USER MANUAL

AKVA Aurora SubLED Combi
Thank you for choosing AKVA group as supplier for Your equipment!

AKVA group develops, manufactures and supplies technology and services aimed at solving biological and technical challenges in the global aquaculture industry. All our products, from single components to service assignments and complete farms, are designed to achieve the best possible fish welfare, operational performance and profitability for our customers.

We aim to write easy to understand user manuals, while providing as accurate and updated information as possible. In order to do this, we rely on input, feedback and collaboration with people who use our products. We appreciate all the input we have received, as this helps us provide better and safer equipment and solutions. Please contact us through our websites with questions or suggestions for improvements.

This AKVA group user manual is written with the purpose of complying with the standard "NEK EN 82079-1" and the requirements for "Accessory Equipment" in the standard "NS 9415".

Unless such responsibility has been agreed upon in a separate written contract with AKVA group, we are not responsible for loss, damage or incorrect use of equipment or software that arises as a result of errors in text or illustrations, or by following instructions in this user manuals.

For a thorough introduction to your AKVA group product, carefully read through this user manual before assembling, installing or using the product. Most of our user manuals are available from our website: www.akvagroup.com/products/user-manuals.

Together we can contribute to making sure that fish farming is an environmentally friendly, sustainable and growing industry that produces safe and healthy seafood for a global market.

Best regards,
AKVA group
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1 SAFETY

Safety for the users of our equipment is top focus when AKVA group ASA develop new products and product manuals.

We strongly recommend that everyone who are going to be using the AKVA product, all who perform any type of repairs, service or other maintenance to AKVA products, and all who work in areas where such products are installed, are aware of the contents in this manual.

This recommendation is based on both personnel safety as well as a desire to keep AKAV products in order, and to avoid risk of damages as a result of not following safety instructions.

1.1 SYMBOLS

Warning!
Electric shock - Safety sign that implies danger for electric shock that may cause death, serious (irreversible) personnel injuries or fish death.

Warning!
Serious health risk or other serious incidents - Safety sign that implies a danger that may cause death, serious (irreversible) personnel injuries or risk of reduced fish welfare or fish escaping.

Careful!
Health injuries - Safety sign that implies a danger that may cause light (reversible) personnel injuries.

NOTE!
Material damages - Safety sign that implies a situation that may cause damages to the products or items in the products surroundings.
**Note!**
Symbol that implies useful hints and recommendations for efficient use for the product.

**Personal protective gear**
Warning symbol that implies mandatory use of personal protection gear.

**Go to**
Symbol that indicates a link to a page or section with further information. Click on underlined words to go to the reference or open the link.

**Recycling**
Warning symbol that provides information on recycling, waste management and disposal.
1.2 PERSONNEL

Everyone who is working with or around the AKVA Underwater lights must undergo training regarding how to use the equipment, and also be aware of all dangers and consequences related to misuse. Owner and farm manager are responsible for informing all personnel about the contents of this manual. Never look directly at a luminaire that is turned on, that may cause eye damage.

1.2.1 PERSONNEL REQUIREMENTS

Installation and use must be executed by professional personnel or personnel with specific training. Electrical connections for underwater lights, shall only be executed by a trained electrician in accordance with current national and local regulations. Everyone that will participate in the installation process, use or maintain AKVA Aurora SubLED Combi, must familiarize themselves in how these tasks shall be executed, as well as all dangers associated with these tasks and this product. Owner and site manager are responsible for that all personnel read and understand the contents of this user manual before installing the product.

Tasks not mentioned in this document shall be executed by AKVA service personnel, or others that have received a specific written consent from an AKVA employee.

