TECHNICAL MANUAL

DISTELL MEAT FATMETER

Model MFM-992 (small sensor)

Model MFM-1092 (large sensor)

CE

Contents

Introduction

This Technical Manual is intended to accompany the User Manual that is included with the Distell Fatmeter. It has been written to cover some of the more advanced ways in which the Fatmeter can be used, as well as to provide some information in the comparison between the Fatmeter and other laboratory methods.

The information here is not expected to be of particular interest to most Fatmeter users, and is aimed at researchers and other technical users.

There is, in addition, a large amount of information on the Distell website at http://www.distell.com. The website includes a 'Frequently Asked Questions' section, where we address many of the queries that have been raised in connection with the Fatmeter.

If, after reading this document and the information on the website, you have questions about or problems with the Fatmeter then please get in touch with us. Our contact details are at the end of this manual.

Creating Custom Calibrations

Note: a comprehensive guide on creating custom calibrations is available on our website at http://www.distell.com/downloads/CustomCalibrations.pdf.

Measurement methodology

Clearly define your measurement protocols

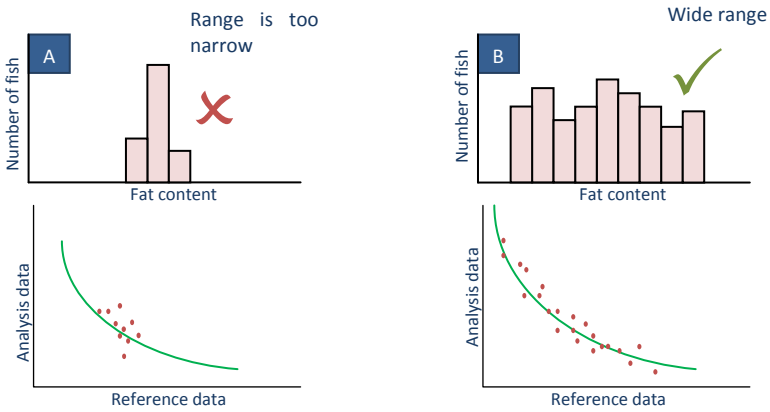
It is important to clearly define your measurement methodology for the product well in advance of the actual measurements. To help you decide on the measurement method, you will find on the CD-ROM supplied by Distell, a large number of calibration charts which outline different measurement protocols for different products. Your choice of measurement method will be determined by the weight, shape, and known characteristics of the Product and by the measurement objective.

Having considered exactly what representative measurement you wish to achieve, print out your measurement protocol in detail, and follow the method in a consistent and rigorous manner.

Selecting your product samples

To create a calibration from scratch you will need a minimum of 20 – 25 samples of product for the measurements. These samples should be evenly spaced across the range of fat content that is expected for the product from very low fat content to very high fat content. This will ensure an accurate calibration.

These graphs show two different situations. Graph 'A' shows a sample where all the samples have a similar fat content. Graph 'B' shows a sample where the fish cover a wide range of fat content from low to high.



In graph 'A', where the samples all have similar fat content, then the custom calibration will only be able to give accurate readings when used on product in the middle range of fat content. When it is used on product with high or low fat contents, i.e. outside the range represented by the samples used to create the calibration, it will not be able to give accurate data because there are no source data points in those areas.

Measurement of samples using the meter

Overview

For a given item of produce, whether meat or fish, a number of samples should be prepared. Ideally these will come from multiple sources - it is best to cover as wide a range of fat content as possible. Each of these samples will be given a unique ID then measured with the Fat Meter on (normally) the Research-1 setting. This measurement forms part of the reference data set.

Each sample is then analysed to find the exact fat content. The fat content is part of the analysis data set. The analysed fat content is paired with the Research-1 measurement. Once all the reference - analysis pairs have been obtained the custom calibration can be created.

Procedure

Having chosen your samples, and prepared your measurement protocol, you can proceed to take measurements for each sample using the Meter in the normal manner:

- Switch the meter on and allow 5 minutes for the sensor to stabilise
- Check the meter values are in agreement with the meter's check pad
- Choose the RESEARCH-1 calibration setting, known as the 'Reference Calibration'
- Set the number of readings to be averaged between 1 and 8
- Note carefully each set of readings taken on each sample, especially the average value. The readings will also be stored in meter's memory, and you can download the data at any time to the DMS. These readings are known as the 'Reference Dataset'
- After each set of readings identify each sample with a unique reference and place it in a sealed bag to retain the sample in its original condition

Once you have measured all of the samples

- Check the number of samples
- Check all the samples have been clearly marked with a unique reference
- Download your sample data from the meter and obtain a printout for reference as well as saving the data on the computer
- If the laboratory analysis is not being carried out immediately store all the samples carefully to preserve their original condition

The samples are now ready to send to laboratory for analysis by the method of your choice. The laboratory results are referred to as the 'Analysis Dataset'.

