



TELEDYNE
ANALYTICAL INSTRUMENTS
Everywhereyoulook™



Model **6650SP**
Fiber Optic-Based UV-Fluorescence
Oil-in-Water Analyzer



6650SP - OVERVIEW

The Model 6650SP is the next generation enhancement of the field-proven Series 6650 Oil-in-Water Analyzer. The 6650SP incorporates the most advanced, state-of-the-art optics which we've successfully incorporated into a well-designed 4"x4"x4" Photometric Transmitter (PX2) package.

The PX2 configuration has allowed TAI to significantly reduce our overall product footprint. We can now conveniently mount the PX2 into our common analyzer platforms that provide our clients with either NEMA4/IP65 protection, for use in general purpose environments, or NEMA4 & NEMA7 type protection for use in hazardous areas. The small footprint makes the 6650SP ideal for tightly confined installations - conditions which are typically found on offshore oil rigs or FPSO's.

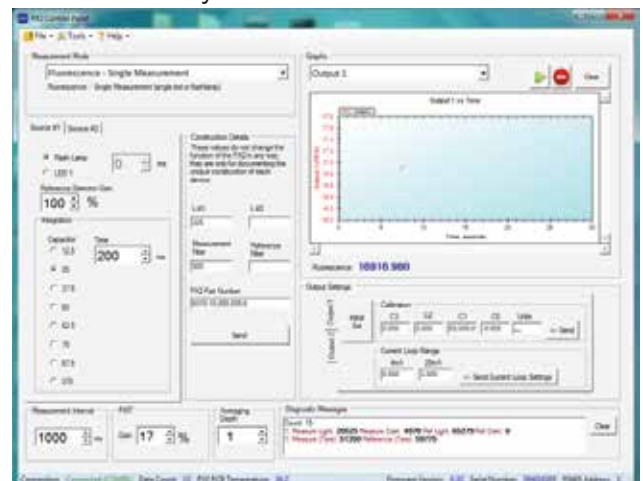


TAI's Photometric Transmitter (PX2)



The PX2 was designed for easy servicability. After removal of the cover plate, both the Xenon Flash Lamp and Photo-Multiplier Tube (PMT) are easily accessible & removable (socket pin-mount), should they ever need to be replaced to restore product performance. In addition, you can also easily replace the optical filter should you choose to apply the analyzer against a different type of oil in the future. The optical filter serves to allow only the preselected excitation energy to reach the oil under analysis. All other wavelengths are blocked.

The PX2 also offers a USB connection which the client can easily link-up with in order to manually optimize system performance. Once the 6650SP user-interface software is loaded onto your laptop, you can then select the ideal setting for (4) separate sensor variables (i.e. the **PMT gain, intergration capacitor setting, integration time and reference detector gain**). Since all oils are not created equal and many have different fluorescence characteristics, we've chosen to provide the end-user with this option to fine tune the PX2's settings in the field to achieve a best-fit condition for the type of oil under analysis.



Recognizing that lap-tops aren't allowed on certain job sites, we developed the capability which provides the end-user with the opportunity to "Auto-Tune" the PX2 through the front-end analyzer user interface control. Simply by placing the probe assembly in a calibration bottle, filled with either a zero or span fluid, the Model 6650SP will automatically select the proper settings of the same (4) variables noted above.



6650SP - FRONT SURFACE UV FLUORESCENCE PROBE

The TAI Model 6650SP Fiber Optic-based UV Fluorescence Oil in Water Analyzer is designed to simplify the detection of oil in water under a variety of challenging application conditions.

