

	<b>Standard Operating Procedure</b> <b>Identification by FTIR and</b> <b>Calibration-Preventative</b> <b>Maintenance Procedures</b>	<b>SOP Number</b> <b>D-823</b>	<b>Revision</b> <b>7</b>
		<b>Effective Date</b> 05/31/23	<b>Page</b> <b>Page 1 of 11</b>
<b>Written by/ Date</b> <i>SS 05/11/23</i>	<b>Reviewed by/ Date</b> <i>SAS 05/11/23</i>	<b>Approved by/ Date</b> <i>[Signature] 05-11-23</i>	
<b>Title: Quality Control</b> <b>Director</b>	<b>Title: Analytical Development</b> <b>Scientist</b>	<b>Title: VP of Quality &amp;</b> <b>Regulatory Affairs</b>	

## 1.0 Purpose

The purpose of this procedure is to provide guidelines on naming reference scans and data scans, executing identification and composition testing, performing system suitability, zeroing the system using a background scan, and performing performance qualification of the instrument.

## 2.0 Scope

This applies to the use of the Thermo-Scientific Nicolet iS models with Omnic software.

## 3.0 Responsibility

- 3.1 It is the responsibility of QC Chemists to understand and work within the guidelines of this procedure.
- 3.2 QC Laboratory Management is responsible for implementing and maintaining this procedure.
- 3.3 QC Laboratory Management is responsible for ensuring compliance with this procedure.

## 4.0 Definitions

- 4.1 **FTIR** – Fourier Transform Infra-Red Spectroscopy
- 4.2 **IPA** – Isopropyl Alcohol
- 4.3 **USP** – United States Pharmacopeia

<p style="text-align: center;">Standard Operating Procedure  <b>Identification by FTIR and Calibration-Preventative  Maintenance Procedures</b></p>	<p style="text-align: center;"><b>SOP No  D-823</b></p>	<p style="text-align: center;"><b>Rev  7</b></p>	<p style="text-align: center;"><b>Page  2 of 11</b></p>
---	---	--	---

4.4 QC – Quality Control

## 5.0 References

5.1 D-109, SOP, Qualitative Standards

5.2 D-106, SOP, Analytical Standards

5.3 21 CFR Part 11, Electronic Records, Electronic Signatures

5.4 Thermo Scientific Nicolet iS10 and iS50 Instrument Manual

## 6.0 Instrument Preparation

6.1 Safety Precautions

6.1.1 Do not turn off the spectrophotometer. The instrument has its own energy saving feature. Turning off the instrument disables the internal fan. This results in exposure of the optics to atmospheric humidity, condensation and dust which will result in failed system suitability.

6.1.2 Do not look directly into the laser light.

6.2 Instrument Setup and Daily System Suitability

6.2.1 Check the desiccant indicator strip on the instrument. Blue indicates that the system is sufficiently dehumidified and the desiccant is still active. Pink indicates that system may have elevated humidity and the desiccant is spent. When the indicator strip is pink, replace desiccant before continuing.

6.2.2 Open the Omnic software from the Window's Desktop or Task Bar.

6.2.3 Select Smart iTR Diamond ATR from the dropdown menu at the top left of the Omnic window.

<b>Standard Operating Procedure Identification by FTIR and Calibration-Preventative Maintenance Procedures</b>	<b>SOP No D-823</b>	<b>Rev 7</b>	<b>Page 3 of 11</b>
--	-------------------------	------------------	-------------------------

6.2.4 Check the instrument status:

6.2.4.1 Click system status in the upper right portion of the Omnic window.

6.2.4.2 In the pop-up window, click Instrument Status.

6.2.4.3 If the Instrument Status shield is red or yellow, then at least one instrument check has failed. Click Explain Error to troubleshoot and correct the problem.

