



- **Direct in-situ measurement of NO<sub>2</sub>, NO, (NO<sub>x</sub>), CO, Visibility and Temperature**
- **Direct optical measurement of nitrogen dioxide (NO<sub>2</sub>) using differential absorption**
- **Visibility measurement using accepted light transmission opacity technique**
- **Proven infrared spectroscopy technique for NO & CO measurement**
- **High quality 316 stainless steel construction ensuring a long service life**
- **Pre-aligned quick release TX and RX heads enabling simpler installation and easier maintenance**
- **IP67 rated external enclosure with quick release dust protection tubes**

The VICONOX tunnel monitor is a single sensor solution for measuring NO<sub>2</sub>, NO, (NO<sub>x</sub>), CO, visibility and temperature within a traffic tunnel, rail tunnel or other confined space.

The VICONOX uses a combination of differential optical absorption and infrared spectroscopy to measure nitrogen dioxide (NO<sub>2</sub>), nitric oxide (NO) and carbon monoxide (CO) in tunnel atmospheres whilst measuring visibility by using the standard light transmission obscuration technique. NO<sub>x</sub> levels are calculated from the measured NO and NO<sub>2</sub> concentrations.

The VICONOX also measures temperature and humidity so all measurements are compensated for both factors to ensure stable readings across all conditions.

The VICONOX can measure up to six (6) parameters simultaneously (including temperature) or combinations thereof. This not only minimises capital cost but also minimises the requirements for cabling, installation and start-up.

The VICONOX is available in the following configurations:

Model	Parameter Measured					
	Vis	CO	NO	NO <sub>2</sub>	NO <sub>x</sub>	Temp
VICONOX-0	√					√
VICONOX-1	√	√				√
VICONOX-2	√	√	√		√	√
VICONOX-3	√	√		√		√
VICONOX-4	√		√	√	√	√
VICONOX-5	√	√	√	√	√	√

Having been designed specifically for tunnel environments, the VICONOX is of rugged construction using powder coated 316 stainless steel to achieve an IP67 / NEMA 6P protection rating. This instrument can withstand the corrosive atmosphere and regular tunnel washing that the tunnel environment endures.

The VICONOX has been designed for ease of use and to minimise tunnel maintenance by using an automatic zero level calibration function. The instrument also performs detailed self-diagnosis to provide information on any instrument faults as well warnings that should be checked at the next scheduled maintenance. The routine maintenance is typically every 12 months consisting of an instrument check and clean. In the unlikely event of a faulty TX or RX head the use of cable sockets and a quick release mounting, makes it very easy to replace a head.

The VICONOX is an intelligent analyser with on-board industry standard SCADA/PLC interface options, such as 0/2/4...20mA outputs, alarm relay contacts and a choice of serial communications protocols. As such the VICONOX has no need for a control unit although one is available as an option. As a stand-alone instrument the VICONOX is set-up and controlled using the supplied utility software, installed on a PC or laptop and connected via the USB connector on the RX.

### Specification

#### NO<sub>2</sub> Measurement Performance

No.	Parameter	Units	Min	Max	Comment
1	Path Length	m	5	12	Optimum 10m
2	Measurement Range	ppm (ppb)	0	10	User selectable (Option)
3	Resolution	ppm		0.01	Display resolution
4	Accuracy	%	-5	+5	Of Reading (at 10m path length)
5	Detection Limit	ppm		0.05	At 10m path length
6	Damping	s	1	999	Default setting is 20s
7	Temperature Stability	ppm	-0.05	+0.05	At 10m path length

#### Visibility Measurement Performance

No.	Parameter	Units	Min	Max	Comment
8	Measurement Range				User selectable With density scale factor =1.0
	Transmission	T	0	1.000	
	Extinction Coefficient (k)	m <sup>-1</sup>	0	0.1000	
	Meteorological Optical Range (MOR)	m	0	15000	
	Opacity	%	0	100	
9	Resolution				Display resolution
	Transmission	T		0.001	
	Extinction Coefficient (k)	m <sup>-1</sup>		0.0001	
	Meteorological Optical Range (MOR)	m		1	
	Opacity	%		0.1	
10	Accuracy	%			At 10m path length
	Extinction Coefficient (k)	m <sup>-1</sup>	-0.0005	+0.0005	
	Opacity	%	-0.5	+0.5	
11	Damping	s	1	999	Default setting is 3s
12	Temperature Stability				At 10m path length
	Extinction Coefficient (k)	m <sup>-1</sup>	-0.001	+0.001	
	Opacity	%	-1	+1	

