DISTELL.COM

GENERAL DESCRIPTION & STEP-BY-STEP GUIDE

DISTELL FISH FATMETER

FFM 992 - Model

(Small Head Model)

INTRODUCTION

General Description

THE DISTELL FATMETER was developed in response to demand from various customers for a meter that could measure lipid content of fish, meat and poultry products simply, and non-destructively. The hand held instrument is placed in contact with the sample and the fat/oil content is displayed on the instrument's digital readout, providing instant processing or quality control information. The value is also stored in memory for later downloading to computer. These features are invaluable for organisations requiring collation and reporting information, especially where HACCP and TQM regimes are in force.

There are calibrations available for a large number of fish and meats of commercial importance. There is also the option of having Distell prepare a specific calibration of your choice, where required.

The instrument is non-destructive and non-invasive in use, and for this reason can be used equally well on… live or dead fish, small live animals, whole pieces of meat, or minced meat products.

Please note however, that the instrument cannot measure samples that are frozen, and it is necessary to fully defrost such samples before measurement.

Principle of Operation

The lipid content of naturally occurring fish is related to the water content, and the measurement of one can serve to determine the other if the relationship is known. THE FISH FATMETER utilises this fact in establishing the fat content.

The instrument uses a microstrip sensor which is sensitive to the water content of the sample. Using stored calibration data the instrument converts the response of the sensor to a displayed percentage fat/oil content.

The principles of the method were defined after a number of years of research and development conducted by the Torry Research Station (TRS) of the UK's Ministry of Agriculture, Fisheries and Food (MAFF) in Aberdeen, Scotland. Calibrations were obtained using large numbers fish covering many species. Results of this work and other related research have been published in the scientific and technical press by staff of TRS.

This instrument has been further developed by DISTELL.COM. The Fatmeter is covered by various patents in several countries.

Fatmeter Update

The first models of the Fish Fatmeter were supplied to customers within the fish industry in July 1992. Since then the Fish Fatmeter has become universally known and is in use throughout the world. Distell has received invaluable feedback from customers about the use of the Fatmeter in the field. This allows us to constantly improve and refine the Fatmeter and to give you hints and tips on its use.

Also, we received numerous enquiries regarding the operation and accuracy of the Fatmeter, and how the results compare with the current, historical methods used in industry.

It would seem that the sampling and analysis procedures are far from standardised and varies from country to country, and even from company to company within these countries. Even where the same laboratory equipment is used, there are different sampling techniques apparent, which seems to give varying results.

This manual should be treated as a guide. It is not fully comprehensive, but is provided simply to help you understand the Fatmeter, how it operates, and how to eliminate factors that may affect your results. If, having read this manual, you still have a query or a problem, please do not hesitate to contact our HELP DESK at the address shown at the end of this manual.

Accuracy of results

The accuracy of the FATMETER depends upon the fat/oil content of the sample being measured and ranges from an uncertainty in the fat content of (+/-) 1% (95% confidence interval) at low levels to (+/-) 4% at very high levels (greater than 45%).

Therefore it is advisable that the operator follows the measurement methodology rigorously, and always takes readings as described in wall charts supplied.

Accuracy Guide

Fat/Oil Reading	**Accuracy**
2 to 15%	*from..* **± 1.0%,** *rising to..* **± 1.5%** *(12.5 -15.5% at 14%)*
16 to 30%	*from..* **± 1.5%**, *rising to..* **± 2.5%** *(27.5-32.5% at 30%)*
31% and above	*from..* **> ± 2.5%,** *rising to..* **± 4.0%** *(46-54% at 50%)*

The results gained will allow the operator to take swift decisions regarding feeding or processing of the fish species being measured.

Other methods currently in use for determining the lipid content of fish samples are destructive and slow, eg. In fish, a section or fillet of the fish is taken and analysed for fat/oil content by weighing, and using solvents to extract the fat, or, by driving off the water content by heating. These methods, unlike the DISTELL FATMETER, obviously cannot be used on LIVE fish.

INFORMATION & GUIDE

Fatmeter Kit - Contents

Your Fatmeter kit comprises the following items…

- Meter Unit
- Power Supply / Charger
- Check Pad
- Datacomms Cable
- CD Disk
- User Manuals and Measurement Charts
- Carry Case

Please take good care of the Meter. It is a measurement instrument and should be handled carefully. On the sensor head, there is a PTFE Film. On no account should this be removed or broken. Damage to the PTFE Film will invalidate readings.

