

Sulfur Measurement for Marine

A portable and robust sulfur analyzer for Marine.
Ensure Sulfur Compliance for IMO 2020 & ECAs



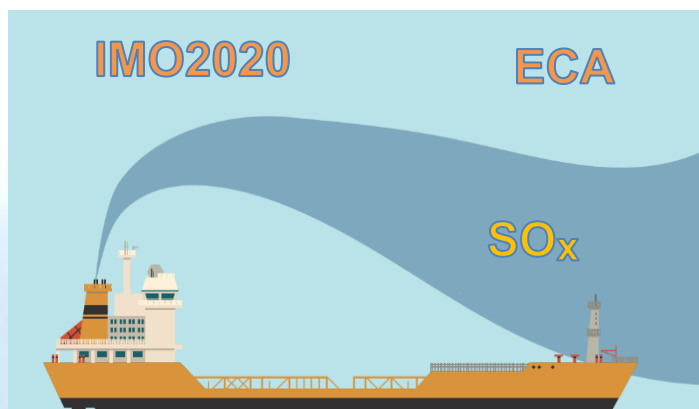
Sea¹⁶

Sulfur Analyzer for Marine

The Sea¹⁶ is an easy-to-use and robust analyzer, designed to provide high-precision ISO 8754 and D4294 sulfur analysis for the marine industry to meet the IMO 2020 regulation.

ISO 8754
ASTM D4294

Ensure Sulfur Compliance Anywhere at Sea



In 2015, SECA trade partners restricted sulfur emissions to 0.1% sulfur content within 24 nautical miles from shore. On January 1, 2020, the International Maritime Organization's (IMO) revised MARPOL Annex VI rule went into effect, which lowered the maximum global sulfur cap for emissions from 3.50% to 0.50%. The Emission Control Areas (ECAs) remains at the 2015 standard of 0.10% S content. To ensure compliance with both regulations, merchant ships need to strictly monitor sulfur content in fuel. Sea¹⁶ was designed to meet these needs with easy, rapid, and precise sulfur analysis.

Rapid Sulfur Testing with Sea¹⁶

Sea¹⁶ delivers rapid and precise sulfur testing with a limit of detection as low as 0.0005% - well below the new regulatory limits. To ensure lab-quality results and compliance with methods approved for marine-fuel testing (covered under ISO 8217), Sea¹⁶ is compliant with ISO 8754 and ASTM D4294 in the concentration range of 0.01%-5%.

To demonstrate the precision of Sea¹⁶, an application study was conducted using three mineral oil samples with sulfur concentrations close to the expected levels in various types of marine fuel. Results are shown in **Table 1**.

Table 1: Sea ¹⁶ Study Results			
Repeat	450 ppm	0.1%	0.5%
1	455.5	0.099	0.500
2	472.9	0.101	0.494
3	452.7	0.101	0.502
4	464.6	0.100	0.496
5	463.5	0.100	0.499
6	468.4	0.101	0.501
7	454.7	0.099	0.498
8	461.1	0.098	0.502
9	460.0	0.101	0.496
10	465.5	0.100	0.497
Average	461.9	0.100	0.498
Standard Deviation	6.4	0.001	0.003
RSD%	1.4%	1%	0.6%

Features & Benefits

- Robust design for maritime environment
- Onboard, offshore, or on-land testing
- Portable with built-in battery
- Advanced detector to ensure long-term stability
- Trusted precision with lab-quality results
- Robust calibration with one curve covering whole range
- Complies with ISO 8754 and ASTM D4294

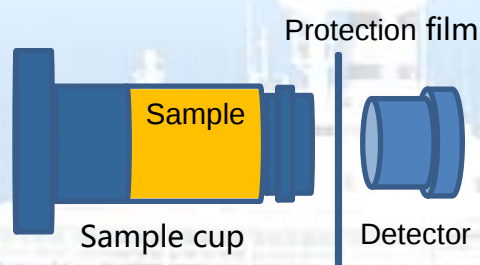
Easy-to-use and Robust Design

Sea¹⁶ provides reliable, rapid, and robust sulfur analysis. Sample preparation is as easy as loading the sample into the pre-film disposable cup using a pipette and mounting the cup onto the sample carrier as shown in Figure 1. The sample is inserted with the sample window vertical, ensuring that any accidental sample leak away from the detector which could be simply removed as shown in Figure 2. This analyzer can be operated by a crew member with minimal training, in as little as 15 minutes.

