

# X-MET8000

## X-MET8000 for fast, on site sulfur in oil analysis to ASTM D4294, ISO8754 and IP366

### INTRODUCTION

The International Maritime Organisation (IMO) has been working for many years to reduce the harmful impact of shipping to the environment. As part of ongoing efforts to reduce air pollution from the burning of marine fuels, the IMO recently announced that the proposed 0.50% global sulfur cap on marine fuels will come into effect on January 1, 2020. This is a significant reduction from the current limit of 3.50%. Within sulfur emission control areas (SECAs), the sulfur limit remains at the 0.10% level established in 2015.

To ensure compliance with marine fuel regulations, ship owners must ensure they use fuel that meet specifications in all locations, i.e. monitor the fuel's sulfur level in the settling tank during the fuel switch over before entering SECAs.

Government laboratories also perform spot-checks on the ships in the SECA ports to ensure compliance. In this case, the analytical equipment used for the test needs to be fully portable.



### X-MET8000 SERIES HANDHELD ANALYSERS

Hitachi High-Tech's latest generation of field portable analysers present many advantages:

- | Take the analyser from site to site, ship to ship
- | Rugged, fast and easy to use
- | Embedded GPS to pinpoint where the analysis is performed
- | Real-time data sharing and management with our app and cloud service
- | Over 40 years' experience in portable XRF analysis

## SOLUTION

Unlike other techniques available (e.g. titration), X-ray fluorescence (XRF) is rapid, simple, and does not require the use of chemicals. It is a field-proven technique that is widely used in the oil industry. With results available in seconds, it is a non-destructive technique, and can be used by any operator with minimal training.

Our field-portable XRF analyser, the X-MET8000, combines a high performance X-ray tube and large area silicon drift detector (SDD) to deliver the speed and performance needed for the routine determination of sulfur in fuels.

Robust (IP54 rated to ensure minimal ingress of dust and splash water; tested to MIL-STD 810G for ruggedness) and compact, the X-MET is versatile and can be used on-board a ship, in a laboratory, or taken to where the analysis needs to be performed.

The X-MET offers users flexible data management to suit all needs: results are automatically stored in the analyser. They can be transferred to a USB flash drive or a PC, printed on a portable Bluetooth printer, or shared in real-time through our App and cloud service.

## SAMPLE PREPARATION

The sample preparation is simple: just pour the solution into a sample cup fitted with thin polyester film (e.g. 3.5µm Mylar®), and place it in the safety window, also fitted with thin film. This minimises the risk for spill, cross-contamination or cup leakage onto the analyser, and avoids costly repairs. The cup and safety window are placed in the light stand or the benchtop stand for analysis. Pressing the X-MET trigger starts the analysis, and initial results are available in seconds, updating until the end of the analysis. A typical analysis time for marine fuel oil is 60 seconds.

When not in use, the benchtop stand can be folded up and safely put away, requiring minimum storage space.

When full portability is needed, operators can use the light stand and safety shield which fit in the X-MET's compact transport case.



Full portability with the light stand.



Sample cups measured in the benchtop stand.

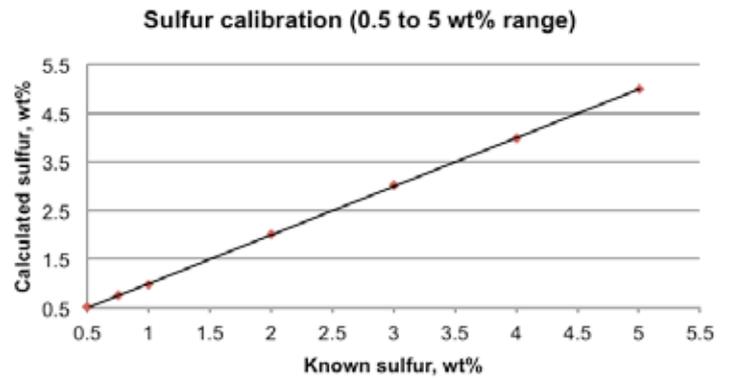
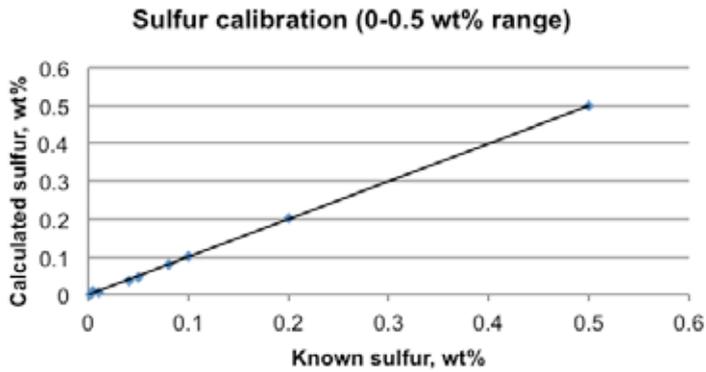


