

Instrument: TGM800

Determination of Moisture in Flour

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Introduction

The TGM800 is a thermogravimetric analyzer designed to determine moisture content of materials using a loss-on-drying technique. Mass loss of the sample is measured as a function of the oven temperature by controlling the atmosphere and ventilation rate.

An accurate determination of moisture content in flour products provides important information related to the food quality and safety (texture, taste, microbial stability) as well as a key variable used to calculate a product's purity, yield, and/or resulting constituent analysis on a dry basis.

Sample Preparation

Sample should be ground to pass through a 40 mesh screen.

Method Reference

AOAC Official Method 925.10 Solids (Total) and Moisture in Flour

Fixed Drying Time Method

With 2.4 in crucible using ~2 g sample mass.

Accessories

621-010-956 Aluminum Foil Crucible (2.4 in),
621-011-237 Carousel (11-place), 621-011-507 Scoop

Sample Mass ~2.0 g

Analysis Time ~1.5 h

Method General Parameters

Crucible Type	Large Foil
Minimum Crucible Weight	1.10
Maximum Crucible Weight	1.75
Crucible Density	0.5
Sample Type	Flour
Sample Density	1.5
Minimum Sample Weight	1.8
Maximum Sample Weight	2.5

Method Step Parameters

Step Name	Moisture
Ramp Rate*	10.0 °C/min
Start Temperature	25.0 °C
End Temperature	130.0 °C
Hold Time	60 min
Maximum Time	120 min
Flow Rate	4.0 LPM
Final Weight	At End of Step

Method Step Calculations

Calculation Name

Moisture

Calculation Equation

$$(((\text{Initial Mass} - \text{Moisture Mass})) \div \text{Initial Mass})$$

*A ramp rate of 20 °C/min can be used, and may speed up the analysis and improve the temperature overshoot without any detrimental effects.

Procedure

1. Create and/or select a method using the parameters described above following the procedure in the TGM800 Instruction Manual.
2. Login and load samples following the procedure outlined in the TGM800 Instruction Manual.

Typical Results—Fixed Drying Time, 2.4 in Crucible

Sample	Mass (g)	% Moisture
Barley	2.1124	7.91
LECO 502-906	2.0008	7.85
Lot 1000	2.0612	7.91
	2.0549	7.89
	2.0588	7.91
	2.0833	7.83
	2.0119	7.91
	Avg =	7.89
	s =	0.03
Wheat Flour	2.1677	7.67
LECO 502-692	2.0037	7.65
Lot 1000	2.0098	7.68
	2.1517	7.63
	2.0176	7.69
	2.0536	7.67
	2.0489	7.68
	Avg =	7.67
	s =	0.02
Rice Flour	2.0783	7.95
LECO 502-907	2.0108	7.92
Lot 1000	2.0722	7.92
	2.0186	7.88
	2.0534	7.94
	2.0667	7.91
	2.0551	7.94
	Avg =	7.92
	s =	0.02
Corn Flour	2.0175	7.94
LECO 501-563-150	2.1290	7.91
Lot 1016	2.0204	7.98
	2.0268	7.92
	2.0782	7.92
	2.0039	7.91
	2.0443	7.95
	Avg =	7.93
	s =	0.02

Fixed Drying Time Method

With 1.5 in crucible using ~1 g sample mass.

Accessories

621-010-236 Aluminum Foil Crucible (1.5 in),
621-010-642 Carousel (17-place),
621-011-507 Scoop

Sample Mass ~1.0 g

Analysis Time ~1.5 h

Method General Parameters

Crucible Type	Small Foil
Minimum Crucible Weight	0.80
Maximum Crucible Weight	1.20
Crucible Density	0.5
Sample Type	Flour
Sample Density	1.5
Minimum Sample Weight	0.80
Maximum Sample Weight	1.20

Method Step Parameters

Step Name	Moisture
Ramp Rate*	10.0 °C/min
Start Temperature	25.0 °C
End Temperature	130.0 °C
Hold Time	60 min
Maximum Time	120 min
Flow Rate	4.0 LPM
Final Weight	At End of Step

Method Step Calculations

Calculation Name
Moisture

Calculation Equation
$$\frac{((\text{Initial Mass} - \text{Moisture Mass})) \div \text{Initial Mass}}$$

*A ramp rate of 20 °C/min can be used, and may speed up the analysis and improve the temperature overshoot without any detrimental effects.

