



**TELEDYNE INSTRUMENTS**

*Monitor Labs*

A Teledyne Technologies Company



**LaserHawk™**

Model 360

# PARTICULATE MATTER MONITOR



A COMPLIANCE PARTICULATE MATTER MONITOR



## A Complete Quality System...

### **PARTICULATE MATTER Monitor - Model 360**

**The most stable (under all operating conditions), accurate and maintenance free PS-11 compliant dust concentration monitor available!**



#### **Meets EPA Performance Specification-11**

The LaserHawk™ was designed to comply with the performance specification for continuous particulate monitors. A complete system includes an optical head, purge system, enhanced remote panel fulfilling all QA/QC requirements.



#### **Rugged Construction Holds Up Under Toughest Conditions**

The Optical Head is 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.

#### **Commonality of Parts**

TML has paralleled the design of the LaserHawk™ from its Model 560 LightHawk Compliance Opacity Monitor and the UltraFlow-150 Ultrasonic Flow Monitor. All utilize the same Enhanced Remote Panel; communication protocols, and mounting hardware. This saves the customer valuable inventory dollars and permits the use of spares on a variety of equipment.

#### **Ideal For Retrofit Applications**

*The LaserHawk™ is a compact design that can be installed on ducts or stacks using a single 4-in. mounting port. There is virtually no alignment necessary since there is no reflector assembly. Adapters are available to match any 3-6 in. existing mounting flange.*

*With an optional I/O module, the Optical Head meets all PS-11 requirements without the need for a Remote Panel. The LaserHawk is 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 particulate mass correlation data and access the full set of diagnostic parameters.



#### **Ideal For OEM Applications**

The LaserHawk™ is easy to calibrate, but for ideal accuracy, it should be calibrated on-site using Method 5 or 17 Isokinetic Testing by a third party. Once the linear, exponential or polynomial correlation curve is input via the keypads on either the Optical Head or Enhanced Remote Panel, the cal kit can be used to set up zero, low, medium and high energy levels in the appropriate scale. User friendly menus on the keypads enable adjustments of gains and currents to ensure proper operation of the monitor. No potentiometer adjustments or resistor changes are required. Instantaneous or average dust concentration can be transmitted directly to a Data Acquisition System or via optically isolated analog signals, network or serial communication.



#### **Advanced Optical Design For Consistent Operation**

Some backscatter 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 LaserHawk™. Its electronically modulated, intensity-controlled solid state laser beam ensures unusually stable operation, without interference from sunlight, room lights or backwall scattered energy. The monochromatic, coherent red laser beam has no alignment issues since the beam shines directly into the stack requiring no reflector assembly.

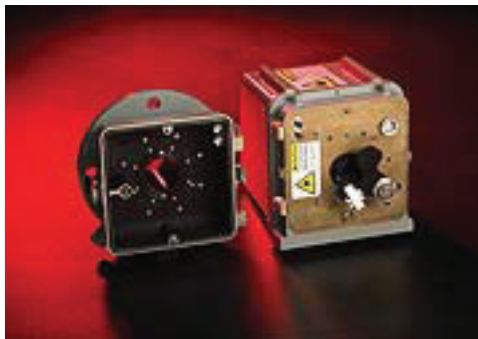


#### **Flexible Trouble-Free Operation**

The Optical Head and Enhanced Remote Panel of the LaserHawk™ are interconnected via a commercial network protocol, using transformer isolated data lines which nearly eliminate the potential effects of electro-static discharge. 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 to any plant, Digital Control System, Data Acquisition System or control system.

#### **Optional Equipment**

Optional equipment with the LaserHawk™ includes; optional flange nozzle materials, high-temperature hardware, adapter flanges and dual analog input module for correction to standard conditions. Consult factory for application criteria and options for small diameter stacks.



## A Complete Quality System...

### Purge System

A purge air system is furnished with each LaserHawk™. The system supplies purge air to the Optical Head, protecting the instruments from stack gases and significantly reducing maintenance intervals. A purge air sensing switch is provided in case of power loss or interruption. Purge fail/power fail alarm is standard.



### 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:

- Instantaneous dust concentration, average dust concentration
- Calibration values (*zero, upscale, or dust compensation*)

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

- Display dust concentration on a mg/m<sup>3</sup> or gr/cf basis
- Identify the cause of an alarm or malfunction
- Configure the relay outputs
- Configure the analog outputs
- Edit parameters such as voltages, currents and gains
- Set alarm values for dust concentration, zero cal and upscale cal
- Load correlation curves for particulate concentration

### Ethernet Interface

The LaserHawk Enhanced Remote Panel now features a 10/100 Based Ethernet interface as standard equipment. This capability provides a multilevel password protected user 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.

