LightHawk®

MODEL 560ES

OPACITY / DUST MONITOR

Meets All EPA Compliance Requirements

A DOUBLE PASS COMPLIANCE OPACITY MONITOR

FOR VERY LOW EMISSION LIMITS

MEETS ASTM D6216-12 ANNEX 1 REQUIREMENTS

Opacity/Dust Monitor - Model 560ES

The most stable, accurate, and maintenance free. EPA compliant opacity monitor for ultra low measurement applications!

Exceeds EPA and ASTM Standards

The LightHawk® was developed to comply with 40CFR60, App. B, PS-1 and ASTM D6216-12 Annex A1 "Standard Practice for Opacity Manufactures to Certify Conformance with Design and Performance Specifications."

Rugged construction holds up under toughest conditions

The Optical Head and Retroreflector are built from heavy gauge aluminum material and finished with acid-resistant enamel paint. All exposed hardware is stainless steel. The rugged design and extremely low heat generation allows operation over wide ranges of ambient temperature. It is built to withstand the typical hostile environment associated with outdoor industrial applications, including substantial shock and vibration.

Ideal for Retrofit Applications

The LighHawk® is more compact than its predecessors, so that it can easily fit inside most existing weather covers. It only requires a 2" mounting pipe; adapters are available for most previously installed opacity monitors.

With an optional I/O module, the Optical Head meets all PS-1 and ASTM requirements without the need of a Remote Panel, making it ideal for OEM applications.

Labor saving on-stack controls

All of the hardware and software needed for the system setup, control and maintenance are packaged within a single optical housing. Via a membrane-sealed keypad and digital display, the user can perform clear-stack zeroing, span/zero setup, reset window dirt calculation following maintenance, input dust load correlation data, and access the full set of diagnostic parameters.

Ideal for OEM Applications

The LightHawk® is easy to calibrate. Just match the standard Optical Head with the appropriate Retroreflector and calibration mechanism filters, focus for distance and use the onboard keypad to set-up energy levels for the clear path condition. No potentiometer adjustments or resistor changes are required. In addition, linearized opacity, optical density, or particulate concentration data from the transceiver can be transmitted directly to a DAS or data logger via network or, if the optional Six Point I/O module is used, via optically isolated analog signals.

Advanced optical design for consistent operation

Some opacity monitors don't operate well in heat, direct sunlight conditions or when stack or duct walls shift slightly due to temperature, wind, etc. Not the LightHawk®. Its electronically modulated intensity-controlled solid state LED (light emitting diode) ensures stable operation, without interference from sunlight or room lights. A Patent Pending uniform LED beam provides accuracy even with small shifts in alignment. Alignment is always visible on the built-in indicator. The LED is guaranteed for many years, minimizing your replacement problems.

Flexible trouble-free operation

The various components of the LightHawk® are interconnected via a commercial network protocol, using transformer isolated data lines which nearly eliminate the potential effects of lightning strikes. This approach provides great flexibility in choices of options and interconnect topology. One twisted pair is required for each system interconnection. The Optical Head and Remote Panel provide all parameters needed for maintenance and diagnostics. It is easily configured for any plant or DCS/SCADA configuration.