Meter Unit – Front View

LCD Display
This displays current calibration setting, fat %, instructions and prompts, readings, and low battery indication.

Download & Power Socket
The 7-way socket on the side of the meter, serves THREE Functions…

- Data download socket, for transferring data to PC, using cable supplied.
- External power
- Charging internal batteries.

On / Off Button
Used to switch instrument ON / OFF

Microstrip Sensor… Microstrip sensor is placed in contact with the sample product, in order to take measurements.

Meter Unit – Back View

Read Button (Yes)

- Press this to take a reading
- Press to answer "Yes" when using Software Menu

Reset Button (No)

- Press to reset the measurement routine, or to abort an incomplete series of readings
- Press to answer "No" when using Software Menu

INFORMATION & GUIDE.... Continued

Battery Charger Unit

Only the unit supplied with your kit should be used to charge the battery pack, or power the meter. This is connected to the 7-way outlet on the meter. The charger supply unit simply plugs into the mains socket, accepting input mains voltage from… 110v–240v AC, 50–60 Hz. The charger unit comes complete with various plug configurations for use around the world.

A Red LED will illuminate when charger / power supply is switched ON. The battery pack should be fully charged after a period of 12 hours. When charging is complete, first disconnect the charger from the mains and then from the meter.

Power Supply

The Battery Charger Unit can also be used as a desktop power supply. This will power the meter + charge the internal batteries.

Check Pad

All scientific instruments need regular calibration. In the case of the Fatmeter an annual calibration is recommended. Where the meter is subject to intensive use, a twice yearly calibration check is recommended.

So that you can be sure that the meter is operating to specifications, it is always best to take measurements on the check pad, PRIOR to commencing work. The check pad provides the user with a quick daily check that the calibration has not changed significantly since last calibration. It should be noted, however, that the results obtained do not verify your meter's precise calibration, but they do give an assurance that there has been no significant change.

The pad has two rectangular slots which provide a representative reading of the high and low range of a stated species selection. A series of eight readings should be taken in each of these slots (firm pressure should be applied). The average readings obtained should fall within ± 2% of the values stated on the pad.

Because of the compressible nature of the pad, different operators may obtain slightly different results on the check pad, using the same instrument. It is therefore recommended that one person be made responsible for this daily check, so that consistent daily checks are carried out.

Data Cable

Always use the data cable supplied for downloading to computer. Connect the 7-way plug to outlet on meter, and the other end directly into a serial port on your computer.

CD Disk

The CD contains the User Manuals, Data Management Software, Measurements Charts, and other useful information.

User Manuals & Measurement Charts

A Hard copy of… User Manuals, Measurement Charts & Calibration Certificate

Carry Case

The Fatmeter Kit is supplied in a robust carry case, and comes complete with 2 keys for security of your Fatmeter.

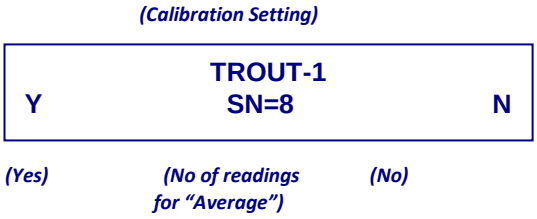
INFORMATION & GUIDE.... *Continued*

Getting started....

Verify that battery has been charged.

Switch on…

Switch on the Meter and allow to meter to cycle through start up routine *(then wait approx 1 minute).* The Meter is now ready for use, and the display should have defaulted to the last calibration setting used. The Screen should show as follows...

