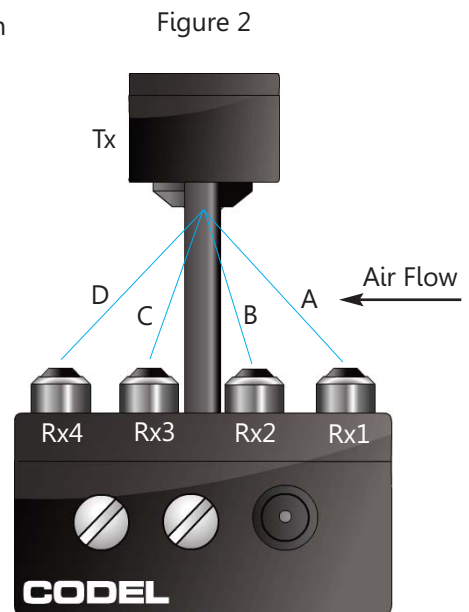
Fully configurable analogue and alarm outputs are provided, an optional choice of either RS232 or RS485 outputs which can be utilised to deliver MODBUS protocol to a SCADA system located in the tunnel control centre.

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.

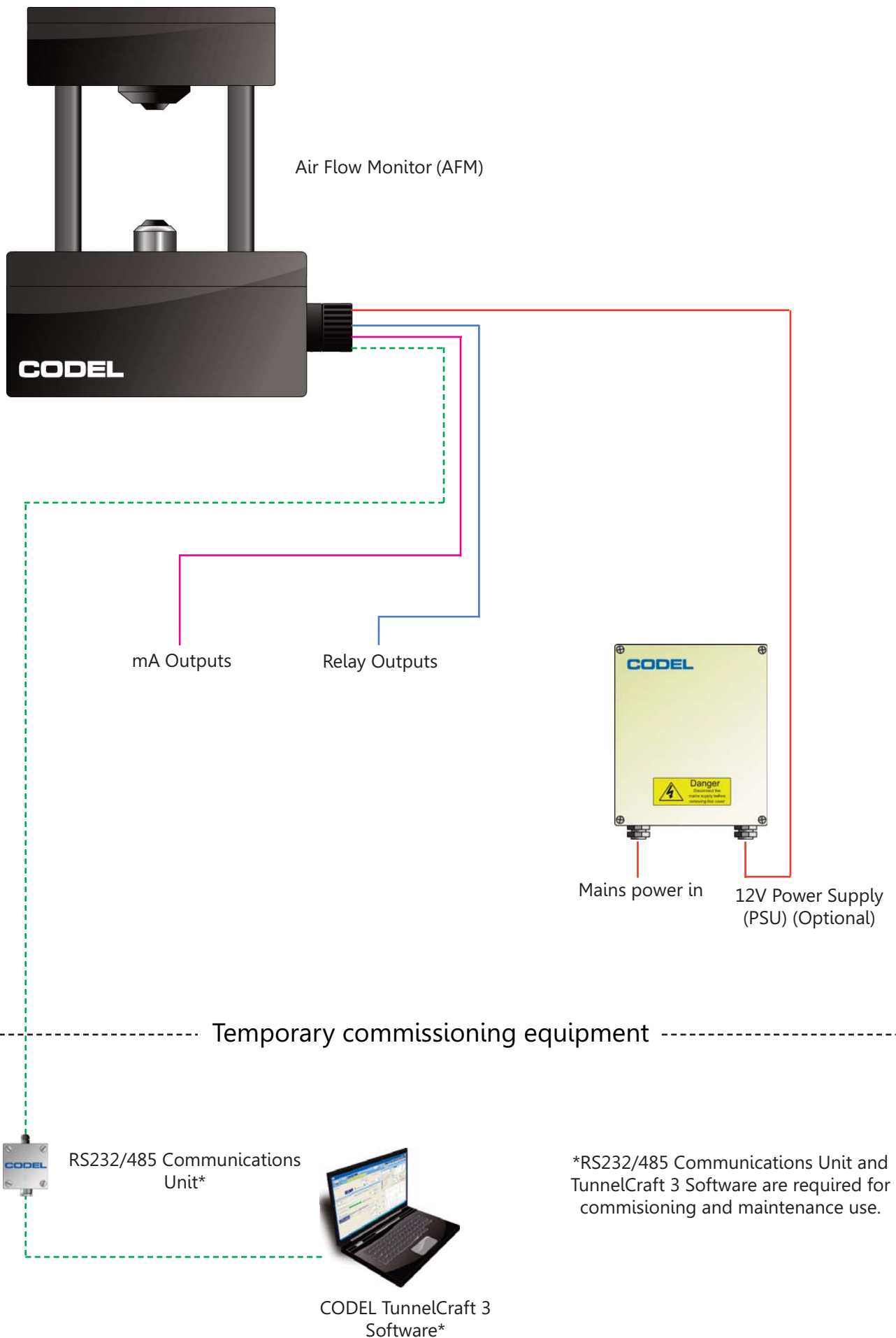
CODEL's tunnel sensor range is further extended by additional sensors for the measurement of CO, NO & Visibility and NO₂

