Summary Specification			
BIL. SEBUTHARGA/QUOTATION REF.:		UBD/Q/218/2025 (FIT) - [G]	
TARIKH DIIKLANKAN :	18 November 2025 [Selasa]		
TARIKH TUTUP :	02 Disember 2025 [Selasa]	JAM: 2 Petang	
		DOCUMENT FEE :	B$ 10.00

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TITLE :		**TO SUPPLY, DELIVER AND INSTALL PORTABLE OIL-IN-WATER/SOIL INFRARED ANALYZER (ATR-BASED) AND FIELD SAMPLING KIT, UNIVERSITI BRUNEI DARUSSALAM**
No.	**Quantity**	**SPECIFICATIONS**
1	1 Lot	**Technical Specifications for Portable Oil-in-Water/Soil Infrared Analyzer (ATR-Based) - (Item 1)** *Refer to the attached document for the full specifications.*
2.	1 Lot	**Specification for Field Sampling Kit for TOG/TPH Extraction and Measurement in Water** **(ATR/HATR Method) (Item 2)** **(Compatible for Use with Item 1** *Refer to the attached document for the full specifications.*

Technical Specifications for Portable Oil-in-Water/Soil Infrared Analyzer (ATR-Based) (Item 1)

1. Introduction

This specification outlines the requirements for a portable infrared analyzer designed for the measurement of solvent-extractable oil and grease (TOG/TPH/FOG) in water and soil samples. The instrument shall utilise attenuated total reflection (ATR) infrared absorption at approximately 3.4 µm to quantify hydrocarbon content after solvent extraction. The analyzer shall be suitable for environmental monitoring, wastewater compliance, industrial pretreatment, and offshore produced water applications.

2. Measurement Principle

The analyzer shall:

- Use infrared absorption at approximately 3.4 µm (≈2940–2930 cm^{-1}), corresponding to the C–H stretch of hydrocarbons.
- Employ a horizontal ATR (HATR) sample stage with a durable crystal (e.g., cubic zirconia or equivalent).
- Measure solvent-extractable hydrocarbons after liquid–liquid extraction using approved volatile solvents.
- Provide direct readout in units such as ppm, mg/L, mg/kg, or %, depending on calibration.
- Allow calibration using standard extraction ratios (e.g., 10:1 or 1:1) according to EPA or ISO methodology.
- Correlate with established reference methods including:
    - EPA Method 1664
    - ISO 9377-2
    - ASTM D7066
    - EPA 413.1/418.1

3. Analytical Performance Requirements

3.1 Detection Limits

- Minimum Detection Limit (Water): 0.3 ppm
- Minimum Detection Limit (Soil): 3 ppm

3.2 Measuring Range

- Water:
    - 0.3 ppm to ≥ 2000+ ppm
    - 0.3% to ≥ 15% oil concentration
- Soil:

    - 3 ppm to ≥ 2000+ ppm
    - 0.3% to ≥ 15% oil concentration
- Additional high-range measurement capability:
    - 0.5 – 10% oil content in water or soil using non-absorbing solvents (e.g., S-316, tetrachloroethylene)

3.3 Repeatability

- Instrument repeatability: ± 0.3 ppm

3.4 Analysis Time

- Total analysis, including extraction: 10 – 15 minutes

4. Solvent Requirements

Analyzer shall support the following solvents:

4.1 Standard Solvents

- Hexane
- Pentane
- Cyclohexane
- Vertrel MCA

4.2 High-Range Solvents (No evaporation required)

- S-316
- Tetrachloroethylene

4.3 Typical Solvent Volume

- 10–25 mL for 10:1 extraction ratio
- 25–100 mL for 1:1 extraction ratio

5. Sample Handling and Preparation Requirements

- Suitable for liquid or soil sample extraction.
- Instrument shall require a precise 60 µL sample application on the ATR crystal; a compatible syringe must be included.
- Sample holding time prior to extraction:
    - Up to several days if stored properly and acidified to pH 2 (HCl or H_2SO_4) when analysis is delayed.
- Should support solvent/emulsion breaking techniques for cloudy extracts.

6. Instrument Features

6.1 User Interface

- Touchscreen display with a multi-language interface.

- Calibration wizard for guided setup.
- Multi-level user access control with password protection.
- On-screen history table with capability to view, recall, or export results.

6.2 Data Storage and Transfer

- Internal memory to store ≥ 2,000 measurement results
- Export via USB flash drive or USB-serial connection.
- Ability to print results via a connected computer (no direct printer or LIMS interface required).