Optional equipment

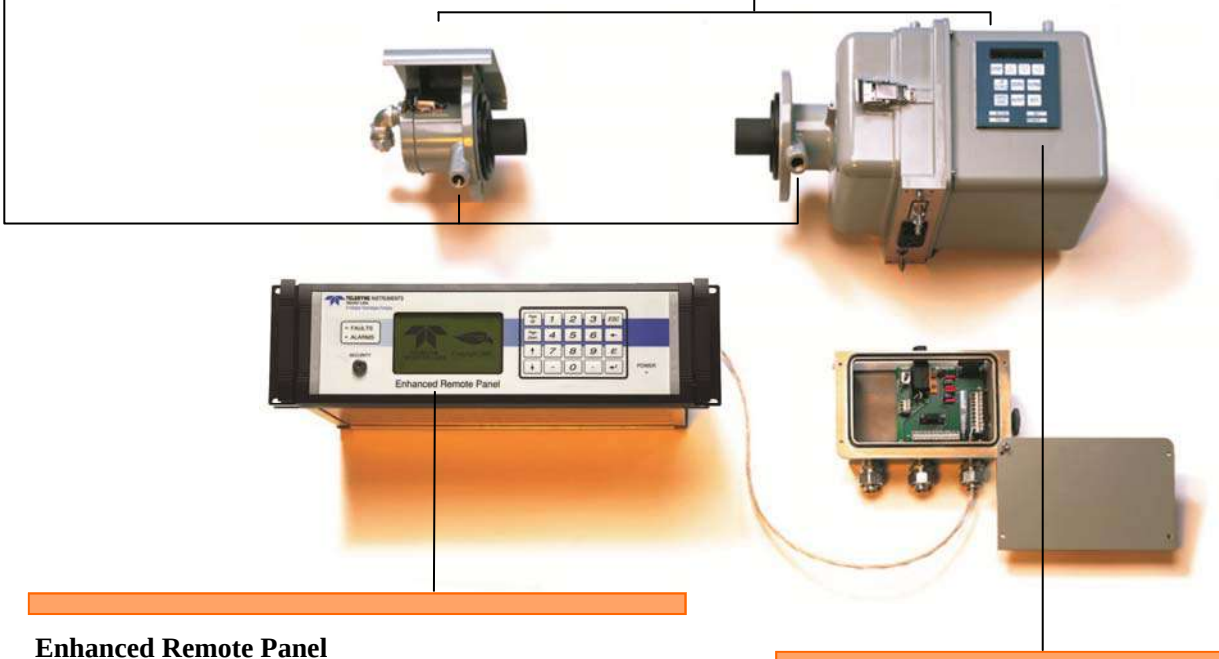
Optional equipment with the LightHawk® includes: non-corroding aluminum purge air shutters, dual blower system, dual weather covers, optional flange nozzle materials, high temperature hardware, adapter flanges, serial data links, Fibrelink III, and separate packaging of the I/O Module. Consult factory for application criteria and options.

Purge System

A purge air system is furnished with each LightHawk®. The system supplies purge air to the Optical Head and the Retro-reflector, protecting the instruments from stack gases and significantly reducing maintenance intervals. Purge Air sensing switches and optional aluminum fail-safe shutters are provided in case of power loss or interruption. Purge fail/power fail alarms are standard.

LightHawk Optical Head and Retroreflector Assemblies

The Optical Head and Retroreflector Assemblies are housed in rugged aluminum castings. The Optical Head contains the active electronics necessary to project a light beam across the stack/duct to the Retroreflector assembly and to detect reflected light. The sealed Optical Head subassembly is designed for simple cover removal, allowing complete access to the electronics.



Enhanced Remote Panel

Uses a large, back-lit, LCD graphics display with English-language, menu driven screens, providing ready access to all information needed for full use of the system. In addition, the user can graph up to the most recent 100 values of a selected parameter, such as:

- Opacity, Optical Density, or Particulate Concentration *(averaged or instantaneous)*
- Calibration Values *(Zero, Upscale, or Dust [compensation])*

The keypad, a rugged 20-button ensemble inlaid under a tough, hard coated, scratch and chemical-resistant Lexan coating, can be used to:

- Display Opacity, Optical Density, or Particulate Concentration
- Identify the Cause of an Alarm or Malfunction
- Configure the Relay Outputs
- Configure the Analog Outputs
- Edit Parameters such as Path Length Correction Factor
- Set Alarm Values for Opacity, Cal Zero, and Upscale Cal
- Load Linearization Curves for Correlation to Particulate Concentration

Standard with the LightHawk® Remote Panel is a security keylock for protection of important calibration parameters. System elements communicate over a single twisted pair using a commercial network communication protocol. Bright LED indicator lights are used to indicate faults and alarms. The four optically-isolated analog outputs, normally packaged within the Remote Panel can also be offered in a separate housing for convenient installation.

Ethernet Interface

The LightHawk® Enhanced Remote Panel now features 10/100 Based Ethernet interface as standard equipment. This capability provides a multilevel password protected interface to TCP/IP networks such as LAN's or the Internet. Client side user interface access is via standard web browsers. Simultaneous Modbus TCP access to instrument parameters and emission data is also supported.

Optical Head Keyboard/Display

Uses a 10 button keypad & 6 digit readout to display and/or enter:

- Instantaneous Opacity
- Average Opacity
- Upscale Calibration
- Calibration Zero
- Dust Compensation
- Path Length Correction Factor
- Status Codes
- Diagnostic Data about the Analog Signals Inside the Optical Head (no need to open the Optical Head)
- Particulate Concentration Curves
- Optical Gains
- Alarm Settings

With optional Six Point I/O board, LightHawk® meets all PS-1 and ASTM D6216 requirements without a Remote Display Panel.

Calibration Kit

The calibration kit, standard with the LightHawk®, is used as an additional check of the unit's proper operation and calibration. The calibration fixture attaches to the front face of the optical head and has been preset to return the same amount of light as the retroreflector when the stack or duct is clear.