The key feature of the Model 6650SP is the Front-Surface UV Fluorescence (FSUVF) Probe. The pulsed-excitation light energy from the Xenon UV Flash Lamp is conveyed to the probe tip via a fiber optic cable. A unique ball lens, located at the sensing surface of the probe, effectively focuses this light energy through an industrially-proven, pressure and temperature resistant sapphire window. The resultant emission energy that occurs when the light is absorbed by the oil present in the water, is carried back to the Photo-X Transmitter by another inner-core fiber optic cable. This emission energy is then directed by a beam splitter to the measuring and reference photo-multiplier tubes (PMT'S), where the resultant oil concentration signal is detected. Another key advantage of the Front Surface probe design is that it doesn't suffer from absorption or scattering due to particles at either the excitation or emission energy (i.e. no inner filter effect) and can also operate in highly turbid environments with minimal consequences.



FIBER OPTIC CABLE

The unique optical design of the Model 6650SP has no moving parts associated with it thereby significantly reducing the servicing requirements and operating costs after installation. The materials of construction (316SS standard; Titanium or Hastelloy-C optional) and the method in which the sapphire window is installed at the optical tip of the probe allows the Model 6650SP to be used in process pressures of over 5,000 psig and over 300 Deg C. Perhaps even more important to the

operator is the fact that the Model 6650SP FSUVF Sample Probe is simple to remove, clean and re-install in the event of a process upset condition. By maximizing the analyzer up-time, the end-user can ensure environmental compliance as well as process control integrity.



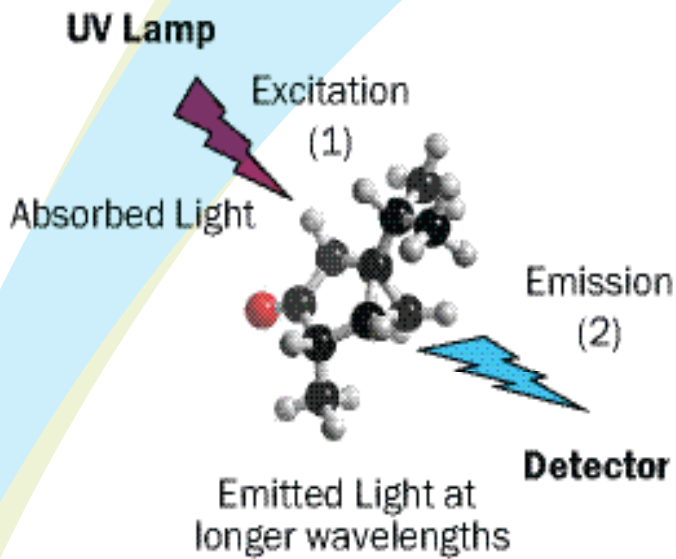
FRONT SURFACE UV FLUORESCENCE PROBE

The flash rate of the Xenon UV Lamp is controlled by the Photo-X Transmitter. This flash rate can be adjusted, depending on the range of interest, to ensure that the most accurate performance of the 6650SP can be achieved. Unlike most lamps which are used in UV Absorbance Analyzers that require replacement in 12 months, the Xenon Flash Lamp can provide an expected operational life of 3 to 5 years. In addition, the Xenon flash lamp provides highly filtered light so that only the excitation energy is transmitted to the target. All other wavelengths are BLOCKED.





