MULTIPOINT OPTICAL METHANE SENSING FOR MINES

CREATING SAFER SURROUNDINGS

The OptoSniff® system continuously and reliably measures methane concentrations from hundreds of sensing points over long distance (up to 20km), inherently safe, optical fibre links. It uses innovative laser and fibre optic technology for rugged gas monitoring in coal and other mines, and offers significant advantages over alternative gas detection technologies.

Key Features & Benefits

- Accurate monitoring where you need it – The OptoSniff system provides real-time gas-monitoring from hundreds of sensor points over potential distances up to 20km.
- Safety First – OptoSniff is an inherently safe, optical system with no electrics in sensing areas. System is certified to ATEX/IECEx for use in mines.
- Data you can trust – Rugged sensor modules are unaffected by catalytic poisoning, cross contamination & humidity. Sensors have proven resistance to dust contamination and continue operating with >95% dust coverage.
- Reduced maintenance costs – Gas sensing technique is self-referencing eliminating the need for ongoing calibration. OptoSniff is self checking helping to pro-actively identify potential problems before they impact your operation.
- Precise and reliable measurement – OptoSniff's sensing technique delivers high sensitivity and a wide measurement range (0.05%-100% CH_4). The system is designed to measure only the target gas (methane) and exhibits no cross-sensitivity to other gases.
- Flexibility to change with your operation – The modular system design allows quick and easy expansion and component replacement allowing system to grow as new areas within the mine are developed.
- Technology you can rely on – Sensors have demonstrated many years of continuous, stable operation in hostile environments.
- Low cost of ownership – Long operational lifespan and system stability compared to alternative systems can realise significant cost benefits for your organisation.

Inherently Safe in explosive environments

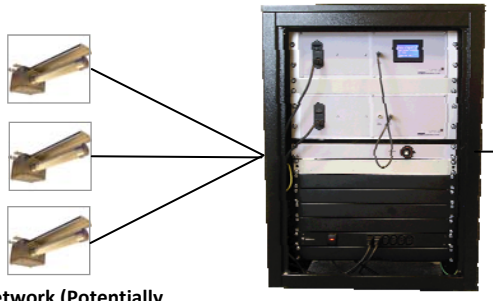

Low maintenance No re-calibration


Sensors operate in humid & harsh environments


Electrically passive sensors & network

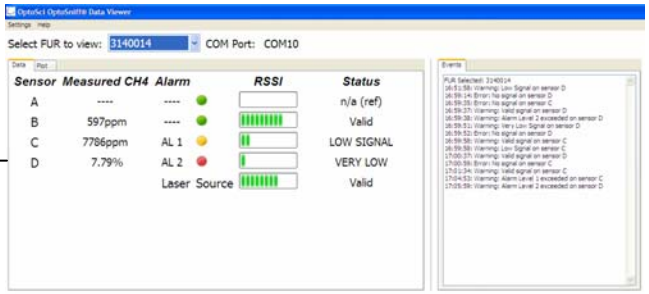
OptoSniff® Operation:

Laser light from the central control unit (CCU) is delivered by a fibre optic network to each of the measurement sensors installed at regular spacing along the service tunnel / duct. Methane present in any sensor partially absorbs the light and imposes a unique concentration dependent signature onto the return signals. All sensor readings are updated in seconds and analysis of the return signals at the individual receivers in the remotely sited CCU allows the gas concentration to be determined for each monitoring point. This information is then logged, displayed and can trigger various system monitoring & safety alarm functions, be saved for historical records, etc.



Sensor Network (Potentially 100's sensors over 20km)