6.2.5 Perform a system suitability test daily

6.2.5.1 Click System Suitability, then click run.

6.2.5.2 Empty the sample area and clean the ATR, then click OK.

6.2.5.3 After the system suitability test is complete, click Report.

6.2.5.4 Select the report for the test just performed, and click OK.

6.2.5.5 Print the system suitability report.

6.2.5.6 If any system suitability test fails, click Explain Error to troubleshoot and correct the problem.

6.3 Analysis Setup

6.3.1 Select the <Experiment Setup> option from the Collect pull down menu.

6.3.2 At the bottom of the pop-up window, click Open and select the Ion Labs FTIR experiment.

6.3.3 In the pop-up window directing to remove the iTR accessory, press Cancel. Do not remove the iTR accessory.

6.3.4 The settings below will automatically be loaded:

Standard Operating Procedure <b>Identification by FTIR and Calibration-Preventative Maintenance Procedures</b>	<b>SOP No D-823</b>	<b>Rev 7</b>	<b>Page 4 of 11</b>
---	-------------------------	------------------	-------------------------

6.3.2.1 Scans = 16

6.3.2.2 Resolution = 4

6.3.2.3 Final Format = Absorbance

6.3.2.4 Correction = ATR

6.3.2.5 Check automatic atmospheric suppression.

6.3.2.6 Check preview data collection.

6.3.2.7 The USP specifies a range of 650nm to 3800 nm for identification analysis. Check that the scanning region encompasses this range (bench tab).

6.3.3 Click OK to exit <Experiment Setup>.

## **7.0 Operation**

7.1 Clear the instrument sample area of any material. Use a cotton swab along with methanol, isopropyl alcohol, and/or water to clean if needed. ***Do not use Kimwipe to clean the crystal.*** Be sure that the crystal is dry before use.

7.2 Run a background check prior to samples each day or when conditions in the lab change. The instrument will require a background check to be performed every 60 minutes.

7.2.1 Remove any sample which may be present on the stage/crystal.

7.2.2 Press the <Col Bkg> button on the toolbar, then click OK.

7.2.3 After the background preview is stable, press Start Collection on the upper right.

7.2.4 After background collection has completed, click yes under Add to Window.

<p style="text-align: center;">Standard Operating Procedure  <b>Identification by FTIR and Calibration-Preventative  Maintenance Procedures</b></p>	<p style="text-align: center;"><b>SOP No  D-823</b></p>	<p style="text-align: center;"><b>Rev  7</b></p>	<p style="text-align: center;"><b>Page  5 of 11</b></p>
---	---	--	---

- 7.3 Clear any previous data from the display window.
- 7.3.1 Click clear repeatedly until all previous data has been cleared from the window.
- 7.4 For solid samples, prepare the sample for analysis by grinding to a fine powder using a mortar and pestle or using an electric blender for homogenization.
- 7.5 To begin sample analysis, place several milligrams of sample over the crystal and dial down the sample arm to compress the sample between the crystal and the anvil. The sample arm dial will begin to click when the anvil is at its maximum distance. **Note:** The use of the sample arm is not required when testing liquids.
- 7.6 Press the <Col Smp> button on the instrument or the icon on the toolbar.
- 7.7 Enter the name of the sample to be collected in the popup window.
- 7.8 Confirm that the sample is ready to be collected.
- 7.9 After the sample preview has stabilized, press Start Collection at the top right.
- 7.10 Once it is collected select <Yes> to add it to its own new window.
- 7.11 In the pop-up window, enter your username and password. Under reason for signature, select authorship.
- 7.12 At the conclusion of testing clean the sample arm with cotton and IPA. **DO NOT USE A KIMWIPE.** If hardened material contaminates the tip of the anvil remove the tip and sonicate in water, IPA and/or cleaner as necessary.
- 7.13 For solid samples, remove the bulk of sample material from the crystal and stage using a soft bristle brush. Then clean the crystal and stage with a cotton swab along with methanol, isopropyl alcohol, and/or water.

## 8.0 Comparison Analysis

Standard Operating Procedure <b>Identification by FTIR and Calibration-Preventative Maintenance Procedures</b>	<b>SOP No D-823</b>	<b>Rev 7</b>	<b>Page 6 of 11</b>
---	-------------------------	------------------	-------------------------

- 8.1 The QC check and QC Check Setup are available in the <Analyze> pull down menu.
- 8.2 The QC check Setup menu is set to spectra vs. reference, prompt for reference and the region 650nm to 3800nm.
- 8.3 Open or leave open the sample file.
- 8.4 Select <QC check> from within the <Analyze> menu.
- 8.5 The system prompts for a reference file. Select the appropriate standard scan from the directory.
- 8.6 The system brings up a window comparing the two IR scans. The system also calculates a correlation coefficient.
- 8.7 Select Report → Preview/Print Report → Print to print the report.

