USER AND MAINTENANCE MANUAL

Vicass HD - Biomass estimator

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For a thorough introduction of Your AKVA product, we ask that all users read this entire manual. If questions occur, contact us!

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This document can also be read and downloaded from our web site, see www.akvagroup.com/products/user-manuals

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Table of contents

1 Safety ................................................................................................................................................. 5
  1.1 Safety symbols used in this manual ................................................................................................. 5
  1.2 Receiving a new product - Warranty ............................................................................................... 6
  1.3 Connections and cables .................................................................................................................. 6
  1.4 Vicass HD Field computer ............................................................................................................. 7
  1.5 Vicass HD Camera ........................................................................................................................... 7
  1.6 Blind plugs ...................................................................................................................................... 7
  1.7 Shocks ........................................................................................................................................... 8
  1.9 Maintenance ................................................................................................................................. 8

2 Introduction ......................................................................................................................................... 9
  2.1 How to use this manual .................................................................................................................. 10
  2.2 About AKVA group ....................................................................................................................... 11
  2.3 About Akvasmart Vicass HD ......................................................................................................... 12

3 Starting up and shutting down the field computer ......................................................................... 18

4 Main menu ........................................................................................................................................... 19
  4.1 Read Manual = opens user manual ................................................................................................. 19
  4.2 Capture Series = capture images ................................................................................................... 19
  4.3 Stop Series = stop capturing ........................................................................................................... 19
  4.4 Properties ....................................................................................................................................... 19
  4.5 Flat battery .................................................................................................................................... 21
  4.6 Exit = close and shut down the program ......................................................................................... 21
  4.7 Exposure ....................................................................................................................................... 21

5 The camera unit ................................................................................................................................ 22
  5.1 Before use ....................................................................................................................................... 22
  5.2 Connecting the camera .................................................................................................................... 22
  5.3 Camera signals ............................................................................................................................... 22
  5.4 Camera suspensions ....................................................................................................................... 24
  5.5 Positioning the camera .................................................................................................................... 24
  5.6 Lighting .......................................................................................................................................... 26
  5.7 Cable coiling ................................................................................................................................... 26
1 Safety

Safety for the users of our products, is top focus when developing new products and user manuals in AKVA group.

Therefore, we strongly recommend that everyone that is going to be using it, carry out repairs, service and maintenance on the product, as well as everyone working in the area where the product is installed or being used, reads this entire manual, and especially this safety chapter.

This recommendation is based on both personnel safety, as well the desire to keep the products in order as long as possible, by avoiding any damages risked if the safety instructions are not followed.

1.1 Safety symbols used in this manual

The following symbols are used in this manual:

- **Information**

- **Show caution, danger of damaging equipment and mild injuries to personnel**

- **Warning - may cause injuries to personnel**

1.1.1 Other symbols used in this manual

Go to, or see chapter or page for further instructions or more information
1.2 Receiving a new product - Warranty

Always make sure that the delivery is complete according to the service note. If the order is not complete or if any other errors are discovered, contact AKVA group immediately.

Contact information is found in the back of this manual.

AKVA group ASA provides a 1 year warranty that covers any manufacturing defects. The warranty is effective upon date of shipment to original recipient.

The following are reasons for a void of warranty:

- Poor treatment of the system due to negligence of preventive recommendations in this manual, or from improper use of power source

- If the Field Computer and/or the camera units are opened without express written consent of an AKVA group employee.

1.3 Connections and cables

Treat cables and connections carefully. If instructions in this manual are not followed, the operating time of the equipment may be shortened, and any warranty may be declared as void.

See chapter 6.7 for cable handling instructions, and read chapter 11 for instructions on how to maintain connections and cables.

Avoid twirling the camera cable, and make sure that there is no tension in the cable.

The cables must not be installed if they have any bends or other damages.
1.4 Vicass HD Field computer

Although the field computer is a rugged product designed to stand a certain amount of shock, it is still a computer and must be handled with absolute care.

Let the field computer temper before use both in- and outdoors. If the temperature variation is more than +/- 10 °C, leave it for tempering for 30 minutes before it turning it on.

1.5 Vicass HD Camera

Although the camera is a rugged product designed to stand a certain amount of shock, it is still a camera and must be handled with absolute care.

When the camera is connected to the field computer, it will be consuming power, even when it is not being used.

The battery must not be fully discharged, and it is therefore important that the camera is disconnected from the field computer is soon as the battery is starting to run out. This is necessary in order to avoid discharge and thereby damages to the battery.

