VICONOX

Combined CO, NO, NO_2 and Visibility Monitor for Tunnels

- **Direct in-situ measurement of NO_2, NO, (NO_X), CO, Visibility and Temperature**
- **Direct optical measurement of nitrogen dioxide (NO_2) using differential absorption**
- **Visibility measurement using accepted light transmission opacity technique**
- **Proven infrared spectroscopy technique for NO & CO measurement**
- **High quality 316L 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_2, NO, (NO_X), 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_2), nitric oxide (NO) and carbon monoxide (CO) in tunnel atmospheres whilst measuring visibility by using the standard light transmission obscuration technique. NO_X levels are calculated from the measured NO and NO_2 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.

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The VICONOX is available in the following configurations:

	Parameter Measured					
Model	**Vis**	**CO**	**NO**	**NO_2**	**NO_X**	**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 316L 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.

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Specification

NO_2 Measurement Performance

Item	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 (at 10m path length)	ppm %	-0.05 -5	+0.05 +5	(Detection Limit) Of Reading
5	Damping	s	1	999	Default setting is 20s

Visibility Measurement Performance

No.	Parameter	Units	Min	Max	Comment
6	Measurement Range				User selectable
	Extinction Coefficient (k)	km^{-1}	0	15	
	Meteorological Optical Range (MOR)	m	0	15000	
	Opacity	%	0	100	
	Particulate Density (Dust)	mg/m^3	0	100	With density scale factor =1.0
7	Resolution				Display resolution
	Extinction Coefficient (k)	km^{-1}		0.1	
	Meteorological Optical Range (MOR)	m		1	
	Opacity	%		0.1	
	Particulate Density (Dust)	mg/m^3		0.1	
8	Accuracy				
	Extinction Coefficient (k)	km^{-1}	-0.2	+0.2	At 10m path length
9	Damping	s	1	999	Default setting is 3s

CO/NO (NO_X) Measurement Performance

No.	Parameter	Units	Min	Max	Comment
10	Measurement Range				User selectable
	CO	ppm	0	300	
	NO	ppm	0	100	
11	Resolution	ppm		0.1	Display resolution
12	Accuracy				
	(Detection Limit) CO	ppm		1	
	NO	ppm		2	
13	Accuracy				
	CO	%	-2	+2	Of Reading
	NO	%	-5	+5	(Instrument calibrated in-situ)
14	Damping				
	CO	s	40		
	NO	s	100		

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Temperature Measurement Performance

No.	Parameter	Units	Min	Max	Comment
15	Display range	°C	-40	+100	User selectable
16	Resolution	°C		0.1	Display resolution
17	Accuracy	°C	-2	+2	

Power

18	Voltage	Vdc	+24		
19	Voltage Tolerance	%	-10	+10	
20	Nominal Current Consumption	A		2	
21	Power Up Current Consumption	A		3	

Interface Options

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

Physical

25	Ingress Protection			IP67	
26	Operating Temperature	°C	-20	+55	
27	Operating Humidity	%		100	
28	Material				AISI/SAE 316L stainless steel
29	Dimensions	mm	180 x 210 x 200		Each head (without sight tubes)
30	Weight	kg		5.3	Each head

Compliance & Design

31	Regulatory Compliance				2014/30/EU (Electromagnetic Radiation) 2014/35/EU (Low Voltage)
32	Design Life	Years	20		
33	MTBF	Years	>20		
34	Warranty	Months	24		Return to base warranty. Extensions available.