#### CO/NO (NO<sub>x</sub>) Measurement Performance

No.	Parameter	Units	Min	Max	Comment
13	Display range	ppm	0	500	User selectable
14	Resolution	ppm		0.1	Display resolution
15	Accuracy	CO %	-5	+5	Of Reading Instrument calibrated in-situ
		NO (NO <sub>x</sub> ) %	-10	+10	
16	Detection Limit	CO ppm		1	
		NO (NO <sub>x</sub> ) ppm		2	
17	Damping	CO s		100	
		NO (NO <sub>x</sub> ) s		200	
18	Temperature Stability	ppm	-2	+2	At 10m path length

#### Temperature Measurement Performance

No.	Parameter	Units	Min	Max	Comment
19	Display range	°C	-40	+100	User selectable
20	Resolution	°C		0.1	Display resolution
21	Accuracy	°C	-2	+2	

#### Power

22	Voltage	Vdc		+24	
23	Voltage Tolerance	%	-10	+10	
24	Nominal Current Consumption	A		2	
25	Power Up Current Consumption	A		3	

### Interface Options

26	Serial outputs				ModBus RTU via RS485 External USB (RX)
27	Analogue Outputs (four)	mA	0 / 2 / 4	20	Isolated and scalable (user selected)
28	Digital Relay Contacts (five)	A	0	3	@30Vdc (signal levels and data valid)