1.6 Blind plugs

It is important to make sure that all blind plugs are intact at all times. If these are damaged, the warranty may be declared as void or be reduced. Make sure not to tear the blind plugs off from the field computer or cable ends, they must always be fastened to their separate connections. If a plug is torn off and disappears, order new plugs from AKVA group immediately. Contact information is found in the back of this manual.
1.7 Shocks

It is important that the Vicass HD equipment is treated carefully when it is being moved around on the site. The camera weighs 16kg and the field computer-box weighs 12kg, although they may be heavy to handle, they still need to be handled with care. Never forget that the equipment consists of a camera and a computer when handling the Vicass HD!

When moving the Vicass HD from one location to another, the equipment must be placed inside the transportation case. This is a special designed case that will protect the equipment during transport. Handle the case with caution also!

1.8 Maintenance

Follow the maintenance instructions in chapter 11 to ensure a long lasting product.
2 Introduction

This user manual is part of the equipment delivered with Akvasmart Vicass HD. Keep the manual for as long as the biomass estimator is being used, and make sure that all changes to the equipment are being noted in the back of this manual.

Thank you for choosing AKVA group ASA as supplier for your biomass estimator. Do not hesitate contacting us for more information regarding installation, use or maintenance for Akvasmart Vicass HD or any other AKVA product.

The purpose of this manual is to make the user use and maintain Vicass HD in a safe and economical way. The manual will show how to use and maintain the product, as well as hopefully answer most day to day questions. If there is anything relevant this manual does not explain or answer, please contact us for assistance and help to find a solution to any problems. Contact the AKVA service department, your subcontractor, your local AKVA office or our main office in Norway for assistance and help.
2.1 How to use this manual

This manual describes how to use and maintain Vicass HD in the best and safest possible way. This entire manual must be read and understood by ALL users prior to use of the biomass estimator.

Before the first chapter, is a table of contents. The headlines works as links to their respective chapter in the .pdf-file.

Chapter 1 is the most important chapter of this manual, and includes safety precautions ensuring safest possible use.

Chapter 2 contains information about AKVA group, the product, Vicass HD, as well as this manual instruction.

Chapter 3 explains how the field computer is turned on and off, chapter 4 shows an overview of the software main menu. The camera unit is introduced in chapter 5.

How to use the equipment is explained in the following section of this manual: chapter 6 explains how to capture images, chapter 7 shows how to execute the analysis, and chapter 8 describes how to complete and generate report for these analysis.

Calibration for Vicass HD is described in chapter 9, and maintenance is instructed in chapter 10. Instructions and precautions for storage and moving are listed in chapter 11.

Four appendixes are found in the back of the manual: Index, with links to the rest of the manual in the .pdf-document, a deviation form for all deviations with the system and the product, pages for notes about new and extra information are also in the back of the manual, and in the last pages are AKVA contact information found.

This entire manual must be read and understood prior to use, as well as used as aid during use and maintenance of Vicass HD
2.2 About AKVA group

With four main brands, AKVA group ASA is a world leading supplier of technical aquaculture equipment. Since 1980 we have developed and produced fish farming equipment, both for cages at sea and for land based hatcheries. AKVA represents an industrial standard, which is presumed to be the turn key to the future. Research, project management, fast deliveries and customer follow-up have been our focus to ensure that we contribute to a positive development within the agriculture industry. Our goal is to deliver the best possible and most cost efficient equipment in order to keep preserving sustainable farming.

We have a wide variety of products, for example: plastic and steel cages, high pressure washers, net washers, boats, feed barges, feeding systems, cameras, sensor systems, under water lighting, software for fish farming and recycling systems.

AKVA has a continuous development of products, and we continue to improve product safety, functions, range of use and reliability. The purpose of this manual is to enable users to use and maintain the Vicass HD in a safe and economic way.

All of our equipment is pre-installed, tested and delivered from our own production department. This means that our customers have total control over which components you can choose from, grouping collocation, testing and deliveries. Our production staff consists of people with great expertise and engagement for producing the best possible products. Having our own production site provides excellent service in case something should go wrong, or if assistance is required. Our service staff is available over telephone or on location to assist whenever necessary. Safety, both for users and equipment is main focus when AKVA group develops products and product manuals.
2.3 About Akvasmart Vicass HD biomass estimator

Vicass stands for Video Image Capturing and Sizing System, and this is an innovation in measuring live fish average weight in cages. The system is accurate, fast and causes no stress to the fish.

The new Vicass HD (High Definition) will provide farmers with accurate and efficient biomass estimation, capturing high quality digital stereo images of the live fish swimming in the cage. The images are analyzed in order to determine average weight of each fish. The new Vicass HD can now connect to an off-the-shelf tablet PC, which reduces size and weight.

