

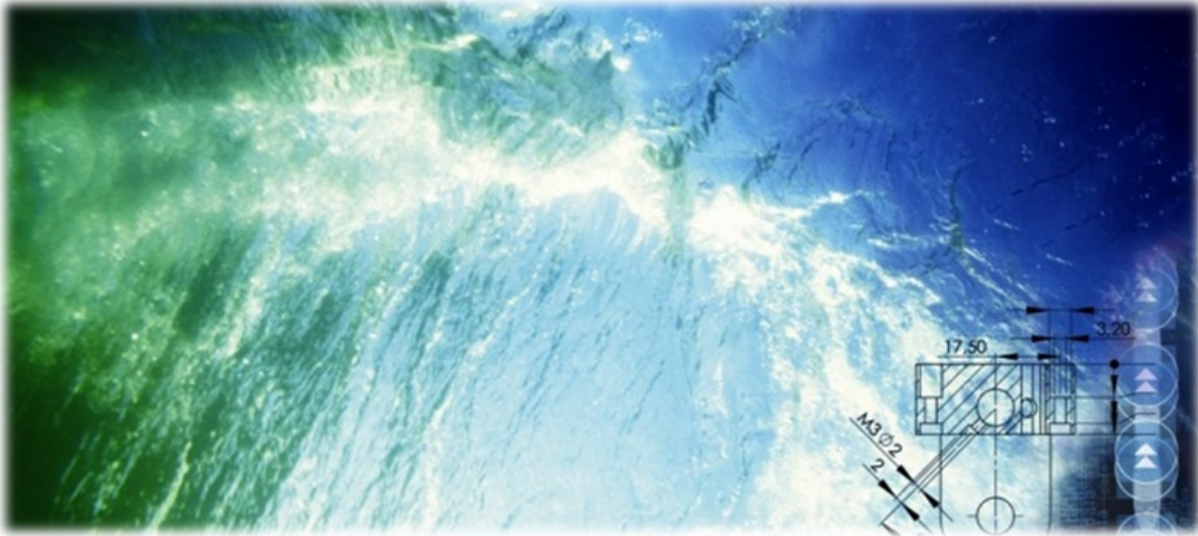
ENGLISH USER AND MAINTENANCE MANUAL

HATZ DIESEL NET CLEANER

D-DRIVE K-28-280-S-D-HZ-20

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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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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 Safety symbols

These safety symbols are used in this manual:



Information.



Show caution, danger of minor personnel injuries and damages to equipment.



Danger! Will cause dangerous situations and danger for personnel.



Personal safety equipment, such as antiskid foot wear and floating garments, are mandatory to wear when working on and by the cage. Use ear protection when staying in areas where diesel net cleaners are being used.



Appropriate PPE should be worn at all times, when handling chemicals.

1.1.1 Other symbols used in this manual



Go to or see page or section for further instructions or more information.

1.2 Personnel safety

All paragraph references in this manual are from the Norwegian directive "Regulations about high pressure cleaning and more" (In Norwegian: FOR 1992-02-13 nr 1263: Forskrift om høytrykksspyling m.m.). All who are working with or by Akvasmart net cleaners must read and understand all these regulations and their contents before using the net cleaner.

All personnel must be trained in how to operate the equipment, and also be instructed in all dangers that may occur by improper use. (ref. § 6)

Employer is responsible for informing all personnel about all safety precautions as well as explaining which of the operations may cause personnel injuries. All personnel must be instructed in all of the safety instructions, and it is employers responsibility every employee understands these instructions. (ref. § 7)

Employer must instruct all personnel to use appropriate personal safety equipment and garments when working with and by high pressure systems. Always use antiskid footwear when walking around the cage edge. (ref. § 9)

If the net cleaner operator can not see the pumping aggregate directly, an assisting operator is required. The net cleaner operator must be able to communicate with the assisting operator, preferably visually. (ref. § 22)

Sealing leaks within piping- or hose fittings, must only be performed on depressurized equipment. (ref. § 13)