1.2.2 PERSONAL PROTECTIVE GEAR

Personal safety equipment, such as antiskid footwear and floating garments, are required to use when staying on the pen edge, for example when installing and maintaining underwater lights. To avoid personnel injury and damaged equipment during installation, maintenance and any repairs of underwater lights, it is important to follow all instructions provided by AKVA group in this manual, as well as to follow current laws and regulations in the country where the equipment is installed.
1.3 CORRECT HANDLING

1.3.1 RECEIVING NEW EQUIPMENT
Always check 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.

1.3.2 SUSPENSIONS AND ROPES
Make sure that ropes are not in touch with other equipment or other ropes inside the pen, such as the rotor spreader, camera or sensor suspensions and cables. This avoids interfering damages during bad weather and gnawing.

1.3.3 LUMINAIRE AND LENS
Always control that the luminaire and the lens is OK and free of any damage before it is used. The luminaire must be fully submerged in water prior to ignition. Never ignite above water or in surface position. Overheated lens can start to crack if it is exposed to rapid cooling. By simply igniting the luminaire under water, fire and cracking damage due to overheated parts is avoided.

1.3.4 CABLE
The cable must be damage free when it is connected to power. The cable must not have any bends, tears or breaks after installation. The cable is not designed to lift the luminaire. This applies to handling on land and after the luminaire has been installed. Always use lifting ropes with the underwater lights.
1.3.5 DISINFECTING EQUIPMENT

If any of the equipment, cables, ropes or other belonging equipment is being moved to a new location, everything must be disinfected to prevent contamination. We recommend rinsing with fresh water after disinfection, because the disinfectants are strong chemicals that may damage the surface materials.

1.3.6 RECOMMENDED KNOTS

It is important to use a stable knot that is easy to open when underwater lamps are installed and attached inside pens. There is a great risk that knots may loosen if they are not done properly, and this may cause the lamp to fall into the net and cause damage and in worst case, cause fish escaping. Knots that stay in or by seawater, may be difficult to release after some time. Regular maintenance, service and controls after periods with bad weather, means that underwater lamps will be taken out from the water on occasion. Ropes and knots should be easy to release, so we recommend using rolling hitch knot for suspending underwater lamps. Description for how to execute this knot, is found in Appendix D - Rolling hitch knot.
2 INFORMATION

This manual applies to all AKVA Aurora SubLED Combi, and is to be regarded as part of the product equipment. Keep the manual for as long as your AKVA product is in use, and note any changes in the back of this manual as they are performed.

The purpose of this manual is to enable the user to install, use and maintain AKVA Aurora SubLED Combi in a safe and economically sustainable way. The manual shows how to safely install the underwater lights in a pen and how to maintain the lamps, and it will provide answers to questions regarding daily use. All instructions given in this manual must be followed.

Do not hesitate contacting us if additional information about installation, use and maintenance of this or other AKVA products is required. If there are questions that are not answered in this manual, please contact us to find a solution to the problem. Contact our service department, your local supplier, your nearest AKVA office or our main office in Norway.
2.1 HOW TO USE THIS MANUAL

This manual is part of the AKVA Aurora SubLED Combi equipment, also referred to as the “sublight” in this user manual. Site owner is responsible for keeping the manual available for all personnel as long as the products are in use.

Before the first section is a table of contents. All headings in this list are links to their respective sections in pdf format of the manual.

Section 1 describes safety instructions to ensure safe and correct installation, use and maintenance. Section 2 provides information about AKVA group, the product AKVA Aurora SubLED Combi, and this introduction to the use of the user manual.

Section 3 contains information about the control cabinet. Here, how to install the control cabinet and how to connect the sublights to power is described. How the underwater light suspension is to be carried out is described in section 4, and in section 5 has an overview and description of all maintenance procedures, as well as a registration form for performed maintenance. Section 5 also includes disposal instructions for the AKVA Aurora SubLED Combi lamps.

Appendixes found in the back of the manual:

Appendix A - Index
Appendix B - Deviation form
Appendix C - Notes
Appendix D - Rolling hitch knot
Appendix E - Contact Information.