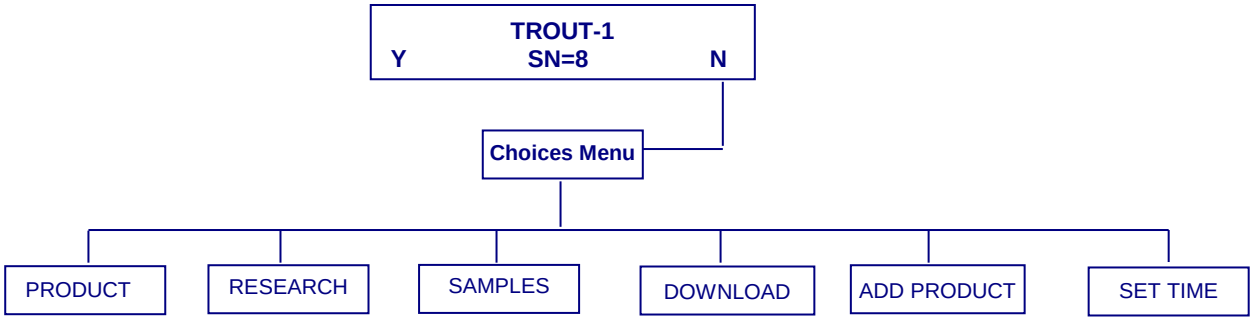


At this point it is worth checking that you have downloaded any previously collected data measurements, and that you have cleared the memory. Please refer to the Menu Structure below, for guidance on how to access Download Section, via the Choices Menu.

Menu Structure..Overview

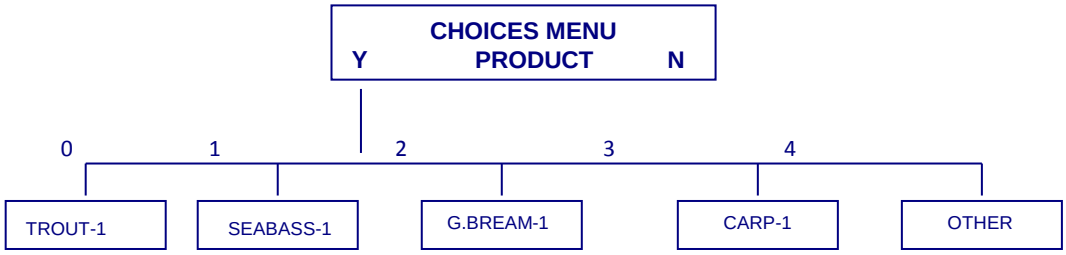
To access "Choices Menu"...

From the screen at Switch-On, choose "NO". The Choices menu screen will appear in the order shown below. There are SIX Options. Cycle through the options untill the correct one is displayed and press "YES".



Product Menu...

In "PRODUCT" Menu your Fatmeter is supplied with your chosen ***Fish Calibration Settings.*** Each calibration is assigned a number, normally between 0 – 4. Simply choose the number that corresponds with the calibration setting on your index card. ***The display will show the calibration selected.***

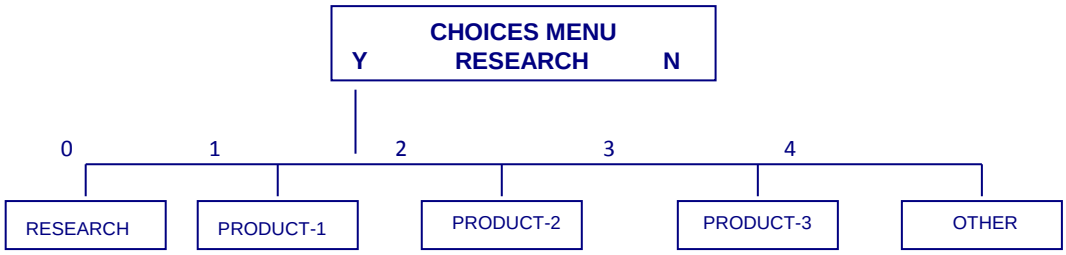


** Please note… You can have up to 80 different calibrations programmed into your Fatmeter*

INFORMATION & GUIDE.... *Continued*

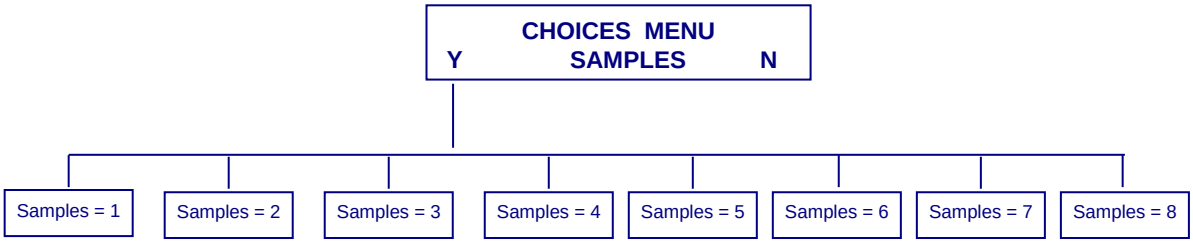
Research Menu...