A stereoscopic video image measures the height and length of each fish while swimming in the cage. Advanced geometry algorithms accurately estimate the live weight of the fish, and provides a detailed biomass report which includes accurate size distribution graphs.

2.3.1 Main benefits of the Vicass HD

- High accuracy, capacity and speed
- Predictable production gives a more cost efficient production
- Touch-screen provides a higher selection- and report speed than other systems

2.3.2 Available models

2.3.3 Concepts and techniques

The concept of the VICASS HD is to obtain a representative weight sample of a cages of fish. There are many keys in making this a consistently accurate operation. Factors that will affect the quality of the images include:
- brightness
- water quality
- the calmness of the fish
- size of the fish

With ideal conditions, small and calm fish, clear water, good lighting and several fish swimming by the camera, it might be enough to capture around 50 frames in order to estimate mass of 100 fish. If the conditions are not this good, it may be necessary to capture up to 150 frames to estimate 100 fish.

The ideal image of a fish is a nice side profile with no curve. To improve the obtainable results, try positioning the camera in a spot in the cage where the fish tend to be moving by in a straight line. If the fish have been or are being fed, wait until they have calmed down before capturing the frames.

Sampling from different depths is especially important when fish stratify in the water column to prevent single depth sampling from only one distinct sub-population that may have an average weight that differ from the cage average weight. Capturing images at multiple depths (typically 2-3 depths), will ensure that if fish stratification is present, capturing several depths will not affect the results. Sampling positions may be reduced to only one where the fish population has a high level of mixing, for instance in cages where dominance is absent. We recommend to always sample from the densest part of the fish. Read more about capturing with Vicass HD in chapter 6.
2.3.4 Camera parallax

The camera parallax is the overlapping area where both cameras have vision. As the figure below shows, top and bottom cameras will not capture the same images. There will always be a part from the top frames that will not show in the bottom frames, and vice versa. To make sure that fish may be measured, they must be visible in both top and bottom camera. This means that fish from the top of the top frames and fish from the bottom of the bottom frames, will not appear in both frames, and can therefore not be used for measuring.

The cameras centers are placed 15cm apart, in order to minimize the “blind zone” providing captured images that are more useful than from the earlier biomass cameras. The closer the fish swims to the camera, the less fish for measuring will be provided by each frame, and a distance between 60 and 200cm is ideal.

The ideal image will show a fish’s nose, tail, belly and back both in the top and the bottom camera.
2.3.5 The field computer

USB-port
Plug an USB stick in to the USB-port. Save images to the stick, this way they can easily be moved from the field computer to the analyzing computer. See chapter 6.3.4 Moving images from field computer to analyze computer for more information on this.

Fuse
The fuse needs to be connected at all times during use of the Vicass HD to avoid that remaining technology is affected in case of any power errors.

Power connection
Connect the power only when the field computer and the camera are going to be used. When connecting the power, the field computer will start up automatically. Use a 12V battery or Vicass HD power supply.

Camera connection
Connect the camera to the field computer before connecting it to power, this will ensure that the camera is ready when the computer is, as the camera use about 25 seconds to start up.

Keyboard
The on screen keyboard will appear when the field computer starts up. Hide this keyboard by clicking the _-button. To close the keyboard, click the X-button. Be ware that the keyboard will need some time to open when it is closed. To open a closed keyboard, open task manager, and find the keyboard-icon from the start-menu.
**Touch screen**

The touchscreen is similar to most touch-screens you would find in a tablet. A great difference is that the touch-screen on the Field Computer can be used in wet and dry conditions. To use the touch screen, press firmly with one a finger on the screen. To move the mouse cursor up, move your finger up and so forth. To click on a button or another place on the screen, simply use a finger or a fingernail and place it on the desired text, link or similar. For the remainder of this manual, we will refer to this as a click.

*In some cases it may be preferable to use a finger-nail to click on the touch screen, especially if the user has large fingers which can be hard to use for small and narrow clicking-areas on touch-screens.*

The start-menu and the task manager are hidden in the left side of the screen. They can easily be shown and used by clicking on the left side of the screen as shown in the images below. The line will disappear automatically after a few seconds, but can be re-opened by clicking the left side again.
2.3.6 Equipment specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply (AC adapter)</td>
<td>12VDC/110-230VAC-50/60HZ</td>
</tr>
<tr>
<td>Power consumption</td>
<td>4A</td>
</tr>
<tr>
<td>Ingress Protection</td>
<td>- Camera: IP68</td>
</tr>
<tr>
<td></td>
<td>- Field computer w/plugs: IP64</td>
</tr>
<tr>
<td></td>
<td>- Field computer, lid closed: IP67</td>
</tr>
<tr>
<td>Size camera (l x b x h - weight)</td>
<td>515mm x 130mm x 195mm - 16kg</td>
</tr>
<tr>
<td>Size field computer (l x b x h - vekt)</td>
<td>485mm x 392mm x 195mm - 12kg</td>
</tr>
</tbody>
</table>
3 Starting up and shutting down the field computer