Note!
This entire manual must be read and understood prior to installation of the AKVA Underwater lights, as well as used as aid during installation and maintenance.
2.2 ABOUT AKVA AURORA SUBLED COMBI

Stable and good light control provides increased profitability, and proper use of additional lighting in aquaculture stimulates increased growth and controls the smoltification process, as well as reduces the proportion of fish maturation. With AKVA Aurora SubLED Combi, faster growth and better feed utilization may also be achieved. AKVA sublights are adapted for smolt and juveniles in small tanks, as well as for salmon, cod and other fast growing species in larger pen based fish farms.

AKVA group has cooperated with large fish farming companies and NORBIT, and together we have developed a dimmable Underwater light, including anti-maturing lighting, contrast light and UV light (attraction effect) in the same lamp.

The lamps are hung in approximately 10 meters depth inside the pen, and can be used throughout the entire sea phase. Keeping the fish in deeper water can reduce the lice pressure, and this effect will be enhanced if deep-water lighting is combined with underwater feeding at 8 meters depth.

Visual effect on anti-maturing light is 1000W and gives max 120 microEinstein at 1 meter distance. Power on the UV light is 120W and this gives up to 12 microEinstein at 1 meter distance.

Recommended use: medium and large penpens.

Illustration 2.1: Aurora SubLED Combi armature
Features:

- Attachment point for rope and cable
- Two wires ensures better stability
- Streamlined design, smooth surface and low weight (6kg) reduces risk of net tearing and hooking
- Seal gland with vulcanized cable entry
- Aluminum bronze core for optimal cooling and minimum fouling
- Double O-ring protects all sealings
- Lens made from industrial acryl
- Blue/green LED light (anti maturation light)
- White contrast light for better pellet detection
- UV-light

Illustration 2.2: Aurora SubLED Combi features
### Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Aurora SubLED Combi</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating Voltage</strong></td>
<td>48 VCD</td>
</tr>
<tr>
<td><strong>Starting current (0,5 second)</strong></td>
<td>6.6 A (1500W)</td>
</tr>
<tr>
<td><strong>Starting current (1 second)</strong></td>
<td>6.6 A (1500W)</td>
</tr>
<tr>
<td><strong>Operating current (2 minutes)</strong></td>
<td>6.05 A (1350W)</td>
</tr>
<tr>
<td><strong>Total efficiency</strong></td>
<td>1200W</td>
</tr>
<tr>
<td><strong>Expected lifetime</strong></td>
<td>Approximately 50,000 hours</td>
</tr>
<tr>
<td><strong>Effect LED light (288 diodes)</strong></td>
<td>1200W (visual effect ~1000W)</td>
</tr>
<tr>
<td><strong>Effect LED light (32 diodes)</strong></td>
<td>150W (visual effect ~120W)</td>
</tr>
<tr>
<td><strong>Wave length blue light</strong></td>
<td>465nm</td>
</tr>
<tr>
<td><strong>Wave length green light</strong></td>
<td>535nm</td>
</tr>
<tr>
<td><strong>Wave length UV-light</strong></td>
<td>405nm</td>
</tr>
<tr>
<td><strong>Contrast light</strong></td>
<td>3000K warm white</td>
</tr>
<tr>
<td><strong>Time from OFF to full brightness</strong></td>
<td>10 minutes</td>
</tr>
<tr>
<td><strong>Size: Ø / h</strong></td>
<td>160mm / 542mm</td>
</tr>
<tr>
<td><strong>Cooling fluid</strong></td>
<td>Water</td>
</tr>
<tr>
<td><strong>Material end piece</strong></td>
<td>POM 1,41g/cm³</td>
</tr>
<tr>
<td><strong>Material cooling core</strong></td>
<td>Aluminum bronze</td>
</tr>
<tr>
<td><strong>Material lens</strong></td>
<td>Acrylic</td>
</tr>
<tr>
<td><strong>Cable dimension</strong></td>
<td>PUR 3F1,5</td>
</tr>
<tr>
<td><strong>Standard cable length</strong></td>
<td>35m or 55m</td>
</tr>
</tbody>
</table>

*Table 2.1: Specifications for Aurora SubLED Combi*
2.3 ABOUT THE CONTROL CABINET

The control cabinet is the lamps' control unit and power supply. It is mounted on the pen edge and weighs approximately 17 kg. AKVA recommends that two people participate in the installation process.