Procedure

- 1 Create and/or select a method using the parameters described above following the procedure in the TGM800 Instruction Manual.
- 2 Login and load samples following the procedure outlined in the TGM800 Instruction Manual.

Typical Results—Fixed Drying Time, 1.5 in Crucible

Sample	Mass (g)	% Moisture
Barley	1.1197	7.90
LECO 502-906	0.9956	7.90
Lot 1000	1.0311	7.91
	0.9948	7.86
	1.0357	7.95
	1.0098	7.89
	1.0200	7.91
	Avg =	7.90
	s =	0.03
Wheat Flour	1.0312	7.60
LECO 502-692	1.0590	7.63
Lot 1000	1.0435	7.60
	1.0502	7.59
	1.1038	7.57
	1.0047	7.55
	1.0623	7.58
	Avg =	7.59
	s =	0.03
Rice Flour	1.0236	7.93
LECO 502-907	1.0027	7.98
Lot 1000	1.0630	8.01
	1.0179	7.96
	1.0261	8.01
	1.0450	7.96
	1.0812	7.99
	Avg =	7.98
	s =	0.03
Corn Flour	1.0576	7.97
LECO 501-563-150	1.0068	7.94
Lot 1016	0.9964	7.95
	0.9931	7.98
	1.0893	7.95
	1.0118	7.96
	1.1006	7.96
	Avg =	7.96
	s =	0.01

Mass Constancy Drying Time Method

With 2.4 in crucible using ~1 g sample mass.

Accessories

621-010-956 Aluminum Foil Crucible (2.4 in),
621-011-237 Carousel (11-place), 621-011-507 Scoop

Sample Mass ~1.0 g

Analysis Time ~1.0 hour

Method General Parameters

Crucible Type	Large Foil
Minimum Crucible Weight	1.10
Maximum Crucible Weight	1.75
Crucible Density	0.5
Sample Type	Flour
Sample Density	1.5
Minimum Sample Weight	0.80
Maximum Sample Weight	1.20

Method Step Parameters

Step Name	Moisture
Ramp Rate*	10.0 °C/min
Start Temperature	25.0 °C
End Temperature	130.0 °C
Hold Time	0 min
Maximum Time	120 min
Flow Rate	4.0 LPM
Final Weight	At Constancy
Constancy Window	9 min
Constancy Level	0.0010 g

Method Step Calculations

Calculation Name	Moisture
Calculation Equation	$((\text{Initial Mass} - \text{Moisture Mass}) \div \text{Initial Mass})$

*A ramp rate of 20 °C/min can be used, and may speed up the analysis and improve the temperature overshoot without any detrimental effects.

Procedure

1. Create and/or select a method using the parameters described above following the procedure in the TGM800 Instruction Manual.
2. Log in and load samples following the procedure outlined in the TGM800 Instruction Manual.

Typical Results—Mass Constancy Drying Time, 2.4 in Crucible

Sample	Mass (g)	% Moisture
Barley	1.0497	7.83
LECO 502-906	1.0227	7.82
Lot 1000	1.0755	7.90
	1.0073	7.78
	1.0085	7.83
	1.0030	7.84
	1.0382	7.93
	Avg =	7.85
	s =	0.05
Wheat Flour	1.0146	7.59
LECO 502-692	1.0158	7.44
Lot 1000	1.0620	7.57
	1.0014	7.42
	1.0151	7.59
	1.0367	7.55
	1.0487	7.67
	Avg =	7.55
	s =	0.09
Rice Flour	1.0456	7.90
LECO 502-907	1.0104	7.80
Lot 1000	1.0010	7.84
	1.0607	7.96
	1.0126	8.06
	1.0938	7.93
	1.0445	7.99
	Avg =	7.93
	s =	0.09
Corn Flour	1.0238	7.95
LECO 501-563-150	1.0401	7.89
Lot 1016	1.0234	7.93
	1.0169	7.86
	1.0593	7.97
	1.0005	7.90
	1.0397	8.00
	Avg =	7.93
	s =	0.05