SPECIFICATIONS

PHYSICAL DIMENSIONS	**Optical Head** (w/o purge shutter)		**17”** (L) **x 9-1/4”** (W) **x 15”** (H) (43.2 x 23.5 x 38.1 cm)
	Optical Head (with purge shutter)		**22”** (L) **x 9-1/4”** (W) **x 15”** (H) (55.9 x 23.5 x 38.1 cm)
	Retro Assembly (w/o purge shutter)		**10”** (L) **x 7”** (Diameter) (25.4 x 17.8 cm)
	Retro Assembly (with purge shutter)		**15”** (L) **x 7”** (Diameter) (38.1 x 17.8 cm)
	Single Purge Blower Assembly		**22-1/4”** (L) **x 20”** (W) **x 33”** (H) (56.5 x 50.8 x 83.8 cm)
	Dual Purge Blower Assembly		**2 assemblies with Single Purge Blower dimensions**
	Remote Display Panel **		**3U 19” Rack Mount 5-1/4”** (H) **x 9” Depth**
			48.3 (W) **x 13.3** (H) **x 22.9** (D) **cm**
OPTICAL CHARACTERISTICS	**Optical Measurement Technique**		**Double Pass Extinction**
	Angle of View		**Less than 4 degrees**
	Angle of Projection		**Less than 4 degrees**
	Spectral Response		**Peak: 500 to 600 nm**
			Mean: 500 to 600 nm
			94% of Energy: 500 to 600 nm
SYSTEM MEASUREMENT CHARACTERISTICS *	**Response Time** (To 95% of Value)		**Less than 10 seconds**
	Calibration Zero Operation		**On Command**
	Upscale Calibration Operation		**On Command**
	Calibration Error (Mean Error + Confidence Coefficient)		**1.0% Opacity Maximum**
	Long Term (60 day) **Drift**		**Zero: 0.5% Opacity Maximum**
			Span: 0.5% Opacity Maximum
	Stability Over Operating Temperature Range		**± 0.3% Opacity Maximum per 40°F** (22°C) **change in temperature** (as per ASTMD6216-12 Annex A1)
	Stability Over Operating Mains Voltage Range		**± 0.2% Opacity Maximum** (as per ASTMD6216-12 Annex A1)
	Flange to Flange Range		**2 ft. (0.61 M) to 60 ft. (18.3 M)**
POWER REQUIREMENTS	**Optical Head**		**85-265 VAC, 47-63 Hz, Single Phase, 30 VA Maximum**
	Single Purge Blower System		**115/230 VAC, 60/50 Hz, Single Phase, 414 VA Maximum**
	Dual Purge Blower System		**Two circuits, each with same requirements as Single Purge Blower**
	Remote Display Panel **		**85-265 VAC, 47-63 Hz, Single Phase, 30 VA Maximum**
AMBIENT OPERATING CONDITIONS	**Optical Head**		**Temperature Range: -4 to +140°F** (startup) (-20 to +60°C)
			-25 to +140°F (operating) (-31.7 to +60°C)
			Relative Humidity Range: 0 to 100% condensing
	Remote Display Panel **		**Temperature Range: +32 to +104°F** (startup) (0 to +40°C)
			Relative Humidity Range: 0 to 90% non-condensing
	Cal Kit		**Temperature Range: +32 to +105°F** (startup) (0 to +40°C)
MEASUREMENT MEDIUM CONDITIONS	**Static Pressure Range**		**Single Purge Blower: -15.0 to +5.0 inches of H_2O Gauge**
			Dual Purge Blower: -15.0 to +15.0 inches of H_2O Gauge
			>15.0 inches of H_2O Consult Factory
	Gas Composition		**Not Critical**
	Humidity		**Must be noncondensing for valid measurement**
	Maximum Temperature		**+500°F** (without high temperature option) (260°C)
			+1500°F (with high temperature option) (815°C)
			Consult factory for higher temperature operation
OPTICAL HEAD HMI CHARACTERISTICS	**Display Type**		**Six 7 segment LED’s**
	Indicating LED’s		**Fault, Set, In Cal, Power**
	User Input Controls		**10-key keypad**
INSTRUMENT CONTROL PANEL HMI CHARACTERISTICS	**Display Type**		**Graphics mode liquid crystal with LED backlight**
	Display Resolution		**240 x 128**
	Indicating LED’s		**Fault, Alarm, Power**
	User Input Controls		**20-key keypad, security keyswitch**
MULTI I/O BOARD CHARACTERISTICS **	**Analog Outputs**	**Number**	**4**
		Isolation Type	**Optical & capacitive barriers: channel to channel, channel to circuit common & earth**
	Digital Inputs	**Number**	**8**
		Modes	**Isolated (**5 VDC-24 VDC user supplied) **and Non-isolated** (dry contact)
	Relay Outputs	**Number & Type**	**8 SPST, N.O.** (Single Pole Single Throw, Normally Open)