Please see additional product data sheets:-

- TunnelCraft 3 Air Quality Monitor
For the measurement Carbon Monoxide, Nitric Oxide & Visibility
- TunnelCraft 3 NO₂ Monitor
For the measurement of nitrogen dioxide



TunnelCraft 3 - Air Flow Monitor - System Arrangement



TunnelCraft 3 Software

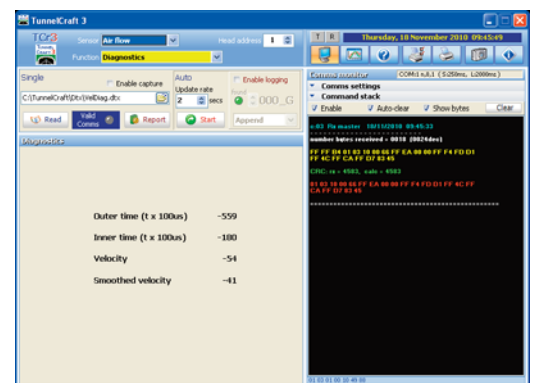
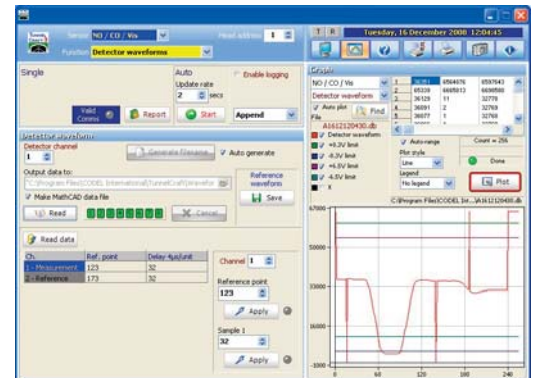
- Easy installation and set-up
- Will operate on any Windows based operating system
- Allows sensor's configuration settings to be adjusted
- Fault diagnostic logging for sensor troubleshooting

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 PC, 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 a PC using either an RS232 or optional RS485 communications box, also supplied with the sensor.

Zero calibrations 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.