Benchtop stand, folded for transport and storage.

## PERFORMANCE AND RESULTS

The X-MET was calibrated following industry-standard procedures (ASTM D4294): a series of commercially available calibration standards were measured to establish the relationship between sulfur content in the oil and X-ray signal. Each standard was measured for 60 seconds.

For optimum accuracy across a wide sulfur range (0 to 5 wt%), the calibration is split into 2 ranges. During routine sample analysis, the correct regression is automatically selected, so there is no decision needed from the operator.



Certified reference materials (CRMs) were measured to verify the calibration accuracy, and to demonstrate how the X-MET can be used to ensure your fuel meets requirements.

CRMs	Oil type	Given, wt%	X-MET result, wt%
NIST 1623c	Residual fuel oil	0.40	0.38
NIST 1622e	Residual fuel oil	2.12	2.15

The results from the repeats test done for 3 known oil samples also shows how the X-MET delivers stable results you can trust.

	Sample 1	Sample 2	Sample 3
X-MET result 1	0.082	0.495	3.01
X-MET result 2	0.083	0.505	3.01
X-MET result 3	0.082	0.506	3.01
X-MET result 4	0.083	0.507	3.01
X-MET result 5	0.083	0.508	3.01
X-MET result 6	0.084	0.508	3.01
X-MET result 7	0.082	0.507	3.01
X-MET result 8	0.083	0.507	3.00
X-MET result 9	0.083	0.507	3.00
X-MET result 10	0.081	0.507	3.02
Average	0.082	0.506	3.01
Known S content, wt%	0.080	0.50	3.00
Standard deviation	0.001	0.004	< 0.01
Precision (95% confidence)	0.002	0.008	< 0.02

## SUMMARY

Once calibrated (a procedure that can be carried out by the user or the analyser can be pre-calibrated on request), Oxford Instruments' X-MET8000 provides accurate and repeatable sulfur analysis in marine fuel oil. The X-MET's ease of use, ruggedness and portability make it an ideal tool for sulfur analysis on ships, at the ports, or in the lab.

Results are available in seconds, for immediate confirmation that the fuel's sulfur level meets regulations. Government lab officers no longer need to take samples to the lab. Results are available on-site, saving time and money.



## ORDERING INFORMATION MINIMUM REQUIRED:

- | X-MET8000 Optimum or Expert. Includes the compact and rugged carrying case, a wrist strap and lanyard, 2 Li-ion batteries, a battery charger, a USB cable to connect to a PC/laptop, 5 replacements thin film windows, Bluetooth and Wifi connectivity, and the user manuals.
- | Empirical calibration software (P/No. 54-4106250; included as standard with the Expert model)
- | Sample cups (P/No. 54-LX6922 for a box of 100)
- | Safety window (P/No. 54-LX6879-2)
- | Thin Mylar film (P/No. 51-3882096 for a roll of 100m)
- | Benchtop stand (P/No. 54-4106313) or light stand (P/No. 54-4106255)

## OPTIONAL EXTRAS:

- | Rack for sample cells (P/No. 54-LX1032 ; holds 10 cups)
- | Factory calibration (P/No. 54-4106218); will be calibrated as per this application note

Visit [www.hitachi-hightech.com/hha](http://www.hitachi-hightech.com/hha) for more information.

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