

# pH Sensor Systems

## Optical pH Sensors Available in a Variety of Form Factors

Our optical pH sensors use a proprietary sol-gel formulation optimized for the biological range and are available in probe, cuvette and patch formats. Each pH sensor works on the same principle: a colorimetric change that's detected with a spectrometer. We immobilize a pH-sensitive dye in a modified sol-gel matrix, where the free diffusion of hydrogen ions in and out of the matrix pores allows for interaction with the dye. When this interaction occurs, the dye exhibits a visible color change.

### Form Factors

We offer transmissive pH probes, self-adhesive pH patches and pH-sensitive cuvettes (see Smart Cuvettes on p. 178) to meet your pH sensing needs. While typical optical sensors are susceptible to changes in ionic strength, our pH sensors overcome this limitation and thus can be used in applications such as food and beverage processing and pharmaceutical production.



### Advantages of pH Sensors

- Are immune to ionic strength sensitivity
- Are compatible with acetone, alcohols and other organic solvents
- Have faster response time and better thermal performance than pH electrodes
- Are designed for use in the biological range (pH 5-9)
- Work well even in low salinity solutions
- Meet USP Class VI certification requirements for biocompatibility
- Are available in probe, patch or cuvette options
- Can be used for non-intrusive measurements

### Typical pH System Setups

Here's what you'll need to build your probe-based pH measurement system:

- Start with the probe. Our transmissive pH sensor probes (T300-RT-UV-VIS and T300-RT-VIS-NIR) work well in non-turbid sample environments. You'll also need a probe tip (RT-2MM, RT-5MM or RT-10MM) and the 5-pack of transmissive patches (PH-BCG-TRANS) to complete the probe assembly.
- Specify the spectrometer. If benchtop use is what you desire, we recommend any of our USB-series spectrometers configured for the UV-VIS and with a 200  $\mu\text{m}$  slit. Your other option is our Jaz spectrometer in the same configuration. With Jaz, you can build a single modular stack consisting of the spectrometer with onboard computing power (JAZ-COMBO), light source (JAZ-VIS-NIR or JAZ-INTLED-WHITE) and battery (JAZ-B) for portable use.
- Add the light source. Your most versatile option is a white-light source like our HL-2000 Tungsten Halogen Source (360-2000 nm). If you're using Jaz as your spectrometer, you can stick with a separate light source or integrate the source into your Jaz stack.
- Select appropriate pH software. For the desktop pH system, the user requires the pH functions available in our SpectraSuite software. The pH module provides the user with intuitive visual calibration, data logging with time, multiple exporting options and other features. The Jaz system runs a pH program from an SD card that offers comparable functions. The user may log pH data with time, and then export that data along with all reference spectra taken.

The setups can vary and are not limited to pH measurements only. Indeed, both setups are versatile enough for a wide range of UV-VIS measurements.

pH Sensor Specifications	
Sensor type:	Colorimetric indicator dye coated onto patch and installed into tip of transmission probe; cuvette version also available
Form factors:	Probe (T300-series), self-adhesive patch (SP-PH) or cuvette (SC-PH-series)
Measurement setup:	Requires Visible spectrometer (350-1000 nm) and light source
pH range:	pH 5-9
Temperature range:	-5 °C-+40 °C
Accuracy:	<1% of reading across the range
Resolution:	0.02 pH
Response time ( $t_{90}$ ):	30 s to 120 sec (depending on form factor)
Calibration requirements (minimum):	3 buffers
Drift (continuous stability):	1% per day
Patches:	Bromocresol Green, 4.35 mm diameter, pack of 5
Patch coating:	Organically modified sol-gel (ORMOSIL)
Chemical compatibility (favorable):	Aqueous solutions, alcohols, some organic solvents, peroxides, ammonia, sodium hypochlorite
Chemical compatibility (not favorable):	Concentrated acids
Sterilization:	Gamma, EtO (Ethylene Oxide)
Storage conditions:	Dry or wet storage