Laboratory analysis of samples

It is important that the laboratory personnel are fully informed of your sample requirements. Questions to consider are:

- What portion of the sample do you wish to analyse?
- What do you wish the analysis to represent?

In the case of a fish product

- Is it the whole fish carcass?
- Is it the trimmed fillets of the fish?
- Is it a defined section of the fish?

In the case of a meat product

- Is it a standard 300 gm sample of minced product (3 – 8mm grind)?
- Is it a whole piece of meat?

Information required from the laboratory analysis

- Fat content
- Water content
- Total solids
- Calorific / bio-energetic values

Once you have received the data from the laboratory, match each laboratory sample value (the Analysis Dataset) with the corresponding Fatmeter sample value (the Reference Dataset). This will give you a list of paired results. One way to retain this data is to create an extra column in the DMS Grid table and record the laboratory value alongside the Fatmeter sample data.

Once completed you are ready to create custom calibration using the DMS.

Components required for a custom calibration

A Custom Calibration for your Fatmeter is produced from combining the following datasets:

- The **Reference Calibration** for your Meter (RESEARCH-1)
- The **Reference Dataset** (Fatmeter values of sample product, produced using the reference calibration)
- The **Analysis Dataset** (Laboratory values of sample product)

Creating a custom calibration

Each meter is shipped with the following calibration settings:

Product settings

- A minimum of four standard product calibrations

Research settings

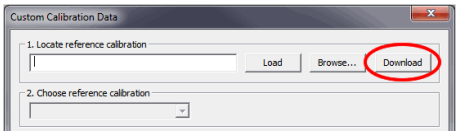
- One research calibration, known as RESEARCH-1, and which is used for reference when creating your own custom calibrations

The data that makes up these product datasets is called a calibration. The DMS provides the capability to create a new calibration, and upload the calibration into the group of research settings.

The process of creating a custom calibration in the DMS follows. To begin, select 'Create Custom Calibration' from the File menu in the DMS. This will open the 'Custom Calibration Data' window.

The following steps should be followed:

1. The first stage is to load the **Reference Calibration**. You can use the 'Download' button to copy the RESEARCH-1 calibration directly from the meter, assuming it is attached via the supplied USB cable. Instructions are given on screen, but the process is quite simple:



   a. Click on the 'Download' button.

   b. Select 'Send Ref' from the meter's Choices menu

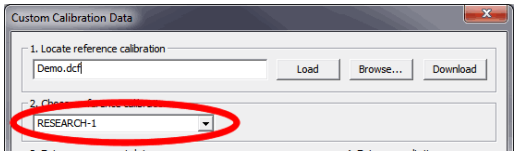
   c. Save the DCF file on your computer for future reference

   d. The data is now available in the Custom Calibration window. You can, for future work, either use the DCF file saved from this process or you can repeat the download.

If the reference calibration you used is not RESEARCH-1 then please get in touch with Distell for guidance.

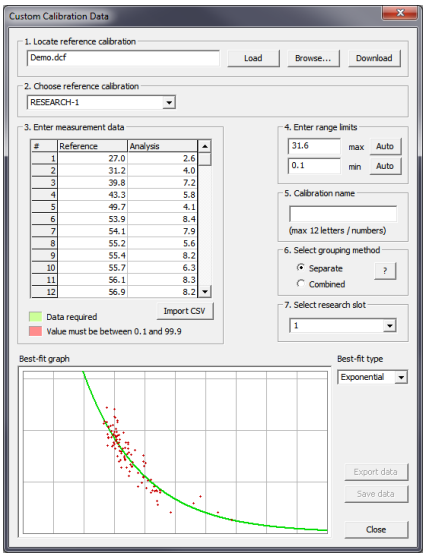
If you are using an existing DCF file, e.g. one that you downloaded from the meter previously, click on the 'Browse...' button to navigate to the file then click 'Load' to load the reference calibration data from the file. Alternatively you can drag the file from the Windows desktop or a file explorer window and drop it on the Create Custom Calibration window.

2. The second stage is to select the reference calibration you wish to use. The .DCF file in stage 1 may contain multiple calibrations, though only those used in the Freshness Meter's Research menu are able to be used for this. Select the appropriate calibration from the drop-down list and the DMS will use this file as your **Reference Calibration** for calculating new custom calibration. You must choose the calibration setting that was used to take the measurements; typically this will be RESEARCH-1.



3. Using the table, enter the values for **Reference Dataset** in left hand column and **Analysis Dataset** in right hand column, for each pair of samples. The data is checked after each entry and any errors in the data will be highlighted in different colours; the key to the colours is shown below the data table. If the data shows no errors then the DMS will now create a calibration curve based upon data values entered, and the new custom calibration will be displayed in the form of a graph.