### LaserHawk™ Optical Head

The optical head is housed in a rugged NEMA 4 aluminum casting. The optical head contains the active electronics necessary to project a laser beam into the stack/duct and to receive back the scattered energy off the particulate. The sealed optical head subassembly is designed for simple cover removal, allowing complete access to the electronics.



### Optical Head Keyboard/Display

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

- Instantaneous particulate concentration (mg/m<sup>3</sup> or gr/cf)
- Average particulate concentration
- Zero calibration
- Upscale calibration
- Dust compensation
- Status codes
- Diagnostic data about the analog signals inside the optical head (no need to open the optical head)
- Particulate concentration curves
- Optical gains

### Calibration Kit



The calibration kit, standard with the LaserHawk™, 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 various audit standards can be inserted to challenge the instrument over the dynamic dust concentration range that is established during on-site calibration. A zero (clear) condition can also be established.



### CAUTION

**LASER LIGHT WHEN OPEN**  
CLASS 1 LASER PRODUCT  
PER IEC 60825-1  
AVOID DIRECT EXPOSURE TO BEAM.  
THIS PRODUCT IS INTENDED TO BE INSTALLED ONLY ON A SMOKESTACK OR DUCT WITH THE BEAM DIRECTED INTO THE INTERIOR. OTHER APPLICATIONS ARE NOT INTENDED AND COULD RESULT IN HAZARDOUS LASER LIGHT EXPOSURE.

# Specifications

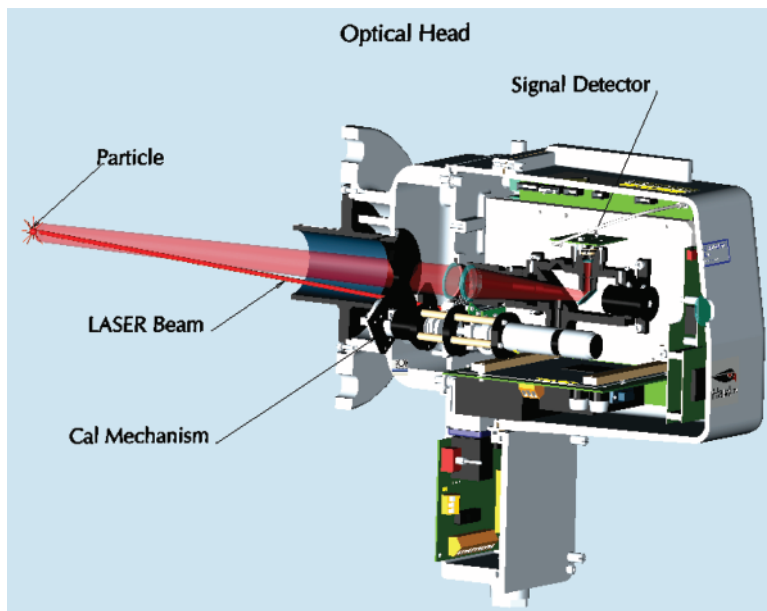
|  |   |  |
|--|---|--|
| <b>PHYSICAL DIMENSIONS</b>   | <b>Optical Head (with cal mechanism)</b>            | 15 <sup>3</sup> / <sub>4</sub> " (400mm) (L) x 9" (229mm) (W) x 14" (356mm) (H)  |
|  | <b>Purge Blower Assembly</b>                        | 22-1/4" (565mm) (L) x 20" (508mm) (W) x 33" (838mm) (H)  |
|  | <b>Enhanced Remote Panel</b>                        | 3U 19" (483mm) Rack Mount 5-1/4" (133mm) (H) x 9" (229mm) Depth  |
| <b>OPTICAL CHARACTERISTICS</b>   | <b>Optical Measurement Technique</b>                | Optical backscatter of light from a red laser  |
|  | <b>Spectral Response</b>                            | 655 nanometers (nominal) +/- 20 nanometers   |
| <b>SYSTEM PERFORMANCE</b>  | <b>Resolution:</b>                                  | 0.5 mg per actual m3   |
| <b>MEASUREMENT RANGE</b>   | <b>MIN:</b>   | 0 – 20 mg per actual m3  |
|  | <b>MAX:</b>   | 0 – 1000 mg per actual m3  |
| <b>SYSTEM MEASUREMENT CHARACTERISTICS</b>                                  | <b>Response Time (to 95% of change)</b>             | Less than 10 seconds   |
|  | <b>Calibration Zero Operation</b>                   | On Command   |
|  | <b>Upscale Calibration Operation</b>                | On Command   |
|  | <b>Stability Over Operating Temperature Range</b>   | ± 2.0% of Full Scale, Maximum per 40°F (22.2°C) change in temperature  |
|  | <b>Stability Over Operating Mains Voltage Range</b> | ± 1.0% of Full Scale   |
| <b>POWER REQUIREMENTS</b>  | <b>Optical Head</b>                                 | 85-245 VAC, 47-63 Hz, Single Phase, 30 VA Maximum  |
|  | <b>Purge Blower System**</b>                        | 115 VAC/230 VAC, 60/50 Hz, Single Phase, 414 VA Maximum  |
|  | <b>Enhanced Remote Panel</b>                        | 85-245 VAC, 47-63 Hz, Single Phase, 30 VA Maximum  |
| <b>AMBIENT OPERATING CONDITIONS</b>  | <b>Optical Head:</b>                                | Temp Range: -4 to +140°F (-20 to +60°C) (start-up) -25 to +140°F (-32 to +60°C) (operating)<br>Relative Humidity Range: 0 to 100% condensing |
|  | <b>Enhanced Remote Panel</b>                        | Temperature Range: +32 to +104°F (0 to +40°C)<br>Relative Humidity Range 0 to 95% noncondensing  |
| <b>MEASUREMENT MEDIUM CONDITIONS</b>                                       | <b>Static Pressure Range**</b>                      | Standard Purge Blower: -15.0 to +5.0 inches H2O (-3736 to +1246 Pa) Gauge. Range: >+5 in. H2O consult factory                                |
|  | <b>Gas Composition</b>                              | not critical   |
|  | <b>Humidity</b>                                     | must be noncondensing for valid measurement  |
|  | <b>Maximum Temperature**</b>                        | +500°F (260°C) (w/o High Temperature option)<br>+1500°F (816°C) (w/High Temperature option)<br>Consult factory for higher temp operation     |
| <b>OPTICAL HEAD HUMAN/MACHINE INTERFACE (HMI) CHARACTERISTICS</b>          | <b>Display Type</b>                                 | Six 7 segment LED's  |
|  | <b>Indicating LED's</b>                             | Fault, Set, In Cal, Power  |
|  | <b>User Input Controls</b>                          | 10-key keypad  |
| <b>ENHANCED REMOTE PANEL HUMAN/MACHINE INTERFACE (HMI) CHARACTERISTICS</b> | <b>Display Type</b>                                 | Graphics mode liquid crystal with LED backlight  |
|  | <b>Display Resolution</b>                           | 240 x 128  |
|  | <b>Indicating LED's</b>                             | Fault, Alarm, Power  |
|  | <b>User Input Controls</b>                          | 20-key keypad, security keyswitch  |
| <b>MULTI I/O BOARD ANALOG OUTPUTS</b>                                      | <b>Number</b>                                       | 4  |
|  | <b>Isolation Type</b>                               | Optical & capacitive barriers: channel to channel, channel to circuit common & earth   |
| <b>MULTI I/O BOARD ANALOG INPUTS</b>                                       | <b>Number</b>                                       | 8  |
|  | <b>Modes</b>  | Isolated and Non-isolated  |