The control cabinet generates enough heat to keep it ice-free. This assumes that the cabinet is energized with belonging luminaries in operation. For prolonged periods of downtime, the cabinet must be removed from the pen and stored in a dry and tempered area.

Illustration 2.3: Control cabinets with measurements

Disclaimer

The bracket in this illustration may deviate from the actual bracket. See next page for correct illustration for the clamp bracket that is being used.
The cuff
To protect the panel with connectors and switches that are found under the cabinet, a two part cuff is placed below around the bottom part of the cabinet. The one half of the cuff is placed around the back side (below the clamp bracket), is attached to the control cabinet. The front half of the cuff is attached to the other half on each side (right and left). Openings for cables are made in the bottom part of the cuff halves.

*Illustration 2.4: Control cabinets with open cuff*
**Clamp bracket**
The control cabinet is delivered with a clamp bracket, attached to the cabinet backside. This is a clamp shaped bracket, that is opened and placed around a pile or a pipe with diameter $\varnothing = 60\text{mm}$. An AKVA approved attaching method, is attaching the clamp bracket to a bird net pole, that is attached to a Rempro-bracket, that is attached to the pen pole.

![Illustration 2.5: Control cabinets with measurements](image)

**Protective sleeve**
The bird net pole is made of fiberglass, and may be weakened by the forces of two simple clamping points. Therefore, AKVA group recommends using an aluminum protective sleeve between the bird net pole and the clamp. The bird net pole diameter is usually $\varnothing = 54\text{mm}$. We recommend that the protective sleeve has outer diameter $\varnothing = 60\text{mm}$. The sleeve can be cut into two halves lengthwise and placed straight into place, or threaded all the way onto the bird net pole top.
The panel
Underneath the control cabinet, inside the cuff, is a panel, consisting of connectors, inlets, outlets, fuses and mode switch.

Illustration 2.6: Panel under the control cabinet

J1/J2: 48V DC

J4: Power in, 220V AC

J5: Connection point for serial connecting option.
Up to 3 cabinets per 16A circuit)

F1/F2: Fuse

Turn switch: Controls light:
- VISIBLE = Visible light is ON (anti-maturation)
- OFF = Visible light is OFF
- UV = UV-light is ON (attraction effect).
3 ASSEMBLING

WARNING!
Be aware that all operations with electrical equipment may increase risk of electrical shock. When working in and around water, this is especially risky. Always use insulating gloves and footwear when working with electrical equipment.

CAREFUL!
Avoid looking directly at the light source, as this may injure the eyes.

NOTE!
Connect to power after launching the lamp inside the water. Lamp must be entirely submerged before turning it on, as this may cause overheating and damaged and cracked glass.

PERSONAL PROTECTIVE GEAR
Antiskid footwear and safety garments, such as safety vest, are mandatory for working on or by the pen edge.
3.1 MOUNTING THE CONTROL CABINET

A possible AKVA approved solution for mounting the control cabinet, is by using a Rempro bracket and a bird net pole.

MOUNT THE REMPRO BRACKET

The control cabinet is attached to a Rempro bracket used for attaching bird net pole. The bracket is attached to a pen pole. Follow the assembly instructions in this video: https://www.youtube.com/watch?v=crrqVWFSMs.

There are several variations of these, for different types and sizes of pens and pen poles:

*Illustration 3.1: Rempro brackets, various types*

*Illustration 3.2: Rempro bracket parts*:

1. Pen pole
2. Mounting board
3. Mounting pole
4. Mounting rings
5. Bird net pole
All number references in the procedure in parentheses refer to Illustration 3.2 Rempro bracket parts on the previous page.

NOTE!
If the recommended protective aluminum sleeve is being used inside the clamp, the sleeve must be thread onto the bird net pole (5) before the sleeve and the Rempro bracket are attached to the pen pole (1).