There is an option to import this data from a CSV file, which may be more convenient for large datasets. The CSV file should be formatted as two columns with no header, the first column being the Reference value and the second column being the Analysis value.



4. The fourth stage, once the data has been entered, is to choose maximum and minimum threshold values. This allows you to limit the range of values in the calibration. Anything outside of your chosen range will appear as 'out of range' on the meter itself. The DMS will attempt to choose sensible values for these, but you can override them with your own choice if you wish.

5. The fifth stage is to enter the name of the new calibration. This is limited to 12 letters, symbols or numbers, due to the size of the display on the meters. The meter will show the calibration name given here on the display.

6. Select the grouping method according to instructions available in the Help Section of the DMS. Normally you will choose 'Separate'.

7. The seventh stage is to select the research setting, or slot, that the new calibration should use. Meters have, by default, 16 slots in the bank of research calibration settings. The first of these is always filled with RESEARCH-1, leaving 15 vacant slots. It is the user's responsibility to track which slots are filled and which are vacant.

8. You can now save the Data in two formats:

   - For uploading your custom calibration to the meter using the DMS, save as a Distell Calibration File (.DCF). The uploading process is discussed in the next section.
   - For exporting to a spreadsheet or database save as a Comma Separated Value file (.CSV). In this form, the data is presented as a series of 1000 discrete data points that reflects the measurement range of the meter.

Note that the best-fit type is best left at Exponential for a natural calibration.

Uploading Calibrations to the Meter

Programming a meter with a new calibration setting

Note: a more comprehensive guide on uploading calibrations is available on our website at http://www.distell.com/downloads/UploadingCalibrations.pdf.

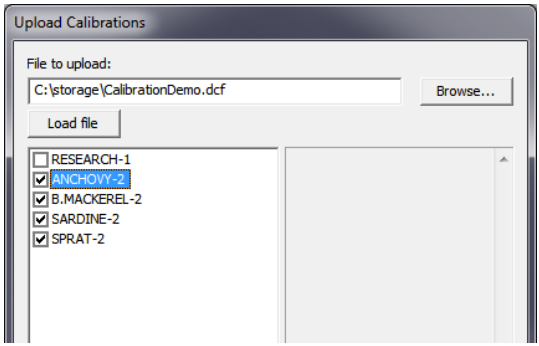
Your meter is shipped with several calibrations pre-installed, but if you have purchased an additional calibration, or you have created a custom calibration, then this option allows you to upload it to your meter.

Note: each calibration is unique to a specific meter because it has been tuned to the exact electronic profile of the sensor in the meter. You *can* upload a calibration to a different meter, but it will not give accurate results.

To upload a calibration to your meter, proceed as follows:

In the DMS

- Open the DMS, select the **File** menu, then **Upload Calibrations**.
- Locate the **Custom Calibration** file that you wish to upload. This should have a .DCF file extension. You can use the Browse... button to help you find the file. Once you have the filename, click **Load** to open the calibration file.
- The third step is to choose which individual calibrations from the file that you wish to upload to the meter. The file may contain more than one calibration, so only tick the calibrations that you wish uploaded at this time.



Important note: You should check the version of the firmware that is on your meter (this is shown when the meter is switched on).

Fatmeters with version 2.6 firmware (or higher) and Freshness meters with version 1.08 firmware (or higher) can upload multiple calibrations at once, but meters with older firmware can only upload one calibration at a time. For these older meters only the first ticked calibration will be uploaded, even though the DMS will look like it is uploading all of the ticked calibrations. To upload multiple calibrations to the older meters, you will need to go through this process once for each calibration. It is best to tick only one calibration each time.

The newer firmware will upload multiple calibrations in one operation.

In the meter

Once you have selected the calibration to upload, switch meter ON, and go to the **'Add Product'** option of the **Choices Menu** on the meter, and press the **Y (Read / Yes)** button.

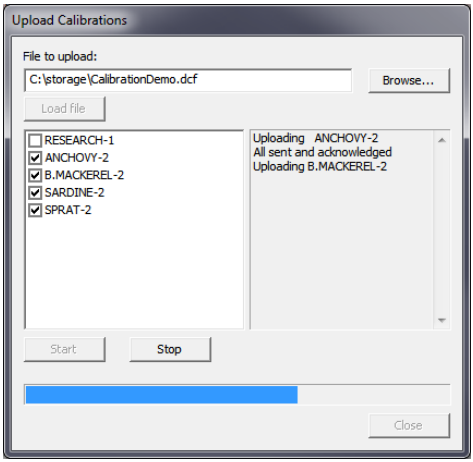
When you are ready to perform the upload, press the **Y (Read / Yes)** button at the **'Data Ready?'** prompt.

When the meter shows **'Waiting data'** you can click the Start button in the DMS to begin the upload.

