

## ChemView® SMART Photometer

ChemView was designed for those liquid and gas applications where a spectrophotometer and chemometric modeling are over-kill. A surprising number of applications can be simplified to a handful of wavelengths. A photometer is a lower cost alternative for long-term success at the plant-level in these cases. Consider a photometer as an alternative where partial least-squares PLS chemometric models show less than five factors are needed. This encompasses a great variety of chemical measurements. Furthermore, photometers typically operate with multiple linear regression (MLR) or simple least-squares (LS) prediction models that can be generated in common spreadsheet programs by most instrument specialists or process engineers at the plant. As such they do not require chemometrics specialists for model maintenance. The models can be maintained at the plant level. ChemView revolutionized process filter photometry since its introduction in 1997. Its main advantages are:

- Compact size starting at 6 x 8 x 10" (NEMA)
- 5 analyzing and 1 reference wavelength
- StabLamp stabilized light source with patented optical feedback
- Extensive thermal stability for best analytical precision
- Very low photometric drift of 1-2 mAU/2 weeks (equivalent to  $\pm 25$  ppm water in a 2 cm optical path at 1900 nm)
- **No Moving Parts** for low maintenance (no spinning filter wheels and bushings to replace)
- Simultaneous measurement of all wavelengths to reduce process "noise" ensuring that your reference wavelength relates EXACTLY to the analyzing wavelengths
- Simultaneous measurement of VISIBLE color and NIR composition (e.g. yellowness and acid number in resin melts)
- **Smart Photometers™** diagnostics to minimize guesswork in troubleshooting
- Can be up to 80 m from the flow cell or insertion probe using fiber optics, eliminating the need to pump explosive or dangerous liquids (phenol, HCN) or gases (Cl<sub>2</sub>, phosgene) into the analyzer. This means that your instruments specialists do not have to suit up to work with ChemView.
- Can accept signals from RTD temperature sensors or pressure transducers to correct for variations in sample conditions



General Purpose  
Nema 4X



North America  
Class 1, Div. 1-2, Groups B-D



Europe  
ATEX, EEx d II T6

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Literature: 1034-06-11

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## ChemView® SMART Photometer

ChemView's patented design is shown below. A tungsten halogen lamp is selected to match the size of the optical fibers. It is stabilized by a detector in an optical feedback loop (a pulsed Xe lamp is used for UV applications). Light is transmitted in a fiber optic cable to the sample cell, where it interacts with the sample. The remaining light is transferred back to the analyzer by a second fiber optic cable. It is divided among (up to) 6 detectors using beamsplitters and then passes through narrow bandwidth (6-15 nm wide) optical filters. We use Si and InGaAs detectors, such that light levels are not a problem. The detectors produce a voltage that is converted to  $\log(\text{voltage})$ . The  $\log(\text{voltage})$  at each analyzing wavelength is subtracted from the  $\log(\text{voltage})$  at the reference wavelength, resulting in a voltage equivalent to units of spectroscopic absorbance. The reference wavelength is generally chosen in a spectral region that does not change with changing chemistry. 1 Volt = 1 Absorbance Unit or AU. From this point in the circuitry, ChemView is now an absorbance machine. Absorbance is proportional to chemical concentration in most instances. The powerful microprocessor applies the calibration coefficients to the absorbances, including sample pressure or temperature if needed, sums the results and outputs the predicted concentration.

The output is displayed on the LCD screen, scaled and transmitted to the process control computer with self-powered, isolated 4-20 mA signals. Optical Solutions' brand ClearView photometer was originally designed to provide a low-cost means to measure color and turbidity using the flexibility of optical fibers to separate the analyzer from the sample cell or probe. This had two advantages:

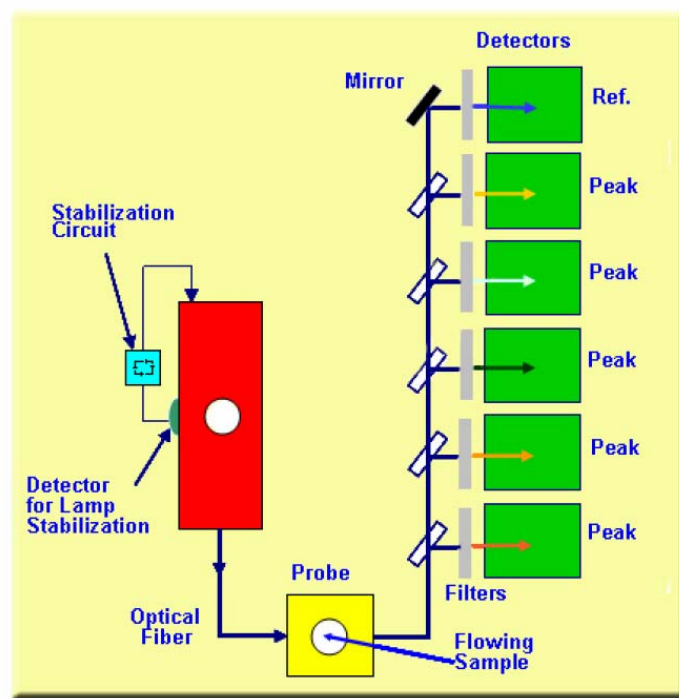
As shown to the right, ChemView can be supplied for NEMA 4X general purpose environments and explosion-proof in C1D1/2 or ATEX enclosures.