Procedure:
1 Review that all necessary parts are included in the delivery.
2 Collect all necessary equipment.
3 Attach a bolt through the lower mounting board (2) and its belonging mounting ring (4) without tightening.
4 Attach a bolt through the upper mounting board (2) and belonging mounting ring (4) on the same side as the lower without tightening to.
5 Bring the bracket to the pen.
6 Place the bracket next to the pen pole (1) where the control cabinet is going to be installed.
7 Place both upper and lower mounting rings (4) around the pole.
8 Attach a second bolt through the other side of the upper mounting board (2) and upper mounting ring (4) without tightening.
9 Attach a second bolt through the other side of the lower mounting board (2) and upper mounting ring (4) without tightening.
10 Position the Rempro bracket on the pen pole (1) and tighten all four bolts.
3.2 ATTACH THE CONTROL CABINET TO THE REMPRO BRACKET

**Warning!**
Use the protection cap whenever the light is not being used.

**Warning!**
The luminaire must be fully submerged in water prior to ignition. Never ignite above water or in surface position.

**NOTE!**
Two persons shall participate in this installation operation.

GO TO
Click on the underlined words to read more about the various parts.

*All parenthesised numbers in this procedure refer to Illustration 3.3 The Cuff attached to the control cabinet.*

**Required equipment:**
- Wrench
- Flat screwdriver

**Procedure:**
1. Prepare the Ø = 60mm aluminium protective sleeve that shall be placed between the bird net pole and the clamp bracket.

2. Attach the sleeve around the bird net pole, either by cutting it into two halves lengthwise, or treading it on to the pole from the top.

3. Loosen the bolts in the clamp bracket attached to the control cabinet back side to open the clamp bracket.

4. Make sure that the control cabinet in placed correctly, with the panel and cuff pointing downwards.
5  Place the control cabinet with the clamp around the protective sleeve.

6  Push the clamp around the sleeve. Use necessary force without bending any of the parts.

7  Close the clamp around the sleeve. Make sure to press the movable part of the clamp closely around the sleeve. Here too, use necessary force without bending any of the parts.

8  Attach the clamp bolts and tighten properly.

9  Place a flat screwdriver in the trace in the protection cap in the socket marked with J5 in Illustration 2.6 Panel under the control cabinet.

10 Rotate clockwise to release the cap from the socket.

Illustration 3.3: Turn counter-clockwise

11 Connect sublight power and lamps according to the instructions in the Panel description.

12 Make sure that the luminaire is fully submerged in water prior to ignition.

13 Turn power ON.
14 Check that everything works as it should.

15 Correct any deviations.

16 Close the cuff front part around the bottom of the control cabinet, and attach the cuff locks on both sides.

17 For extra cuff and panel protection, we also recommend fixing the cuff halves together by using plastic strips in the openings on the side of the cuff.

Illustration 3.4: Control cabinet cuff, locked

1 Cuff front part
2 Cuff side locks
3 Holes to be used if extra clamping is needed.
3.3 PREPARE FOR MAIN POWER

Note!
It is possible to connect one extra power cabinet per 16A circuit (outlet J5 in Illustration 2.1 Aurora SubLED Combi armature).

Procedure:
1. Connect the main power cable to the QPD QUICKON socket.
2. Connect the main cable to the socket with the following pins out:
   
<table>
<thead>
<tr>
<th>Power cable</th>
<th>Phoenix QUICKON socket</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral</td>
<td>Terminal marked N</td>
</tr>
<tr>
<td>Loaded</td>
<td>Terminal marked 2</td>
</tr>
<tr>
<td>Earth</td>
<td>Terminal marked with earthing symbol</td>
</tr>
</tbody>
</table>

   Table 3.1: Connection table for main power

3. Connect the QPD QUICKON socket to the power cabinet terminal marked J4, see Illustration 2.6 Panel under the control cabinet.

