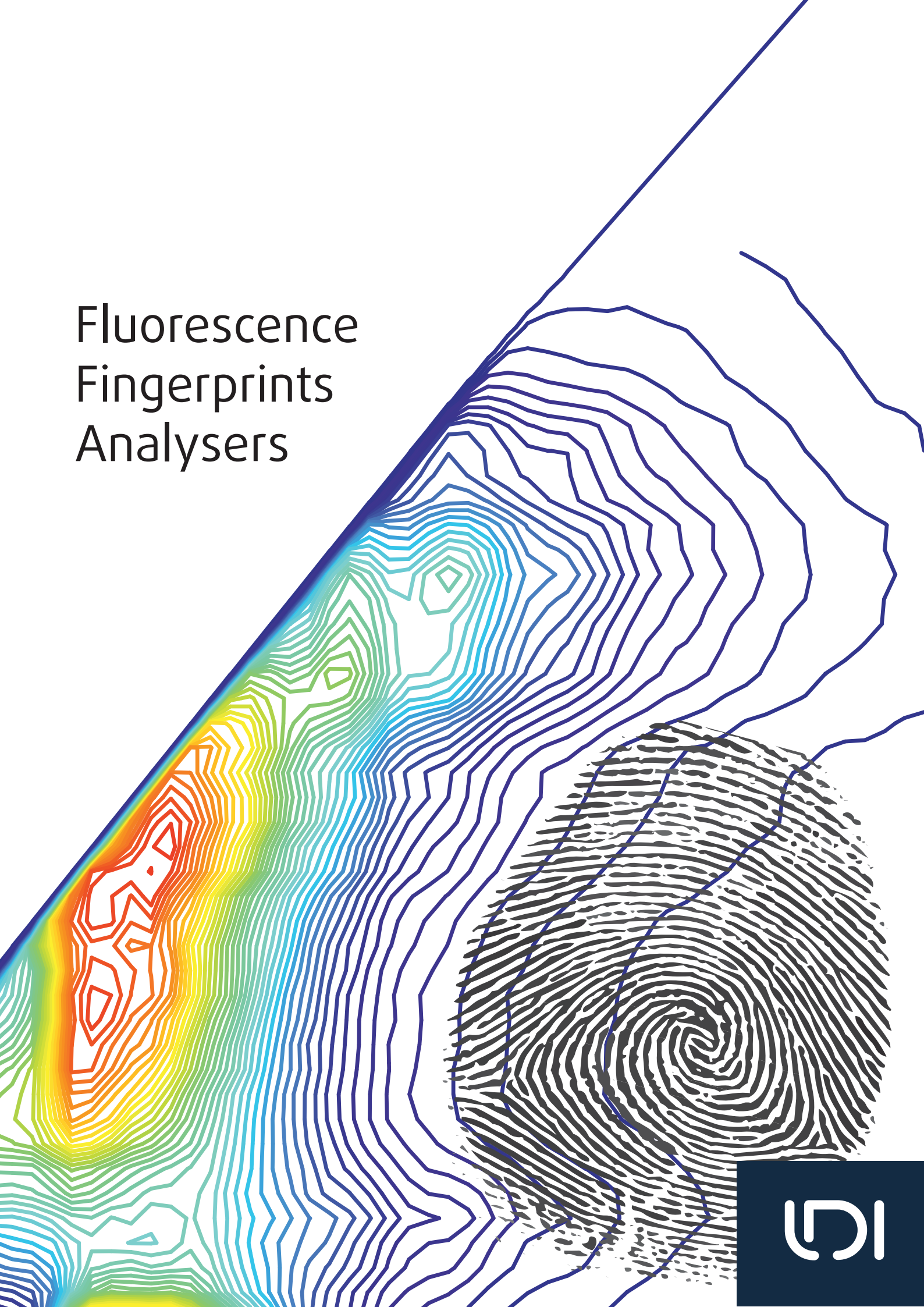
Fluorescence Fingerprints Analysers



INTRODUCTION

The Fluo-Imager™ analysers offer express detection and identification of organic compounds in liquid samples. Its operation is based on the techniques of Spectral Fluorescence Signatures (SFS) and pattern recognition. This direct measurement method provides quantitative and qualitative information on a wide range of parameters without the need for sample pre-treatment.