## **9.0 Generation of Reference Standard Scans and Naming Nomenclature**

- 9.1 Reference standards
  - 9.1.1 See SOP D-106 Analytical Standards and SOP D-109 Qualitative Standards for specific information on selecting a reference standard.
- 9.2 Nomenclature for reference scans
  - 9.2.1 Analytical Standards
    - 9.2.1.1 Analytical Standards should be saved in the library using the standard name, internal reference number created, i.e. 21AS070, and year scan is performed. Note: Previous versions that were created prior to this SOP revision may be saved under a different nomenclature.

**Examples of nomenclature:** Niacinamide 21AS070 2023

<p style="text-align: center;">Standard Operating Procedure  <b>Identification by FTIR and Calibration-Preventative  Maintenance Procedures</b></p>	<p style="text-align: center;"><b>SOP No  D-823</b></p>	<p style="text-align: center;"><b>Rev  7</b></p>	<p style="text-align: center;"><b>Page  7 of 11</b></p>
---	---	--	---

9.2.1.2 It is recommended that analytical standards scans be recreated every three years using fresh standard.

9.2.2 Finished product reference standards

9.2.2.1 Finished product reference material will be given a unique identifier using the last two digits of the year – the formula number the reference material relates to – revision number of the product profile, to distinguish multiple reproductions of a product. Note: Previous versions that were created prior to this SOP revision may be saved under a different nomenclature.

**Examples of nomenclature:** 23-SPW00400-00, 23-SPW00400-01,  
etc.

9.2.2.2 Finished product reference materials should be, at minimum, recreated every three years.

**10.0 Security**

10.1 Security Software 21 CFR Part 11

10.1.1 Omnic DS software and Thermo-Fisher Security Administration software manage the file systems for the data generated by FTIR and user logins.

10.1.2 Each user will have their own log-in and password for use of the Omnic software.

10.1.3 File deletion and file copying are not allowed by the software.

10.1.4 Thermo-Fisher Audit Manager is set up to monitor and record all activity related to the use of the Omnic software.

10.1.5 User is authenticated at each save operation.

<b>Standard Operating Procedure Identification by FTIR and Calibration-Preventative Maintenance Procedures</b>	<b>SOP No D-823</b>	<b>Rev 7</b>	<b>Page 8 of 11</b>
--	-------------------------	------------------	-------------------------

## **11.0 Electronic Data and Audit Trail Review**

- 11.1 When a scan is performed, the result is automatically saved.
- 11.2 From the Windows start menu, click Thermo Scientific → Audit Manager
- 11.3 Audit trail events can be filtered by source, severity, or category.
- 11.4 A comment can be added to each individual event.
- 11.5 Review of the electronic data generated and audit trail must occur for each result generated.
- 11.6 Audit Event Report
  - 11.6.1 An Audit Event Report can be generated using Audit Manager. In Audit Manager perform the following:
    - 11.6.1.1 Click the columns button and select the fields to display in the report.
    - 11.6.1.2 Click the filter button to filter events based on source, severity, or category.
    - 11.6.1.3 Save the report by selecting Report from the menu, then click Save.
    - 11.6.1.4 In the pop-up window, enter a name for the report and click Save.
    - 11.6.1.5 Click Report from the menu, and select Sign.
    - 11.6.1.6 In the pop-up window, select a saved report and choose Open.
    - 11.6.1.7 In the pop-up window, enter your username and password.
    - 11.6.1.8 Click OK to close the message box.
  - 11.7 To digitally sign a saved report:

<b>Standard Operating Procedure Identification by FTIR and Calibration-Preventative Maintenance Procedures</b>	<b>SOP No D-823</b>	<b>Rev 7</b>	<b>Page 9 of 11</b>
--	-------------------------	------------------	-------------------------

11.7.1 Click Report from the menu, and select Sign.

11.7.2 In the pop-up window, select a saved report and choose Open.

11.7.3 In the pop-up window, enter your username and password. Then click OK.

11.7.4 Click OK to close the message box.

11.8 Audit trail evaluation should confirm:

11.8.1 All entries align with testing being reviewed

11.8.2 Assess if any data was changed.

11.8.3 Assess if multiple evaluations of sample was performed.

11.9 Electronic Data and Audit Trail review can be acknowledged as defined above or, alternatively, may be captured as a written acknowledgment on data print-out.