Employer is responsible of marking all areas where high pressure equipment is being used, as well as securing the danger area properly. (ref. § 23)

When cleaning with manually operated high pressure equipment, only devices with balanced reaction force must be used. Only one diver may stay in the water where the high pressure washer is being used. A diving assistant must control the pumping aggregate, so that the process can be shut down immediately in case of an emergency. (ref. § 26)

Under aged personnel (under 18 years of age) must not operate the washer alone. (ref. Regulations about work performed by children and youth, § 9)

Show general caution when using high pressure equipment. The equipment generates strong forces and may cause severe damage to both personnel and equipment if used incorrectly. When using high pressure net cleaners, the "Regulations about high pressure cleaning and more" (FOR 1992-02-13 nr 1263: Forskrift om høytrykksspyling m.m.), has to be complied. According to § 4 in these regulations, overstepping them is a legal offence.

1.3 Inspection before use

High pressure water represents massive forces, and therefore it is important that critical components are inspected and tested frequently.

Bypass/safety valves are installed at all high pressure equipment to ensure that no higher pressure than the maximal pressure endured by the various components occurs. The safety valve is set to open up for water flow in case the water pressure inside the system exceeds the predetermined level. If any of these valves are out of order when the system runs, this can cause severe damages to the equipment and injure personnel. (ref. § 30)

The safety valve is set to a pressure value the equipment endures while in use. Never change this value to a higher pressure. (ref. § 14)

All hoses used in the construction, must be able to endure the working pressure of the equipment. Read the mark on all hoses to make sure they are constructed to bear the desired pressure before using them.

All hoses must be inspected for external damages before each time the net cleaner is being used. If a hose is damaged, it must be replaced or repaired before use.

1.4 Equipment safety

1.4.1 General treatment of the equipment

All mechanical and electronic equipment used in the aquaculture industry must be maintained properly in order to function over time and according to expectations, especially in periods when they are being used the most. High pressure washers work in demanding environments with high pressures, large amounts of water and an aggressive corrosive salt water environment. Because of this, following the maintenance instructions are highly required.

Materials that do not require much maintenance are chosen for most of the critical components. Most of the exterior components, however, would be too expensive to produce of corrosion resistant materials. Therefore, rinsing the equipment with fresh water after every use is highly recommended to avoid surface corrosion.

All the movable parts, such as hinges, locks, gas regulators, wheels and such, must be lubricated after rinsing. If scratches or other damages appear in any enameled surfaces, these must be sealed with wax or lubricant immediately in order to prevent further corrosion.

Before using the equipment, always make sure it stands steadily, and if necessary, is securely attached to the foundation to prevent it from slipping and damaging its surrounding equipment or personnel.

If the equipment is going to be moved from one site to another, it is required by law to disinfect the equipment to avoid spread of contagious diseases. Some disinfectants may be aggressive to some metals, o-rings, sealings and other internal components. Therefore, rinse the equipment after use of disinfectants, both inside and outside, with fresh water.

1.4.2 Disinfecting equipment

Net cleaning systems are in essence portable equipment. Therefore, to ensure good biosecurity between sites, it will be necessary to disinfect this equipment on a regular basis. There are a number of proprietary disinfectants available and individual operators may identify an appropriate disinfectant according to a sites recommendations or approvals. However to ensure longevity of the Net cleaning system a solution suitable to machinery should be selected if at all possible. Use of the disinfectant and appropriate dilution, should be as per manufacturer's instructions. It is mandatory to wear appropriate personal protection gear at all times, when handling chemicals.

1.4.3 Storage

Do not store the equipment at too high temperatures because of the risk of contagious Legionella bacterial growth within the system. It is advised that the equipment is rinsed off with a narrow beam of fresh water directed away from people after storage.

Salt water drying inside the high pressure pump and components surrounding the pump (suction pump, filters, bypass valve, hoses or other salt water leading components) must be avoided. When this happens, salt crystals are left inside as the water vaporises, and they may cause damage to gaskets and sealings, high abrasion and reduces the equipment's functions. Therefore, if the equipment is going to be stored for more than one week, it is recommended that the entire system is flushed through with fresh water before placing in storage.