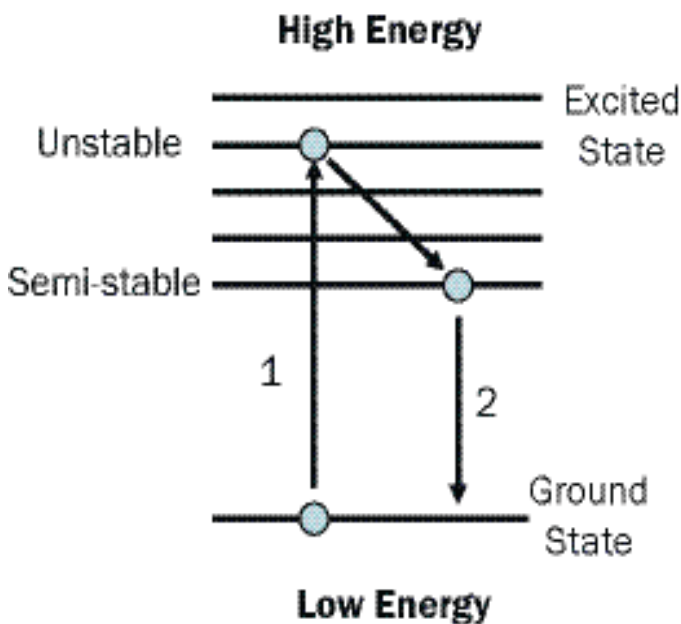
6650_{SP} - UV FLUORESCENCE THEORY OF OPERATION - APPLICATIONS & CONFIGURATIONS



VARIOUS CONFIGURATIONS

The Model 6650SP Oil in Water Analyzer can be provided in a variety of different configurations to suit your particular hazardous or non-hazardous conditions. Systems can be supplied with either an X (Division 1) or Z (Division 2) - Purge or in fully explosion-proof, non-purged designs.

Fully Explosion Proof (NEMA7) Extractive Version
Suitable for Class 1, Division 1 hazardous areas including Ultrasonic Homogenizer



Absorption of UV radiation by a molecule excites it from a vibrational level in the electronic ground state to one of the many vibrational levels in the electronic excited state. This excited state is usually the first excited state. A molecule in a high vibrational level of the excited singlet state will quickly fall to the lowest vibrational level of this state by losing energy to other molecules through collision. Fluorescence occurs when the molecule returns to the electronic ground state, from the excited singlet state, by emission of a photon.

APPLICATIONS

- Steam Condensate
- Boiler Feed-water(BFW)
- Refinery Run-off
- Cooling Tower Water
- Offshore Rig - Produced Water Discharge
- Offshore Rig - Rigwash Runoff Discharge
- FPSO Produced Water
- Ballast Water Discharge
- Marine Terminal Storage / Oil - Water Separation



6650_{SP} - TAI'S ADVANTAGES

DESIGN FLEXIBILITY:

The Model 6650SP FSUVF Probe can be installed in a variety of conditions. For most low range oil-in-water applications, (such as steam condensate return and cooling tower water service conditions), where the detection range is 0-30ppm or lower, the probe can be installed directly into the process on an in-situ basis.



levels to ensure the discharge is within the local environmental regulatory compliance limits. For all Model 6650SP installations, and for particularly remote sensing applications such as this, TAI provides the fiber optic cables in a flexible conduit to protect the fibers from being accidentally mishandled.



Alternatively, for higher range applications, the probe can be incorporated into an extractive design, typically with an ultrasonic homogenizer, which can provide two analysis benefits. On most high range oil in water applications, the oil has separated from the water sample and is typically delivered in a two-phase condition owing to oil in water solubility limitations. To achieve results which are truly representative of an end-user's process conditions; however, the oil-in-water sample should be analyzed in a single, homogenous condition. The sound waves from the ultrasonic homogenizer provide the ability to convert the sample from a dual to single phase solution. Moreover, by placing the ultrasonic homogenizer directly opposite the 6650SP Sample Probe tip, the strength of the ultrasonic homogenizer sound waves also provide the added benefit of keeping the sapphire window clean to again maximize analyzer up-time. We provide static mixer also as option in place of Ultrasonic homogenizer.

Another benefit associated with the fiber-optic cable design of the Model 6650SP is the ability to remotely locate the FSUVF Analysis Probe from the Control section. This capability is highly desirable on Sump Pit Applications (i.e. refinery rainwater run-off that is collected before discharging into a river-way or settling pond) where the probe can be lowered into the pit to conduct continuous analysis of oil in water

Ease of Calibration

Whether the Model 6650SP FSUVF Sample Probe is utilized on an in-situ or extractive basis, the probe can easily be removed from its mounting position through a simple turn of a wrench to loosen its fitting. After removal, the probe is conveniently placed in zero or span calibration bottles for recalibration purposes. After calibration is conducted, the probe is simply re-installed, the fitting re-tightened, and the Model 6650SP returned to the analysis mode.