You can monitor the upload progress on the meter display, and also on the computer.

Note: If you cancel the upload before it is complete you will have an incomplete calibration in the meter and measurement results will be unpredictable and inaccurate.

You should always allow the upload process to finish.



Comparison with Laboratory Methods

Fatmeter measurements vs. Foss-let method

Introduction

If you wish to test the accuracy of the Fatmeter measurements, and compare the results with the Foss-Let laboratory analysis method for an accurate appraisal of its performance, it is essential that the techniques employed are the same as those from which the original calibration data were derived.

When checking the calibration of the Fatmeter against the Foss-Let method a key element in the process is the preparation of fish samples for these determinations. The purpose of this note is to describe the procedures to be used in the preparation of these samples. For detailed instructions please refer to the User Manual and the calibration charts supplied with the meter.

Background

In attempting a calibration check of the Fatmeter, there are three points that must be understood. These are:

- The Fatmeter is primarily intended as a tool for those involved in the meat processing industry. It provides a non-destructive estimate of the fat content of natural and processed meats. Please refer to the calibration chart for the product being analysed.
- The Fatmeter is an averaging instrument and to ensure accuracy, especially where large batches of meat product are to be measured, several random samples should be taken from various locations on the batch before the specified accuracy of the instrument can be achieved. On the other hand, the fat content of a single sample can be assessed accurately if eight readings are taken from a well mixed batch of meat.
- All fat content measurements used in the preparation of the calibration data for the Fatmeter were obtained using a Foss-Let Oil Meter. This laboratory chemical extraction method requires a 45g sample of the meat product. To allow for losses in mincing, a sample of the meat product with a minimum weight of 60g should be prepared. It is advisable to prepare enough minced material in case a duplicate Foss-let measurement is required, so that a sample of at least 100g in weight is desirable. It is also good practice to carry out triplicate Foss-Let measurements on each filtrate. Any contamination of the filtrate or of the Foss-Let itself will then be immediately apparent.

Preparation & measurement of meat samples

Beef, poultry, pork, horse & pony, sausage meats

The preparation procedures for all the above meat products are basically the same.

The usable flesh of the animal (i.e. excluding the head, bones, offal etc.) is uniformly minced as required. A portion of the minced meat of approximately 300g is randomly selected from the batch, hand pressed into a solid mass and placed in a suitable glass dish or bowl.

The depth of the material should be at least 50mm as a flat burger shape or 60 – 100mm if shaped into a round sausage shape. The sample should be wider than the sensor head so that the sensor head is entirely in contact with the sample.

The sensor head is then pressed firmly into the meat to ensure good contact over the whole of the sensor head, but not so firmly that the mass of the material is penetrated significantly. After completing such a measurement, there should be just a slight indentation in the surface of the minced meat product, a few millimetres at the most.

This procedure is repeated eight times, at different points on the sample to obtain the average Fatmeter reading. Please refer to measurement sites section for details on this process.

A sample of the minced meat of approximately 45g is then taken for analysis by Foss-Let using the normal Foss-Let methodology.

For the greatest accuracy of any calibration check, it would be advisable to perform as many Foss-Let analyses on the mince as the sample allows. This then will take account of any inconsistency in the fat distribution within the sample.

Conclusion

Using the techniques described above, it should be possible to achieve accuracies (95% confidence interval) within the following limits:

Fat/Oil Reading	Accuracy
4 to 10%	± 1.0%
11 to 20%	± 1.5%
21 to 30%	± 2.0%
31 to 40%	± 3.0%
41% +	Rising to ± 4.0%

Factors affecting results

The results obtained with the Meat Fatmeter can be affected by various factors:

Operator

The operator of the equipment must use the instrument in a consistent manner and follow the guidelines set out in the User Manual and calibration charts. Take care that:

- The sensor head is fully in contact with the sample or specimen prior to taking a reading and not at an angle to the surface. If the sensor head is not fully in contact with the sample then the Fatmeter may display an erroneous high reading.
- The sensor head is clean and no excess oil or water is present.
- The sensor head is not removed from the sample before releasing the **Read/Yes** button.

Samples / specimens

Where possible, follow diligently the guidelines within the User Manual. It is possible to use the Fatmeter on meat products other than those for which the instrument is calibrated, and in different ways, however, the results obtained will not necessarily be accurate. They should allow, however, reproducible results that may be used as a basis for calibration or measurement.

Where wholly consistent results are required, then the procedures as laid down in the calibration charts supplied must be adhered to, or, in the case of a different meat product, a specific calibration obtained from Distell. Please ensure that:

- The specimen / sample has been prepared as per guidelines, and that the constituents of the meat product have not been artificially changed. Where the composition of the product has been changed from the natural state, then, for really accurate results, a specific product calibration must be used.