For over winter storage, avoid temperatures below the freezing point (100°C and 32°F). It is also recommended to flush the system with a water containing anti-freeze fluid, to prevent the inside water to freeze and possibly destroy the equipment if exposed to freezing-temperatures. The antifreeze solution will also function as lubricant for the system and its internal components.

2 Information

Thank you for choosing AKVA group as supplier for Your net cleaning system. Do not hesitate to contact us for more information regarding maintenance for net cleaners or any other AKVA products.

This user manual is part of the equipment belonging to the Hatz Diesel Net Cleaner. Keep the manual for as long as Your AKVA products are being used, and make sure that all changes to the equipment are noted in the back of this manual.

The purpose of this manual is to enable the user to use and maintain the Hatz Diesel Net Cleaners in a safe and economical way. This manual will hopefully answer any day-to-day-questions regarding the camera system.

If any necessary information is missing from this manual, please contact AKVA group 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.

To ensure that the net cleaner equipment is installed correctly, and that all adjustments are performed according to the existing standard in the current country, personnel from AKVA group must attend the first start up of the net cleaner.

2.1 How to use this manual

This manual describes how to use and maintain the Akvasmart Hatz Diesel Net Cleaner in the best and safest possible way. This entire manual must be read and understood by ALL users prior to use of the product. Site owner and farm manager are responsible for that all site personnel and users know and understand the contents of this manual.

Before the first section, is a table of contents. The headlines may work as links to their respective sections in the pdf-file.

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

Section 2 contains information about AKVA group and the net cleaner, as well as this user manual instruction.

Section 3 displays main parts and specifications of the Hatz Diesel Net Cleaner. Procedures required before starting up net cleaner are explained in section 4 and section 5 explains how to start and stop the machinery. How to operate the net cleaner frame is described in section 6, and cleaning and storage procedures are found in section 7. Section 8 contains maintenance instructions as well as frequency tables and registration forms for maintenance tasks.

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, pages for notes about new and extra information are also in the back of the manual and AKVA contact information.



This entire manual must be read and understood before commencing use of the Hatz Diesel Net Cleaner, as well as used as aid during use, maintenance and other processes.

2.2 About AKVA group

AKVA group is present in all markets with offices in Norway, Chile, Denmark, Scotland, Spain, Greece, Iceland, Canada, Australia and Turkey. AKVA group is a unique partner with the capability to offer both cage 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 cage based fish farming.

OUR VISION:

CUSTOMER FOCUS

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.

AQUACULTURE KNOWLEDGE

Skilled employees with versatile knowledge is the key to develop innovative solutions and service based on our customers' needs.

RELIABILITY

In AKVA group we are proud of keeping our promises. If necessary, we will walk the extra mile to get things right.

ENTHUSIASM

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.

2.3 About Akvsmart Net Cleaners

Akvsmart Net Cleaners were launched in 1987, under the brand Idema. These net cleaners are today renowned for quality, high performance and their ease of use. The first net cleaners had single 30cm diameter cleaning discs, operated from the cage edge using a shaft. Underwater pressure washing cage nets where fish reside, has become even more common as the requirement to environmentally friendly aquaculture in larger cages provides the best scale of economics.

With this in mind, we have developed and improved the Akvsmart Net Cleaners, and can now present the best range of net cleaners and high pressure pumps ever. This combination offers the most efficient cleaning system suited for all types and sizes of cages.

In net cleaning, filtered high pressure sea water is used to remove marine fouling on the nets. Akvsmart Net Cleaners use rotating cleaning discs mounted on support frames in various shapes and combinations. We use rugged, tailor made high pressure pumps to run the cleaning discs.

The cleaning process starts with submerging the frame inside the net, and then using high pressure sea water to hose the net from the inside and out. Our cleaning systems do not use any chemicals or scrubbing action, making them environmentally friendly and ensuring minimal wear on the net.