In "RESEARCH" Menu your Fatmeter will normally be supplied with the following settings... *RESEARCH-1, PRODUCT-1, PRODUCT-2, PRODUCT-3.* Each setting is assigned a number, normally between 0 – 3. The Research Setting is used to create a new calibration setting. Settings... PRODUCT-1 to PRODUCT-3 can be programmed with your own custom calibration data, where required. Full details are available in... "METER CALIBRATION PROCEDURE" Section of this Manual. Simply choose the number that corresponds with the calibration setting on your index card. ***The display will show the calibration selected.***



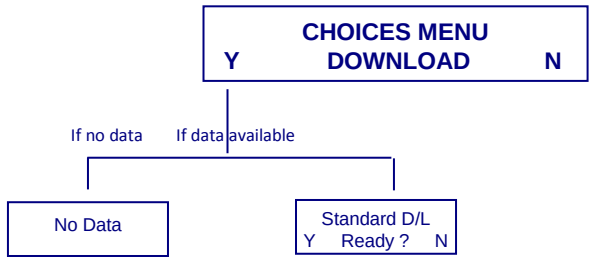
Samples Menu...

For greatest accuracy you should always choose... Samples = 8, and measure eight sample fish. For single fish you should choose... Samples = 1, and measure at recommended measurement site. ***The display will show the number of samples selected.***



Download Menu...

Downloads the following data...***Sample Reference, Time, Date, Calibration, Individual readings, Average.*** The data is available in a spreadsheet format, and is saved as a text file in comma delimited format for use with other spreadsheet programs... Full details are available in... "DATA MANAGEMENT SOFTWARE" Section of this Manual.



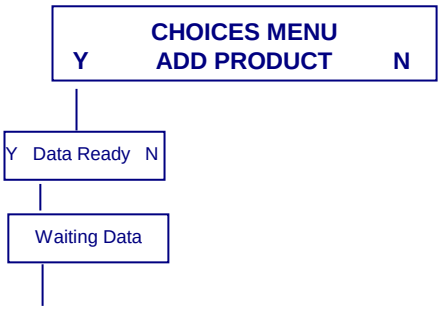
INFORMATION & GUIDE.... *Continued*

Add Product...

Using this menu provides the ability to programme the Meter with additional calibrations. This facility is especially useful for Researchers and Others who wish to…

- Refine existing Meter calibrations
- Create a new fish calibration setting

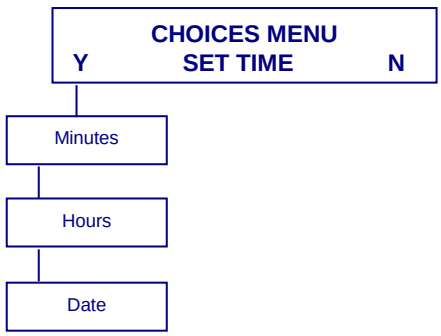
Full instructions on how to use this facility is available later in this manual, and is also available on your CD Disk under the title… METER CALIBRATION PROCEDURE**.**



Please refer to CD for more programming instructions

Set Date & Time...

You should reset minutes, hours and date when you first receive the meter.



This will then ensure that all downloads reflect the correct date and time.

INFORMATION & GUIDE.... *continued*

Calibration Check…

Each morning it is important to check that **the calibration of the fatmeter HAS NOT CHANGED from the previous check**. The check is carried out using the CHECK PAD supplied.

Procedure is as follows…

- Select the correct calibration from the menu. Press RESET on the fatmeter to confirm that you have selected the correct calibration setting. The chosen setting (eg. SALMON) should agree with the calibration setting stated on the check pad.
- There are TWO ranges on the check pad. High range and low range.
- Locate the sensor in low range aperture... ensuring a steady pressure is applied to the fatmeter to ensure that the sensor head is fully in contact with the pad. Press the READ button, and hold until reading is stable, then release. Repeat readings until "Average Reading" is displayed.
- Now locate the sensor in high range aperture and repeat the procedure above.