* Measurement based on single pass response with a PLCF of 1.00
** Does not apply to Direct Interface version

Simplified Audit Procedures

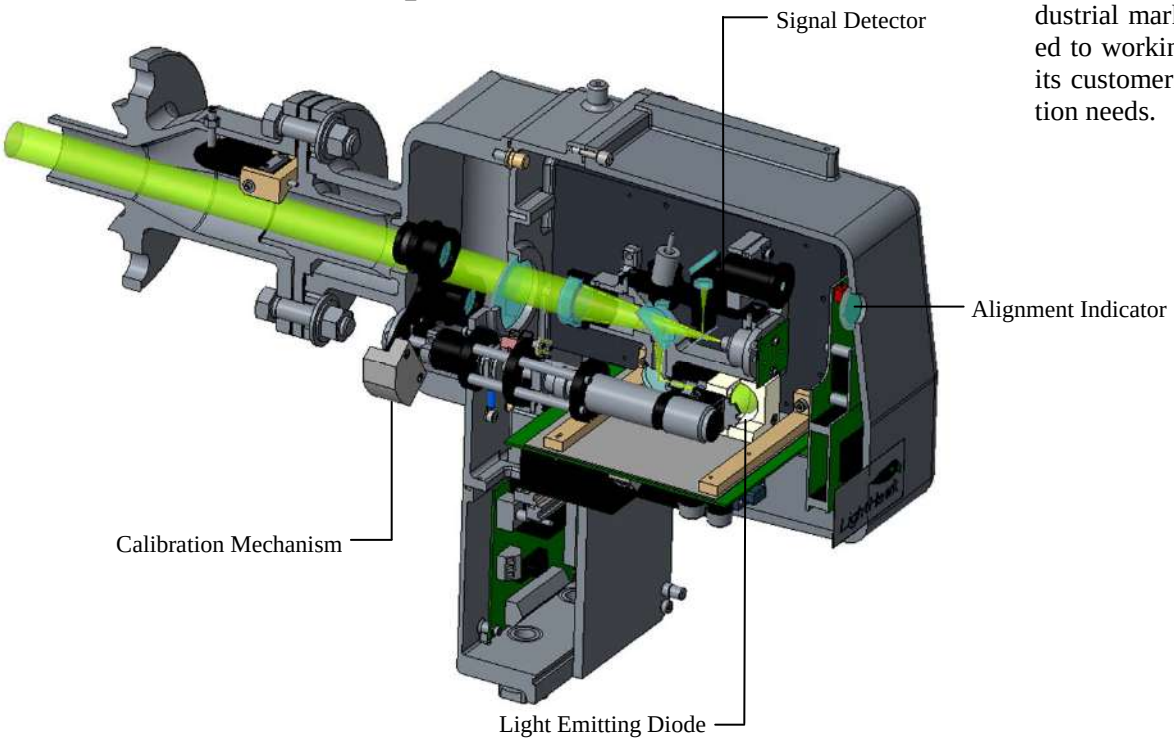
EPA regulations require that all opacity monitors (regardless of optical design) be periodically set up under clear-stack conditions, the zero verified, and audit filters run. When the process is running, this requires removing the opacity monitor from the stack. The LightHawk® is designed such that this can be done without the need of test stands. Furthermore, the LightHawk® can capture audit filter readings at the stack level, making it easy for one operator to perform the test without the need of reading a strip chart.

The LightHawk® measures zero, upscale calibration, and dust compensation using only one moving part. The LightHawk® employs a single gear motor, unlike competitor's designs, is located safely inside the sealed optical housing, completely isolated from the potential of damage from stack gas. The gear mechanism is also brake-isolated from the effects of vibration. Finally, both the span and zero surfaces are iris-adjustable, eliminating the need to open up the optical housing to change a span filter when regulations change.

How the LightHawk® works

The heart of the Opacity/Dust Monitor is an electronically modulated (2400Hz), intensity controlled LED located in the Optical Head assembly. Light from the LED is projected from the Optical Head across the stack/duct sample area to a Retroreflector on the opposite side. The reflected light re-enters the Optical Head, where it is evaluated by a signal detector. If the stack is clear, the light transmission is 100% (zero opacity). When the reflector returns no light, the transmission is zero (100% opacity). Opacity can be correlated against a reference methods to calculate dust loading.

