

GETTING STARTED WITH THE AMB MOISTURE BALANCE

The AMB moisture balance depends upon the user understanding the balance, knowing about the material to be tested, having an idea of the results expected and preparing the sample correctly.

While the balances are called moisture balances, it should be stressed that it is not only water that is evaporated by the heat, it may be oils, alcohol, flavourings or other components that are changed by the heat.

Refer to the AMB Operators Manual for details of the operation of the balance.

AMB MOISTURE BALANCE

The AMB Moisture balance will dry samples using heat from infrared lamps mounted above the sample. The user can set parameters for drying the sample that will affect the results. The parameters are:

Mode

7 options, 3 for moisture, 2 for solids and 2 for moisture as a percentage of residual mass.

Temperature

Set the drying temperature from 50°C to 160°C, or 250°C on high temperature models.

Strobe time

The time interval that the balance will check the results and print the current results. One most modes the strobe time is important as the balance will automatically stop when 3 consecutive readings are the same.

Maximum Time

One modes 4-7 this time is the maximum time the test will run. On modes 4, 5 and 6 the test will stop when the results are stable for 3 consecutive readings or when the maximum time has been reached. On Mode 7 only the maximum time is used. In all modes the user may stop the test at any time.

Another parameter used with the AMB balance is the Substance Temperature Selection SubSt. For the purpose of this note use SubSt = 0. See the operators manual for details of how to use the other SubSt numbers (1-9).



AMB SAMPLE PREPARATION

Sample preparation is the single most important item for accurate results. The sample must be prepared so the whole of the sample is heated uniformly and the moisture is near the surface of the material.

For powders no further preparation is necessary. For most other materials the sample should be ground, chopped, grated or otherwise made as fine as possible. Liquids or paste may need to be spread onto glass fibre pads to distribute them evenly and thinly. Some materials that may splatter as they are heated (oils, butter) may need to be spread on the glass fibre pads or mixed with dry sand.

Trial and error is often the only method to find the best method for the material.

When the sample is placed on the weighing pan it should be as thin as possible, however enough material should be used to assure good repeatability of the results. Typically samples of 3 to 8 grams are used.

Some materials will require special preparation. For example when testing cheese, if the cheese is very soft it may be necessary to use dry sand as a buffer material so it does not splatter or form a skin. To do this it would be necessary to prepare the sand by drying it in an oven until you were certain no moisture remains. Put the sand on the sample pan and tare the balance. Mix the sand with the cheese so you have smooth mixture, spread this mixture on the sample pan and then do the test.

An alternative to this preparation is to spread the cheese on dry spun glass gauze to assist in spreading the heat and preventing splatter or skins forming. Remember to tare the balance with the gauze in the weighing pan for accurate results.

Other materials will hold water within them in a way that is not suitable for this type of test. For example sugar will bind the water to the sugar molecules so strongly that heat will not remove the water before the sugar is burned.

Most plastics also are not suitable for this type of method due to the very low percent moisture and the heat required to extract this moisture.

AMB PARAMETERS

When initially setting the parameters for a material often it is a matter of trial and error to find the most suitable settings.

Initially use mode 7. This will allow the test to run without interruption until you stop it. Thus if the material dries slowly the balance will not falsely determine the test is over. The strobe time can initially be set to 15 seconds.

If you have some experience with an oven method or other moisture balances the temperature should be set to these same values. However if you do not have any experience then the initial temperature setting is a guess at first. Try using 120°C initially and then increase it if there are no signs that the material is burned, or decrease it if the material burns or goes excessively brown. Some material need to be dried at lower temperatures if they form a skin over the surface during drying.

We find it helpful to have the balance connected to a PC for data collection or to a printer during these test to help determine the best settings for test.

Begin the test and watch the output from the scale. After a few minutes the moisture should increase. After some time the %moisture will become stable for a long period of time. Terminate the test at this time.

Repeat the test at other temperatures, generally try to use the highest temperature possible that does not damage the material.

After you are getting consistent results with 10-15g samples you can try reducing the size of the samples. Often good results are obtained using samples of 3-8g.

By observing the results the time and temperatures needed to finish test it is possible to determine the typical time of a test, the typical %moisture and the strobe time that will be needed to determine the automatic stopping point.

KNOW THE MATERIAL

As described above some materials are not well suited for this method of moisture determination.

In addition it is important to know enough about the materials so that you do not endanger or inconvenience others. For example some solvents have very low flash points that are not suitable for drying with heat sources that can reach 100°C. Other materials will cause odour or fumes that will be dangerous or objectionable, consider drying fertiliser slurry without using a vent to extract the odour.

