Canadian Grain Commission
Commission canadienne des grains

Protein and Oil Determination using the FOSS Grain Analyzer

Standard Operating Procedure

AC04.521.v3

Canada

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1. Purpose

This document has been developed to ensure consistent and accurate operation, maintenance, and results of FOSS grain analyzers to determine protein and oil content throughout the Canadian Grain Commission. The FOSS grain analyzers use near infrared technology by transmittance mode and are calibrated for protein based on the Grain Research Laboratory's ISO 17025-accredited Combustion Nitrogen Analysis method.

2. Abbreviations

2.1 CGC – Canadian Grain Commission

2.2 CNA – Combustion Nitrogen Analysis

2.3 CWRS – Canada Western Red Spring

2.4 GRL – Grain Research Laboratory

2.5 ISO – International Organization for Standardization

2.6 QSO – Quality System Occurrence

3. Health and Safety

3.1 The Canadian Grain Commission's Health and Safety Program complies with the Canada Labour Code Part II and the Canada Occupational Health and Safety Regulations. Contact the Manager, Health and Safety, for further details.

3.2 Refer to applicable equipment and instrument operating manuals for manufacturer recommended safety precautions.

3.3 Review applicable Safety Data Sheet (SDS) information for chemicals prior to use.

3.4 Review applicable Job Safety Analysis (JSA) procedures before testing.

3.5 Wear appropriate personal protective equipment (PPE).

4. Responsibilities

4.1 The GRL Protein Technician (or delegate) is responsible for training staff and overseeing operations.

4.2 Technicians are responsible for processing samples submitted to the laboratory.
4.3 Inspectors are responsible for processing samples pertaining to inspection and submitted sample activities.

5. Equipment and materials

Instrumentation

5.1 FOSS grain analyzer
5.2 Analytical balance
5.3 Carter Dockage Tester

Equipment

5.4 Boerner divider
5.5 Brush
5.6 Canned air or equivalent

Software

5.7 Microsoft Excel
5.8 The appropriate application:
5.8.1 Harvest app
5.8.2 OSCAR app
5.8.3 SOS app

Reference Materials

5.9 Daily CWRS ABC Check samples
5.10 Daily Soybean ABC(D) Check samples
5.11 Calibration Sets
5.12 Moisture Check sample

6. Required training

6.1 Laboratory staff must read and acknowledge this procedure in SoftExpert Suite (SES) and complete applicable sections of AC06.1344 before work commences.

6.2 Non-laboratory staff, such as inspection staff, are encouraged to complete AC06.1344 before commencing work. However, the requirement to complete training is at the discretion of managers/supervisors.

7. Procedure

Verifying Grain Analyzer Performance Using Check Samples

7.1 Turn the FOSS grain analyzer on and allow it to perform a start-up test. The main window will appear on the screen when the start-up test is complete.

7.1.1 If possible, the FOSS grain analyzers with the touchscreen (TM model) are to remain on at all times, as the instrument may take up to 48 hours to warm up.

7.1.2 Older models of the FOSS grain analyzer should be turned off at the end of the day to prolong the life of the lamp. Older models only take about 10 minutes to warm up.

7.2 Ensure the catchment drawer is empty.

7.3 Click the application model button and select the appropriate commodity/grain from the list based on the check sample to be run through the analyzer.

7.3.1 Check samples must be run once daily when the instrument is in use.

7.3.2 Run the Daily CWRS ABC Checks before analyzing wheat, barley, rye, and oat samples. If the checks are within tolerance, all wheat, barley, rye, and oat application models are ready to use for the day.

7.3.2.1 If only barley samples are run, refer to 7.3.4.

7.3.3 Run the Daily Soybean ABC(D) Checks before analyzing soybean samples. If the checks are within tolerance, all soybean (protein and oil) application models are ready to use for the day.

7.3.4 If testing barley samples **only**, run the Barley Calibration Set before analyzing barley samples. If the checks are within tolerance, all barley application models are ready to use for the day.