- The specimen / sample is not dehydrated. As the Fatmeter is actually measuring the water content as part of the measurement of oil content, it is important that the specimen has not been allowed to dry out.
- Where product has been frozen, it must be allowed to thaw / defrost completely before taking measurements.

Measurement recommendations

Each calibration that is available for the meter has several points that you should be aware of:

1. The exact meat product that the calibration should be used with;
2. The measurement method that should be followed when using the calibration;
3. The representation of the calibration, i.e. when the Fatmeter shows a fat measurement, what does that measurement actually represent?
4. The preparation and processing involved if the meat product sample was to be measured by laboratory process, in order that a like-for-like comparison can be made between the laboratory results and the calibration data.

The following pages show two sample calibration charts. One is for minced / ground meat, and most of the Distell meat calibrations should be used with this calibration chart. The other is for homogenised meat, and should be used with calibrations that are specific to the homogenisation process.

There are very many calibrations and associated charts available for Distell Fatmeters. The full range of calibration charts can be seen on the CD-ROM and calibration information can be found on our website at http://www.distell.com/information/calibrations/meat-calibrations.

Using the Distell Fatmeter

Subject: **Minced / Ground Meat**
Represents: Fat content of a 300g sample
Use on: Natural or processed meat, e.g. beef, pork, poultry, lamb, sausage, burger, ham, salami, etc.

1. Selection & Preparation

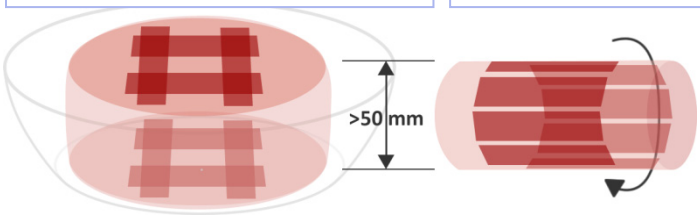
Randomly select 300g of processed meat from a batch. Best results will be obtained with a grind size of 3mm to 8mm. Coarser grinds will lead to greater variability in readings.

2. Take readings

Squeeze and mould the sample to remove any air cavities then form it into a burger or sausage shape. Ensure the sample is at least 50mm thick.

Place the instrument head on the sample at the positions shown below. **Apply firm pressure** to ensure there are no air cavities below the sensor and take readings as shown:

For a burger shape, take four readings from the top then turn it over and take four from the bottom.	For a sausage shape, take eight readings from around the surface of the sample.



- To ensure accurate measurements keep the 'read' button pressed until the reading is stable. Once the reading is stable, release the 'read' button. It is important that you release the 'read' button *before* removing the sensor from the sample.
- It is normal to find a wide variation in readings, especially in a coarse grind.

3. What do these results represent?

After eight readings the readout shows the average fat content of the 300g sample.

Laboratory Analysis

Subject: **Minced / Ground Meat**
Represents: Fat content of a 300g sample
Use on: Natural or processed meat, e.g. beef, pork, poultry, lamb, sausage, burger, ham, salami, etc.

Preparation of samples

It is very important that the laboratory analysis is done correctly, and truly represents ALL of the sample, as represented by the Fatmeter measurements.

Please prepare the samples for analysis, as follows:

- Always ensure that the entire sample that was measured by the Fatmeter is sent to the laboratory for analysis. Where a rigorous comparison is required then it is necessary to ensure that the laboratory is fully aware of these preparation requirements.
- Blend the entire 300g sample for two minutes to ensure that the sample is thoroughly mixed and homogeneous.
- Take the analysis portions from different parts of the blended sample. For example, 3 x 15g portions should be taken for triplicate Foss-Let chemical analysis)

Note: The Fatmeter has been calibrated against the AOAC-approved Foss-Let chemical extraction method. This method will give the best correlation with Fatmeter measurements.

The Fatmeter results can be checked against other methods, but please ensure that the methodology gives a fair comparison and that it does represent the whole 300g sample.

Using the Distell Fatmeter

Subject: **Homogenised Meat**
Represents: Fat content of a 300g sample
Use on: Natural or processed meat, e.g. beef, pork, poultry, lamb, sausage, burger, ham, salami, etc.

1. Selection & Preparation

Randomly select 300g of processed meat from a batch of homogenised meat. The blending process can introduce air into the sample, so the sample should be compressed before measuring for the most accurate readings.

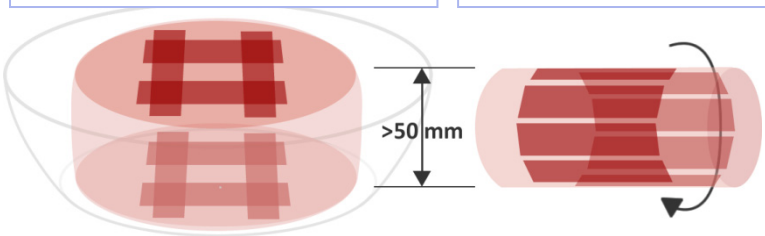
2. Take readings

Squeeze and mould the sample to remove any air cavities then form it into a burger or sausage shape. Ensure the sample is at least 50mm thick.

