Nano Fish Counter



User Manual



Edition: May 2013



Contents

Warranty
Assembly
Counting Head5
Set Up6
Pumping6
Vacuum pumps6
Netting6
Start Up7
Main Screen
Set Fish Size
Test with water only10
Start Counting Session
Store and Continue Counting
Video and Fish spread
Progress bar
Clear one channel
End counting session
Settings14
Settings
Advanced15
Report
Licence codes
Calibration & Visibility
Visibility
Counter calibration
View report
View record
Technical specification21
Nano Counter
Storing





PREFACE – The Nano Fish Counters

VAKI Aquaculture Systems thank you for choosing the MACRO Range of fry and smolt counters. These counters are used in many aquaculture enterprises where an accurate knowledge of fish numbers is important. Applications include counting fish when grading, accurate stock control when transferring fish between tanks and delivering fish by helicopter, wellboat and truck.

VAKI counters have been developed in collaboration with a number of leading fish farming companies and are currently being used for counting Atlantic and Pacific salmon, trout, char, sea bass, sea bream, cod, tilapia, cobia, yellowtail, flatfish and other species. VAKI continue to develop the functions on the counters and for use with additional species including prawn, shrimp and ornamental fish.

The counters are based on a digital scanning camera and computer vision. The outlines of objects that pass beneath the camera are recorded and specially designed software is used to analyse the images and count the individual fish. The fish enter the counter and the water from the fish pump or spray bar then carry the fish over the curved counting channel. The fish pass over a light source and a mirror above reflects the images of each fish into the digital camera where the outlines are recorded and counted.

The NANO counter is designed for counting small batches and smaller fish. The NANO is not commonly used with a fish pump but when hand netting or bucketing fish into the counter. The NANO can count fish down to 0.05g.

This manual is a guide to the use of the NANO counters.



Warranty

VAKI Aquaculture Systems Ltd. offers warranty for defects that appear within one (1) year from the date of delivery from VAKI Iceland, on condition that the equipment has been assembled, used and maintained in accordance with the instructions for assembly and use. Changes to the start date of this warranty, such as delayed delivery to the user, must be reported to VAKI upon receipt of the equipment and agreed in writing.

VAKI undertakes to repair all defects that are due to faults in the design, materials used, or manufacture of the equipment. These defects will be rectified by repairing the equipment, or replacing components. The customer may be required to return the complete unit or parts thereof to the factory in Iceland for repair. VAKI accepts corresponding warranty for original parts fitted by VAKI as replacements, for a period of one (1) year from the date supplied.

VAKI will *not* be liable for:

- * Incorrect assembly and use, or inadequate maintenance.
- * Defects which result from the fitting of materials, components, or devices not supplied by Vaki, and which are purchased and fitted by the user.
- * Defects due to changes made to the equipment by the user, without the written consent of VAKI.
- * Faulty or inadequate repairs carried out by the user.
- * Normal wear and tear of the equipment.
- * Faulty connection of electrical equipment.
- * Faults caused by excessive voltage.
- * Damage or stoppage due to immersion of the computer or camera in water.
- * Damage to electrical supply cables.
- * Any economic loss that may arise from production stoppage.

If faults or defects appear in the equipment, the user must report this in writing to Vaki or its appointed representative as soon as possible, and without unjustifiable delay. The report must be sent within two (2) weeks from the expiry of the deadline, which is one (1) year from the date of supply by VAKI Iceland.

If the purchaser does not inform VAKI or its representative within the time limits stated above, the purchaser shall forfeit the rights of the warranty.



Nano Fish Counter Manual

Assembly

After delivery, the main parts of the counter may need to be bolted together. These are counter body, legs,weels and inlet. The legs are assembled and fitted with the wheels at the front and the inlet tubs bolted to the counter body as shown with soport hinge.

The Nano is a single channel unit. The main steps in the assembly are always the same.





Other equipment supplied:

1 x Power cable 1xCounter Manual 1 x Computer Manual

Optional equipment includes: Biomass Function, UPS 80 – 100W (un-interrupted power supply), USB Keyboard & Mouse, Twisted LAN cable.



Counting Head

The counting head contains the computer, and touch screen.

On the back are connections and ports required to connect the counter to power supply, DC power supply, and for external equipment such as, keyboard, mouse.



110V/ 220V

- 1. Connection for main earthed power.
- 2. Power out.
- 3. USB port, for keyboard, mouse, printer.
- 4. USB port as above.
- 5. Local Area Network (LAN) connection for camera.