Prepare the zero or span solution, pour into the calibration bottle, insert the probe and calibrate the unit.



6650SP -TAI'S ADVANTAGES - SPECIFICATIONS

Diagnostics:

The Photo-X Transmitter provides the operator with the ability to determine the condition of the Model 6650SP's "optical -health" by viewing the colored LED located on the front of the Photo-X Transmitter. The color of the LED will change from blue or red and thereby clarify for the operator if a potential problem has occurred with any of the optical components of the Model 6650SP.



Features & Benefits:

- No moving parts
- Long-life Xenon UV Flash Lamp
- Easy to operate, calibrate and maintain
- Self-diagnostics to identify the potential problem source
- Single platform design suitable for multiple application requirements

Light Source: Xenon UV Flash Lamp

Sample Interface : Front Surface UVF Probe with hi-temp & pressure rated sapphire window (316SS standard wetted parts; other alloys are available). Probe length is 4 inches (std); longer lengths available.

Fiber Optic Cable: Multi-fiber Cable with SMA connections housed in a 1/2" OD flexible conduit for cable protection purposes.

TECHNICAL SPECIFICATIONS :

6650SP UVF Transmitter: Specifications

Measured Parameter : Oil in Water

Operating Principle : UV Fluorescence

Measuring Range : 0 to 500ppb up to 0-2,500ppm (*)

Ambient Temperature range : -20 to +60° C

Response time : < 1 sec to 90% of FS

Detector response : 200 - 650 nm

Long term output drift : <2% signal loss / year

Repeatability : 1% of full scale range

Analyzer display: LED & VFD display

Engineering units : ppb / ppm

Power requirement : 110/220VAC, 50/60Hz

Power consumption : 0.48 Watts

Analog outputs : 4-20mA isolated

Alarms : High / low range, Adjustable Form C relay contact

UV Lamp Type : Xenon flash lamp

Wavelength range : 200 - 650 nm

UV Lamp Life : Typically 3 years

UVF Probe : 316SS / SDSS / Monel / Hastelloy C

UVF Sensor, Process Tmax rating: 315.5° C (600° F)

UVF Sensor, Process Pmax rating : 5000 psig

Area Classification : Hazardous / Non Hazardous Designs (*)

Hazardous Area Certification : ATEX & IECEx

IECExExd IIB T4 (-20 to +60degC)