1 The field computer will normally start up as soon as it is connected to power. The green indication light on top of the screen frame will be turned on. If the field computer does not start up, press the power button on the left side of the computer screen (just a light press, not more than 0.5 sec.) to turn it on manually

ON:  

OFF: 

2 When the power is on, Windows will start

*This start-up will appear up-side-sown, but it will turn around when the operative system is started*

3 When the field computer is started properly, the VICASS HD Software screen image and a screen keyboard will open on the screen. If the camera is connected to the field computer (recommended), live video images will appear on the screen

4 Capturing may begin, see chapter 6 for further instructions

5 Turn off the field computer by closing all programs. Remember to save all data first, and choose shut down in the start menu.

*If necessary, the on/off-button may be used to turn off the computer, hold it in for about 3 seconds. We strongly recommend to always turning off the computer by using the shutdown button in the start menu to ensure that all data is saved properly*
4 Main menu

4.1 Read Manual = opens user manual

The Read Manual tab will open an online user manual similar to the one you are currently reading.

4.2 Capture Series = capture images

The capture series starts the automatic capturing of images according to the user specifications set in the Properties section.

4.3 Stop Series = stop capturing

The Stop Series button stops the auto capturing of images and allows the user to capture frames manually. It is also possible to change the properties when the series are stopped. This is the best suitable for capturing in different depths in the same series.

4.4 Properties

The properties section is the place where you can set a variety of user preferences and find information.
4.4.1 Number of images
Select how total number of images to be capture in each process from this drop down menu.

4.4.2 Scroll bar for frame rate settings
Frame rate is used to set number of images captured per second. This setting is based on ocean currents and the swimming speed of the fish.

4.4.3 Root path for images
Find the folder in which the images should be saved.

4.4.4 Disk usage
Shows current used and available disk space.

4.4.5 Capture history
Paths to all saved images and series are found here. Go directly to a folder by clicking the Explore-button.

To close a viewing, hold one finger (or finger nail) on the touch screen until the menu on the left appears - choose Exit.

*(holding the finger to the touch screen is equal to a right clicking with a mouse)*
4.5 Run down battery

If battery is used as power source, the camera will shut down when the battery *begins* to run down, because it needs full power to run. The capture screen will turn black, the camera indicator-light will change color, and the warning below will appear. The battery must not be entirely discharged, so if the camera shuts down and no back-up power source is available, the field computer needs to be turned off too. Remember to save all work before shutting down.

![Error message](image)

4.6 Exit = close the program

To close the Vicass HD Capture Software, click the Exit button.

4.7 Exposure

When using Auto Exposure, the software considers the brightness in the area when capturing in order to provide best possible images.

Manual Exposure means that the brightness is manually set by the user. Set brightness by using the scroll bar in the bottom of the screen.

Change between automatic and manual capturing by clicking the Exposure button.
5 The camera unit

5.1 Before use

Before using the camera, the lenses must be controlled. If these are spotty or dirty, clean them to make sure that images for analyzing are accurate and not disturbed by spots on the lenses.

5.2 Connecting the camera

Start up the camera by connecting it to the field computer. Remove the blind plug from the camera connection port and connect the camera cable. To save time, connect the camera to the computer before turning the computer on/connecting the computer to a power source. This is because the camera needs about 25 seconds to get ready for use.

![Camera connection diagram]

5.3 Camera signals

1. Connect camera to field computer
2. Connect field computer to power source and the field computer starts up
3. The capture series program starts up automatically
4. The camera signal icon shows when the camera is connected correctly:

   - The top button represents the top camera
   - The bottom button represents the bottom camera
Images from the top camera is now shown on the screen, this is indicated by a light green color. To change between top and bottom cameras, click the dark green button to open this camera. The viewing will change.

This message appears on the screen whenever the camera is not connected to the field computer, if the camera signals are not picked up by the field computer as well as when the battery is running down:

Try restarting the field computer or reconnect the camera.

*If the battery is running down, turn off the camera and disconnect it from the field computer. If this is not done, the battery will continue using power and the battery will be damaged if it is run down completely*

In addition to the Error-message, the camera signal buttons will turn dark red when the battery is running low. If this message appears when the camera is connected and the battery is not run down, the field computer needs to be restarted.
5.4 Camera suspensions

The camera has two lifting hooks, one on each side, to attach the ropes. Use both to make the camera hang steadily in the water. Additionally, fastening-hooks may be attached in front or on the back of the camera as well to achieve desired angle.

