



- **Designed specifically for tunnels**
- **Reliable ultrasonic transit time measurement**
- **No moving parts or wear items, low maintenance**
- **Range of on-board outputs, the control unit (TSCU) is optional.**
- **Separate alignment brackets with latched sensor attachment**
- **High quality plug and socket connectors for external connections**

CROSSFLOW is a cross bore air flow monitor designed to measure air speed and direction in multi-lane and bi-directional tunnels. The monitor consists of a pair of transceivers which are mounted and aligned on either side of the bore. The transceivers both emit ultrasonic pulses and measure the sound waves time in flight in each direction. The difference between these flight times is used to determine the flow of air within the tunnel. This can then be used as part of the tunnel's ventilation and energy management system.

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

CROSSFLOW can also be paired with a TSCU operator interface (Tunnel Sensors Control Unit), which is a remotely located control unit with a display, keypad and full range of interface capabilities to match those found in the CROSSFLOW itself. Since the TSCU has all the same interface abilities as the CROSSFLOW, interface connections can be made directly to the TSCU (which can be positioned at a convenient accessible location) and/or to the CROSSFLOW. This versatility offers the flexibility to accommodate a wide range of wiring schemes.

The CROSSFLOW monitor has no moving parts and no regular service requirement, making it a very reliable “fit and forget” monitor. The instrument performs several self-checking and diagnostic routines, which in the unlikely event of a problem, can identify the fault and report it via the service alarm relay and/or serial comms.

CROSSFLOW provides a reliable long term solution that is simple to install whilst requiring minimal service and maintenance. Plug and socket connectors and latched alignment brackets help to decrease the installation and maintenance time. An IP67 rating and the use of stainless steel ensures that CROSSFLOW can withstand the harsh environments and aggressive cleaning cycles found in tunnels.

### Specification:

#### AIRFLOW Measurement

Item	Parameter	Units	Min	Max	Comment
1	Measuring Principle				Ultrasonic transit time (open path)
2	Measuring Path	m m	5 15	25 35	CROSSFLOW CROSSFLOW-L
3	Measurement Range	m/s mph	-20 -45	+20 +45	User selectable (also available as ft/min or kph)
4	Measuring Angle	deg	30	60	
5	Resolution	m/s		0.1	Display resolution
6	Accuracy	m/s %	-0.1 -2	+0.1 +2	Relative to reading
7	Damping	seconds	1	999	User selectable (response time ~3x damping)

#### TEMPERATURE Measurement (CROSSFLOW-T & CROSSFLOW-LT only)

No.	Parameter	Units	Min	Max	Comment
8	Measuring Principle				RTD
9	Measurement Range	°C	-20	+70	User selectable (also available as °F)
10	Resolution	°C		0.1	Display resolution
11	Accuracy	°C	-0.5	+0.5	
12	Damping	seconds	1	999	User selectable (response time ~3x damping)

#### Power

13	Voltage	Vdc		+24	
14	Voltage Tolerance	%	-10	+10	
15	Nominal Current Consumption	mA		300	
16	Power Up Current Consumption	mA		300	

### Interface Options

17	Serial Outputs				Modbus RTU via RS485 External USB
18	Analogue Outputs (two)	mA	0 / 2 / 4	20	Isolated and scalable (user selected)
19	Digital Relay Contacts (three)	A	0	3	@30Vdc (signal level and data valid)




### Physical



20	Ingress Protection			IP67	
21	Operating Temperature	°C	-25	+55	
22	Operating Humidity	%		100	
23	Operating Pressure	hPa	600	1100	
24	Materials Transceiver Enclosure				AISI/SAE 316L stainless steel
25	Dimensions	mm	96 x 158 x 197		Each head (without dust tube)
26	Weight	kg		2.5	Each head

### Compliance & Design

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

### Options & Accessories

Description	Order Code	Notes
CROSSFLOW instrument 	CROSSFLOW CROSSFLOW-T CROSSFLOW-L CROSSFLOW-LT	Standard instrument With external air temperature monitor Long path instrument Long path instrument with external air temperature monitor
Variable Angle Mounting Bracket Adapter 	TSL-CFW-VAMBA	Wall bracket adapter for use on curved or sloping tunnel walls.
Cable	CBL-099 CBL-098	7-core screened LSHZ cable 20-core screened LSHZ cable
Cable Assemblies 	CBL-194 CBL-103 CBL-105 CBL-195 CBL-104 CBL-106	Power / comms cable - 5m length Power / comms cable - 10m length Power / comms cable - 20m length Outputs cable - 5m length Outputs cable - 10m length Outputs cable - 20m length

<p>Combined Termination Unit</p> 	TSL-CTU	Local cable termination unit for CROSSFLOW 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 CROSSFLOW electrical connections, based on a choice of DIN rail terminals and a 75W PSU – see separate datasheet for details.
<p>Large Combined Termination Unit</p> 	TSL-CTU-L1	Large local termination unit for CROSSFLOW 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 CROSSFLOW electrical connections, with circuit board mounted two-part terminals and a 75W PSU – see separate datasheet for details.

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