Assuming that the readings agree with your previous checks, then you can proceed to take measurements on your daily product samples.

Failed Check Pad Test…

What if Check Pad readings do not agree with the Fatmeter ? This means that something has changed from the last test. Possible areas for error include…

- New , or inexperienced operator carrying out the checks.
- Incorrect calibration setting chosen
- Sensor not properly located in aperture, thus not in contact with the pad.

If the checks using the check pad have been carried out correctly, then we must suspect that the calibration in the Fatmeter has somehow changed. There are THREE options at this point…

- Carry out a check in Iso-Propanol Solutions, and verify that the fatmeter results agree with Calibration Table supplied on the rear of your calibration certificate..
- If this check is OK, then the pad itself must be faulty. WE WOULD EMPHASISE THAT A FAULTY CHECK PAD IS RARE.
- If this check confirms that the fatmeter is 'out of calibration', then please contact Distell, to arrange for the fatmeter to be returned for service and re-calibration.

Contact Distell's Helpline for advice. We will talk you through the check procedure, and advise accordingly.

INFORMATION & GUIDE.... *Continued*

Satisfactory Check Pad Test…Measurement of Product Samples...

Having ensured that the Fatmeter is operating correctly you can now proceed to the measurement of product samples…

It is extremely important to follow the instructions on the ***Measurement Instruction Chart*** supplied for the fish you intend sampling. Here is a quick check routine…

- You have chosen the correct fish calibration.
- You have checked to ensure that the fish product is indeed a natural fish product, free of additives and other additions.
- Select the fish samples at random from the batch. Where you are measuring smaller whole fish, eg. Sprat, Sardine, Small Herring, Small Mackerel, etc., then the samples should be grouped according to size.
- For best accuracy always follow the measurement recommendations on your Measurement Instruction Chart.
- Temperature of the fish to be measured should be between 0 – 10°C, with no ice crystals present in the samples.
- Ensure that the sensor is placed **firmly** against the skin of the fish, thus ensuring that there are no air pockets between the sensor and the sample to be measured.
- It is normal to experience variability in the individual readings. When taken at different parts of the fish.
- For the most accurate results...EIGHT readings should be taken, as recommended on your measurement instruction chart for that species of fish. The object is to try and obtain readings that are truly representative of ALL of the sample. This will ensure the greatest accuracy.
- The data is stored within the fatmeter for later downloading to PC, via Software supplied by Distell.

Preparation of product samples for sending to Laboratory...

It is important that ALL of the fish to be represented by the fatmeter measurements is packaged, and sent to the laboratory for the analysis. The sample should be stored in a sealed polythene bag immediately after measurement. This will ensure that the sample does not dehydrate, and that there is no drip loss from the product sample.

Here is a quick checklist for the laboratory…

- Whole carcass, fillets, or sections of the fish, should be received at the lab, properly packed and sealed.
- The fish sample should be skinned, the head, tail, fins, and belly wall mucus should be removed from the sample. In the case of fillets the fat depots at the Dorsal Fin, and Anal opening should be removed. It is important to retain ALL of the remaining flesh of the fish (including any free oil) for blending, ensuring that any drip loss is included in the blended sample
- The sample should be blended, so as to create as homogenous a sample as possible.
- The laboratory personnel MUST take THREE samples of product from different parts of the blend for the chemical analysis. This will illustrate the homogeneity obtained by the blending process.
- The average of the laboratory triplicate analysis should be compared with the triplicate readings taken using the Fatmeter.
- They should compare favourably to accuracy claims in Handbook.

If the results do not compare favourably….

Check the Fatmeter use, as follows…

- Has the correct calibration been used on the Fatmeter
- Has the Fatmeter been checked on the Check Pad
- Is the operator proficient in the use of the Fatmeter
- Is the fish sample truly within the specification of the Fatmeter calibration being used
- Check the product for species identification, measurement technique, size, and preparation

INFORMATION & GUIDE.... *Continued*

Preparation of product samples for sending to Laboratory...continued

Check Laboratory procedure, as follows…

- Analytical method being used
- Sample preparation is OK
- Three samples, from differents parts of the blend have been analysed

If, after these checks there is still a significant difference, please contact Distell for advice and help.

Data Management & Download to Computer

The Fatmeter can download the measurements in "Real Time", or, as "Historical Data".