Fasten the rope with and ensure that the ropes do not loosen when the camera is in the water.

Examples to how the camera might be hung in the cage:

5.5 Positioning the camera

There is no key answer to where camera should be positioned for capturing, but this is integral to good frame results. Best position varies with species, lighting conditions, the user, season among other things. Some may prefer the sun in the background to create good contours and others may prefer to use the net as background.

As shown in the photos in the next page, the fish will not always swim straight by the camera. The user preferences may vary, and all users need to proceed tentatively to find the best way for capturing usable frames for measuring.

The range of the Vicass sizing software to size accurately is 60-200cm. If the fish are too far away from the camera, the analyze software will reject them. So when grabbing images of the fish, make sure they are within the defined range.
When the camera is placed in the preferred horizontal position; lower it as deep into the water as you still can see the fish. If there are lots of fish present on the screen, and they are nice and close, you may begin grabbing images. If there are no fish to be seen readjust the camera and check again.

Sometimes the fish can be scared of the camera. Give them a chance to get used to it being in the water (about a minute). If they are still not close enough, try moving the camera to another depth.
5.6 Lighting

Capturing will always turn out the best in daylight, with the sun at its highest in the sky.

5.7 Cable coiling

The cable may be rolled together as a regular rope, but make sure that no bends or twists appear on the cable roll. Also consider that the cable is going to be used again sometime, and therefore will be easiest to handle if the coiling is done systematically and neatly. Fasten the roll and its end piece with a rubber strap, some tape or strips after use.

Make sure that the cable ends are easy to locate for the next use, and make sure that the ends are not tread through the center of the coil.

Make sure that there are no bends in the cable during the coiling process, because these may cause irreparable damage to the cable.
6 Capturing images

Before the camera is used, it is important to check the glass covering and protection of the camera lens for salt water remnants or other spots that may cause wrong measurements. Clean off any spots and follow further instructions.

6.1 Preparations

1. Firstly, connect the camera to the field computer, and connect the computer to the power source. Use either shore power or a fully charged battery.

2. The field computer starts up automatically when connected to power, if not: by pressing the power button on the left side of the screen -->

3. The Vicass HD Capture Software will also start automatically when the computer starts up.

6.2 Capturing frames

There are two ways if capturing frames: manual and automatic. After finding the best camera position in the cage, and the Capture Software has opened, the capturing may begin. When a usable image is shown on the screen, click on the image and the frame is captured.

In the top left corner of the screen, there is an indication to how many images are captured in the current series:

“Acquiring image 1 of 10” when capturing image 1
“Acquiring image 2 of 10” when capturing image 2
“Acquiring image 3 of 10” when capturing image 3
.....
Before the automatic capturing can start, various settings need to be set:

**Number of images** – must be large enough to ensure enough usable frames

**Frame rate** – the less active fish, the higher rate (very active fish – lower rate)

**Root path for images** – folder for where the frames will be saved

The program will automatically save all images that appear on the screen when capture series is activated. This means that for every time the screen image is updated, the image will be captured and saved automatically. This goes on until the given number of images has been reached. How long this takes, varies as a function of frame rate declared in the Image Setup.

Many of the captured images may not be applicable for measuring. However, this method will be efficient when the fish swims together, and most of the images contains good images of fish and therefor are useful for analyzing.

The frame rate must also be high enough, so that each fish will not appear in two following frames. Several measurements of the same fish from two (or more) different frames will spoil the result of the biomass estimation as this will not give an accurate estimation.

Make sure to capture enough frames (400+) and check that the fish swims nicely by the camera from time to time. Automatic capturing is efficient when time pressure is high, as the user is able to perform other tasks while the Vicass captures the images without constant surveillance.
6.3 Switching between manual and automatic capturing

It is possible to switch between manual and automatic capturing during the capturing process:

- From manual to automatic:
  - Click on the Capture Series-button

- From automatic to manual:
  - Click the Stop Series-button
  - Capture the frames by clicking on the touch-screen as the desired image is shown

6.3.1 The ideal image

An image with one or more fish with a nice side-profile, without curves, is the most usable image. The nose, belly, back and tail must be visible to attain an accurate estimation with Vicass HD.

6.3.2 Finishing the series before all frames are captured

If there are sufficient useful frames before the number of preset frames are captured, the series may be stopped:

1. Choose Properties from the main menu
2. Image Setup
3. Change Number of Images to a lower number
4. Capture one more frame (manually if the capturing is set to manual)
5. The series will end.
6.3.3 Edit sequence information

When the predetermined number of images has been captured, the window to the left will appear on the screen.