Place the instrument head on the sample at the positions shown below. **Apply firm pressure** to ensure there are no air cavities below the sensor and take readings as shown:

For a burger shape, take four readings from the top then turn it over and take four from the bottom.

For a sausage shape, take eight readings from around the surface of the sample.



- To ensure accurate measurements keep the 'read' button pressed until the reading is stable. Once the reading is stable, release the 'read' button. It is important that you release the 'read' button *before* removing the sensor from the sample.

3. What do these results represent?

After eight readings the readout shows the average fat content of the 300g sample. Calibrations using this process are BEEF-2, BEEF-5, CHICKEN-2, CHICKEN-3 and CHICKEN-4.

Laboratory Analysis

Subject: **Homogenised Meat**
Represents: Fat content of a 300g sample
Use on: Natural or processed meat, e.g. beef, pork, poultry, lamb, sausage, burger, ham, salami, etc.

Preparation of samples

It is very important that the laboratory analysis is done correctly, and truly represents ALL of the sample, as represented by the Fatmeter measurements.

Please prepare the samples for analysis, as follows:

- Always ensure that the entire sample that was measured by the Fatmeter is sent to the laboratory for analysis. Where a rigorous comparison is required then it is necessary to ensure that the laboratory is fully aware of these preparation requirements.
- Blend the entire 300g sample for two minutes to ensure that the sample is thoroughly mixed and homogeneous.
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Note: The Fatmeter has been calibrated against the AOAC-approved Foss-Let chemical extraction method. This method will give the best correlation with Fatmeter measurements.

The Fatmeter results can be checked against other methods, but please ensure that the methodology gives a fair comparison and that it does represent the whole 300g sample.

Technical Specifications

Sensor

Type:	Microstrip transmission line
Microwave Frequency	2.0 GHz (+/- 20 MHz)
Microwave Power	< 2 milliwatts
Materials	Stainless steel, PTFE

Display

Type	LCD, 2 lines x 12 characters (MFM-1092)
	LCD, 2 lines x 16 characters (MFM-992)

Sensor Enclosure

Material	ABS Plastic, waterproofed to IP 65
Size	195mm x 100mm x 40mm
Weight (including batteries)	MFM-992: 375g
	MFM-1092: 600g

Hardware / Software

Capacity	Up to 48 calibrations can be stored in each meter and up to 1000 data samples can be recorded before a download is required.
Software	The Distell Data Management System is supplied with each meter, and is downloadable from our website.
Interface	Distell meters are supplied with a waterproof USB cable that can be used for periodic downloads as well as real time data capture.
Batteries	Powered by internal rechargeable batteries, Nickel Metal Hydride (NiMh)
Charger / Power Supply	Universal charger / power supply, also acts as desktop power supply unit. Fitted with waterproof connector.
	Input voltage 110V – 250V AC, 50 – 60 Hz
	Output voltage 12 V DC, 1.2 A

Declaration of Conformity

The Products covered by this Declaration

The following Electrical / Electronic equipment, manufactured by Distell.com, for measurement, control and laboratory use:

Fish Freshness Meter	- Torrymeter
Fish Fatmeter	- FFM 692, FFM 992
Meat Fatmeter	- MFM 1092, MFM 992
Moisture Meter	- MM 692, MM 992

Directives and Standards to which these Products Conform

Directives

SAFETY	**EEC**	73/23/EEC, 93/68/EEC
EMC	**EEC**	89/336/EEC, 93/68/EEC

CE

Standards

SAFETY	**EEC**	EN 60950: 2000, as amended	
EMC	**EEC**	EN61326-1 : 2006	EN/CISPR 11: 2003 (Class B)
	EEC	EN/IEC61000-3-2: 2006	EN55011: 1998+A1: 1999+A2: 2002 (Class B)
	EEC	EN/IEC61000-3-3: 2002	EN/IEC61000-4-2: 1995 +A1 + A2
	EEC	EN/IEC61000-4-3: 2002 +A1	EN61000-4-4: 2004
	EEC	EN/IEC61000-4-5: 1995 +1	EN/IEC61000-4-6: 1996 +A1
	EEC	EN/IEC61000-4-11: 2004	
	FCC	CFR47: 2005 - Part 15, Sub Part B (Class B) (US Federal code of regulations), Consisting of : Clause 15.107, Clause 15.109	
	VCCI	Agreement of VCCI: 2006.4 (Class B),In conformance with : Table 4.2, Table 4.6	