\*\* Does not apply to Instrument Air Purge version. Consult factory.

## Simplified Audit Procedures

Under regulations, there are times when continuous particulate monitors (CPMs) are periodically set up under clear-stack conditions, the zero verified, and audit filters run. When the process is running, this requires removing the CPM from the stack. The LaserHawk™ is designed such that this can be done without the need of test stands. Furthermore, the LaserHawk™ 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 Teledyne Monitor Labs opacity product line, the LaserHawk™ measures zero, upscale cal, and dust compensation using only one moving part. The LaserHawk™ employs a single gearmotor that, unlike competitor 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.



## How the LaserHawk works

The heart of the LaserHawk™ Dust Monitor is an electronically modulated (2400Hz), intensity controlled solid-state red laser located in the Optical Head assembly. A beam from the laser is projected from the Optical Head into the stack and along a path through the effluent. The laser beam is reflected, refracted, absorbed and scattered in all directions by the particulate matter, including in the backwards direction. The scattered light re-enters the Optical Head, where it is evaluated by a signal detector. The measured signal is correlated to dust concentration using either a linear, exponential or polynomial correlation curve. The dust concentration is provided in units of mg/m<sup>3</sup> (or grains/cf). Zero and upscale calibration drift tests are conducted utilizing a superior anti-vibration calibration mechanism design. The unit displays extremely low drift and is sure to operate in the widest variety of applications.

## Ethernet Interface

The LaserHawk Enhanced Remote Panel now features a 10/100 BaseT Ethernet interface as standard equipment. This capability provides a multilevel password protected user 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.



## Training

An Operation and Maintenance Manual is provided with the LaserHawk™ monitor. In addition, periodic hands-on training classes are offered at both the Colorado and Pennsylvania facilities. Training classes may also be scheduled at the customer's facility. A certified trainer conducts factory and customer-site training classes.