24V

- 1. Connection for 24V power.
- 2. N/A.
- 3. USB port, for keyboard, mouse, printer.
- 4. USB port as above.
- 5. Local Area Network (LAN) connection for camera.



Set Up

When setting up the Nano Counter it is important to note the following:

- The counter should be placed on a flat and stable surface.
- Set the counter level by adjusting the height of the legs to ensure both fish and water are evenly spread across the scanning area.
- Locate the counter so that the touch screen is easily accessible and not exposed to water or direct sunlight. Note that in hot weather, high temperatures can affect the computer.
- Before each count check that the mirror is completely clean and free from any stains, residue or water droplets.
- Ensure that all pipes and hoses are securely fastened.
- Connect the lamp cable to lamp connection on counting head.
- Connect external alarm or batch splitter to the "Alarm" port
- Connect the power cable to earthed power outlet. <u>The use of a UPS (un-interrupted power supply) device is recommend. The counter power requirement is 80-100W</u>.
- Ensure that water and fish have a continuous free flow from the counter. Backpressure in the pipes can overload the counter.
- Take care not move or shake the counter while it is operating to protect against hard disk failure.

Pumping

When using a fish pump to transfer fish to the counter it is important to ensure an even flow of fish and water. Uneven delivery of fish to the counter can cause inaccurate counting as the number of fish may exceed the capacity limits.

It is also important to test the counter on the correct fish size settings pumping water only to ensure excess water does not create over-counting and adjust pump as required.

Ref: section 7.2 "Test with water only"

Vacuum pumps

When using larger vacuum pumps it may be necessary to provide additional dewatering or a buffer tank. Short bursts of many fish can overload the counter and both excess water and white water can affect the performance of the counter particularly when counting smaller fish.

Netting

When netting the fish into the counter it is similarly necessary to supply a sufficient amount of water for gentle handling of the fish and maintain an even flow of fish over the curved counting channel.



Start Up

The counter is now assembled and set up as instructed.

Turn on counter

Wait for approximately 10 minutes as the software is started and lamp heats up. The following window will be shown on screen.



If the counter has been used recently and the lamp has not cooled it is possible to skip this by pressing, "Cancel".

The main screen will then be shown.



Main Screen

The features and options shown on the main screen are as follows.



- 1. "New counting session" starts a new counting session, once activated this button will change to "End counting session"
- 2. "Stop" to pause the counting when cleaning mirror. Remember to press again to start counting.
- *3.* "**Store**" to store an intermediary batch count to the counting report. *Reminder: remember to store the last batch before ending the counting session*
- 4. "Settings" access settings menus.
- 5. "Visibility" used to display the graph showing intensity of light detected by camera.
- 6. "Calibration" to automatically calibrate the counter.
- 7. "Record" to view recorded images.
- 8. "**Report**" to view counting reports.
- 9. "Exit" to close the software before switching of counter.





- A. **Progress Bar** indicates the rate of fish passing through the counter, turning yellow and then red when over capacity.
- B. **Shows the count** in each channel, the size setting and the % in that channel.
- C. For selection between Throughput, Video or Fish spread on the screen.
- D. Click once for changing the tab on the screen to a **right mouse click**.
- E. "Counting" / or "Not counting" message indicates if counter is ready to count. If this area turns red and shows as "Not counting" and the error message "visibility insufficient" appears, please refer to Calibration & Visibility Section of this manual.
- F. **Total count** including all batches stored in the counting session. If tabbed twice it shows Sub Total
- G. Buttons to set the size group closest to average fish size to be counted for each channel



- H. **Size group** selected with size group buttons.
- I. Channel label. The name of the label can be changed in settings.
- J. **Estimated Size** gives the average weight for each counting channel. The moving blue bar is an indication of the sample level, once sample is complete the average weight is displayed
- K. **Throughput** graph, the lines show the rate of fish passing through the counter and the red shows the maximum capacity the counter can accept.

Set Fish Size

The size groups are: 0.2g, 1g, 3g, 10g, 30g, 100g & 200g

Using the size group buttons set the size group closest to the average size you intend to count. Each size setting covers a range of fish approximately 5 x smaller and 5 x larger than the size setting.

Should sensitive settings for very small fry count small air bubbles, water disturbance, or suspended particles it is advisable to increase the initial size range.

Test with water only

Adjust the amount of water from the fish pump to suit the size of fish being counted. With smaller fish, reduce the amount of water as much as possible running through the counter to prevent miscounting. Use the dewatering valve to adjust the water level.