OptoSniff Central Control Unit



Internal Test / Development Software

TECHNICAL DATA: OptoSniff®

PARAMETER	SPECIFICATION	NOTES
GENERAL		
Detection Method	Tuneable Diode Laser Spectroscopy (TDLS)	
Gas Detected & Range	Methane: 0.05% to 100% v/v	Using standard tunnel sensors
System Self-Checking	Continuous laser, sensor and optical network condition monitor	Full diagnostic data available at control unit; Automatic gain control ensures system still operates reliably even with 90% signal loss; Allows predictive maintenance
Calibration	Single, initial calibration of full system at control unit	TDLS detection technique is self-referencing, so calibration stable; No requirement to calibrate individual sensors in the field
PERFORMANCE		
Sensor Response Time (gas diffusion)	T_{20} < 2s, T_{50} < 10s, T_{90} < 30s	For unforced gas diffusion into air filled sensor; Sensor will respond immediately to gas flowing into it under external pressure.
System Update Time	< 3 seconds	Full system update from hundreds of sensors in < 3s (programmable)
System Repeatable Accuracy (for over 200 points)	±200ppm or ±5% of reading (i.e. 1%±0.05%)	Whichever is greater; Valid at STP; Repeatable accuracy for full system, monitoring over 200 sensors simultaneously
Number of Sensing Points	Up to 240 points	Using a single laser in control unit & standard optical network split
Maximum Link Distance	Up to 20km round-trip from Control Unit to each sensor	Longer distances also possible using fewer sensors on network
CENTRAL CONTROL UNIT		
Dimensions	19" Rack System	Overall 19" rack system height depends on number of points; Plug-in modules ease system expansion
Electrical Power Requirement	115/230V AC, 50/60Hz	Electrical power only required at control unit
Operating Temperature	0°C to +40°C	Control unit usually sited in standard office environment
Output Signal	ASCII datastream from USB output	System output can be user interfaced to link to an existing industrial data monitoring, control or alarm system.
Receiver	4-channel InGaAs photodiode receiver modules	Automatic gain control system; Up to 20 detectors in CCU rack & a further 48 points max. in each additional receiver rack
TUNNEL SENSOR		
Operating Temperature	-10°C to +60°C	Many years stable operation demonstrated in harsh environments
Operating Humidity	0 to 95% RH, non-condensing	Sensor shows full recovery after water evaporation
Input / Output Signal	Optical	Sensor compatible with standard optical telecommunications fibre
TS-JB Tunnel Sensor & Junction Box Dimensions & Weight	TS-JB: Sensor - 325L x 49 diam. (mm); 0.8kg Junction Box - 150L x 150W x 120H (mm); 2.8kg	TS-JB: Separate 316 stainless steel sensor and junction box; Easier sensor insertion into & removal from network
OPTICAL NETWORK		
Network Architecture	Multi-Branched or Linear optical fibre network depending on site layout	Uses standard optical telecommunications cable, components and installation techniques
APPROVALS		
ATEX Explosive Atmosphere Equipment	Sensor: I M1 Ex op is I Ma (-10°C ≤ Ta ≤ +60°C) II 1G Ex op is IIC T4 Ga (-10°C ≤ Ta ≤ +60°C)	ATEX Certificate Number: Baseefa14ATEX0128 Optical Radiation Inherently Safe. All optical system with no electrical power in gas sensing area. Sensor & optical network located in hazardous area CCU located in the non-hazardous area & emitting into hazardous area via fibre optic network
	CCU: (I M1) [Ex op is I Ma] (0°C ≤ Ta ≤ +40°C) (II 1G) [Ex op is IIC T4 Ga] (0°C ≤ Ta ≤ +40°C)	
IECEx (Electrotechnical Commission Explosive Scheme)	IEC 60079-0 : 2011 and IEC 60079-28 : 2006-08 Sensor: Ex op is I Ma (-10°C ≤ Ta ≤ +60°C) Ex op is IIC T4 Ga (-10°C ≤ Ta ≤ +60°C) CCU: [Ex op is I Ma] (0°C ≤ Ta ≤ +40°C) [Ex op is IIC T4 Ga] (0°C ≤ Ta ≤ +40°C)	IECEx Certificate Number: IECEx BAS_14.0069
CE Mark	Indicates conformity with EU harmonised standards	Registered Mark: CE1180
EMC	EN 50270: 2006	Electromagnetic Compatibility - Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen.
Laser Safety	**BS EN 60825-1:2014** Equipment classification and requirements (Eye & skin safety) **BS EN 60825-2 :2004+A2 :2010** Safety of optical fibre communication systems **BS EN 60079-28:2007** Explosive Atmospheres – Protection of equipment and transmission systems using optical radiation	Laser module emitting <10mW in fibre & fully enclosed in CCU; <200µW of laser power transmitted from CCU into any fibre in the optical network with <30µW of optical power incident at any sensor. Laser λ between 1300 to 1700nm
Sensor Ingress protection	IP54	Sensor designed to limit impact of dust and water on operation; Sensor fully recovers after water flooding.

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