## **12.0 Performance Qualification**

12.1 Performance Qualification should be performed annually.

12.2 This procedure is specific to the Thermo Nicolet iS50 spectrophotometer with Omnic DS software.

12.3 Supplied needed

12.3.1 Polystyrene film with thickness of 0.038 mm for calibration of wavelength and resolution (Thermo part number 269-173000 or equivalent).

12.3.2 Desiccant replacement bag

12.4 Replacing the desiccant

<b>Standard Operating Procedure Identification by FTIR and Calibration-Preventative Maintenance Procedures</b>	<b>SOP No D-823</b>	<b>Rev 7</b>	<b>Page 10 of 11</b>
--	-------------------------	------------------	--------------------------

12.4.1 The desiccant is located near the upper, left side of the instrument near the beamsplitter. Replace the desiccant.

## 12.5 Alignment

12.5.1 If not already on, turn on the spectrometer and wait at least thirty minutes for warmup.

12.5.2 Remove any sample or accessory (including the SmartATR accessory) from the sample compartment (except a transmission sample holder).

12.5.3 Choose Experiment Setup from the Collect menu or the toolbar.

12.5.4 Make sure Sample Compartment on the Bench tab is set to Main.

12.5.5 Set Gain on the Bench tab to 1 (do not use autogain).

12.5.6 Click the Align button on the Diagnostics tab.

12.5.7 Alignment should take 2 – 4 minutes.

12.5.8 When alignment is finished, close the Experiment Setup dialog box.

## 12.6 ValPro Qualification

12.6.1 In the Omnic main window, select System Status in the upper right corner.

12.6.2 Select ValPro Qualification, and click Run.

12.6.3 Three qualification tests must be performed:

12.6.3.1 Quantification & Algorithms.

12.6.3.2 Nicolet iS50 Main DTGS KBr.

12.6.3.3 Smart iTR accessory.

<b>Standard Operating Procedure Identification by FTIR and Calibration-Preventative Maintenance Procedures</b>	<b>SOP No D-823</b>	<b>Rev 7</b>	<b>Page 11 of 11</b>
--	-------------------------	------------------	--------------------------

12.6.4 Select the next qualification test to perform.

12.6.5 Click Qualify.

12.6.6 After the test is completed, enter your login information to sign the test.

12.6.7 Select the row corresponding to the current qualification, click Report, then click Print.

12.6.8 Repeat for each of the three qualification tests.

12.6.9 If the acceptance criteria are not met, consult the instrument manufacturer and/or instrument manual.

### 13.0 Revision History

Revision	Date	Description of Changes	CCR #	By
0	06/24/10	New	-	-
1	11/15/12	Added section 5.5.7 and 5.5.8, updated SOP format	-	-
2	05/17/13	Added section on generating reference standards added section on nomenclature for identifying finished product and raw material reference standards, added section on use and configuration of security software, updated old information, added detailed information on selection criteria for generating a reference scan composite, added a section on generation and use of a daily reference standard scan	-	-
3	11/12/13	Removed selection and qualifying criteria for generating any reference standard and referenced D-109 for specific information, adjusted nomenclature for naming standard scans to reflect today's practices, added QC Management responsibility.	13-1037	B. Johns
4	03/12/14	Added tableting of finished product reference standard to standard preparation methods; format update.	14-0186	B. Johns
5	09/22/16	Updated format. Reworked for clarity. Update FTIR current practices.	16-0903	N. Zhang
6	10/29/20	Update Purpose and Responsibilities. Add reference to instrument manual. Add acceptance criteria for performance qualification. Corrected SOP to reflect current practices.	CC-20-0754	J. Maignan
7	05/11/23	Aligned with current instrument and processes. Added electronic data review.	CC-23-0244	J. Sassman