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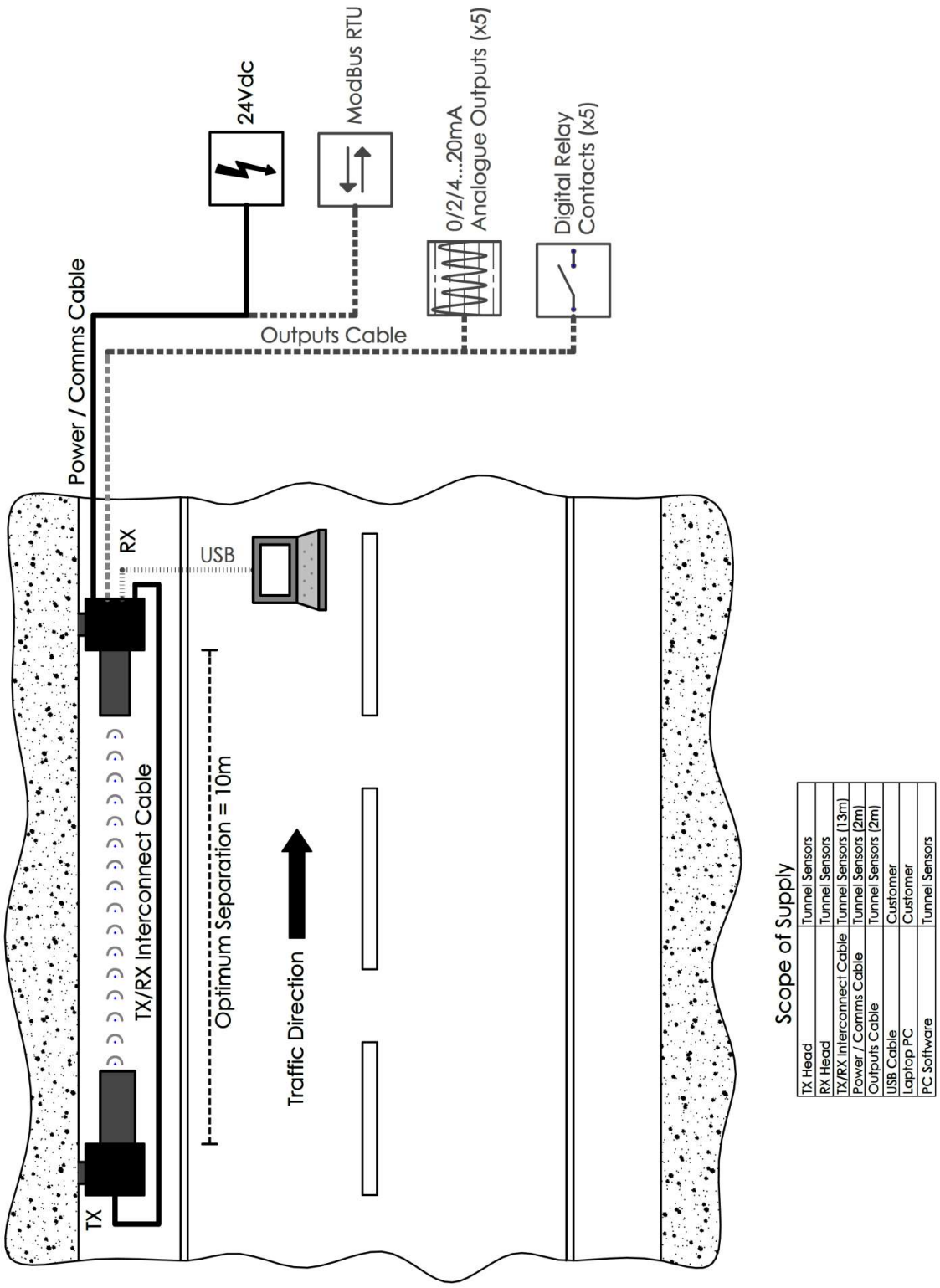
Installation Overview