Optical Head



Training
An Operation and Maintenance Manual is provided with the LightHawk® Monitor. In addition, periodic hands-on training classes are offered at our Englewood, CO technology center. Training classes may also be scheduled at the customer's facility.

User Support
TML maintains a user support line that may be accessed for assistance during normal working hours. A special 24-hour phone line is also available.

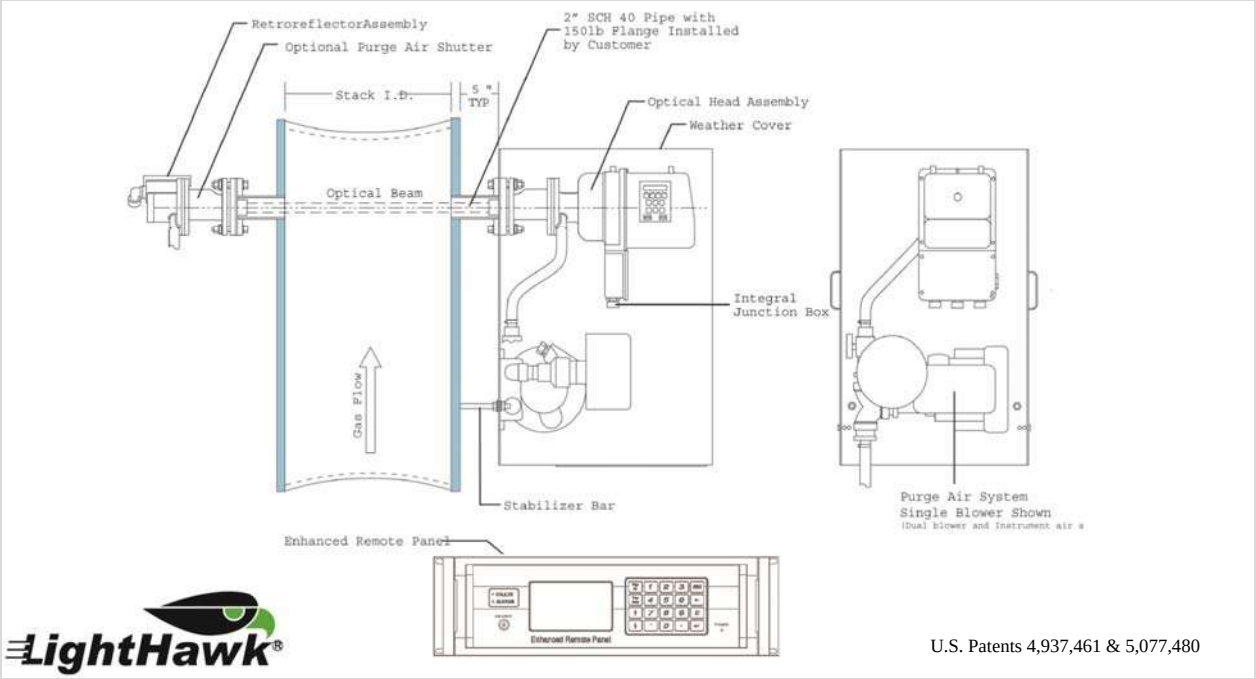
Commitment
TML has over 40 years of experience in providing state of the art Continuous Emission Monitoring products to a wide variety of industrial markets. TML is dedicated to working in partnership with its customers to solve an application needs.

Teledyne Monitor Labs

Leading the Way in Emissions Monitoring

Teledyne Monitor Labs offers state-of-the-art continuous emission monitoring (CEM) technologies to CEM users. The TML line of opacity/dust monitors were the first to use a patented Light Emitting Diode (LED) as the source, and the ULTRAFLOW 150 has proven to be the most reliable, drift free way to monitor stack flow for mass emission based monitoring. Teledyne Monitor Labs Windows based RegPerfect Data Acquisition represents a quantum leap in flexible, configurable systems for satisfying a wide range of reporting requirements. Together with TML's CEM systems for NOx, SO_2, CO, CO_2, H_2S and NH_3 and the largest, most broadly trained service organization of it kind, TML is you one-stop center for systems solutions.

LightHawk System Assembly



Contact the TML Sales Team to ask about our DAS replacement program.

We offer a full regulatory, hardware and software support team to help you maintain environmental compli-ance.

Teledyne Monitor Labs, Inc. reserves the right to make changes in construction, design, specification, and/or pricing without prior notice.

TELEDYNE MONITOR LABS
Everywhereyoulook™

35 Inverness Drive East/ Englewood, CO 80112
Phone: 303-792-3300/ Fax: 303-799-4853
Tml_sales@teledyne.com www.teledyne-ml.com

ISO 9001 Certified