SFS method

The principle of Spectral Fluorescence Signatures (SFS) is based on the measuring of the fluorescence intensity of a sample at different excitation and emission wavelengths. These three parameters - excitation/emission wavelengths and intensity - are used to produce a 3-dimensional fluorescence matrix of the sample.

Such matrix, named as the Spectral Fluorescence Signature (SFS), can also be presented in a 2-dimensional colored pattern, where the colors represent the intensity of fluorescence.

Since various chemical substances have different characteristic excitation and emission spectra of fluorescence, they typically produce different spectral patterns in SFS, which are used for substance identification. The intensity of fluorescence serves as a measure of substance quantity. This is why the SFS analysis technique can be referred as spectral or mathematical chromatography.

Features

COMBINED FLUORESCENCE AND ABSORPTION MEASUREMENTS

Fluo-Imager™ analysers measure SFS (modified Excitation Emission Matrixes-EEM) as well as the fluorescense spectrum of the sample at preselected fixed wavelenghts. The Fluo-Imager™ performs **simultaneously** measurements of absorption spectra additionally to SFS.

This enables the detection of non-fluorescing compounds in water samples and control of optical density. Absorption data are also taken into account in multivariate calibrations of integrated water quality parameters.

PURPOSE-BUILT SFS LIBRARY

The self-adjustable library gives the opportunity to develop or refine applications according to requirements. The Fluo-Imager™ is designed for the measurement of a wide range of sample streams as natural water, boiler water, cooling water, industrial waste water, ground water, process streams, oil and PAH detection around drilling platforms.

NO CHEMICALS REQUIRED

Using a direct measurement technique has the advantage that no chemicals are required. This allows to take analyses without creating waste, while the sample can be returned to the source.

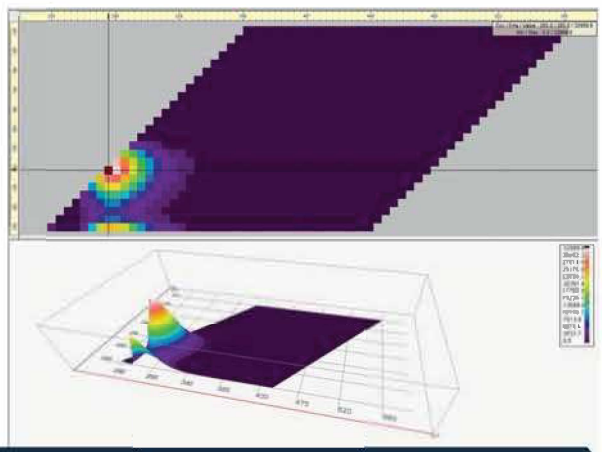
MULTI - PARAMETER DETECTION AND IDENTIFICATION

By using an easy self-adjustable library the Fluo-Imager™ is capable of recognizing and measuring all products that are in its library. In this way the substance of interest could be measured individually or alongside other compounds.This allows to set alarm thresholds when a specific product reaches a critical level.

CONTINUOUS BACKGROUND CORRECTION

The SFS of pure natural waters contains spectral patterns of humic and fulvic acids. To measure water contamination the fluorescence of natural background (FDOM) is taken into account.

TWO DIFFERENT REPRESENTATIONS OF SFS OF XYLENE IN WATER: A 2- dimensional and a 3- dimensional, where colours indicate fluorescence intensity (ranging from violet to red).



SUBSTANCES THAT WE DETECT

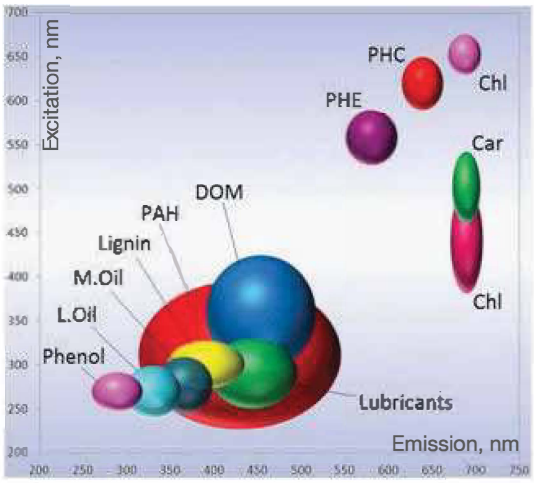
engine oils, turbine, hydraulic plant and mineral, fuel oil, marine diesel, crude oil, petroleum gas, kerosene and lubricants, fuel oil and other organic compounds