TEMPERATURE OF THE SAMPLE

When the samples are dried the temperature at the sample may need to be known. The AMB Moisture balances have a location to insert a second temperature probe with a 3mm shaft into the samples. When the samples are tested using Mode 7 as before the 2nd temperature probe can be used to measure the temperature within the sample. The results from these test should be discarded as the probe touching the samples will affect the readings.

When the temperature of the sample has been determined a correction factor can be stored in one of the 9 SubSt memories for future use. Refer to Appendix A in the User Manual for details of setting the values for SubSt1 to SubSt9.

TEMPERATURE CONTROL within the AMB BALANCES

The temperature of the weighing changer is measured by a sensor just above the samples. As the temperature approaches the final value the lamps will be cycled on/off to maintain the temperature at the set point.

The initial increase in temperature will happen quickly, it will usually take about 1 minute to gain the first 90% of the final temperature and then another 30 seconds to reach the final temperature. This method helps avoid the temperature overshooting the set point and thus avoids damaging the sample .

RS-232 DATA FROM THE AMB BALANCES

The AMB Balances will output the current results at the same interval as the strobe time. These results can be used to plot the progress of a test or to keep records of a test. The data can be collected using many different RS-232 interface programs or a program that runs with Windows™ is available from Inscale.

EFFECT OF CALIBRATION ON MOISTURE DETERMINATION

The AMB moisture balance can be used as a laboratory balance if it is calibrated with a mass standard of OIML Class F2 or better. However the scales do not need to be calibrated if they are only used for moisture determination.

The results obtained from a moisture test are not dependent upon the accuracy of the balance as the results are a ratio of 2 weights.

APPENDIX B

GUIDANCE NOTES

The following guide notes are offered as examples of temperature, display update time and expected results when drying various substances. The preparation, distribution and amount of product can all significantly effect the results. It is important to find suitable procedures to process the material, usually by trial and error.

In general it is recommended that a temperature of 100°C, a time interval of 10 seconds, and a sample sized 2-5g be selected for initial test. After a number of tests with these conditions this will provide a basis for comparing other times, temperatures or sample preparations.

The items in the following table are taken from actual test results. The user of the AMB balance will need to determine the best procedures for their samples.

AMB MOISTURE BALANCE EXAMPLES

MATERIAL	SAMPLE MASS (g)	DRYING TEMPERATURE.(° C)	STROBE TIME(s)	AVERAGE WATER CONTENT	STANDARD DEVIATION	DRYING TIME(min)
BUTTER	2-5	138	15	16.3	0.1	4.5
CEMENT	8-12	138	15	0.8	0.1	4-5
CHARCOAL	8-10	120	10	3.8	0.1	8-10
CHOCOLATE POWDER	2-4	100	5	1.9	0.1	4
COCOA POWDER	2-3	106	20	0.1	0.1	2
COFFEE CREAMER POWDER	2-3	130	15	78.5	0.1	6-8
CORNFLAKES	2-4	120	15	9.7	0	5-7
DRY APPLE PULP	5-8	100	10	76.5	0.1	10-15
DUST	5-10	104	10	7.3	0.3	8-15
FLOUR	8-10	130	10	12.5	0.1	4-5
GROUND COFFEE	2-3	106	5	2.8	0.1	4
MARGARINE	3-4	138	20	16	0.1	10
MAYONNAISE	1-2	138	20	56.5	0.4	10
MILK	2-3	120	15	88	0.2	6-8
MILK CHOCOLATE	2-5	106	15	1.3	0.1	3.5
MILK POWDER	2-4	90	15	5	0.2	6
MUSTARD	2-3	130	20	76.4	0.7	10
PAPER	2-4	106	20	6.4	0.1	10
POLYAMIDE	2-5	138	20	2	0.2	75
POTATO FLAKES	3-4	106	15	6.9	0.1	7.5
POWDERED SOUP	2-3	80	15	3	0.2	4.5-7
RED WINE	3-5	100	15	97.4	0.1	15-20
SLIME	11-12	130	15	80	-	90
SUGAR	4-5	138	15	11.9	0.1	10
SUNFLOWER OIL	10-14	138	20	0.1	0	2
WET APPLE	5-8	100	10	7.5	0	5-10
WHITE GLUE	2-5	136	15	54.3	0.1	6-8
YOGHURT	2-3	110	15	86.5	0	4.5-6.5

This list will be extended as information becomes available. If you wish to supply any information that may help others, please contact Inscale