The dewatering valve is adjusted using this screw

Test run with water only through the counter and check that the counter does not show any counts due to water disturbance.

It may be necessary to adjust the flow of water to prevent this, particularly with small fry. If the counter is "counting the water", this may be due to:

- The surface of the mirror is dirty or has water splashes.
- Too much water is being pumped through the counter.
- The water may be too dirty.
- The counter is not level and/or the water is not evenly spread over the counting channel.
- The size range setting is too sensitive.



Start Counting Session

To start counting press "New counting session" button on the main screen.

The display will show:



Text such as the site name, tank identification, the population / year class can be entered by pressing the keyboard buttons as indicated. This information will be included in the report. Press "Enter" on the keyboard after typing. IT IS IMPORTANT THAT ONLY LETTERS AND NUMBERS ARE USED WHEN A NAME IS GIVEN. DO NOT USE SIGNS SUCH AS (/ , . & - OR THE DATA FILE WILL NOT BE SAVED.

The counter should now show 0 in all counting windows. Start pumping or netting the fish into the counter.





Store and Continue Counting

An intermediate count can be stored by pressing the "**Store**" button. Then the following message will be shown. The number will be stored to the report together with the time label.



Video and Fish spread



Progress bar





Clear one channel



End counting session

When counting is finished press **"End counting session**". The following message will appear to be confirmed.

Confirm 🔀
Confirm end counting session
OK Cancel

The total count, stored numbers, recordings and information about the counting session are stored into the counting report.

<pre>save_print_form</pre>	
Data was saved to C:\Reports\20120613_TANK 03 TO 0_1.mse Copy report View report Close	

It is now possible to view the recording and print reports and start a new counting session.



Settings

To access the settings function press "Settings" on the main screen.

Settings

In the screen below it is possible to choose between **languages**. Select the species for the biomass function and the **weight constants** can also be used to fine tune the average weight calculations for each group.

The Control function is for devices connected to the "Alarm" connector on the counting head.

- There are 4 options:
 - 1. None: No control function activated
 - 2. Overload Alarm: enables an external alarm to sound when the counter is overloaded.
 - **3.** Batch Alarm: sets the external alarm to signal when the batch number is reached.
 - 4. Batch Splitter: this controls a batch splitter with twin outlets. This function counts a pre-selected number of fish through the counter into one outlet, then automatically switches to the other outlet and resets the batch count.



Batch Number: This is used to set the number at which the batch alarm or batch splitter will be activated.

"Reset" this button is used to turn off the external alarm and to switch between outlets on the batch splitter.

Settings				
Settings Multi Channels Advanced Report Licence Codes				
Language				
Fish type to Weight	Weight constants	Control function (Ctrl port)		
 Salmon/Trout 	100	C Overload Alarm C Batch Alarm		
C Sea Bream	100	C Batch Splitter		
C Sea Bass	100	Number 100 🝨		
Folder for Report and Record file C:\Reports\				
VAKI Micro/Macro counter Version 386 # 37828				

Folder for Report and Record file: This shows where the folder is located that stores the report and image files created after a counting session. The preset folder is c:\reports\. The file location can be changed by pressing the dotted button to activate the keyboard to type the folder name and location. The user must be sure that this new folder has been created on the computer.

The program version: 386

The software serial number is 37828
 The camera serial number is 13036428



Advanced

Settings			
Settings Multi Channels Advanced Report Licence Codes			
Camera settings Line scan rate	Imaging hardware C Itex © GigE		
Light strength 1100	Counter type		
Image buffer size 2048×480	C 1 Nano		
Voltage 11 V	C 1 Micro		
Temperature 38 C	C 3 Micro		
Activate Biomass function C 1 Macro			
Status Active	4 Macro		
<u>Ein number</u>	C 1 Wellboat		
VAKI Micro/Macro counter Version 386 # 37828 Camera serialnumber: 13036428			

"Line Scan Rate" Shows how many lines per second the camera is scanning.

"Light Strength" This value indicates the strength of the lamp. Normally this value should be 1000-1400. Should the value drop below 700 this suggests the lamp tube should be replaced.

"Image buffer size"

"Voltage"

"Temperature"

"Active Biomass function" Indicates the status of the biomass function.

Pin number		×
Enter pin number		
ОК	Cancel]

"Imaging hardware" "Counter type" This



Report

Here it is possible to enter the name of the operator and the company to include in the Report. Also it is possible to insert an image file with the company logo.

