

 **TELEDYNE ANALYTICAL INSTRUMENTS**




LightHawk

MODEL 560

**OPACITY / DUST
MONITOR**



A DOUBLE PASS COMPLIANCE OPACITY MONITOR



LightHawk Opacity / Dust Monitor - Model 560

The most stable, accurate, and maintenance free
EPA - compliant opacity monitor available
under all operating conditions.



Exceeds EPA and ASTM standards

The LightHawk was developed to comply with new ASTM D6216 "Standard Practice for Opacity Monitor Manufacturers to Certify Conformance with Design and Performance Specifications". D6216 provides tighter performance standards compared to the 1983 version of 40 CFR60 App. B, PS-1. The LightHawk will meet the ASTM standard practice and future revisions of PS-1 based on it, assuring you many years of EPA-compliant performance.



Rugged construction holds up under toughest conditions

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

Ideal for Retrofit Applications

The LightHawk 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 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 datalogger 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, high noon 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 unusually stable operation, without interference from sunlight or room lights. The 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.

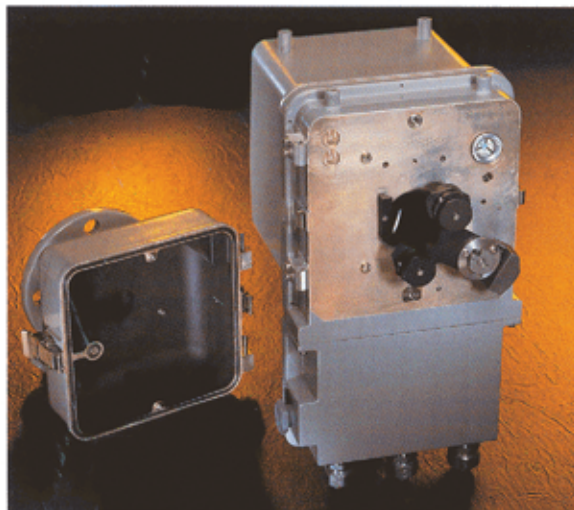


Flexible trouble-free operation

The various components of the LightHawk are interconnected via a LonWorks 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, and separate packaging of the I/O Module. Consult factory for application criteria and options.



A Complete Quality System . . .

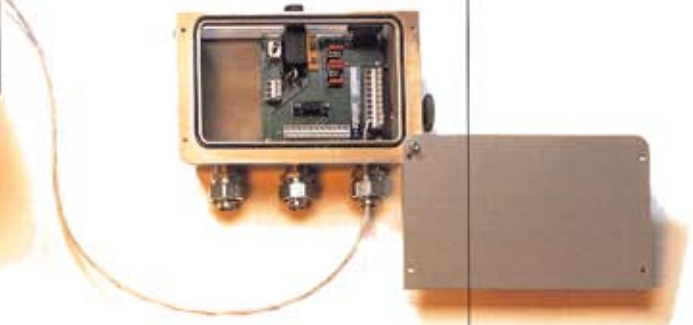
Purge System

A purge air system is furnished with each LightHawk. The system supplies purge air to the Optical Head and the Retroreflector, 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.



Remote Display 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 (FTT) using LonWorks 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.