6.3 Alarms and Control

- High/low concentration alarms
- Configurable control limits

6.4 Power

- Operates on 18 VDC, ~3.3 A
- Universal AC/DC adapter supplied
- Internal rechargeable battery with:
    - ≥ 6 hours continuous operation
    - Suitable for field portability

7. Physical Characteristics

- Maximum weight (including battery): ≤ 3.2 kg
- Approximate dimensions:
    - Height: 17 cm
    - Width: 19.8 cm
    - Depth: 13.2 cm
- Operational Temperature Range:
    - 5°C – 40°C
- Construction:
    - Rugged, field-portable enclosure
    - Stainless-steel ATR sampling area
    - Supplied dust cover

8. Maintenance and Service Requirements

8.1 Maintenance

- Minimal routine maintenance
- Cleaning of the ATR crystal using solvent + lint-free cloth
- Final rinse with isopropyl alcohol

8.2 Stability and Warm-Up

- Warm-up time: ≥ 30 minutes
- Calibration stability: ~1 year or more depending on use
- Recommended annual calibration verification

8.3 Consumables

- Replaceable IR source (≥ 5-year lifespan)
- Field-replaceable components such as source and sample trough, with supplier guidance

9. Safety and Compliance

- Should comply with:
    - EPA 1664 correlation
    - ISO 9377-2 requirements
    - Relevant IR safety standards for laboratory equipment
- Solvent handling must follow environmental, safety, and chemical compatibility guidelines.

10. Accessories to be Supplied

The system shall be supplied with at minimum:

1. Portable IR analyzer unit INFRACAL 2 ATR-SP Oil-in-Water/Soil Infrared Analyzer
2. Internal rechargeable battery
3. Universal AC/DC power supply
4. 60 µL precision dosing syringe (OEM-supplied type)
5. ATR sample stage cleaning kit (lint-free cloth + recommended solvent)
6. USB flash drive for data transfer
7. Protective dust cover
8. Instrument manual and calibration instructions (including preparation of standards)

Specification for Field Sampling Kit for TOG/TPH Extraction and Measurement in Water (ATR/HATR Method) (Item 2)

(Compatible for Use with Item 1)

1. Purpose of the Kit

This field sampling kit is intended to support on-site extraction and preparation of water samples for the determination of Total Oil and Grease (TOG) / Total Petroleum Hydrocarbons (TPH) using infrared-based ATR/HATR analytical instruments.
The kit is specifically compatible for use with Item 1, which refers to the infrared oil-in-water/soil analyzer procured under this specification.

2. General Requirements

The kit shall:

- Be fully compatible with the sampling and extraction workflow used by Item 1.
- Support extraction procedures aligned with ASTM D7066, EPA 1664, or equivalent TOG/TPH solvent extraction standards.
- Be suitable for field-based, portable operation.
- Include all consumables required for performing solvent extraction, filtration, drying, and precise dosing of solvent extracts.

3. Components of the Field Sampling Kit

The kit shall include the following components (or equivalent):

3.1 Measuring and Transfer Equipment

1. 100 mL Graduated Cylinder
2. 25 mL Graduated Cylinder
3. 125 mL Solvent-Safe Wash Bottle
4. 20 mL Borosilicate Glass Beaker
5. 100 µL Precision Syringe
    - Must support accurate delivery of 60 µL aliquots, compatible with the sampling requirement of Item 1
6. Glass Funnel, solvent-resistant

3.2 Pipettes and Filtration Consumables

7. Disposable Transfer Pipettes (≈8 mL capacity, ~400 pieces)
8. Filter Paper (100 pieces)
    - Compatible with supplied funnel

- Suitable for removal of particulate matter from solvent extracts

3.3 Drying and Separation Media

9. Silica Gel – 250 g
10. Anhydrous Sodium Sulfate – 500 g
    - Reagent-grade; for water removal during extraction

3.4 Sample Containers

11. 6 oz (approx. 180 mL) Glass Graduated Bottles with Caps – 48 pieces
    - Solvent-compatible
    - Suitable for extraction, shaking, and storing sample–solvent mixtures
12. Septa Caps – 48 pieces
    - PTFE-lined (or equivalent)
    - For sealing sample bottles to prevent volatilization and contamination

4. Compatibility Requirements

All supplied items shall be:

- Compatible with volatile extraction solvents such as hexane, pentane, cyclohexane, or Vertrel MCA.
- Suitable for TOG/TPH extraction methods required by Item 1.
- Designed to interface with ATR/HATR sample application procedures, especially precise dosing of solvent extracts.

5. Packaging and Delivery

- Kit must be delivered as a complete, ready-to-use field sampling package.
- All items must be new, unused, and safely packaged to prevent breakage of glassware or contamination of consumables.
- Supplier shall include specification sheets for the main consumables.

6. Applicable Standards

The kit shall support extraction methods compliant with:

- ASTM D7066 – Standard Test Method for Oil and Grease by Infrared Determination, or
- Equivalent standard for solvent-based extraction and infrared measurement of hydrocarbons.