If there are any comments to the captured series, these may be filled out in the Optional Comment box. Remember to click the add-button. The comment will follow the photos. Change Site name and/or the Cage ID if necessary and chose Fish Species from the roll down menu.

It is very important to chose correct species, or else the entire analysis will be miscalculated

6.3.4 Moving images from field computer to analyzing computer

Insert an USB memory stick in the field computer USB port and follow the instructions below to move the captured frames from field computer to analyzing computer:

1  Click and hold the pointer on the name of the folder where the recently captured images are saved to open the ‘right click menu’

2  Choose ‘Copy’

3  Open the memory stick folder

4  Click and hold inside the folder to open the ‘right click menu’ (same menu as in pt. 1)

5  Choose ‘Paste’

6  Close the memory stick folder, remove the USB stick and proceed to chapter 7.3 to continue with the analyzing process or go to the start of chapter 7 if the Vicass Analyzing program is not yet installed in the analyzing computer.
7 Vicass HD Analysis

Install Vicass HD Analysis in a regular computer (PC). We recommend saving the program in the desktop (or saving a short-cut for the program to the desktop), so that it is easy to locate for all users. Close all other programs during the installation process.

Installing the program to PC:

a  Insert the CD/USB memory stick to the computer

b  Wait a few seconds, then click “Open folder and show the files”

c  Double click the “VICASS HD Analyze Installer”-folder to open

d  Double click the “VICASS HD Installer”-folder and double click the “Volume”-folder to open them

e  Double click the “setup.exe”-file to initialize the installation

f  Follow the instructions from the installation wizard to complete the installation.

7.1 Main menu

Click the ‘Analysis’-button to go to the analysis area

Click the ‘Report’-button to open the report

Click the ‘Help’-button to open the user manual

Click the ‘Exit’-button to exit the program
7.2 Uploading images and start the analyzing

1. Click on the 'Analysis'-button in the main menu and choose the folder where the captured frames are saved.

2. Click the 'Current Folder'-button to open the frames in the analysis-program.

   !

   Do not choose 'Open'.

3. The first frame captured will appear on the screen and the analyzing may begin.

7.3 Navigation commands

The most frequently used analyze commands:

<table>
<thead>
<tr>
<th>Key</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>F3</td>
<td>Jump to</td>
</tr>
<tr>
<td>F4</td>
<td>Previous</td>
</tr>
<tr>
<td>F5</td>
<td>Next</td>
</tr>
<tr>
<td>F6</td>
<td>Save and stay</td>
</tr>
<tr>
<td>F7</td>
<td>Save and next</td>
</tr>
<tr>
<td>F8</td>
<td>Mouse click</td>
</tr>
<tr>
<td>F9</td>
<td>Fit image to screen</td>
</tr>
<tr>
<td>ESC</td>
<td>Empty</td>
</tr>
<tr>
<td>DEL</td>
<td>Delete all</td>
</tr>
<tr>
<td>END</td>
<td>Delete fish</td>
</tr>
</tbody>
</table>

Use the left hand to click the tab-buttons F3 to F9, this will save some time while marking the fish for measuring.
All analyze commands:

Zoom in

Shift + Zoom out

Move around in the frame

Tool for sizing the fish. Click on nose, tail, back and belly

If the box is ticked ‘on’ (green dot) both top and bottom frames will zoom. If the box is ticked ‘off’ (gray dot) in one frame, only the other one, which is ticked ‘on’ will zoom.

Takes you to the frame in the series that you type in

Takes you to the previous frame in the series

Takes you to the next frame in the series

Save the measurement and stay in the same frame

Save the measurement and go to the next frame in the series

Mouse click

Clear current selection

Erase all saved measurements of fish in the current frame

Erase a specific measurement of a fish in the current frame

Zoom to fit the image to the frame
7.4 Selecting fish for measuring

The ideal image of a fish is a nice side profile without any curves. You need a good view of the fish’s back, belly, nose and tail. Make sure that the fish appears in both the top and bottom frame. Be very accurate during this marking job.

Marking process:

1. Choose one fish for measuring to start with. Click on the symbol (a cross-hair symbol will appear) and move the pointer to the top frame fish’s nose, and click it. The number 1 will appear after the nose has been marked.

2. Mark the center of the fork of the tail of the same fish in the top frame, and click it. A number 2 marking will appear. A red line will appear between the two marked points (1 & 2).

3. Same fish, same frame: Position the cross-hair on the “tallest” part of the fish and click for the number 3 marking. The point of this marking is to select the part where the fish is at its tallest/thickest.
4 Position the cross-hair so that the 4th point makes a vertical red line from point number 3. Make a ~ 90° angle between the vertical and horizontal lines.