The large net cleaners can be operated automatically by two persons using a crane, winch, cap stand or as a integrated option on a ROV (Remotely Operated Vehicle). The smallest net cleaners can easily be operated from the cage edge by a single person.

Larger net cleaning frames are delivered with cameras and recording systems that give full overview over the cleaning process, and makes it possible to inspect the net as it is being cleaned.

Gasoline, diesel or hydraulic driven net cleaners

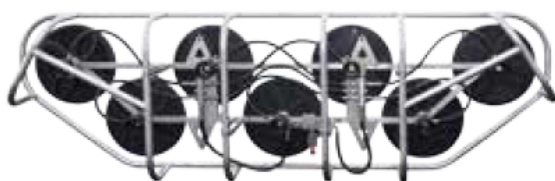
AKVA group offers a rugged series of high pressure washers for seawater, suited for various system solutions and cage sizes.

The gasoline net cleaners are light-weight and perfect as portable units.

The diesel net cleaners are almost maintenance free, use less fuel than the gasoline models and are well suited for large, powerful, permanent installations.

The hydraulic net cleaners are small, compact and almost maintenance free, perfect for below deck installations in work boats.

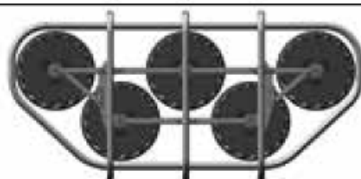
Net cleaning rigs



• 270 cm



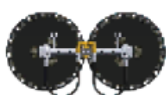
• 270 cm



• 180 cm



• 180 cm



• 90 cm

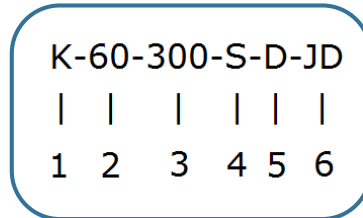


• 30 cm (modell med skaft)

The Heavy Duty cleaning discs are equipped with stainless steel frames. The discs have a rotation speed from 750-1500 rpm.

2.3.1 Model description

All high pressure net cleaners delivered by AKVA group have a uniform model description. The description contains information about machinery, capacity and function. Example:



1 K = Cold water, V = Hot water

2 Liter water per minute

3 Water pressure (bar)

4 Water supply: S = Integrated suction pump
X = Without suction pump

5 Motor type: H = Hydraulic
B = Gasoline
E = Electro
D = Diesel

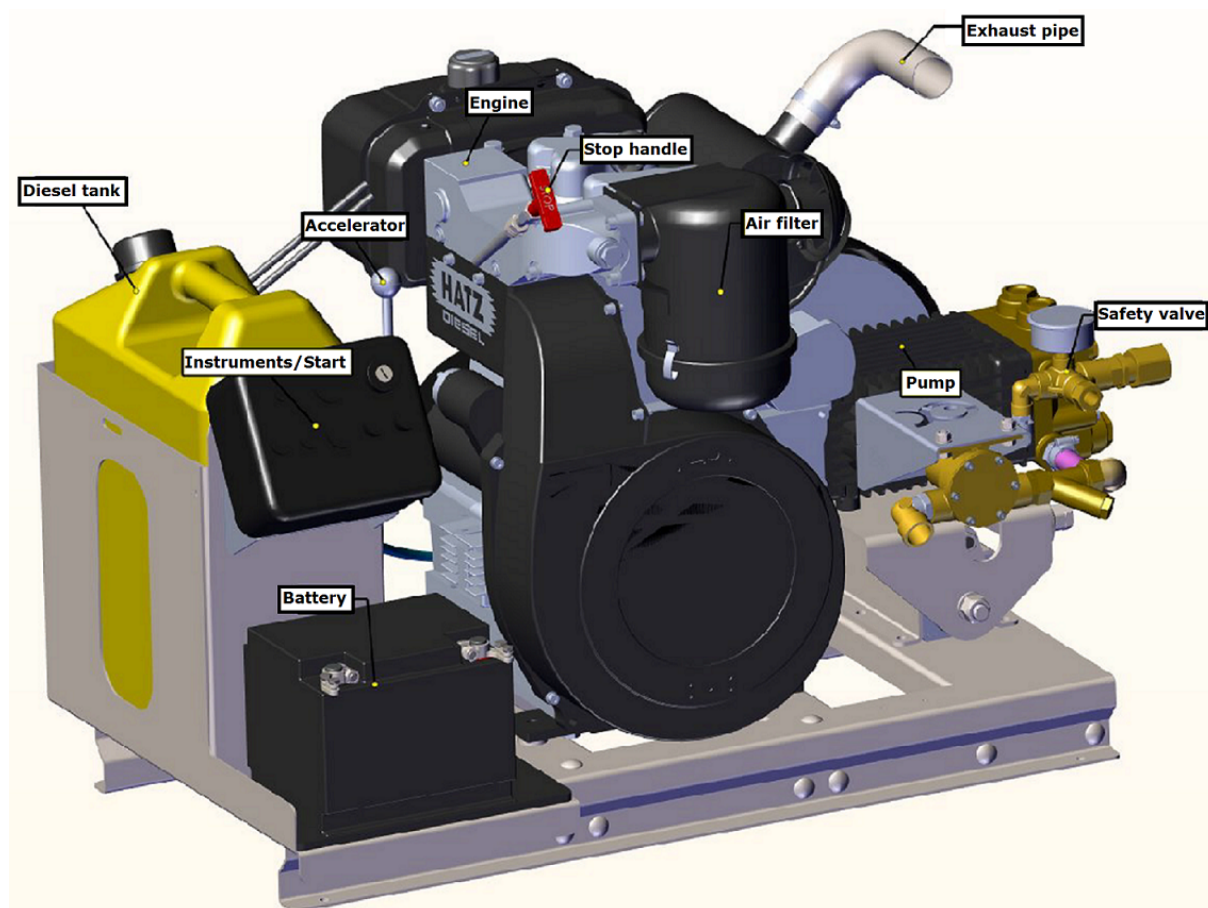
6 Motor fabrication: CO = Comer
VA = Vanguard
HO = Honda
HZ = Hatz
IV = Iveco
JD = John Deere
SU = Sunfarb

7 Volume/effect: B og D - effect in Hp
E - effect in kW
H - Vol.=ccm/rev

3 Net Cleaner machinery



The main purpose of images and illustrations in this manual is to show how to perform various tasks, and may differ from how the parts and products actually look like



3.1 Specifications motor and pump

Motor: Diesel, Hatz 2G 40, 14.9kW, 20Hp

Pump: 2530 PTO dual shaft

3.2 Specifications net cleaning rigs

The Hatz Diesel Net Cleaner is best used with:

- pistol washers
- The Dual head-cleaning frame

4 Before use



All who are working with or by a net cleaner have to read and understand the content of this manual before using it, and all tasks and safety instructions must be followed as described in this manual.



High pressure water represents severe forces. Therefore, it is important that critical components are inspected and tested regularly.



The predetermined level of pressure in bypass valves must never be changed.



Before every use, oil level in motor and pump must be controlled according to the instructions in this section.

4.1 General precautions

Show great caution when using any high pressure equipment. These systems generate severe forces and may cause damages to personnel and other equipment if used incorrectly. Regular control and maintenance is required to ensure safest possible use and as long lifetime as possible.

Reading every safety, user and maintenance instructions before using the equipment will reduce risks of personnel injuries and damages to the net cleaner and other equipment.

Bypass valves should open for water flow when the pressure inside the system exceeds the predetermined level. If this is not in order, the high pressure may cause serious consequences for both equipment and personnel.

4.2 Remove transport plug

When net cleaners are transported pump is plugged with a transport plug to prevent oil leaking. The net cleaners are not meant to be operated with transport plugs.

If transport plug, red top, is installed in pump when receiving the net cleaner, remove these, and replace with normal yellow top or dip stick top. Keep the red tops for potential transport later.