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 cal 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 <i>(w/o purge shutter)</i> Optical Head <i>(with purge shutter)</i> Retro Assembly <i>(w/o purge shutter)</i> Retro Assembly <i>(with purge shutter)</i> Single Purge Blower Assembly Dual Purge Blower Assembly Remote Display Panel**	17"(L) x 9-1/4"(W) x 15"(H) (43.2 x 23.5 x 38.1 cm) 22"(L) x 9-1/4"(W) x 15"(H) (55.9 x 23.5 x 38.1 cm) 6-1/2"(L) x 7" (Diameter) (16.5 x 17.8 cm) 11-1/2"(L) x 7" (Diameter) (29.2 x 17.8 cm) 22-1/4"(L) x 20"(W) x 33"(H) (56.5 x 50.8 x 83.8 cm) 2 assemblies with Single Purge Blower dimensions 3U 19" Rack Mount 5-1/4"(H) x 8" Depth 48.3(W) x 13.3(H) x 20.3(D) cm
OPTICAL CHARACTERISTICS	Optical Measurement Technique Angle of View Angle of Projection Spectral Response	Double Pass Extinction Less than 4 degrees Less than 4 degrees Peak: 500 to 600 nm Mean: 500 to 600 nm 94% of energy: 500 to 600 nm
SYSTEM MEASUREMENT CHARACTERISTICS*	Response Time Calibration Zero Operation Upscale Calibration Operation Calibration Error <i>(Mean Error + Confidence Coefficient)</i> 24 Hour Drift Long Term <i>(60 day)</i> Drift Stability Over Operating Temperature Range Stability Over Operating Mains Voltage Range Mean Time Between Failure	Less than 10 seconds On Command On Command 2.0% Opacity Maximum Zero: 0.4% Opacity Maximum Span: 0.4% Opacity Maximum Zero: 0.5% Opacity Maximum Span: 0.5% Opacity Maximum ± 2.0% Opacity Maximum per 40°F (22°C) change in temperature <i>(as per ASTM D6216)</i> ±1.0% Opacity Maximum <i>(as per ASTM D6216)</i> 8300 Hours <i>(estimated)</i>
POWER REQUIREMENTS	Optical Head Single Purge Blower System Dual Purge Blower System Remote Display Panel**	85-265 VAC, 47-63 Hz, Single Phase, 14 VA Maximum 115 VAC/230 VAC, 60/50 Hz, Single Phase, 414 VA Maximum Two circuits, each with same requirements as Single Purge Blower 85-265 VAC, 47-63 Hz, Single Phase, 25 VA Maximum
AMBIENT OPERATING CONDITIONS	Optical Head Remote Display Panel**	Temperature Range: -4 to +140°F <i>(startup)</i> (-20 to +60°C) -25 to +140°F <i>(operating)</i> (-31.7 to +60°C) Relative Humidity Range: 0 to 100% condensing Temperature Range: +32 to +104°F (0 to +40°C) Relative Humidity Range: 0 to 95% noncondensing
MEASUREMENT MEDIUM CONDITIONS	Static Pressure Range Gas Composition Humidity Maximum Temperature	Single Purge Blower: -10.0 to +5.0 inches H ₂ O Gauge Dual Purge Blower: -15.0 to +15.0 inches H ₂ O Gauge not critical must be noncondensing for valid measurement +500°F <i>(without High Temperature option)</i> (260°C) +1500°F <i>(with High Temperature option)</i> (815°C) Consult factory for higher temperature operation
OPTICAL HEAD HMI CHARACTERISTICS	Display Type Indicating LED's User Input Controls	Six 7 segment LED's Fault, Set, In Cal, Power 10-key keypad
REMOTE DISPLAY PANEL HMI CHARACTERISTICS**	Display Type Display Resolution Indicating LED's User Input Controls	Graphics mode liquid crystal with LED backlight 240 x 128 Fault, Alarm, Power 20-key keypad, security keyswitch
MULTI I/O BOARD CHARACTERISTICS**	Analog Outputs Digital Inputs Relay Outputs	Number Isolation Type Number Modes Number & Type
		4 Optical & capacitive barriers: channel to channel, channel to circuit common & earth 8 Isolated (5 VDC-24 VDC user supplied) and Non-isolated (dry contact) 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

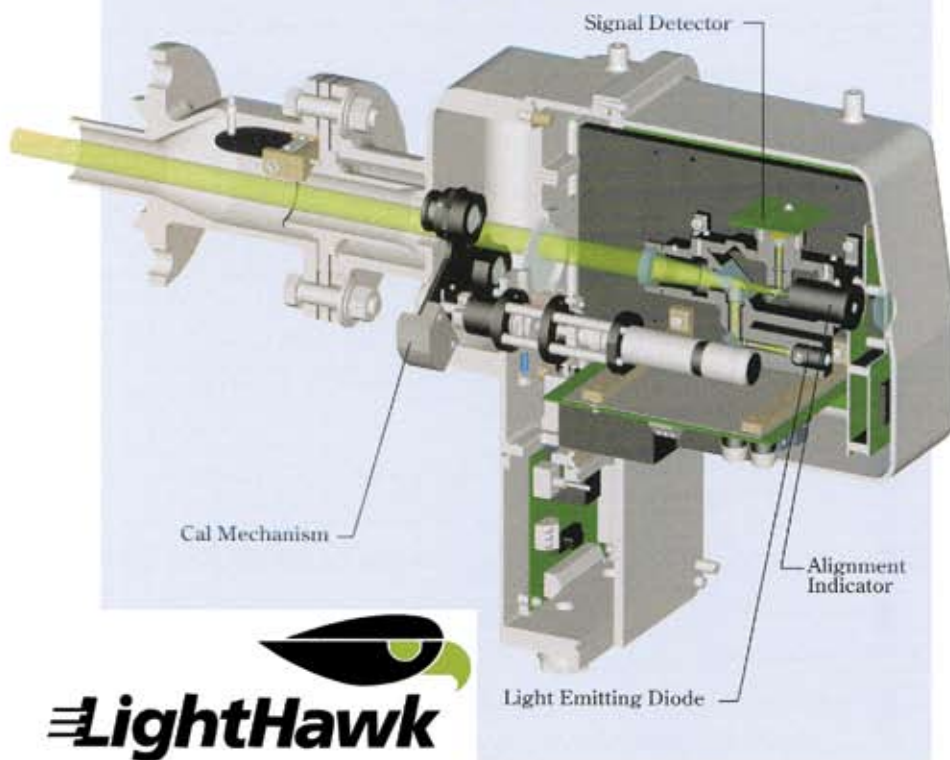
EPA regulations require that all opacity monitors (*regardless of optical design*) be periodically set up under clear-stack conditions, the zero verified, and audit filters run. When the process is running, this requires removing the opacity monitor from the stack. The LightHawk is designed such that this can be done without the need of test stands. Furthermore, the LightHawk can capture the 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.