7.3.5 One sample must also be analyzed in duplicate and pass tolerances each day. The difference of replicates must be within ±0.2% protein for wheat, ±0.3% protein for barley, and ±0.5% oil and protein for soybean.

7.4 Pour the required sample into the hopper, double-check that the correct application model is selected, and press the **Analyze** key to begin the test.

7.5 The results will appear on the screen once the analysis is completed.

7.6 Record the check results (protein only for CWRS, protein and oil for soybeans) on the appropriate worksheet(s): AC06.1345 Daily Protein Check (protein only), and/or AC06.1346 Daily Soybean Protein and Oil Check, and/or AC06.1351 Daily Barley Protein Check. Record duplicate test in AC06.1339 Daily Protein Duplicate Sample Check.

Analyzing Samples on the Grain Analyzer

7.7 Ensure samples are commercially cleaned, if applicable, prior to testing. Refer to AC04.502 Sample Cleaning on Carter Dockage Tester.

7.8 Ensure the catchment drawer of the FOSS grain analyzer is empty.

7.9 Click the application model button and select the appropriate grain or commodity (application model) from the list based on the sample to be run through the analyzer.

7.10 Pour the sample into the hopper, double-check that the correct application model is selected, and press the **Analyze** key to begin the test.

7.10.1 If a sample is less than 500 g, the instrument will prompt for additional sample, at which time the sample from the catchment drawer can be used to complete the test by returning to the hopper.

7.11 The protein, moisture (if applicable), and oil (if applicable) results will appear on the screen after the analysis has been completed.

7.12 Enter the results into the appropriate application such as the Harvest app, SOS app, or OSCAR app.

7.13 Unless otherwise instructed, single tests are performed. Repeat testing is only required when error messages are displayed on the grain analyzer screen.

Running Calibration Sets

7.14 When locations receive their annual calibration sets, ensure the grain analyzer is cleaned and analyze in duplicate on each grain analyzer. Refer to “Analyzing Samples on the Grain Analyzer” section of this procedure.

7.15 Record the calibration results on form AC06.1347 CGC Annual Grain Analyzer Calibration Results saved on the ischecktests shared drive.

7.16 A designated GRL Protein Technician will review the calibration data. If a grain analyzer requires adjustment, the GRL Protein Technician will request a rerun of the calibration set. If a rerun is requested, record the results on form AC06.1347 CGC Annual Grain Analyzer Calibration Results saved on the ischecktests shared drive.

7.17 Proceed with use of the grain analyzer only once the grain analyzer has been approved for use by a designated GRL Protein Technician.

Running Moisture Verification

7.18 When locations receive their Moisture Check sample, follow procedure AC04.608 Moisture Check Samples.

8. Quality control

8.1 Proceed with protein testing of wheat, rye, barley and oat samples on the grain analyzer only if the following criteria are met:

8.1.1 The annual calibration set has passed and approval has been received from a designated GRL Protein Technician to use the instrument.

8.1.2 The monthly moisture verification has passed. Refer to AC04.608 Moisture Check Samples.

8.1.3 The results of the Daily CWRS ABC Check samples are within ±0.2% of the target average protein value.

8.1.4 The sample that was analyzed in duplicate is within the applicable tolerance for its commodity.

8.2 Proceed with protein and oil testing of soybean samples on the grain analyzer only if the following criteria are met:

8.2.1 The annual calibration set has passed and approval has been received from a designated GRL Protein Technician to use the instrument.

8.2.2 The monthly moisture verification has passed. Refer to AC04.608 Moisture Check Samples.

8.2.3 The results of the Daily Soybean ABC(D) Check samples are within ±0.5% of the average target oil and protein value.

8.2.4 The sample that was analyzed in duplicate is within the applicable tolerance for its commodity.

8.3 Proceed with protein testing of barley samples on the grain analyzer only if the following criteria are met:

8.3.1 The annual calibration set has passed and approval has been received from a designated GRL Protein Technician to use the instrument.