Settings
Settings Multi Channels Advanced Report Licence Codes
Name of operator/company:
Logo imagefile:
VAKI Micro/Macro counter Version 386 # 37828 X Cancel VAKI
Camera serialnumber: 13036428

Licence codes

Settings						
Settings	Multi Channels	Ad∨anced	Report	Licence Coo	des	
	1	627330807		······································		
				Add		
VAKI M Camera	ficro/Macro cour serialnumber: 1	nter Version 3036428	386 # 378	28	🗙 Cancel	🗸 ОК



Calibration & Visibility

Each time the counter starts it carries out the following checks:

- The scanning area of the camera.
- The intensity of the light detected by the camera.

If the visibility is not acceptable, the following message will appear "**Insufficient visibility check again?**" To find what is wrong, push the "**Visibility**" button.

Visibility

Press "Visibility" button to show the visibility graph:

The black vertical lines indicate the edges of the area scanned by the camera, which should correspond to the inside edges of the counting channel.



The "**Visibility**" function is also used to check that the camera is correctly positioned and the amplification of the light is correct. It is also possible to check if dirt or residue blocks or disturbs the sight of the camera.

This diagram on the left shows how the graph should look. It shows the position of the edges of the scanning area with two vertical black lines. It also shows that

the light intensity detected by the camera is even. The scanning area on this graph is the distance between 500 and 1500 on the x-axis, and on the y-axis, the strength of the light is approx. 220. The x-axis is the length of the scanning area in pixels (1 pixel = appx.0.55 mm). The graph for Nano should indicate 730 pixels (400mm) The y-axis is the strength of the light on scale 0 to 255. The counter ignores the area

outside the edges. If the strength is under 180 or over 250, the counter must be re-calibrated. (See section: **10.2 Counter Calibration**)

The diagram on the right shows how the graph can look when something disturbs the light. In this case, the reason may be humidity or dirt on the mirror. This would prevent





calibration of the camera. In this case, it is necessary to clean the mirror.

The black vertical lines should be positioned where the light intensity (shown by the red curve) falls steeply. If not it is necessary to re calibrate (**see Counter Calibration**).

If no red curve appears this may be caused by, no light source (lamp) or the counting head is not positioned correctly on the counter body.

Counter calibration

The **Calibration** function calculates a new position automatically. Press **"Calibration**" button on main screen with no water running through the counter.

It is also important that the lamp has been on for five minutes or more and the mirror and camera window are clean. Wait until **counting** message appears on bottom left of screen. It is good practice to re check the "**Visibility**" graph. If the edges of the scanning area are still not acceptable then it may need to be done manually.

Calibrating	×
Calibrating Counter	
	_
l	





View report

After pressing "**End counting session**", the programme automatically creates a report file. To open and view the reports press the "**Report**" button on main screen. A list of all stored counting reports is displayed. Each report is labelled by date and tank name. With the Biomass function the average weight, total biomass, standard deviation, and size distribution chart is included in the report.

A company logo can be printed on the top right of the report. The logo must be in a Windows Bitmap format and under the filename logo.bmp in the folder **c:\Reports**





View record



To view the images stored press "**Record**" on the main screen. The files are labelled by date and tank name, open the file to be viewed from the list. Each screen shows a recording for around one-second interval.

The graph at the top of the screen indicates the rate of fish through the counter over time. Press the graph and a graph for the next counting channel will be shown.

- **♦** buttons are used to move to the next screen.
- **↓** buttons locate the beginning and end of the recording.

Start/End button, is used to select a part of the recording to be counted.

The pointer indicates the location of the screen currently viewed and can be dragged to quickly locate a position in the recording. **"Close"** to exit.



Technical specification

Nano Size: 1.7x 0.75 x	1.4-1.9 m (L x W x H)
Material:	Stainless steel (AISI 316L)
Light source:	VAKI Led light.
Power consumption:	110/220 V
UPS requirement:	80-100W
Size of inlet/outlet pip	es: 2"in and 4"out
Size of dewatering pipe	e: 2"

Capacity:

Fish size

	<u>Fry/min</u>
0,3 g	7000
1 g	4600
3 g	3100
10 g	2100
30 g	1400

Accuracy:	98% -100%	

Fish species: Sea bass, sea bream, salmon, trout, halibut, turbot, tilapia, cod, and ornamentals.



Nano Counter





Storing

When storing the NANO Counter it is important to bear the following in mind:

- Store the Counting Head in a safe, dry place where temperature fluctuations are not great.
- Clean any salty seawater off the counter with fresh water after use.
- Ensure the counting head is handled with care.