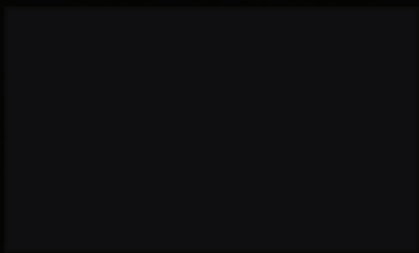


NARWHAL

COLORIMETRIC ANALYZER



Uniquely specialized to be the most adept of its kind, this colorimetric analyzer is engineered at the intersection of precision and economy.

Every detail has been designed to perfect performance and user experience. There's simply nothing else like NARWHAL™ on the market.

NARWHAL automates time-consuming lab-based tests for an array of water quality applications. Setting up is simple, and the 7" intuitive touch screen allows for easy customization and data monitoring – including real-time indication of process conditions. With faster turnaround, higher testing volume, and increased precision and reproducibility, NARWHAL makes a splash both in reducing human error and increasing productivity in the lab.

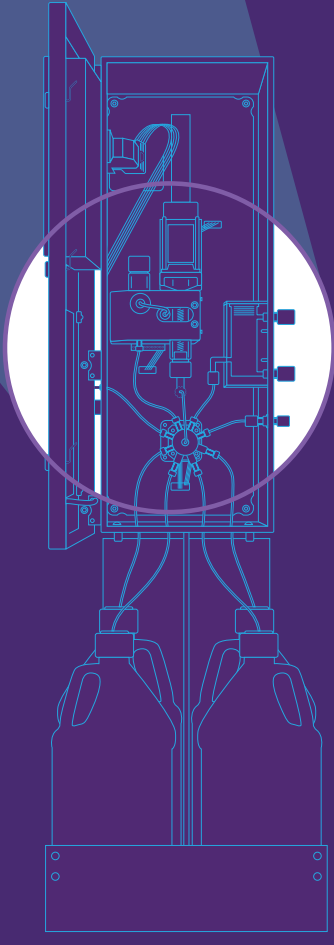
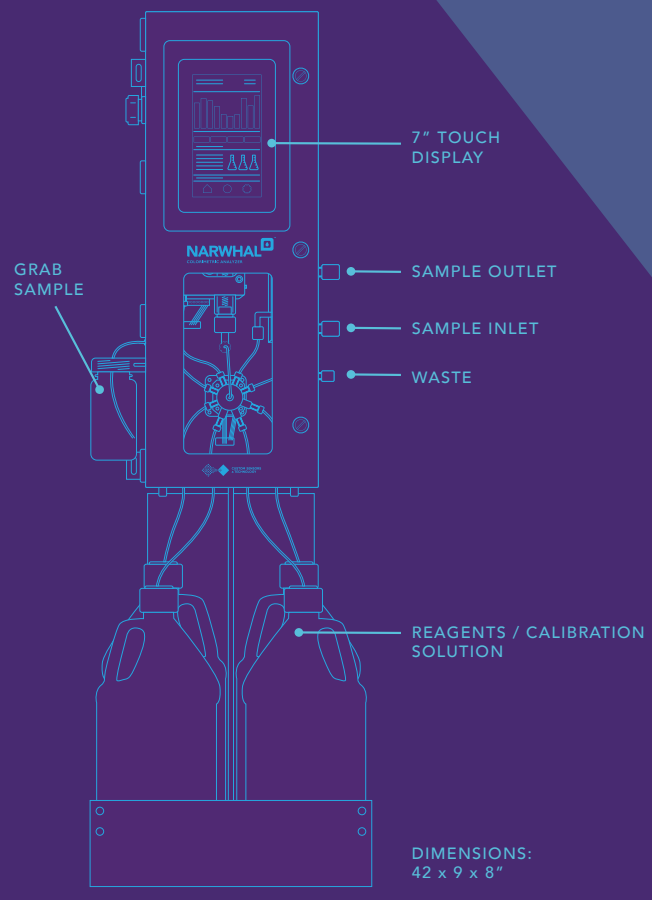
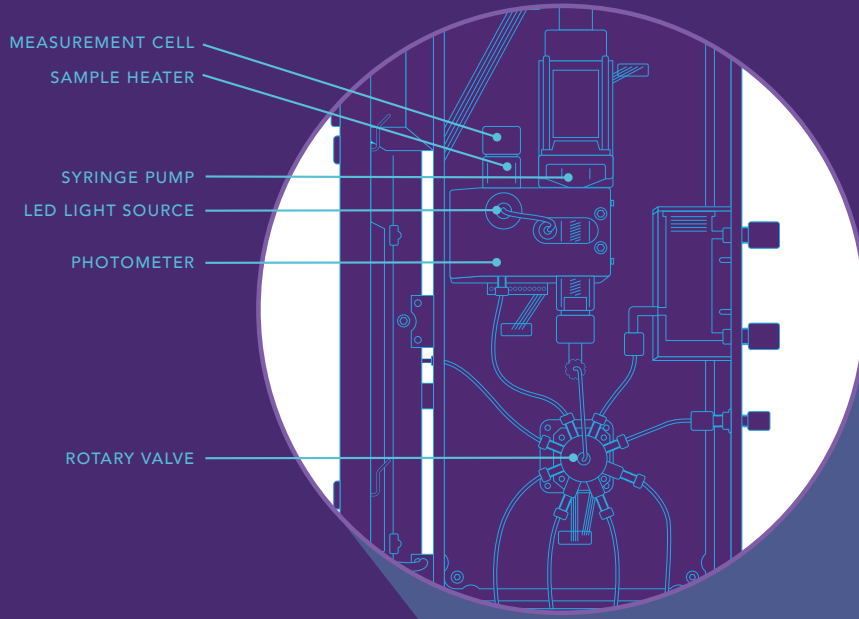
Features & Benefits