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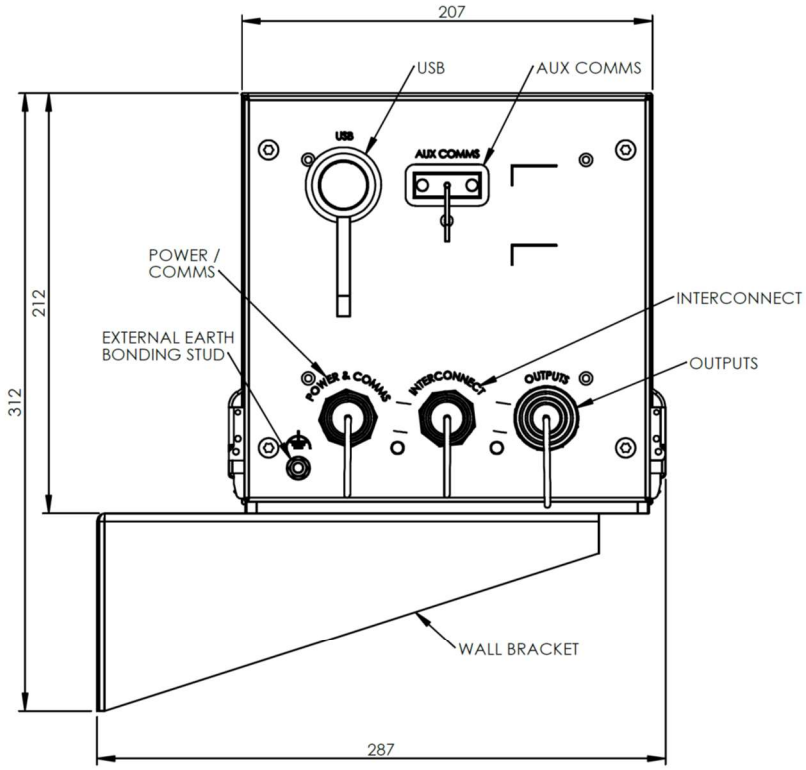
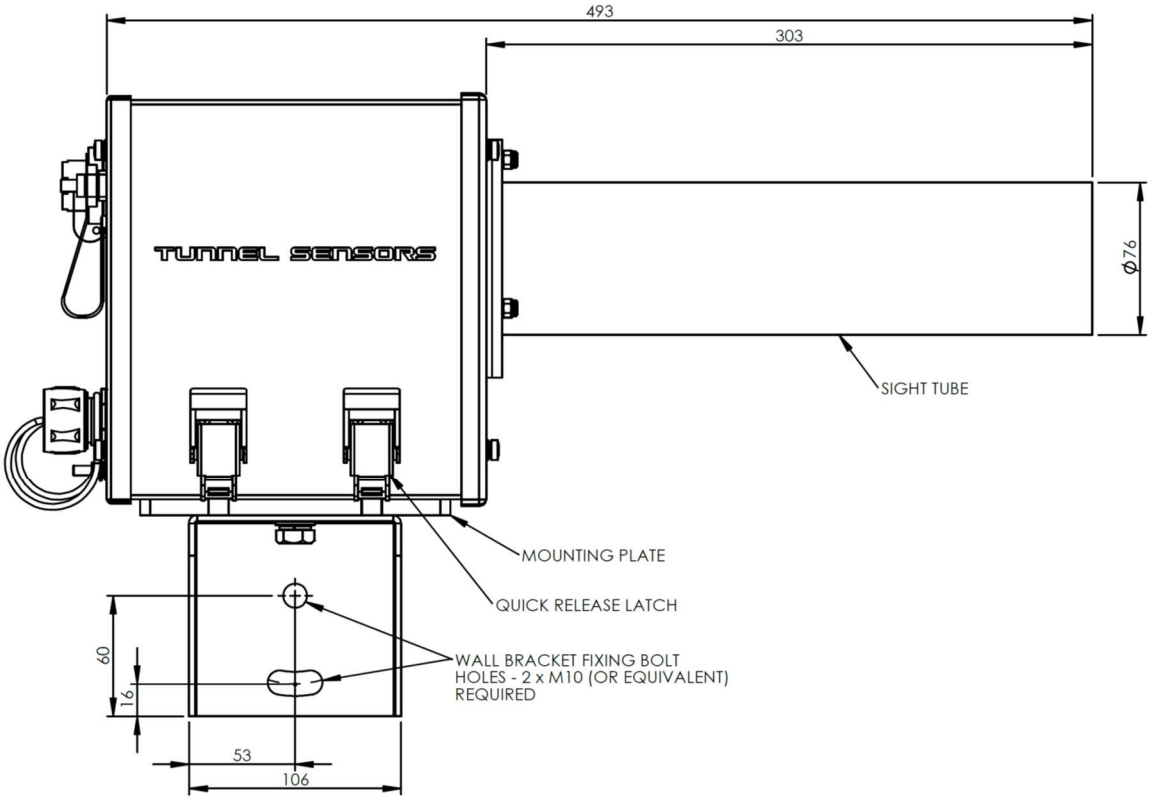
Dimensions RX Head (mm)





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Options & Accessories

Description	Order Code	Notes
VICONOX Instrument 	TSL-VICONOX-0 TSL-VICONOX-1 TSL-VICONOX-2 TSL-VICONOX-3 TSL-VICONOX-4 TSL-VICONOX-5	All include: TX head & RX head with sight tubes; 13m interconnecting cable; 2 off wall brackets; 2m power / comms cable; 2m outputs cable.
Cable	CBL-099 CBL-098	7-core screened LSHZ cable 20-core screened LSHZ cable
Cable Assemblies 	CBL-103 CBL-104 CBL-105 CBL-106 CBL-158 CBL-192	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
Combined Termination Unit 	TSL-CTU	Local cable termination unit for VICONOX electrical connections, based on a choice of DIN rail terminals – see separate datasheet for details.
	TSL-CTU-P	Local termination unit with integral 24V PSU for VICONOX electrical connections, based on a choice of DIN rail terminals and a 75W PSU - see separate datasheet for details.
Large Combined Termination Unit 	TSL-CTU-L1	Large local termination unit for VICONOX electrical connections, with circuit board mounted two-part terminals – see separate datasheet for details.
	TSL-CTU-L1-P	Large local termination unit with integral 24V PSU for VICONOX electrical connections, with circuit board mounted two-part terminals and a 75W PSU - see separate datasheet for details.

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Audit Filter Kit  	TSL-VX-AFK-0	Audit kit including optical filters and optical filter holder necessary for calibration checking VICONOX-0
	TSL-VX-AFK-1	Audit kit including optical filters, optical filter holder, and gas filled check cell necessary for calibration checking VICONOX-1
	TSL-VX-AFK-2	Audit kit including optical filters, optical filter holder, and gas filled check cell necessary for calibration checking VICONOX-2
	TSL-VX-AFK-3	Audit kit including optical filters, optical filter holder, and gas filled check cell necessary for calibration checking VICONOX-3
	TSL-VX-AFK-4	Audit kit including optical filters, optical filter holder, and gas filled check cell necessary for calibration checking VICONOX-4
	TSL-VX-AFK-5	Audit kit including optical filters, optical filter holder, and gas filled check cell necessary for calibration checking VICONOX-5
 	TSL-VX-FTC	Flow through gas cell for calibration checking

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