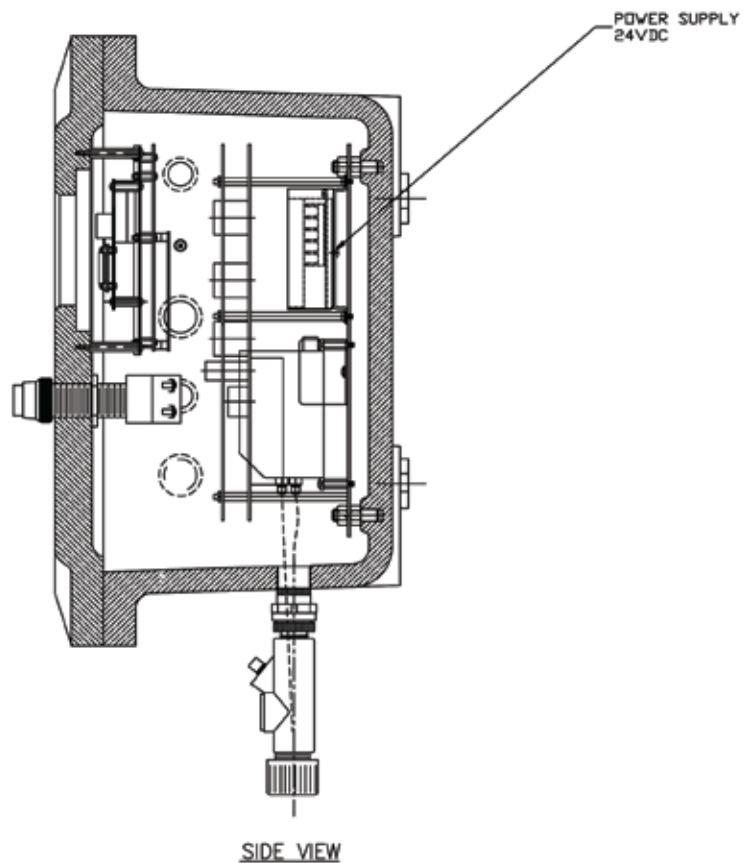
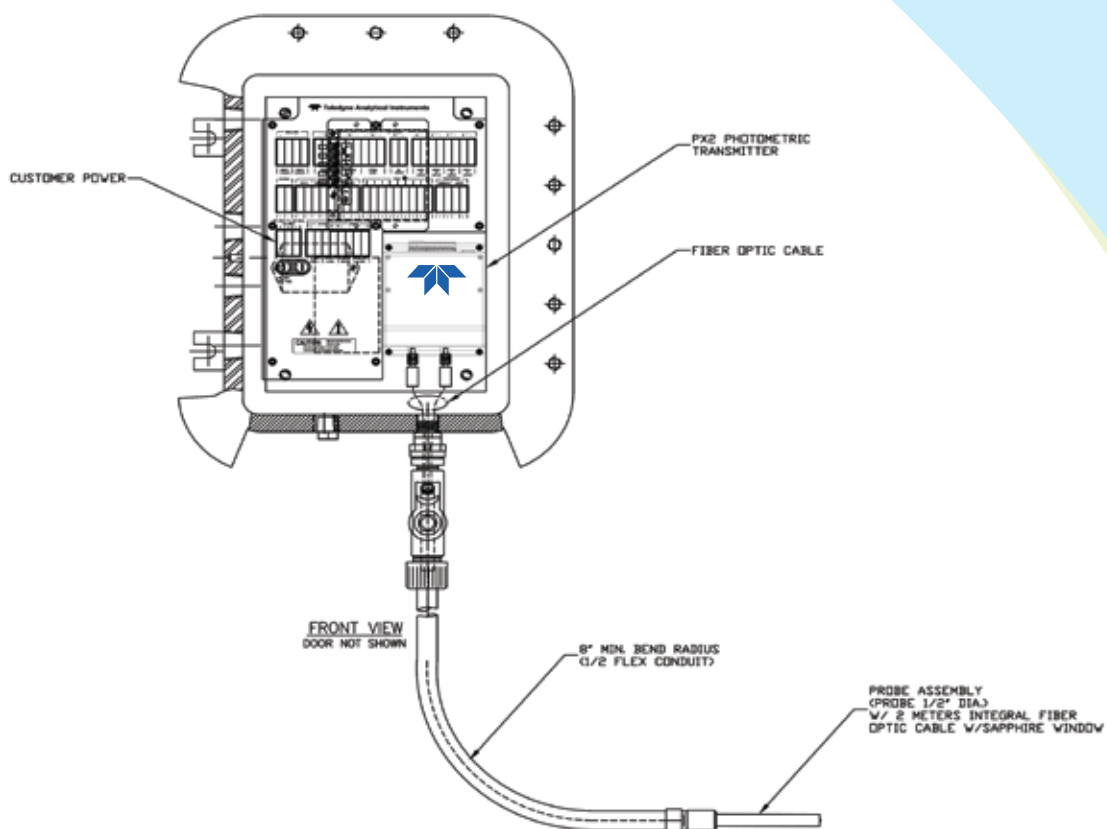
IECEX Cert No # ITS 16.0029X/2016.

Sample System Requirements : Application Dependent (*)

(*) = Contact Factory for application feasibility and sample system design recommendations.



6650_{SP} - OPEN VIEW





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Warranty

Instrument is warranted for one 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.



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