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



Communication Interfaces

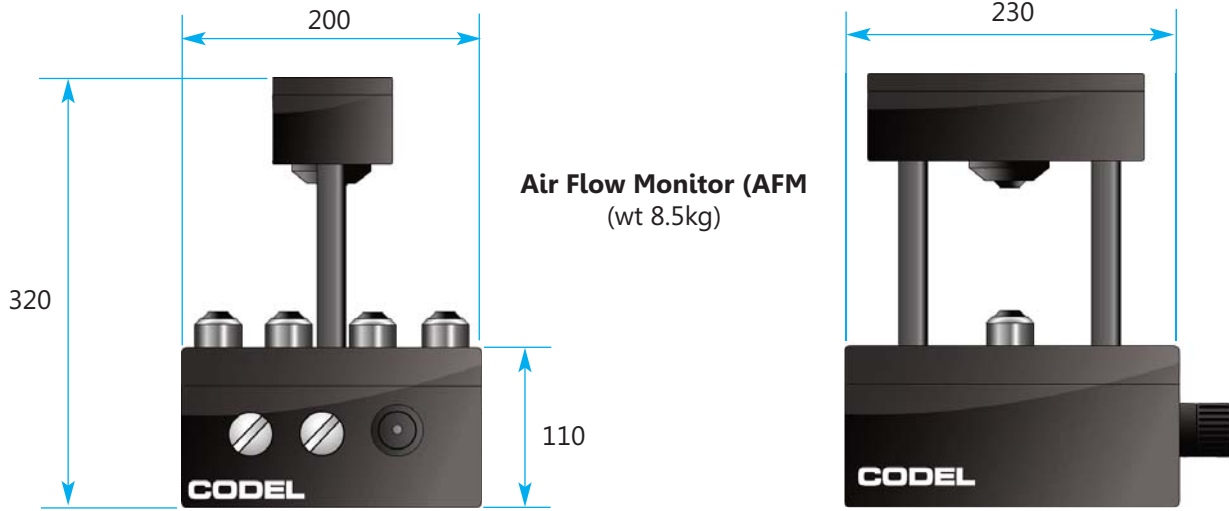


RS232 Unit



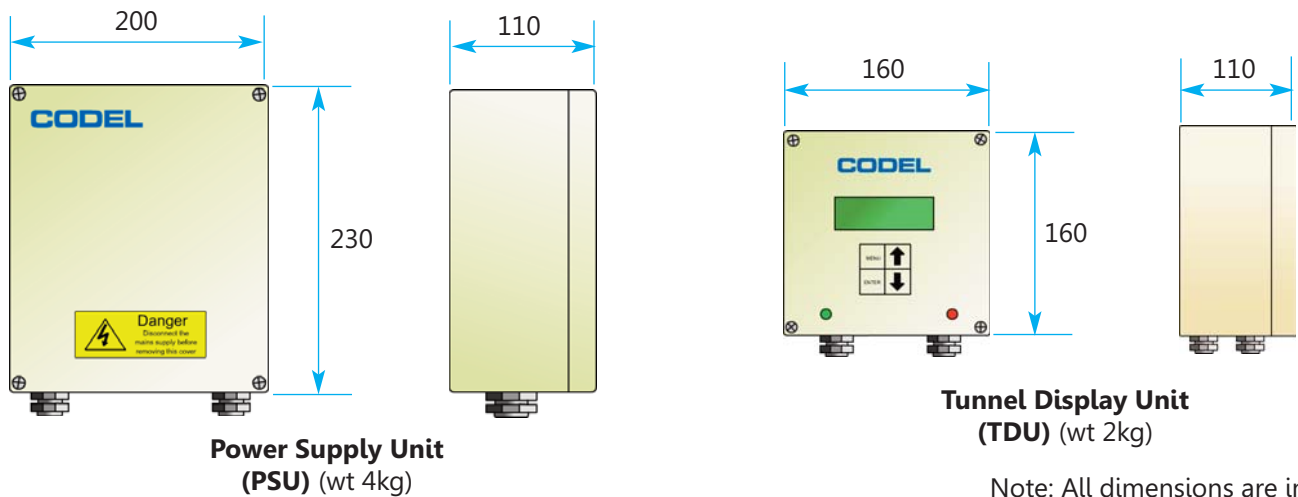
RS485 Unit

Overall Dimensions - TunnelCraft 3 - Air Flow Monitor



Note: All dimensions are in mm

Overall Dimensions - Power Supply Unit & Tunnel Display Unit (Optional)



TunnelCraft 3 Air Quality Monitor - Technical Specification

Sensor Unit

Measurements	Windspeed and direction
Units	m/sec
Measurement Technique	Ultrasonic
Measurement range (typical*)	-20 to +20m/sec
Accuracy	+/- 0.2m/sec
Averaging Time	10 Sec to 60min
Ambient Temperature	-20°C to +50°C
Power supply	12V DC, 20 VA from separate power supply
Construction	Corrosion resistant epoxy coated aluminium housing sealed to IP67

Compliances

EMC	EN61326-1:2006 & EN50270:2006 directive compliant
Low Voltage	73/23/EEC directive compliant

Communications & Outputs

Analogue outputs	2 x 4-20mA current outputs as standard, isolated, 500Ω load max, fully configurable through TunnelCraft software.
Relay Outputs	2 x volt-free SPCO contacts, 50V, 1A max, configurable as alarm contacts
Communications Port	For local connection to laptop PC using RS232 or optional RS485 interface unit

Output Configuration Options

Option 1

Using 2 x mA outputs	1 x mA output configured for -20 to 0m/sec.
	1 x mA output configured for 0 to +20m/sec.

Option 2

Using 2 x mA outputs	1 x mA output configured for 0 to +20m/sec.
Using 1 x relay output	For flow direction

Option 3

Using 1 x mA outputs	1 x mA output configured (4 to 12mA) for -20 to 0m/sec
	1 x mA output configured (12 to 20mA) for 0 to +20m/sec

Services

Power	12V DC @1.5A
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Optional Items

Power Supply	110/220VAC , 50Hz +/- 10%, 60w at 12V
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