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YEAR CE MARKING FIRST AFFIXED: 2000

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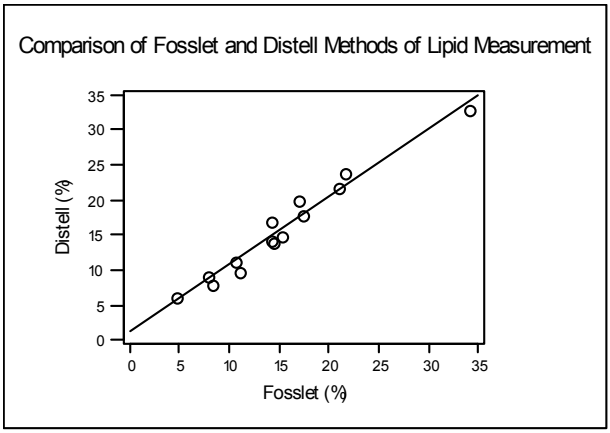
Application Data Sheets

Application Data Sheet 1

TITLE:	Comparison of Distell Fatmeter and Fosslet methods of lipid analysis.	
PRODUCT:	Raw minced (ground) beef from shops and supermarkets in the Aberdeen area.	
DATA SOURCE:	Torry Research Station.	
SAMPLING METHOD:	Eight measurements made on 500g hand-compressed samples.	
STATISTICS:	Number of mince samples:	14
	Maximum lipid content (Fosslet):	33.8%
	Minimum lipid content (Fosslet):	4.6%
	Regression equation, y = a + bx:	a = 1.14; b = 0.977
		(y is Fatmeter result, x is Fosslet)
	Correlation coefficient r:	0.979
	Standard error:	±1.46



Comments

These measurements were taken using the recommended procedure, using Fatmeter model MFM-1092.

Conclusion

The standard error could be diminished by taking more readings.

Application Data Sheet 2

TITLE: Comparison of Distell Fatmeter and Fosslet methods of lipid analysis.

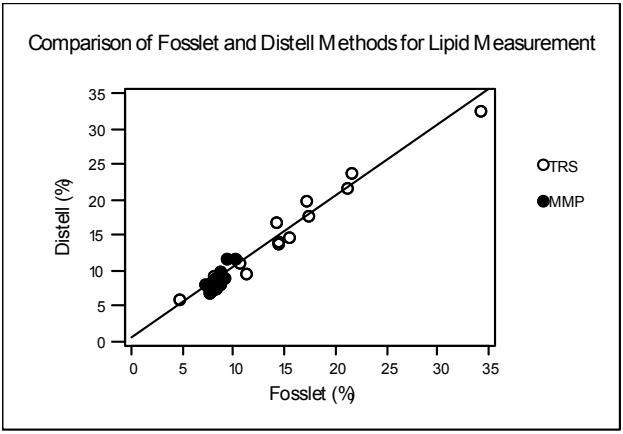
PRODUCT: Raw minced (ground) beef from shops and supermarkets in the Aberdeen area. Minced beef samples taken from production at Midland Meat Packers (MMP).

DATA SOURCE: Torry Research Station (TRS) and Foss Electric.

SAMPLING METHOD: Eight measurements made on 500g hand-compressed samples.

STATISTICS:

Number of mince samples:	33
Maximum lipid content (Fosslet):	33.8%
Minimum lipid content (Fosslet):	4.6%
Regression equation, y = a + bx:	a = 0.607; b = 1.004
	(y is Fatmeter result, x is Fosslet)
Correlation coefficient r:	0.981
Standard error:	±1.14



Comments

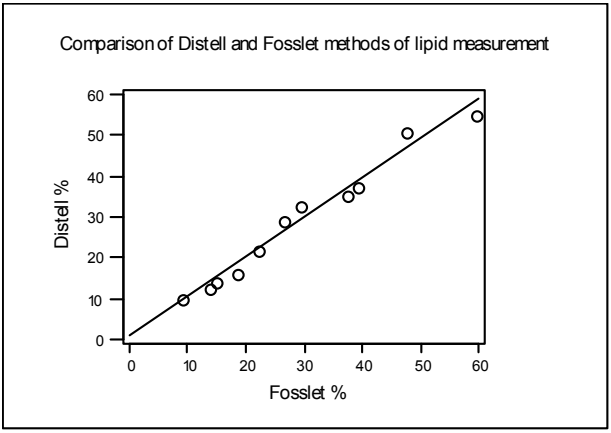
These measurements include those shown in data sheet 1 on the previous page. Because the MMP data covers only a narrow range of fat contents, this allows them to be seen as actually equivalent to the previous data. These measurements were taken using the recommended procedure, using Fatmeter model MFM-1092.

Conclusion

Their inclusion does not significantly change any of the regression parameters.