4. Use J5 for serial connecting extra SubLED control cabinet if used.

5. Connect the Aurora SubLED Combi lamp to the socket marked J2 in Illustration 2.1.

6. Tighten the socket protection properly to ensure expected water ingress protection (IP).
3.4 OPERATION FOR AURORA SUBLED COMBI PEN CABINET

3.4.1 THE TURN SWITCH

The Turn switch controls lamp operation:

<table>
<thead>
<tr>
<th>Position</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>No lights</td>
<td>UV and visible light is turned off</td>
</tr>
<tr>
<td>Visible</td>
<td>Visible light ON</td>
<td>Visible light will increase to full power in 10 min.</td>
</tr>
<tr>
<td>UV</td>
<td>UV-light ON</td>
<td>UV-light will increase to full power in 10 min.</td>
</tr>
</tbody>
</table>

Table 3.2: Turn switch positions

When the Turn switch is returned to OFF position during feeding, the light will decrease gradually down to 0% intensity over a 10 minute period.

3.4.2 FUSE

Both phases in the main power (L and N) are protected with 16A/250V slow fuses (F1 and F2).

2 spare fuses are included in the delivery, and when ordering extra fuses, these specifications must be provided:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Fuses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>Glass fuse with clip on, 5mm*20mm</td>
</tr>
<tr>
<td>Type</td>
<td>Slow</td>
</tr>
<tr>
<td>AC</td>
<td>250VAC</td>
</tr>
<tr>
<td>Rated current</td>
<td>16A</td>
</tr>
</tbody>
</table>

Table 3.3: Fuse specifications
4 SUSPENSION

Warning!
Use the knot rolling hitch to attach underwater lamps to ropes for suspension.

Personal protective gear
Use personal protective gear when staying at the pen edge.

NOTE!
Always use lifting ropes with recommended knot to suspend the underwater lights, and never suspend from cable.

NOTE!
Make sure that the cable hangs flexibly and in an arc, to avoid loads from movements in the lamp. Make sure that the cable never gets cracks or sharp bends during the installation process.

NOTE!
Underwater lamps must be suspended as far inside the pen that it will not touch the net.

Note!
Incorrect suspension can void the warranty.

Procedure for recommended knot, rolling hitch, is found in APPENDIX D - ROLLING HITCH KNOT. To learn how to execute this knot to suspend underwater lights properly, read the entire procedure.
**Suggested suspension:**

Using correct suspensions and connections, will provide desired light functions for several years ahead. The luminaries must be suspended so that it does not rotate around its own axis.

They can be suspended as a V:

![V-shaped suspension](Image)

*Illustration 4.1: V-shaped suspension*

- or they may be stabilized with u-shaped suspensions:

![Stable suspension with ropes and buoys](Image)

*Illustration 4.2: Stable suspension with ropes and buoys*

The lifting rope must be fastened correctly to the lamp, either with two ropes or with a stabilization rope that runs through both eye bolts in the lamp and stabilized with rolling hitch.

Make sure that the cable hangs freely and in an arc to avoid loads when moving in the luminaire. Make sure the cable does not get cracks or sharp bends when mounting. This will destroy the cable and can impair the lamp's power and operation time. If the luminaire is suspended incorrectly and the cable is pulled out of the luminaire or the bushing nipple, there will be leakage.
5 SERVICE AND MAINTENANCE

Personal protective gear
Antiskid footwear and safety garments, such as safety vest, are mandatory for working on or by the pen edge.

NOTE!
For maintenance and service, all lamps must be brought to the barge or on land.

General:
Material and design choices for the underwater lamps are made to ensure simple maintenance.

To ensure best possible functionality and use of underwater lights, regular external cleaning is recommended. Use warm water with a soft scrub or brush to remove fouling, sprout, shells and other filth that gets stuck on the luminaire and cable surfaces. We recommend that the lamps are cleaned before storing and between every production cycle.

The external parts (acrylic, POM and PUR) must be disinfected if the lamp is being moved to a new location, or in case disease has been detected in the location. We recommend that all parts are rinsed with fresh water after disinfecting.

Expected service life for the LED bulbs, is in the region of more than 50,000 hours, or 8 to 10 years.