## User Support

TML prides itself on providing reliable and competent service utilizing one of the largest service forces in the environmental instrumentation business. TML has multiple remote offices placing our technicians closer to the customer ensuring quicker response time to boost the customer's equipment availability. A Call Center may also be accessed for assistance 24-hour/day/365 days/year. TML technicians are cross-trained and have individual skill sets which best support the customer's equipment. State-of-the-Art computer programs and databases enable instantaneous access to historical service records for each customer. These can be reviewed and checked while on site to identify problem areas.



## Commitment

TML has over 35 years experience in providing state-of-the-art Continuous Emissions Monitoring products to a wide variety of industrial markets. TML is dedicated to working in partnership with its customers to solve any application needs.

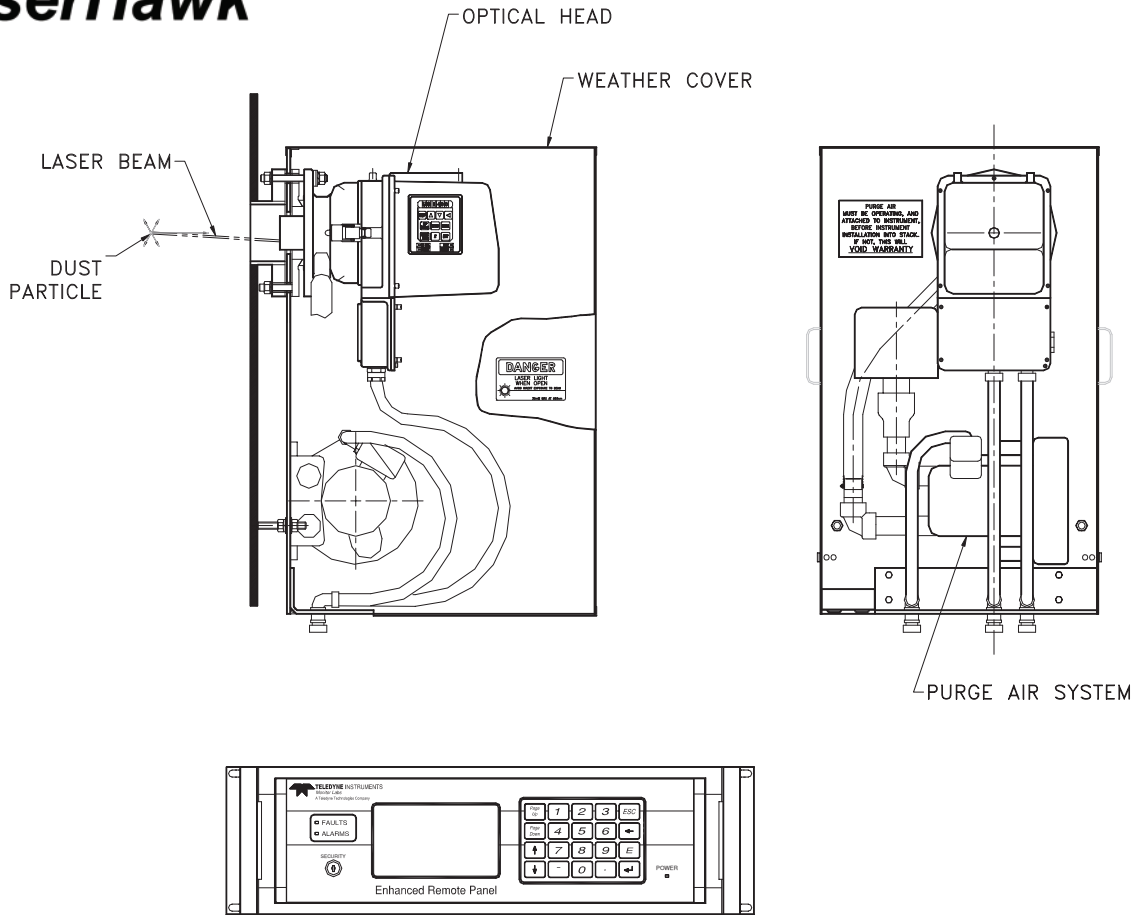
# Teledyne Monitor Labs

## Leading the Way in Emissions Monitoring

Teledyne Monitor Labs offers state-of-the-art CEM technologies to CEM users. Its' line of opacity/dust monitors were the first to use a patented Light Emitting Diode (LED) as the source. The UltraFlow 100 & 150 have 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 Software represents a quantum leap in flexible, configurable system for satisfying a wide range of reporting requirements. Together with TMLs' Sensor-e™ analyzer line and CEM systems for NOx, SO2, CO, O2, CO2, NH3, TRS and other gases. TML is your one-stop center for total emission monitoring solutions.



## System Assembly



ENHANCED REMOTE PANEL



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