Remove this:



Attach this:

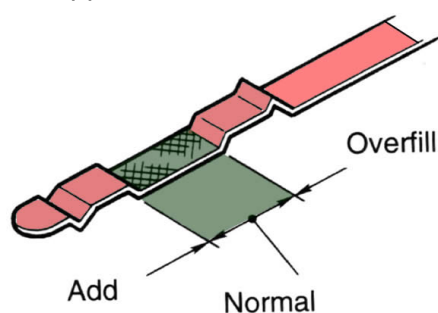


Note that oil-filler plug in the Hatz net cleaner is red, and shall not be exchanged with the yellow plug before use.

4.3 Check oil levels

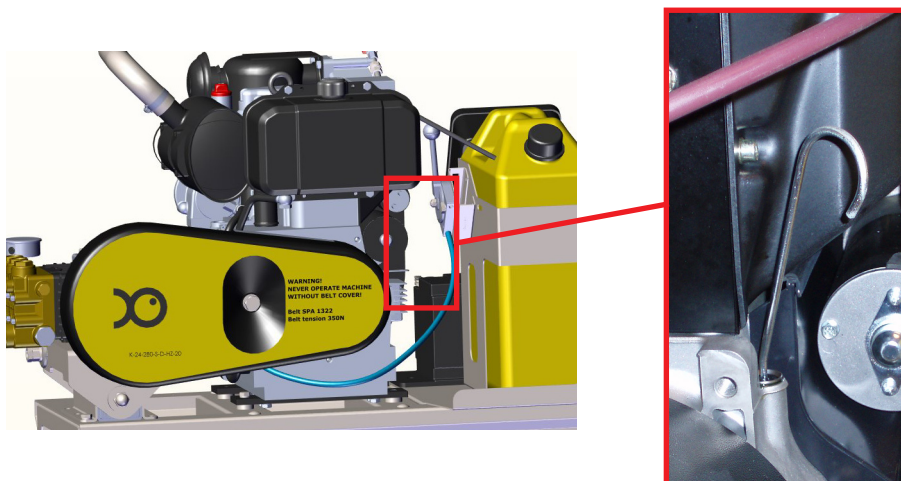
Use oil see glass or dipstick to control oil level in net cleaner motor and pump. Before each use, the washers motor oil and pump oil has to be checked. Oil for both pump and motor is 10W-40.

Dip stick: The oil level is shown in the stick end, and should be between the two lines. If the level is below the bottom line, the engine needs more oil. If the level is over the top line, oil must be tapped.

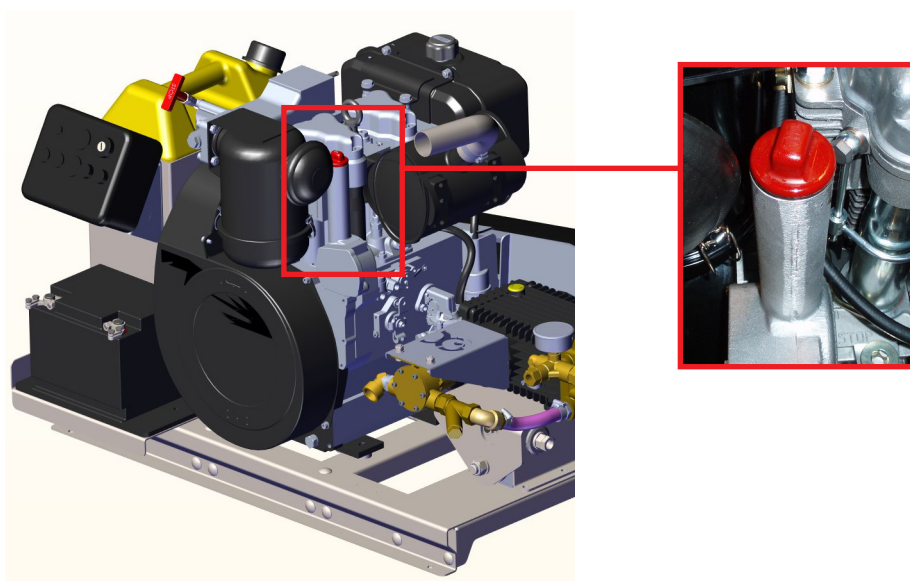


4.3.1 Motor

For motor oil, the dip stick is placed on the back side of the washer, behind the upper right side of the motor belt:



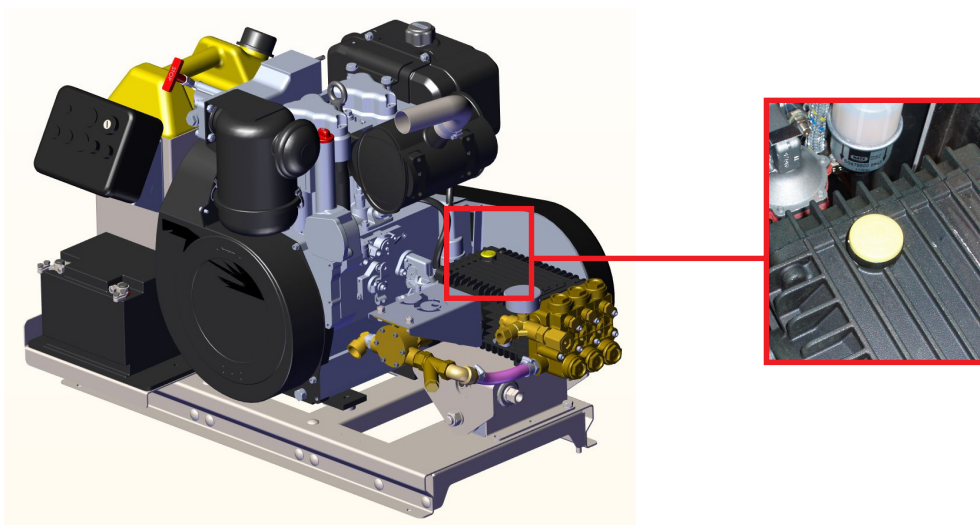
Remove the red top, and use a funnel when pouring the oil. The motor takes 2-2.2 liters, fill in only a small amount at a time, and use the dip stick to check the amount a few times during the filling process, so that there is not too much oil.



4.3.2 Pump

Pump oil is either checked through the see-glass on the side of the pump (the side facing the motor), or using the dip stick placed on top of the pump (yellow).

The pump top has a dipstick connected to it. Release the top, wipe it dry and dip it in to the pump for a few seconds, then read the results. Fill or tap if required.



The oil is filled into the pump in the opening where the dip stick is. Use a funnel to avoid spilling oil, fill in small amounts, and use the dipstick or the oil see glass on the side to see how much oil there is.

4.3.3 Air filter

Check oil by taking off the container placed in the bottom of the air filter. The amount should be between max and min

- if over - tap oil
- if under - refill oil.

4.4 Bypass/safety valve



The predetermined pressure inside the safety valve must never be changed.

One or more safety valves are placed on all high pressure equipment to ensure that the pressure inside the system does not exceed the highest bearable pressure for any of the components. The safety valve is set to open up for the water pressure if this exceeds the predetermined level. If a safety valve is out of order, the high pressure may cause severe damage to both equipment and personnel, it is therefore very important to control these before each use. If water appears in the hoses connected to a bypass valve, something is wrong:

- Something may be wrong with the bypass valve itself. In that case, the valve must be overhauled or changed before use
- The pressure can be higher than the predetermined pressure. The most common cause of this is that one or more nozzles in the net cleaner are clogged. Check these and rinse them if they are clogged
- Check all hoses, including the ones on the net cleaning frames for bends, and straighten up if bent or twisted

Contact AKVA service personnel if the problem can not be solved according to these instructions. Contact information is found in the back of this manual.



4.5 Hoses

All hoses used with this high pressure cleaner must be constructed in order to bear the working pressure of the equipment. Make sure the hose you are using can bear this pressure, by reading the labelling on the outside of the hose.