Data in "Real Time"…

Each time an average reading" is generated, after a series of readings, the meter downloads the data collected via the Download / Charging Socket. If you wish to collect the data in real time, simply connect the data cable to the meter, and connect to your PC. The data can either be collected using our standard software, or can be directly input to third party software (contact Distell for details in setting up).

Historic Data…

Up to 1,000 sets of readings can be stored in memory.

There are TWO download options...

- ***Standard ...***downloads the following data...***Sample Reference, Time, Date, Calibration, Individual readings, Average.*** The data is available in a spreadsheet format, and is saved as a text file in "comma delimited format (CSV)" for use with other spreadsheet programs.

- ***Darwin...*** downloads the following data... ***Average only***. Thereafter you use the Darwin Software to collate, batch, analyse, and create reports, etc. *Please note : Darwin DOES NOT WORK with Windows 2000 or Windows NT.*

Your Computer Hardware…

Your computer should be IBM compatible, with the ability to run Windows.

The Fameter comes complete with a Data Cable for connection to a communications port on your computer.

Please note… Always use the data cable supplied by Distell..

LIST OF STANDARD CALIBRATIONS AVAILABLE
&
SHORT NAMES USED IN DATA MANAGEMENT SOFTWARE SOFTWARE (Shaded column)

FISH SPECIES	*SCIENTIFIC NAME*	*CALIBRATION DESCRIPTION*	*MEASUREMENT METHOD*	*REPRESENTING FAT / OIL CONTENT OF…*
Anchovy (South African)	*Engraulis encrasicolus* *Engraulis capensis*	ANCHOVY –2	Thru' the skin	Whole fish carcass
Argentine / Smelt (Atlantic / North Sea)	*Argentina*	ARGENTINE-1 ARGENTINE-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Butterfish	*Pholis gunnellus*	BUTTERFISH-1 BUTTERFISH-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Carp (Fresh Water)	*Cyprinus* *Carpio*	CARP-1 CARP-2	Thru' the skin Thru' the skin	TWO trimmed fillets, with Skin TWO trimmed fillets, without skin
Arctic Char (Arctic)	*Salvelinus*	CHAR-1 CHAR-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Eel (Farmed eel)	*Anguilla anguilla*	EEL-1 EEL-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Hake (European hake)	*Merluccius merluccius*	HAKE-2	Thru' the skin	Whole fish carcass
Herring (Atlantic / North Sea)	*Clupea harengus*	HERRING-1 HERRING-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Mackerel – Horse Mackerel, (Atlantic / North Sea)	*Trachurus trachurus*	H. MACKEREL-1 H. MACKEREL-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Mackerel – Blue Mackerel (Atlantic / North Sea)	*Scomber Scrombus*	B. MACKEREL-1 B. MACKEREL-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Mackerel – Jack Mackerel (Pacific, Asiatic)	*Trachurus murphyi*	J. MACKEREL-1 J. MACKEREL-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Mackerel – Chub Mackerel (Pacific, Asiatic)	*Scomber japonicus*	C.MACKEREL-1 C.MACKEREL-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Mackerel – West African (Atlantic / Mediterranean)	*Scomberomorus tritor*	WA. MACKEREL-1 WA.MACKEREL-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Salmon (Atlantic Salmon)	*Salmo salar*	SALMON-1 SALMON-2 SALMON-3 SALMON-4 SALMON-5 SALMON-6	Thru' the skin Thru' the skin Thru' the skin Thru' the skin Thru' the skin Directly on flesh	TWO Trimmed fillets, without skin WHOLE fish carcass "Mowi" section only "Norwegian Quality Cut" only "Dorsal" section only "Smoked Salmon" minced sample
Salmon (Pacific salmon)	*Oncorynchus Neuka*	SOCKEYE-1 SOCKEYE-2 SOCKEYE-3	Thru' the skin Thru' the skin Thru' the skin	TWO trimmed fillets, without skin "Mowi" section only "Norwegian Quality Cut" only
	Oncorhynchus Kisutch	COHO-1 / KING-1 COHO-2 / KING-2 COHO-3 / KING-3	Thru' the skin Thru' the skin Thru' the skin	TWO trimmed fillets, without skin "Mowi" section only "Norwegian Quality Cut" only
	Oncorhynchus Tshawytscha	CHINOOK-1 CHINOOK-2 CHINOOK-3 CHINOOK-4	Thru' the skin Thru' the skin Thru' the skin Thru' the skin	TWO trimmed fillets, without skin "Mowi" section only "Norwegian Quality Cut" only "Dorsal" section only