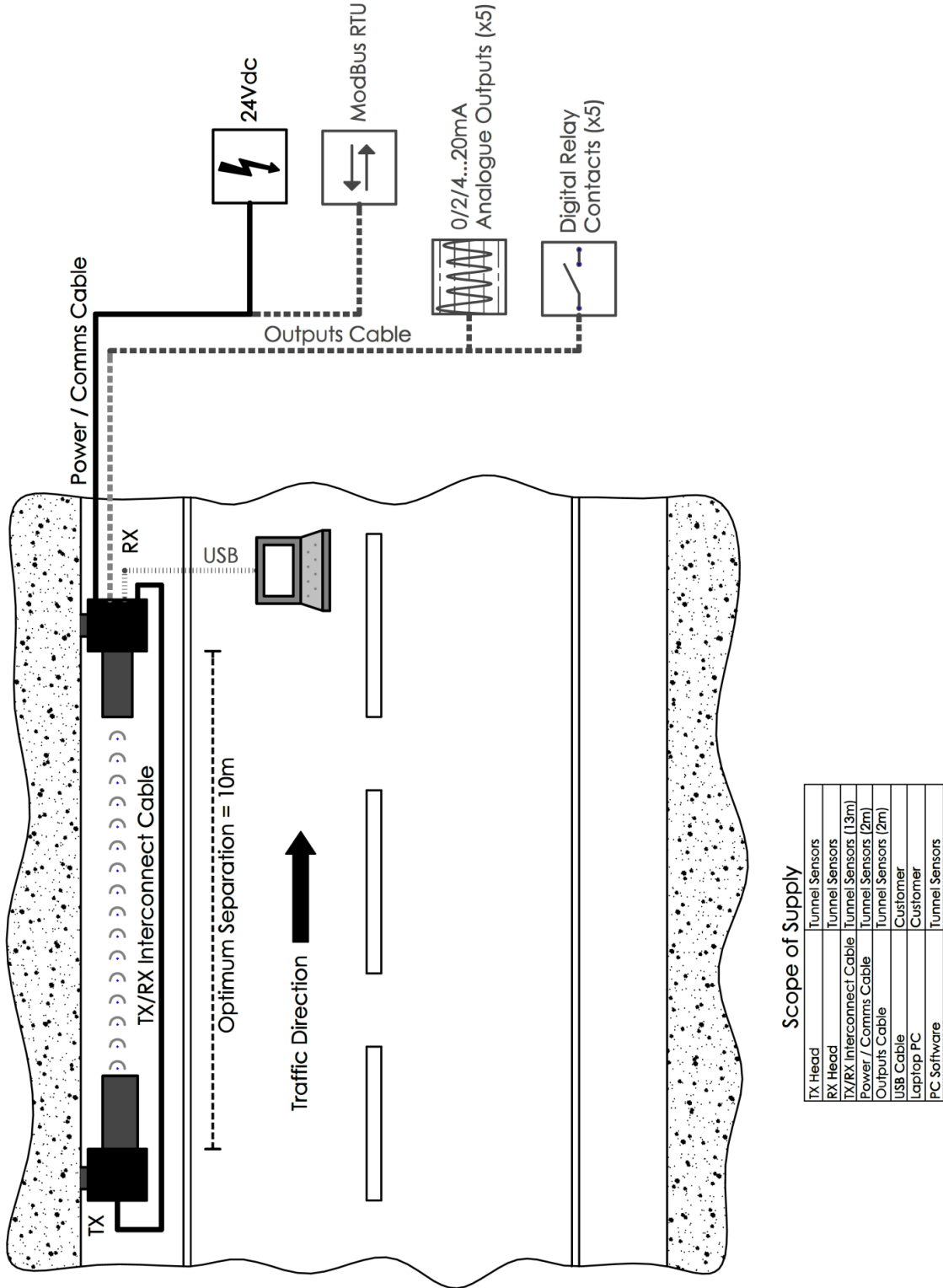
### Physical

29	Ingress Protection			IP67	
30	Operating Temperature	°C	-20	+55	
31	Operating Humidity	%		100	
32	Materials				Stainless Steel (powder coated)
33	Dimensions	mm	180 x 210 x 200		Each head (without sight tubes)
34	Weight	kg		5.3	Each head

### Compliance & Design

35	Regulatory Compliance				2014/30/EU (Electromagnetic Radiation) 2014/35/EU (Low Voltage)
36	Design Life	Years	20		
37	MTBF	Years	>10		
38	Warranty	Months	24		Return to base warranty. Extensions available.

