

# Specifications: Spectrometer Handheld and Bench Top (FTIR)

## Fourier Transform Infrared Instruments

### Specifications: Handheld FTIR

The Handheld FTIR shall meet the following requirements.

#### 1. FTIR

- 1.1. Handheld FTIR must have a measurement range from 4,500 to 650  $\text{cm}^{-1}$ .
- 1.2. Handheld FTIR must have a resolution of 4 to 16  $\text{cm}^{-1}$ .
- 1.3. Handheld FTIR must have a Wavelength accuracy of 0.05  $\text{cm}^{-1}$  based on ASTM E1421.
- 1.4. Handheld FTIR must have a DTGS detector with electronically temperature control.
- 1.5. Handheld FTIR must contain non-hygroscopic optics (ZnSe) for use in outdoor environmental conditions and operate at temperature between 0°C and 50°C
- 1.6. Handheld FTIR shall be compact and lightweight for field use. It must weigh 4.15 pounds or less.
- 1.7. Handheld FTIR shall be operable with one hand.
- 1.8. Handheld FTIR shall be battery operated battery and must be able to be swapped out while maintaining operation. Must provide 2 Lithium Ion Batteries that are compatible with Handheld FTIR.
- 1.9. Handheld FTIR shall be capable of attaching to an included stand for laboratory measurements.
- 1.10. Handheld FTIR must include a shock resistant carrying case.
- 1.11. Handheld FTIR must be capable of acquiring spectra when held in any position (vertical or horizontal).
- 1.12. Handheld FTIR must be capable of acquiring spectra without destruction of the sample. It must be able to analyze a wide variety of samples in their undisturbed state, such as plastic roadside delineators, paint coatings on in service bridge beams, and other in service infrastructure materials.

#### 2. Interferometer

- 2.1. The FTIR interferometer must not require any alignment. Systems with dynamic or automatic alignment will not be considered for purchase.

#### 3. Sampling Interfaces

- 3.1. Handheld FTIR shall have the capability to change the sampling interface. The interfaces that shall be included with the instrument are Spherical Diamond ATR and Diffuse Reflectance interfaces.
- 3.2. The handheld FTIR shall automatically recognize which interface is currently on the instrument.

**4. FTIR Software**

- 4.1. Software must be Windows 7 compatible.
- 4.2. Software shall be capable of synchronizing methods, results, and reports with a desktop PC.
- 4.3. Software shall be capable of collection, quantitation, and qualitative search methods. The Handheld Software must be capable of full spectral display as well as final quantitation and search results.
- 4.4. Software shall be capable of generating customizable reports in .pdf format and spectral data in .spc and .csv format.
- 4.5. Software must be method-driven with color pictures of sample interfacing with accessory. Quantitative results must have the option for color coded result thresholds for easy viewing of sample results that are in and/or out of specification.
- 4.6. Software should be capable of synchronizing methods, results and reports with a laptop or desktop PC that is fully capable of running collection, quantitation, and qualitative search methods with color coded results similar to the PC based software.
- 4.7. Software should be able to run methods based on PCA and PLS based algorithms.
- 4.8. Software should be able to control the Bench Top FTIR too.

**5. Installation and Training**

- 5.1. Physical set up of testing machine including making all physical and electrical connections.
- 5.2. Computer will be supplied by TDOT IT and notification of system installation date must be provided at least one month ahead of time.
- 5.3. Verify correct operation of testing machine.
- 5.4. Training for 5 employees shall be conducted on same day as installation or the following day as desired by the department. Training shall include set-up of commonly used testing procedures.

**6. Warranty**

- 6.1. Any equipment included must be warrantied for one year against defects in materials and/or workmanship including parts and labor.

## Specifications: Bench Top FTIR

The Bench Top FTIR shall meet the following requirements.

### 1. FTIR

- 1.1. Bench Top FTIR must have a measurement range from 4,000 to 650  $\text{cm}^{-1}$ .
- 1.2. Bench Top FTIR must have a resolution of 4, 8 or 16  $\text{cm}^{-1}$ .
- 1.3. 25. The bench top FTIR must have a Wavelength accuracy of 0.05  $\text{cm}^{-1}$  based on ASTM E1421.
- 1.4. FTIR must be able to use standard 120V AC outlet.
- 1.5. Chassis must be capable of resisting most organic solvents and water and dust ingress.
- 1.6. The FTIR must have a compact chassis with dimensions not to exceed 8" x 8" x 4.5" and weighing 8lbs or less.

### 2. Sampling Interface

- 2.1. Bench Top FTIR should have an ATR accessory with a press for analysis of solids, liquids and pastes.
- 2.2. Sample interface shall be a Single reflection Diamond ATR.

### 3. Software

- 3.1. Software must be Windows 7 compatible.
- 3.2. Software shall be capable of synchronizing methods, results, and reports with a desktop PC.
- 3.3. Software shall be capable of collection, quantitation, and qualitative search methods. The Handheld Software must be capable of full spectral display as well as final quantitation and search results.
- 3.4. Software shall be capable of generating customizable reports in .pdf format and spectral data in .spc and .csv format.
- 3.5. Software must be method-driven with color pictures of sample interfacing with accessory. Quantitative results must have the option for color coded result thresholds for easy viewing of sample results that are in and/or out of specification.
- 3.6. Software should be capable of synchronizing methods, results and reports with a laptop or desktop PC that is fully capable of running collection, quantitation, and qualitative search methods with color coded results similar to the PC based software.
- 3.7. Software should be able to run methods based on PCA and PLS based algorithms.
- 3.8. Bench Top Software must be capable of controlling the handheld FTIR with methods, data, libraries and reports full compatibility.

**4. Installation and Training**

- 4.1. Physical set up of testing machine including making all physical and electrical connections.
- 4.2. Computer will be supplied by TDOT IT and notification of system installation date must be provided at least one month ahead of time.
- 4.3. Verify correct operation of testing machine.
- 4.4. Training for 3 employees shall be conducted on same day as installation or the following day as desired by the department. Training shall include set-up of commonly used testing procedures.

**5. Warranty**

- 5.1. Any equipment included must be warrantied for one year against defects in materials and/or workmanship including parts and labor.

**6. Compatibility**

- 6.1. The Bench Top FTIR shall be fully compatible with the Handheld FTIR included in this specification.