8.3.2 The results of the Barley Calibration Set are within ±0.3% of the average target protein value or the results of the Daily CWRS ABC Check samples are within ±0.2% of the target average protein value.

8.3.3 The sample that was analyzed in duplicate is within the applicable tolerance for its commodity.

8.4 If any of the criteria in sections 7.1 to 7.3 are not met:

8.4.1 Do not proceed with testing.

8.4.2 Do not release the result.

8.4.3 Contact the regional labs, the GRL Protein Technician, or regional inspection manager and initiate a QSO report following AC04.127 if necessary.

9. Reporting results

9.1 Complete the appropriate form for check sample results and enter official results into the appropriate app as follows:

9.1.1 Enter Daily CWRS ABC Check sample results into AC06.1345.

9.1.2 Enter Daily Soybean ABC(D) Check sample results (protein and oil) into AC06.1346.

9.1.3 Enter Barley Calibration Set results into AC06.1351 Daily Barley Protein Check.

9.1.4 Enter official test results into either the Harvest app, SOS app, or OSCAR app.

9.2 Data must be verified after transfer to an electronic database.

9.3 Results must be reviewed and authorized results prior to release to customers.

10. Equipment maintenance

Routine Cleaning

10.1 FOSS grain analyzers require regular cleaning to prevent excessive dust build-up. Grain analyzers must be cleaned:

10.1.1 At least once a month. It is recommended to clean the grain analyzers once a week during periods of high-volume testing.

10.1.2 After infested samples.

10.1.3 When the instrument displays outlier errors or fails check samples.

10.2 To clean the grain analyzer, press the **Flush** button and follow the step-by-step instructions on the instrument’s screen. Use a brush and canned air to assist in

cleaning. Refer to the manufacturer manual and/or AC04.523 Setup and Maintenance of FOSS Grain Analyzers for additional information on the grain analyzer cleaning procedure.

10.3 Record the date of cleaning in the AC06.1348 FOSS Grain Analyzer Cleaning Log on the ischecktests shared drive.

Troubleshooting, Maintenance, and Repairs

10.1 When the grain analyzer displays a sample error on its screen:

10.1.1 Complete all troubleshooting.

10.1.2 Clean the instrument.

10.1.3 Perform a retest of the sample.

10.1.4 If the issue persists, consult the manufacturer manual, troubleshoot with a GRL Protein Technician, regional laboratory staff, and/or regional inspection manager and initiate a QSO report following AC04.127 if necessary.

10.2 Repairs of the grain analyzers will be performed as needed by a designated GRL Protein Technician following AC04.523 Setup and Maintenance of FOSS Grain Analyzers.

10.3 Change lamp and piston components when required. Follow the manufacturer manual and/or AC04.523 Setup and Maintenance of FOSS Grain Analyzers.

10.4 Applicable checks must be analyzed after any instrument error displays, maintenance performed, repairs completed, instrument power cycling, or intercept adjustment before resuming analysis of samples.

11. References

11.1 AC00.1003 Authorization for Non-Accredited Methods and Procedures
11.2 AC04.127 Quality System Occurrence
11.3 AC04.502 Sampling Cleaning on the Carter Dockage Tester
11.4 AC04.512 Operation of the Boerner-type Divider
11.5 AC04.523 Setup and Maintenance of FOSS Grain Analyzers
11.6 AC04.608 Moisture Check Samples
11.7 AC06.1339 Daily Protein Duplicate Sample Check
11.8 AC06.1344 FOSS Grain Analyzer Training Form
11.9 AC06.1345 Daily Protein Check
11.10 AC06.1346 Daily Soybean Protein and Oil Check

11.11 AC06.1347 CGC Annual Grain Analyzer Calibration Results
11.12 AC06.1348 FOSS Grain Analyzer Cleaning Log
11.13 AC06.1351 Daily Barley Protein Check