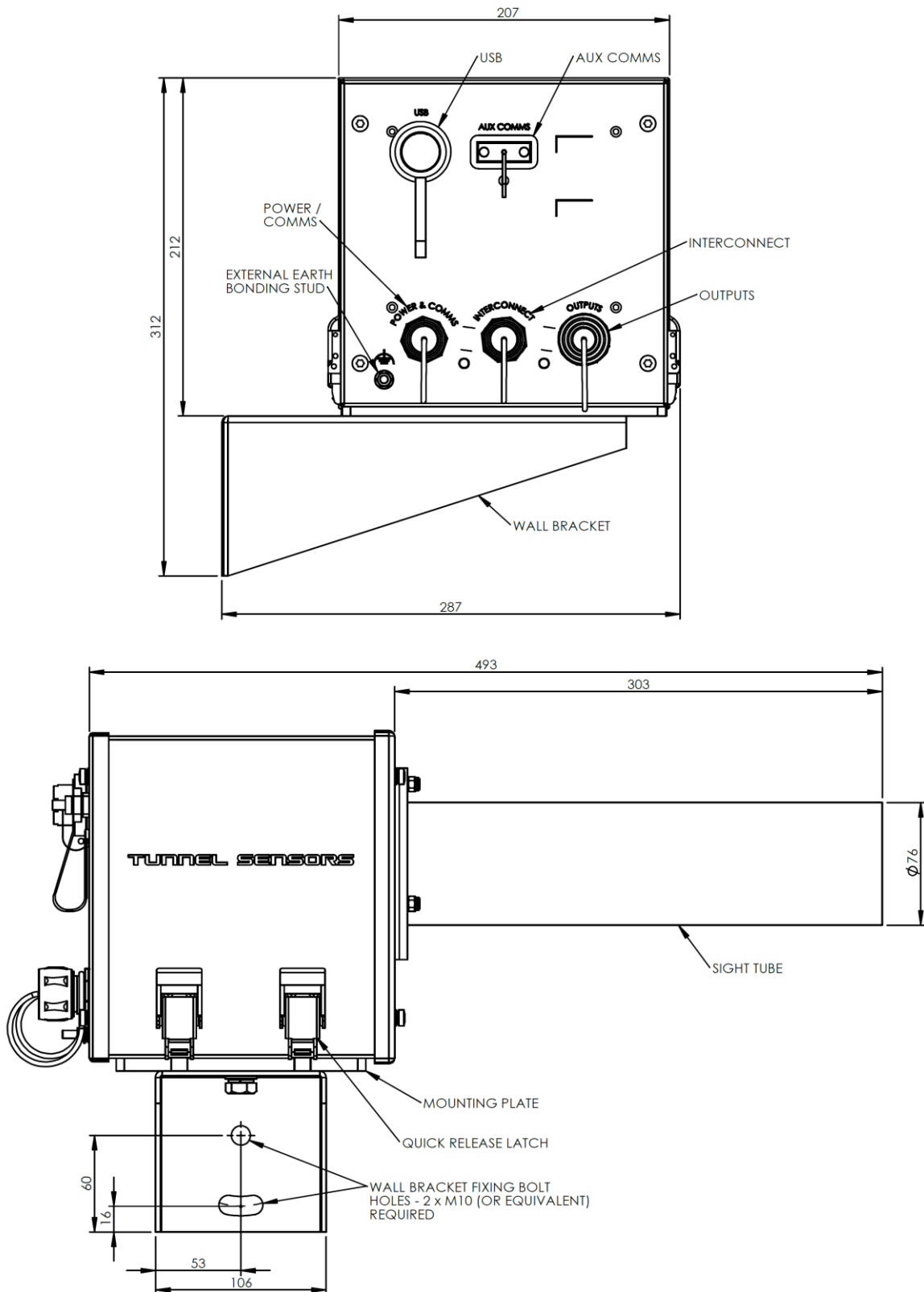
### Installation Overview



[sales@tunnelsensors.com](mailto:sales@tunnelsensors.com) [www.tunnelsensors.com](http://www.tunnelsensors.com)

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**Dimensions RX Head (mm)**



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### Options & Accessories

Description	Order Code	Notes
 <p>VICONOX Instrument</p>	<p>TSL-VICONOX-0 TSL-VICONOX-1 TSL-VICONOX-2 TSL-VICONOX-3 TSL-VICONOX-4 TSL-VICONOX-5</p>	<p>All include: TX head &amp; RX head with sight tubes; 13m interconnecting cable; 2 off wall brackets; 2m power / comms cable; 2m outputs cable.</p>
<p>Cable</p>	<p>CBL-098 CBL-099</p>	<p>7-core screened LSHZ cable 20-core screened LSHZ cable</p>
 <p>Cable Assemblies</p>	<p>CBL-103 CBL-104 CBL-105 CBL-106 CBL-158 CBL-192</p>	<p>Power / comms cable – 10m length Outputs cable – 10m length Power / comms cable – 20m length Outputs cable -20m length Interconnecting cable – 20m length Interconnecting cable – 15m length</p>
<p>PSU (Boxed)</p>	<p>TSL-PSU-75</p>	<p>Multi AC input, 24Vdc output 75W, IP67 rated enclosure</p>
 <p>Combined PSU / Termination Unit</p>	<p>ASY-206</p>	<p>Variable Vac input; 24Vdc output 75W power 6 free terminals (for power / comms) IP67 rated enclosure</p>
 <p>Junction Box</p>	<p>TSL-JB-6</p>	<p>Junction box with 6 free terminals, for local termination of power / comms</p>
 <p>CO &amp; NO Calibration Check Cell</p>	<p>TSL-NC-001</p>	<p>CO ~100ppm</p>
	<p>TSL-NC-002</p>	<p>CO ~100ppm NO ~100ppm</p>

<p>Optical Filter holder</p> 	<p>ASY-143</p>	<p>Calibration filter holder for visibility and NO<sub>2</sub> filters</p>
<p>Visibility Calibration Check Filter</p> 	<p>ASY-190</p>	<p>Visibility ~8% opacity</p>
	<p>ASY-133</p>	<p>Visibility ~20% opacity</p>
	<p>ASY-183</p>	<p>Visibility ~35% opacity</p>
<p>NO<sub>2</sub> &amp; Vis Calibration Check Filter</p> 	<p>ASY-177</p>	<p>Viibility ~35% opacity NO<sub>2</sub> ~5ppm</p>

Note that the actual part may differ from the above representative pictures.