5 Repeat these processes (1-4) for the bottom frame. Make sure to measure the same fish in both frames!

6 Click the F6 key to save the measurements and to stay in the same frame. Click F7 to save the measurements and move on to the next frame in the series.

7 To redo a measurement, click the ESC key (Clear). Once a fish has been sized and saved, it will be marked with a red cross (see image below) to prevent the operator from measuring the same fish twice.
7.5 Delete markings

If the markings has to be deleted for any reason, go to the frame and press the End-button. White boxes will appear around all fish that have been marked in this frame. Click inside the white box to delete the marking.

Click the End-button again if you want to proceed.

7.6 Marking fish - a quick guide

Start in the top frame and mark:
1. the nose
2. the center of the tail
3. the tallest point
4. the lowest point
   (make sure that the horizontal line between 3 and 4 is as angled to the vertical line between 1 and 2 as possible)

Repeat in the bottom frame.

Save and stay (F6) to keep marking in the same frame.
Save and next (F7) to keep marking in the next frame.

Delete markings:
END -> White box -> click in the box you wish to delete
DEL -> Deletes all markings in the frame
7.7 Selection summary

When the fish are measured, the Vicass HD Analyzing Software will start by creating a selection summary. This summary will show all completed measurements, as soon as they are completed.

In the selection summary all saved measurements from the current capturing are listed:

**Frame:**
- Refers to the image number

**Weight:**
- Calculated weight on sized fish in this frame

**Length:**
- Measured length on sized fish in this frame

**Height:**
- Measured height on sized fish in this frame
7.7.1 Frame min/max
The smallest and largest fish from each frame will show here. If large deviations appears here, we recommend checking them out to find what is causing them. Great deviations are usually caused by inaccurate or incorrect measurements (for instance when the two different fish are measured in top and bottom frame). Any errors like these will affect the results, and should be corrected or removed before completing the analysis process.

7.7.2 Size summary
The size summary diagram presents an accurate biomass distribution graph:
7.7.3 Confidence

When the confidence number has reached 97% (or more), proceed to the report procedure in chapter 8.
8 Report

When confidence > 97% is accomplished, the report may be generated. To start generating, click on ‘Report’ from the main menu.

Find the correct folder, click on its name to mark it, and confirm by clicking on Current folder.

8.1 Editing the report

Before the report is finally generated, the following must be checked and, edited if necessary:

- Site
- CageID
- Cage population
- Comments
- Species
8.2 Save and print report

To save the report as pdf:
- File -> Save as pdf or
- File -> Print and choose a pdf printer

To print the report:
- File -> Print or Ctrl+P

Delete frames from the field computer when the analyzing process is done.

8.3 Close the program

To close the Vicass HD analysis program, click on the Exit button in the main menu.

Remember to always save all work done in the program before it is closed
8.4 Statistics for the report

This is a description of the possible statistics to display:

**Average Weight:**
- The average weight of the fish sampled in the database.

**Average Dressed Weight:**
- The average weight of the fish sampled minus the gutted loss inputted by the user.

**Weight STD:**
- The standard deviation of the average weight. This is a measure of how widely values are dispersed from the average value. The lower the standard deviation, the less individual values vary from the average.

**Dressed Weight STD:**
- The same as the Weight STD only using the Average Dressed Weight.

**C.V = Coefficient of Variation:**
- This is useful in comparisons of samples where mean and variance, vary together. This value is calculated as the percent of standard deviation of weight divided by the average weight.

**Sample Size:**
- The number of fish sized in the database.

**Percent Rejected:**
- If any fish are outside of four standard deviations from the mean, they are considered outliers and are not included in the data set.

**Confidence:**
- Equal to 100% minus the probability of errors between the distribution of the sized and a reference Gaussian distribution. It is assumed that the weight distribution of fish is Gaussian.
9 Calibration

When calibration test for the Vicass HD camera is needed, use the attached “Calibration Fish” chart.

Capture images from several distances, from 60 to 200cm with the chart centered in the image.

Transfer the images to the analyse computer and analyse the results as described in chapter 7.1.
The chart size is 280mmx70mm. The measurements from the analyse will normally be within +/- 5mm of these values.

Should the measurements be more than +/- 5mm, double check that the measuring has been performed correctly by capturing a new set of images and analyse them.

If the control measurement difference is also more than +/- 5mm, contact AKVA service personnel for calibration control and possibly maintenance or repair.

If the calibration is good, and the average weight satisfyingly measured, the cause may be that the capture series does not reflect a representative biomass selection or that the analyse model does not correspond with the applicable fish species.
9.1 Unsynchronized frames

If frames from top camera is not in sync with frames from the bottom camera, please report this to AKVA group immediately.