APPLICATIONS

Fluo-Imager™ can be used for fast screening of water samples or continuous monitoring of water stream in flow-through mode, decreasing the number of routine and time-consuming laboratory analyses significantly and making the device appropriate for applications, where efficiency of information gathering is essential:

- RIVER, LAKE AND SEA WATERS
- INTAKE OF DRINKING WATER
- DISCHARGE WATER
- SURFACE WATER CONTROL
- GROUND WATER
- PROCESS CONTROL
- PRE-SCREENING SAMPLES
- BOILER/COOLING WATER

THE STRUCTURE OF THE SFS EXPERT SYSTEM



TYPICAL DETECTION LIMITS*

Crude oils	Heavy	0.5 mg/l
	Medium	0.5 mg/l
	Light	0.3 mg/l
Fuels	Kerosene	0.1 mg/l
	Petrol	0.5 mg/l
	Diesel oil	0.5 mg/l
	Gasoline	0.2 mg/l
Lubricants	Car oil	0.5 mg/l
	Turbine oil	0.5 mg/l
Phenols	Phenol	0.01 mg/l
	m-Cresol	0.1 mg/l
	Thymol	0.05 mg/l
PAH	Anthracene	1 µg/l
	Naftalene	5 µg/l
	Benzo(a)pyrene	1 µg/l
Phytoplankton	Chlorophyll	1 µg/l

* in water without sample treatment

Fluo-Imager™ Product

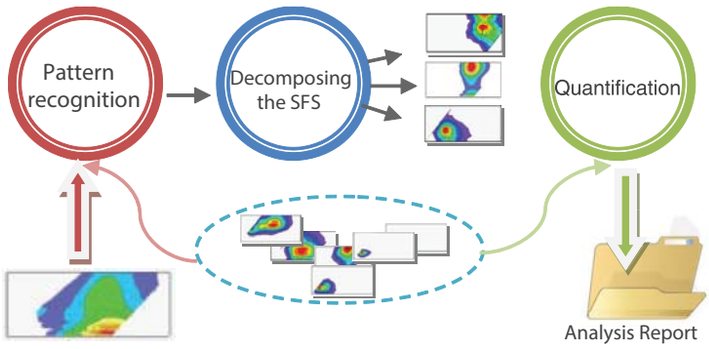
FLUO-IMAGER™

- Fully automated system with built-in peristaltic pump
- On-line flow-through measurements on-site
- Laboratory use for single measurements
- Measurement frequency every 2 minutes
- Customized for phytoplankton or oil pollution applications
- Powerful Xenon lamp
- 11 kg

OPERATION

The measurement session with **Fluo-Imager**™ starts with self-diagnostics test. The device verifies the intensity of the light source, the scale of the excitation and emission wavelengths and the sensitivity of the detectors and does necessary adjustments to compensate any variations of operational parameters. In this way the device provides stable and reproducible data collected in the lab or in the field.

THE STRUCTURE OF THE SFS EXPERT SYSTEM



SFS LIBRARY

Different measurement setups and libraries may be used depending on the task. Since different type of oils have different SFSs, it is possible to detect and identify such oils in a mixture within one measurement by applying corresponding calibrated library.

To analyse an unknown sample, the SFS library of sought after organic compounds is compiled and calibrated. Multivariate calibrations are used to estimate the integrated parameters like Total Oil, COD, BOD etc.

The SFS analysis is carried out by pattern recognition algorithms decomposing the measured SFS and comparing the patterns with corresponding spectral data in the SFS library. Essentially, the expert system looks for the similarity between the spectral patterns in measured SFS and corresponding spectral data in the SFS library.

SOFTWARE

Multi-task software with standard and advanced Graphic User Interfaces serves to manage all device operations, starting from self-tests of device functionality to user defined set-up of measuring procedures and analysis specification.

The software provides all tools for Library development according to application.

CONTACT

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Based in Estonia, **LASER DIAGNOSTIC INSTRUMENTS** develops and manufactures sensing systems that analyze substances in real time. Combining photonics with software analysis, our products excel at detecting specific molecules in complex solutions.

QUALITY SYSTEM CERTIFICATION DNV·GL ISO 9001