- The RS1 performs fully automated colorimetric measurements in a process setting utilizing up to three reagents.
- 7" intuitive touch screen display with easy-to-use software allows users to calibrate and view data.
- Automatic 2-point calibration maintained with self-referencing feature. The interval between calibrations can be manually configured.
- Self-cleaning design and long life LED minimize required maintenance.
- Unique fluid handling system utilizing a single valve and pump for ease of maintenance and high-precision measurements.
- Low reagent and sample usage (ex: optional 2.5 L reagents for 3 months silica).
- Multitude of diagnostic features that alert users of process upsets.
- Standard data outputs include MODBUS, 4-20mA, USB to CST Software, and removable SD card.

Theory of Operation

The RS1 is designed to perform fully automated colorimetric measurements and deliver the product of the chemical reaction to an analysis cell in a process setting. The system first retrieves a known volume of sample from a stream and mixes it with up to three reagents in succession. After each reagent addition, a mixing cycle is performed followed by a variable reaction delay.

Once the reagent addition process is complete, the final solution is transported to measurement cell where the compound of interest can be determined via an absorbance measurement. The RS1 is designed to be mounted near the pipeline containing the sample of interest which is retrieved from the pipeline via a fast loop. The RS1 also utilizes a grab sample chamber to make analyzing small sample volumes quick and easy.



TRACE ANALYSIS

Technical Specifications

Application / Detection Range* / Part Number

ALUMINUM	COPPER	IRON	MANGANESE	SILICA	HYDRAZINE	HARDNESS	AMMONIA	PHOSPHATE
13 Al	29 Cu	26 Fe	25 Mn	14 Si	H ₂ N-NH ₂	H	NH ₃	[PO ₄] ³⁻
0-300 ppb	0-3 ppm	0-1 ppm	0-2 ppm	0-500 ppm	0-500 ppm	0-1 ppm	0-3 ppm	0-10 ppm
RS1-004-300	RS1-006-003	RS1-009-001	RS1-002-002	RS1-001-500	RS1-008-500	RS1-007-001	RS1-005-003	RS1-003-010

*Other ranges available on request.

Narwhal™ Configuration

Measurement Principle	Absorbance
Accuracy	±5% of full scale or better
Repeatability	±2% of full scale or better
Light Source	LED
Detector	Silicon Photodiode

Operating Conditions

Ambient Operating Temperature	5°C to 45°C
Process Temperature	1°C to 40°C
Ambient Operating Humidity	Up to 90% RH non-condensing
Minimum Flow Rate	100-500 ml/min
Inlet/Outlet Pressure	5 psi maximum

Communication

Measurement/Diagnostic Output	On-board display, isolated 4-20 mA, RS-485 (Modbus RTU)
Storage	Removable SD card
Alarms	Contact closure (60VDC, 0.75 A max) One each per unit: Motor, Reagent Low, Calibration, and Reference/Result Alarms

Utility Requirements

Power Requirements	24VDC nominal (12-48VDC), 8.5 watts max
Power Consumption	120W max

Physical

Enclosure Material	Powder coated carbon steel
Overall Dimensions	39" H x 9" W x 8" L
Weight	40 lbs. (18.4 kg)
Pump Tubing	1/8" OD Teflon
Connection Tubing	1/4" OD Teflon
Fittings	Teflon
Measurement Cell	Borosilicate / Polycarbonate
Syringe Pump	Polycarbonate
Display	7" capacitive LCD (password protected)

Maintenance

Reagents	1-3 month replacement (application dependent)
Sample Tubing	Annual replacement
Calibration	Weekly automatic calibration
Measurement Cell O-Ring	Annual replacement
Piston Seal	Annual replacement