ChemView's diagnostic features with fault alarms are extensive, helping the instrument specialist to determine:

- lamp replacement
- window fouling
- fiber breakage
- sample cell failure
- intermittent cloudiness or turbidity

If there are no system faults, ChemView can further help in determining if the sample is an "outlier", that is, it does not "fit" within the calibration model. ChemView optionally has a patented chemical outlier detection (**OutlierDetect**) capability that can be trended or alarmed if the calibration uses 2 or more analytical wavelengths.

Lastly, ChemView can be provided with **VirtualView**, where an operator has access to nearly all menus, output scalings and calibration coefficients on a remote PC via local area network. This saves time in sending an instrument specialist to another building to check a specific reading on the LCD display or upgrading the prediction model with new coefficients.





## ChemView® SMART Photometer

### Easy-to-Use Interface

The operator will mostly see the following screens on ChemView, indicating how easy the system is to use. Enter the coefficients from the calibration, display the predicted:

MEASUREMENT MODE			
NTU	2.9		
SAYBOLT	12.7		
CONF	DIAG	ADJ	ABS

**Measurement Mode Screen**  
displays all answers

ABSORBANCE VALUES			
5975	2177 MV		
455	98 MAU		
REFERENCES			
670	3134 MV		
ZERO	CLR	HELP	EXIT

**Absorbance Screen**  
shows the absorbances at all wavelengths used in the Coefficient Screen to determine chemical concentration. The reference voltage is a key diagnostic.

MAIN CALIBRATION	
NAME: APHA GROUP A	
A0 =	+0.00000E+00
T1 =	+1.23450E-01
A2 =	+0.34500E+00 455NM
RF =	+0.00000E+00 700NM

**Coefficient Screen**  
allows you to input coefficients for each wavelength, including sample temperature, to convert absorbances to chemical concentrations. Two types of calibrations are shown here. The upper screen shows a linear calibration with sample temperature compensation. The lower screen shows a polynomial calibration typically used for Saybolt color.

MAIN CALIBRATION	
NAME: SAYBOLT GROUP A	
S0 =	+0.00000E+00
S1 =	+1.23450E-01
S2 =	+0.34500E+00
S3 =	+5.00000E-01
S4 =	+0.00000E+00

NTU			
MA			
4 =	+0.0000E+00		
20 =	+2.0000E+01		
INC	DEC	HELP	EXIT

**Analog Output Screen**  
scales your 4-20 mA output in concentration units for each answer.

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### Specifications

Enclosures	<ul style="list-style-type: none"> <li>NEMA 4x 304SS</li> <li>Class 1, Div. 1,2, Groups B-D (Z- or X-purge) 304SS</li> <li>ATEX (non-purged) powder-coat Al</li> </ul>
Dimensions	<ul style="list-style-type: none"> <li>NEMA 8x6x10" (wxdxh) (20x15x25cm) 14.5 lbs, 6.6 kg</li> <li>C1D1/2 15x9x16" (wxdxh) (38x21x41cm) 40 lbs, 18.2 kg</li> <li>ATEX 24x20x31.8cm (wxdxh) 18.2 kg</li> </ul>
Certifications	<ul style="list-style-type: none"> <li>C1D1 NFPA 496, 1993, FM compliant</li> <li>CE</li> <li>ATEX II 2 EEx d IIC T6</li> </ul>
Purges	Expo-Safety Systems, continuous flow sub-miniPruge (1ZCFSS1S). Intrinsically safe switch closure and pneumatic "winkie" fo purge loss. 1/2" NPTF purge fitting. Purge vent orifice is Size 1 (for 0.4 cfm; 10L/min). Allow 6 min. purge cycle (min. 4 volumes) prior to power up
Purges	110 p.s.i. clean, dry compressed air or inert gas
Fiber connections	SMA 905 400 - 600 micron (core)
Detectors	Max. 5 analyzing and 1 reference <ul style="list-style-type: none"> <li>Si for 250-950 nm</li> <li>InGaAs for 900-1650 nm</li> <li>TE-Cooled extended InGaAs for 1000-2150nm</li> </ul>
Filters	10 nm FWHM for UV/VIS, 15 nm for NIR typical. 4 OD out-of-band blocking
Light Source	<ul style="list-style-type: none"> <li>Optical Solutions brand StabLamp, optical feedback circuit, Tungsten-halogen bulb, precision mounting for easy replacement. Approx 8 months bulb life nominal.</li> <li>Pulsed Xe lamp for UV/VIS. Approx 2 year bulb life.</li> </ul>
Wavelength Drif	0.1 nm with Si detector 0.2 nm near 1450 nm with InGaAs detector
Photometric Drift	<2 mAU with $\pm 5^{\circ}\text{C}$ variation ( $\pm 2$ to 3 mAU with Xe) 0.2 mAU/ $^{\circ}\text{C}$ at 0 AU typical <2 mAU over 2 weeks
Photometric Noise	<1 mAU (3 mAU with Xe source)
Outputs	4 4-20 mA isolated, self-powered. 2 4-20 mAU additionally optional for a total of 6
Environmental	10 - 40 $^{\circ}\text{C}$ , 10-90% rel. humidity (non-condensing)
Power	110 - 240 V AC, 50-60 Hz, 70 VA (24 V DC, 2.1 A optional)