Figure 1. Disposable sample cup



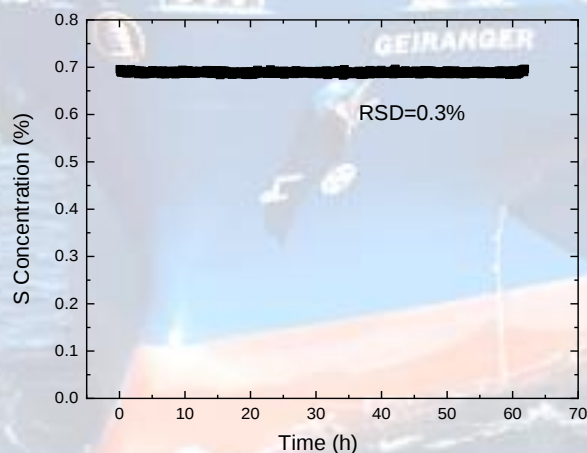
Figure 2. Sea¹⁶ side sample loading



Robust Stability

The robust stability has been tested through continuous measurement of standard NIST fuel oil sample 1619b (0.698%) within the temperature range from 10 °C to 30 °C. Results are shown in **Figure 3**.

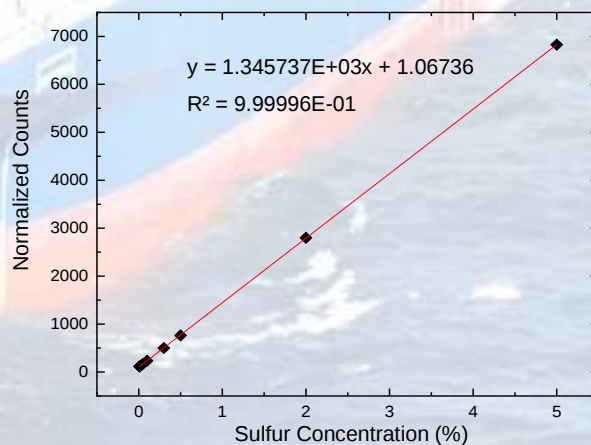
Figure 3. Stability test



Robust Calibration

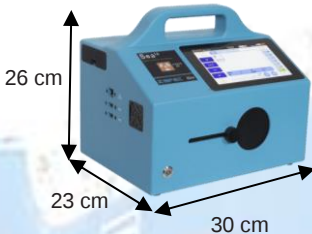
With corrected net counts, the calibration covers the whole range of marine application with one linear curve, ensuring robust calibration with precise sulfur analysis. Results are shown in **Figure 4**.

Figure 4. Calibration



Technical Specifications

Dynamic Range & Applications		
Sea ¹⁶	Dynamic Range	Sulfur 5 ppm – 5 wt%
	Applications	Sulfur in Marine fuel

Sea ¹⁶ Specifications	
Method Compliance	ASTM D4294 & ISO 8754
Measurement Time	30-900 seconds
Calibration	- 30 calibration curves - Linear (automatic customer calibration available)
Sample Cup Volume	2 mL
Data Output	Printout, USB, and Ethernet to PC connection
I/O Ports	Ethernet 10/100, USB
AC Power Supply	110-240 VAC $\pm$ 10%, 50-60 Hz (hertz)
Battery Power	98 Wh for >4 hours continuous operation
Operating Temperature	5°C to 40°C (41°F to 104°F)
Operating Humidity	30 – 85 %
Weight	8.8 kg (19.5 lbs)
Dimensions	23 cm W x 30 cm L x 26 cm H 

Z-Spec – XOS joint effort

Z-Spec and XOS have partnered together to provide an easy-to-use, robust solution to the marine industry to meet the IMO 2020 regulation. By combining XOS' industry-leading XRF technology with Z-Spec's product-development expertise in the marine industry, we're able to deliver the most practical and effective solution to meet customer's application needs.

Z-SPEC

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