Application Data Sheet 3

TITLE:	Comparison of Distell Fatmeter and Fosslet methods of lipid analysis.	
PRODUCT:	Raw minced pork from a retailer in Elgin.	
DATA SOURCE:	Distell.	
SAMPLING METHOD:	Eight measurements made on 500g hand-compressed samples.	
STATISTICS:	Number of mince samples:	11
	Maximum lipid content (Fosslet):	59.1%
	Minimum lipid content (Fosslet):	8.95%
	Regression equation, y = a + bx:	a =0.994 ;b=0.962 (y is Fatmeter result, x is Fosslet)
	Correlation coefficient (r):	0.986
	Standard error:	±2.5



Comments

There is high correlation between these methods although the number of data points is small. These measurements were taken using the recommended procedure, using Fatmeter model MFM-1092.

Conclusion

The standard error is large due to both this small number of samples, and the large range of fat contents. More samples would reduce this considerably.

Trading Terms and Warranties

In line with most manufacturers, the products that we manufacture and sell are covered by a comprehensive warranty. In order that all customers are fully aware of the terms and conditions of order acceptance, terms of sale and after-sales warranty, we have summarised below our current terms for reference.

Terms and Conditions of Order Acceptance

Orders

An order received by Distell.com (hereinafter referred to as 'The Company') is deemed to be an offer to purchase by the customer, and subject to the conditions herein contained which will be deemed to be accepted by the customer upon delivery of the goods.

Prices

The prices quoted are subject to stock availability and whilst every endeavour will be made to supply at quoted prices, The Company reserve the right to revise prices at any time prior to delivery, upon giving notice to the customer to that effect.

Terms of Payment

Payment for goods is cash with order. Payment for services is due on delivery or completion of services. Any other terms of payment must be confirmed in writing from The Company prior to ordering goods and services. The Company reserves the right to charge interest on overdue accounts at the monthly rate of 5% above base rate.

Terms and Conditions of Sale

Retention of Title

The ownership of any goods supplied by The Company shall remain vested in The Company until full payment has been received. The customer shall be entitled to resell the goods or services only as agents of The Company and shall be bound to account to The Company therefore.

Risk

All risks in relation to the goods will pass to the customer upon delivery to the customer or his agents.

Delivery

Delivery shall be deemed to be effected when the goods have been delivered to the address agreed between the customer and The Company or when collected by or on behalf of the customer.

The Company will endeavour to deliver the goods without delay, but shall not be liable for late delivery howsoever caused, nor shall such failure be deemed to be in breach of any contract.

If for any reason the customer refuses delivery, then without prejudice to any other rights due to The Company, The Company reserves the right to treat the order as cancelled forthwith.

Returns

No returns of goods or services supplied by The Company will be accepted without The Company's prior written consent.

Liability for Loss or Damage

The Company does not accept liability for damage or partial loss of goods or services under the following circumstances:

- where there is a clear signed receipt of delivery to the customer.
- where the customer has signed for receipt of goods marked as unexamined.

- where the customer fails to give notice of any damage or loss within three days of delivery.

Terms and Conditions of After Sales Warranty

Any warranty given is solely confined to the repair / replacement of any product supplied or manufactured by The Company, directly to the customer.

All equipment supplied or manufactured by The Company is covered by a twelve month warranty covering parts and labour. The warranty commences on the date of shipment or, where delivery is by The Company's own staff, from the date of delivery.

The Company warrant that the Equipment shall be free from defects in workmanship and materials. Any equipment that is demonstrably defective on receipt by the customer must be returned within seven working days of receipt of goods to qualify for a free of charge replacement.

Thereafter our sole responsibility shall be to repair or replace the defective product at our discretion, upon receipt at our premises. The faulty equipment must be received properly packaged, protected and insured from Transit Damage.

The Company accepts no responsibility under the warranty for any product that has been opened, tampered with, reprogrammed, altered modified or misused in any way, and in no event shall the company be liable for incidental, consequential, indirect or special damages including, but not limited to damage arising from the loss of use of the product, system or profits, or any claim against the company by any other party.

This warranty is in lieu of all other warranties, whether expressed or implied, including without limitation, implied warranties of merchantability and/or of fitness for a particular purpose.

Following the expiry of the manufacturer's warranty, we strongly advise our customers to avail themselves of our comprehensive service and maintenance contract. This contract covers your equipment and where applicable your installation, for a period of one, two or three years. Note that all labour and parts are covered by this service contract, but shipping, packaging and insurance are payable by the customer. For further details please contact our offices.

In the event of a warranty claim or a service requirement please contact our Returns Department. Details of address and telephone numbers are shown at the rear of this manual.

For a copy of the complete Terms and Conditions, please contact our sales office or distributor.

Contact Details

The

DISTELL MEAT FATMETER

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