Like the traditional United Sciences opacity line, the LightHawk measures zero, upscale cal, and dust compensation using only one moving part. The LightHawk employs a single gearmotor that, unlike competitors' 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 stack passes no light, the transmission is zero (*100% opacity*). Opacity can be correlated against 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 both the Colorado and Pittsburgh facilities. Training classes may also be scheduled at the customer's facility.



User Support

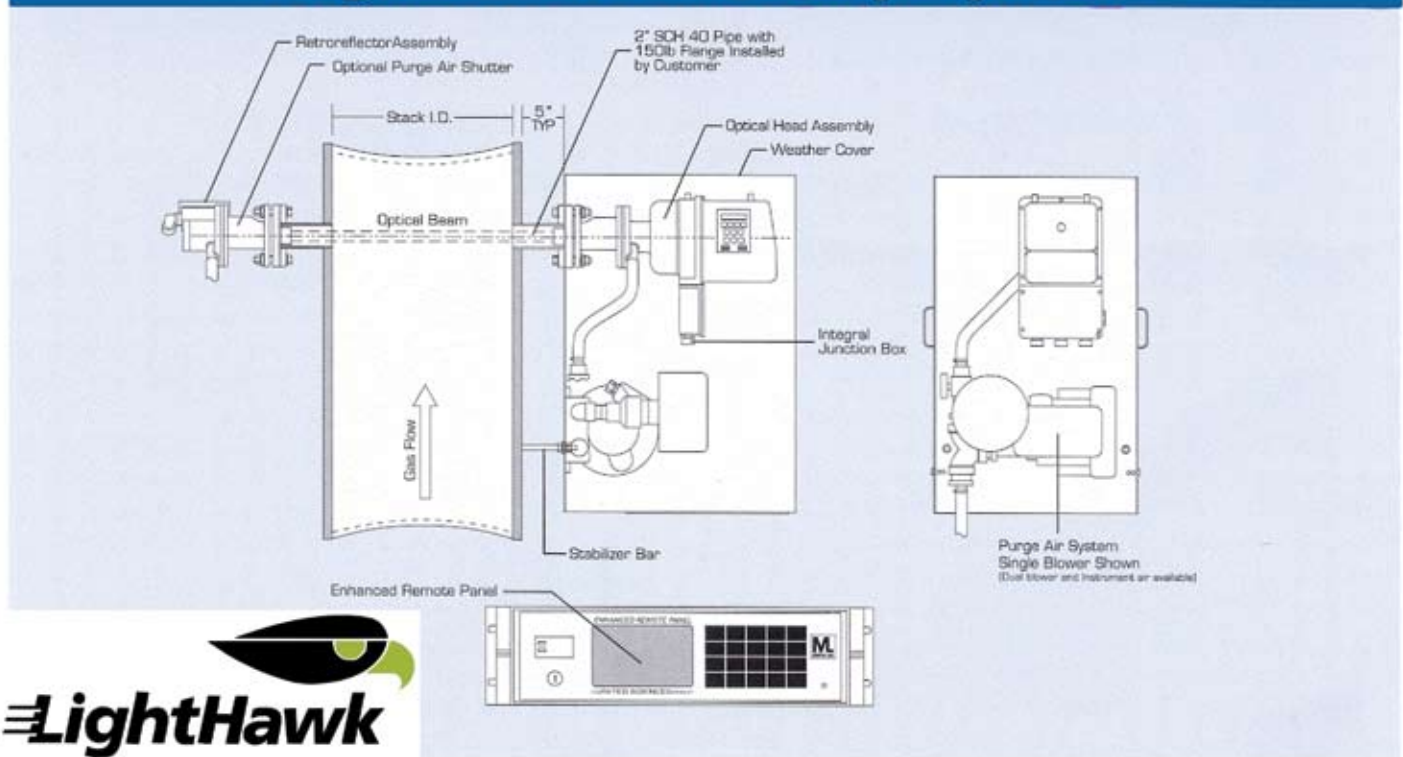
ML maintains a user support line that may be accessed for assistance during normal working hours. A special 24-hour phone line is also available.



Commitment

ML has over 30 years experience in providing state-of-the-art Continuous Emissions Monitoring products to a wide variety of industrial markets. ML is dedicated to working in partnership with its customers to solve any application needs.

LightHawk Assembly System



U.S. Patents 4,937,461 5,077,480

TELEDYNE ANALYTICAL INSTRUMENTS

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Warranty

Instrument is warranted for 1 year against defects in material or workmanship

NOTE: Specifications and features will vary with application. The above are established and validated during design, but are not to be construed as test criteria for every product. All specifications and features are subject to change without notice.