For internal maintenance, contact AKVA group for a consultation.
See Appendix D - Contact information.
5.1 MAINTENANCE OVERVIEW, SERVICE INTERVALS

<table>
<thead>
<tr>
<th>Activity</th>
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<tr>
<td>Brush cooling core</td>
<td>Before every new production cycle</td>
</tr>
<tr>
<td>Change LED panel</td>
<td>By AKVA service personnel when defect</td>
</tr>
<tr>
<td>Change male contact</td>
<td>By AKVA service personnel when defect</td>
</tr>
</tbody>
</table>

*Table 5.1: Maintenance and service intervals*

5.1.1 BRUSH COOLING CORE

Use a suitable brush to remove impurities from the cooling core before every new production cycle.

![Illustration 5.1: Cooling core before mounting it inside the lamp](image1)

*Illustration 5.1: Cooling core before mounting it inside the lamp*
5.2 MAINTENANCE REGISTRATION

![Note!]
Sign after the task is performed.

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<th>Task performed</th>
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5.3 DISPOSING

Recycling
This product is considered inert and may be delivered to approved location for waste disposal and recycled as a category EE waste.

AKVA group will receive lamps and control cabinets after ended operation time, for secure disposal.
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APPENDIX E - ROLLING HITCH KNOT

**NOTE!** The lamp hoop is drawn on the illustration as a green coloured line.

Follow all safety procedures that are provided in the user manual in which this instructions belong.

**Procedure:**

1. Tread the rope through the lamp hoop.
2. Bend the rope end up on the right side.
3. Create a hoop longer up the Tree. The hoop is called the Hole. Make sure that the top end of the rope that creates the Hole is the Rabbit in the end.
4. Tread the Rabbit in from under the Hole.
5. The Rabbit keeps going under the Tree.

![Diagram of the rolling hitch knot](image1)

![Diagram of the rolling hitch knot](image2)
6 The Rabbit continues around the Tree, and goes back into the Hole from above.

8 Pull the Rabbit and the Tree from each other, so that the knot is tightened. This forms the rolling hitch knot:

7 Grab the Tree in one hand and the Rabbit in the other hand.

9 Before installing underwater lights in a pen, all rolling hitches must be tightened so that they will not loosen as the light is inside the pen.
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AKVA group is present in all markets with offices in Norway, Chile, Denmark, Scotland, Spain, Greece, Iran, Iceland, Canada, Australia and Turkey. AKVA group is a unique partner with the capability to offer both pen farming and land based aquaculture operations with complete technical solutions and service.

**Technology for sustainable biology:** By developing technology focused on solving the biological challenges, we contribute to the continued development of a sustainable industry. Good operational performance and fish welfare are paramount in achieving good results, and investing in our technology will help deliver both.

**OUR MISSION:** Solutions and services that optimize production and enables a sustainable, cost-efficient and safe aquaculture industry. AKVA group is a global technology and service partner that deliver technology and services that helps solve biological challenges within the aquaculture industry. Good operational performance and fish welfare ensures sustainability and profitability for the customer. This is the premise for everything we deliver, from single components to services and complete installations. In-depth aquaculture knowledge, extensive experience and a high capacity for innovation characterizes and enables us to deliver the best solutions for both land based and pen based fish farming.

**OUR VISION:**

<table>
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<tr>
<th>CUSTOMER FOCUS</th>
<th>AQUACULTURE KNOWLEDGE</th>
<th>RELIABILITY</th>
<th>ENTHUSIASM</th>
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<td>Our customers are always first in line. We take pride in listening and being helpful in order to provide our customers with the best service and solutions.</td>
<td>Skilled employees with versatile knowledge is the key to develop innovative solutions and service based on our customers’ needs.</td>
<td>In AKVA group we are proud of keeping our promises. If necessary, we will walk the extra mile to get things right.</td>
<td>Our common enthusiasm keeps us moving forward together. Being enthusiastic about what we do and having fun at work is an important part of our culture.</td>
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