If there only a few frames are out of sync, and there are a enough frames for a complete analysis from these, proceed. If there are more unsynchronized frames than there are synchronized, restart the field computer.

If this happens on several occasions, this may be prevented by closing and restarting Windows after capturing in each cage.

![Switching options](image.png)

*Please inform AKVA group immediately about any case of frame unsynchronization in the Vicass HD Biomass Estimator*
10 Maintenance

Never use high pressure washers to clean this equipment, use only normal-pressure hoses and soft cotton cloths for cleaning the VICASS-equipment.

The four connections/ports (for USB, fuse, power and camera) in the field computer, must be covered with blind plugs at all times when the equipment is not being used. Contact AKVA and order new plugs if any are broken or removed from the field computer.

All of connections must be sprayed regularly with a thin layer of siliconc grease to prevent verdigris and hereby increasing Vicass HD’s operating life.

Before use, the camera lenses must be cleaned to remove any spots, both visible and invisible. If there are any scratches, the lens must be replaced. Any spots or scratches may affect the measuring result negatively.

After each use, the camera unit must be rinsed off with fresh water in order to remove any salt water deposit. Use a soft cotton cloth to wipe off excess water from the lenses after the rinsing.

Disconnect all equipment from the field computer, replace all of the blind plugs, and rinse off any sea water with fresh water from the field computer, both inside and outside. Wipe dry with a soft cotton cloth, and be extra careful while wiping off the touch screen.

Before moving any equipment from one site to another, it is decreed by law to disinfect every part of the equipment. Make sure to rinse off the disinfection detergents with fresh water so that the chemicals do not harm gaskets or any other parts of the equipment.
10.1 Check list for maintenance Vicass HD

Make copies of this form before filling anything in.

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<th>Date</th>
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11 Storage

Follow these instructions in order to avoid damages to the products:

- Do not expose the field computer to any types of shock. The field computer is especially sensitive to shock and vibration when it is in operation.

- Do not expose the field computer to temperatures below -10°C (14°F) or above +50°C (122°F).

- Degrees of ingress protection (meaning protection against water: “spray water falling at up to 60° from the vertical”)
  - camera: IP 68
  - computer, open position, plugs connected: IP64
  - computer, closed position: IP 67

- Do not expose the equipment to heavy rain, dust or dirt or direct sunlight.

- Do not subject the field computer to magnetic fields.

- Never place objects on top of the field computer as this may cause damage to the unit.

- Never place the field computer on uneven surfaces.

- Make sure the equipment is clean and dry after use, and stored it indoors at room temperature. The field computer must be open during storage.

- Never place objects on top of the Field Computer as this may cause damage to the unit.
11.1 Moving field computer ON site

1. Save all ongoing work
2. Shut down via the start menu
3. Disconnect camera and power unit
4. Replace blind plugs
5. Move the computer to desired location on the site.

11.2 Moving field computer from site to site

1. Save all ongoing work
2. Shut down the software
3. Shut down via the start menu
4. Disconnect camera and power unit
5. Replace the blind plugs
6. Disinfect the equipment according to safety regulations and rinse with fresh water
7. Dry off any moist and water residues, and place the field computer, the camera and all belonging cables in the protective transportation case, and the Vicass is ready to be moved to a new location.
Appendix A - Index

A
auto exposure 21
automatic capturing 19, 28, 29
average weight 12, 13, 41, 43

B
battery 7, 15, 21, 23, 27
bottom frame 14, 33-36

C
cable 6, 7, 22, 26, 28, 43
cage ID 29
calculated weight 37
camera connection 15, 22, 45
camera parallax 14
camera position 27
confidence 39, 41
cross-hair 34, 35
current folder 32, 39

d
deviation 38, 41
disk usage 20

F
fastening-hooks 24
frame rate 20, 28
fuse 15, 45

I
ideal conditions 13
ideal image 14, 29, 34
ingress protection (IP) 17, 47

M
manual capturing 21, 27

N
number of images 20, 28, 29

P
power 6, 7, 15, 17, 18, 21-23, 27, 45, 48
properties 19, 29

R
red cross 35
root path 20, 28

S
salt water 27, 45
screen keyboard 15, 18
sequence information 29
shut down 18, 21, 48
specifications 17, 19
summary 37, 38

temperature 7, 8, 9
top frame 14, 32, 33, 35
touch screen 12, 16, 21, 28, 43

U
USB 15, 29, 30
user manual 5, 10, 19, 30

W
warranty 6

Z
zoom 32
## Appendix B - Deviation form

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