
Fuel Oil Analysis Cart

General Description

The proposed system is a light mobile platform for monitoring Solids, Water Content, Viscosity, Density, and Temperature of Marine Gas Oil. The system is designed and built as a robust, corrosion resistant, unit required for ship board systems. It is light weight and can fit an envelope of 600mm x 700mm x 300mm. However as a mobile platform the overall height size of the unit will be increased to facilitate transfer on casters and provide a comfortable position for the interactive touchscreen. Further the unit's depth will be increased for stability.

The fluid portion of the system will be an open frame with the electronics housed in a stainless steel enclosure. All internal components will be rated for -20 to 60°C

All pipe tubing and valves will be stainless steel. All components are suitable for use in Class I Div. 2 or ATEX Zone 2 hazardous areas.

Viscosity/Density/Temperature

Viscosity, Density, and Temperature will be retrieved from a single device through digital communications.

With Emerson's Micro Motion Fork Viscosity Meter you get a fast-response, direct insertion multi-variable sensor that is capable of viscosity, density and temperature measurement. The meter incorporates an innovative new integral transmitter that has extensive communications flexibility and is pre-configured to your specific application. Maintenance burdens can also be minimized through a revolutionary new meter health diagnostic – Known Density Verification (KDV).



Sensor Range and Performance:

- Viscosity accuracy $\pm 0.2\text{cP}$ (0-10cP range) then $\pm 1\%$ FS of calibrated range
- Density accuracy $\pm 0.001\text{g/cc}$ ($\pm 1\text{ kg/m}^3$)
- Temperature accuracy: BS1904 Class, DIN 43760 Class B

Water Content

Understand that “Total Water Content” is the sum of all “Dissolved”, “Emulsified” and “Free” water found within any hydrocarbon, and the dynamic ratio between these “Phases” is greatly dependent upon changing temperature and pressure. Experience has proven that changing moisture readings up to 1,000 ppm can be caused by simply changing the temperature or pressure.

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EESiFlo's EASZ-1 Moisture in Oil Sensor is a Capacitance Measuring device capable of accurately measuring all three phases of water. The output of the EASZ-1 is a true measurement of "Total Water Content", regardless of the dynamic ratio of Dissolved and Free water. The EASZ-1 is temperature compensated and is easily "User Calibrated" to any Range up to 100% water in 0.1% increments, with an accuracy of 0.05%, a resolution of 35 ppm and a response time of 1 second. The sensing element inside a 3 inch EASZ-1 is two inches in diameter, and 15 inches long. Unlike humidity and photometric sensors, the EASZ-1 measures a very large volume of passing fluid thereby providing very representative moisture data.

- ASTM 316L Stainless Steel, 3 inch Schedule 40 Pipe
- ASTM 316L Stainless Steel Internal Sensor
- ANSI 150 316L RFSO Flanges both ends
- Measurement Range 0 to 25% water cut (User Adjustable)
- Resolution 35ppm water
- Accuracy $\pm 0.05\%$
- Temperature Compensated 0 to 300°F

Particle Counter

The PAMAS S50 is a high-performance, laser-based online system with simple integration into industrial data management systems. An automatic digital flow rate determination provides accurate measurement results. The PAMAS S50 counts particles with high resolution in eight particle size channels, available via the data interface for report in real time to the PC. The triple code according to the cleanliness class standard ISO 4406 for the particle sizes $> 4 \mu\text{m(c)}$, $> 6 \mu\text{m(c)}$ and $> 14 \mu\text{m(c)}$ is indicated on the instrument display.



The PAMAS OLS50P is equipped with a wear resistant ceramic piston pump. The pump provides a constant flow rate of 10 or 25 ml/min at a pressure range from 0 to 6 bar.

- Maximum particle concentration: 24.000 particles per ml at a coincidence quote of 7.8% and a flow rate of 25 ml/min
- Calibration range: $4 \mu\text{m(c)}$ to $70 \mu\text{m(c)}$ according to calibration standard ISO 11171
- Measurement in eight size channels: $> 4 \mu\text{m(c)}$, $> 6 \mu\text{m(c)}$, $> 10 \mu\text{m(c)}$, $> 14 \mu\text{m(c)}$, $> 21 \mu\text{m(c)}$, $> 25 \mu\text{m(c)}$, $> 38 \mu\text{m(c)}$ and $> 70 \mu\text{m(c)}$
- Report of measuring results according to cleanliness class standards SAE AS 4059 and ISO 4406. Particle counter measures ISO classes from 0 to 22.

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Control and Data Acquisition

Housed within a stainless steel enclosure resides the PC, PLC, and Power Supply.

The data acquisition and control software is National Instruments Labview. Pre-programmed for this task, the software displays each element in numeric format and includes a graph vs. time with all parameters. The data is collected at a selectable rate and stored in a CSV file for easy retrieval from a USB Drive or through the Wireless LAN. This program can be viewed on any computer connected to the LAN by simple access through Internet Explorer.

User settings are available for alarm levels which will trigger audible and visual annunciators. Each alarm event is recorded with a date and time.

Embedded Computer

C1D2 Certified Intel Atom D510 DIN Rail PC with Mini-PCIe Slot

- Featuring Intel Atom[®] D510 1.67GHz processor
- Integrated with 2GB DDR2 memory with onboard 1MB battery-backup SRAM
- UL listed for Hazardous Locations: Class I, Division 2
- 4 x USB, 2x RS-232/422/485 ports with automatic flow control
- 3 x GbE Ethernet ports with teaming function support



Touchscreen Monitor

The FPM-8151H is a particularly rugged and reliable 15" XGA wide temperature industrial monitor for a variety of industry applications. Equipped with a wide operating temperature range of -20 ~ 60°C (-4 ~ 140°F), it can satisfy demands in a wide range of harsh industrial applications. This model also features enhanced 5-wire resistive touch and system isolation to enhance the reliability. Moreover, FPM-8151H is designed to be safely operated in these locations and is certified with UL Class I Division 2 for hazardous environments.



- 15" XGA TFT LCD with LED backlight
- Stainless steel 316L front panel
- IP65 compliant front panel
- -20 ~ 60°C (-4 ~ 140°F) wide operating temperature range

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Performance Summary

Liquid Compatibility: 100% Ethanol/Methanol, Gasoline, Diesel.

Power Supply: 240 VAC, 1 Phase, 5 Amps Cord and Plug

Temperature Range: -20°C to 40°C

Fuel Pressure: 10 Bar max.