LIST OF STANDARD CALIBRATIONS AVAILABLE
&
SHORT NAMES USED IN DATA MANAGEMENT SOFTWARE SOFTWARE (Shaded column)

FISH SPECIES	*SCIENTIFIC NAME*	*CALIBRATION DESCRIPTION*	*MEASUREMENT METHOD*	*REPRESENTING FAT / OIL CONTENT OF…*
Sardine **(Atlantic / North Sea)**	*Sardina pilchardus*	SARDINE-1 SARDINE-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Sardine **(Pacific / Asiatic)**	*Sardinops melanoticta*	SARDINE-3 SARDINE-6	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Sardine **(Spanish Sardine)**	*Sardinella Aurita*	SARDINE-4 SARDINE-5	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Saury **(Pacific)**	*Saurus*	SAURY-1	Thru' the skin	TWO trimmed fillets, without skin
Sprat **(Atlantic / North Sea)**	*Sprattus sprattus*	SPRAT-1 SPRAT-2 SPRAT-3	Thru' the skin Thru' the skin Directly on flesh	TWO trimmed fillets, without skin Whole fish carcass Emascerated Fillets of the fish
Sea Bass	*Dicentrarchus Labrax*	BASS-1 BASS-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Sea Bream, Black Bream **(Mediterranean)**	*Spondyliosama Cantharus*	B.BREAM-1 B.BREAM-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Sea Bream, Gilthead Bream **(Mediterranean)**	*Sparus aurata*	G.BREAM-1 G.BREAM-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Silver Warehou **(Pacific)**	*Seriolella Punctata*	S. WAREHOU-1 S. WAREHOU-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Research Setting	*Used to measure product where no specific calibration is available*	RESEARCH-1	As required	Meters response to the product being measured
Trout **(Rainbow Trout)**	*Salmon gairdneri* *Salmon irideus*	TROUT-1 TROUT-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass
Tuna - Bluefin **(Atlantic, Pacific, Mediterranean)**	*Thunnus Thynnus*	BLUEFIN-1 BLUEFIN-2	Thru' the skin Directly on flesh	Fish flesh of section measured Fish flesh of section measured
Tuna - Bonito **(Atlantic, Pacific, Mediterranean)**	*Sarda sarda,* *Sarda Chiliensis*	BONITO-1 BONITO-2	Thru' the skin Directly on flesh	Fish flesh of section measured Fish flesh of section measured
Tuna - Albacore **(Atlantic, Pacific, Mediterranean)**	*Thunnus Alalunga*	ALBACORE-1 ALBACORE-2	Thru' the skin Directly on flesh	Fish flesh of section measured Fish flesh of section measured
Tuna - Skipjack **(Atlantic, Pacific, Mediterranean)**	*Katsuwonus pelamis*	SKIPJACK-1	Thru' the skin	Fish flesh of section measured
Tuna - Yellowfin **(Atlantic, Pacific, Mediterranean)**	*Thunnus Albacares*	YELLOWFIN-1 YELLOWFIN-2	Thru' the skin Directly on flesh	Fish flesh of section measured Fish flesh of section measured
Whiting – Blue Whiting **(Atlantic, North Sea)**	*Micromesistius poutassou*	B.WHITING-1 B.WHITING-2	Thru' the skin Thru' the skin	TWO trimmed fillets, without skin Whole fish carcass

Please Note ….

Thru' the skin…	Means that the Meter is placed directly against the moist skin of the fish in order to take the measurements
Directly on flesh…	Means that the Meter is placed directly against the flesh of the fish in order to take measurements
Trimmed Fillets…	Means the flesh of the fish processed for eating…normally the trimmed fillets(excluding head, tail, fins, belly cavity, bones, seasonal fish roe). Various commercial organisations have differing trimming techniques. ***Distell's calibrations have been created, by trimming only the excess fat in the Dorsal & Anal Fin areas***.
Whole fish carcass…	Means…. ALL of the fish carcass