Hoses must be checked for tears and other damages. In case of damage, repair or replace the hose before use.

4.6 Check the belt between motor and pump



Remove the cover and check tightness by placing one hand on top of the belt and press down. The belt should be able to press about 2cm down.

Tighten the belt if it goes too far down, or release it a bit if it goes less than 2cm down.

4.7 Suction hose

Make sure that the suction hose is well attached to the feeding pump.

It is also important that the entire suction filter is below water during the running of the washer.

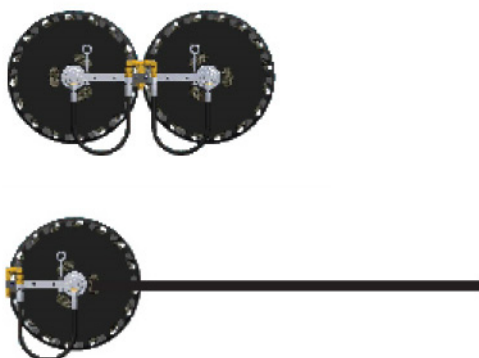
4.8 Net cleaning frames

Check the hoses on the frame for bends, these should be flattened. Check hoses for tears and other destructions.

Repair or replace damaged hoses before use.

Check all hose couplings and tighten if necessary.

Run the system with feed pressure to check the function and condition of all the nozzles.



5 Starting and stopping the machinery



To avoid damage to other equipment and personnel, make sure that the machine stands steadily, and if necessary, is fastened to the foundation.



Use ear protection when staying around the net cleaner motor.



Instructions

1 Make sure that the stop handle is set back (pushed all the way in).



2 Turn the key (red ring).

3 Let the motor run idle for about 2 minutes.

4 Push the accelerator (yellow ring) half way forwards and leave the motor to run for another 3-5 minutes so that it is properly warmed up before use.

5 Set the accelerator to max and start using the net cleaner.



See section 3 Net Cleaner machinery to see these parts with the rest of the net cleaner.

6 Before the motor is shut down after use, it has to cool down for a few minutes first. Bring the accelerator back to starting position, and pull the stop handle after 5-10 minutes.

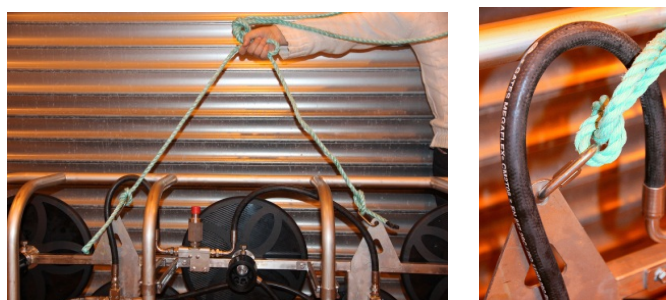
7 Stop the motor by turning the key back and set the stop handle back to running position after the motor is stopped.

6 Net Cleaning rig



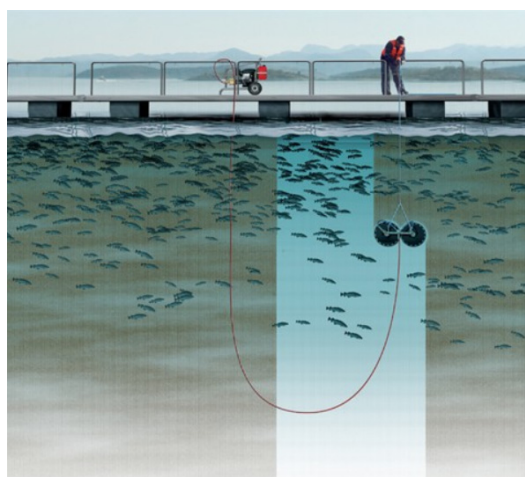
Personal safety equipment, such as antiskid foot wear and floating garments, are mandatory to wear when working on and by the cage. Use ear protection when staying in areas where diesel net cleaners are being used.

Attach the rope for lowering and lifting the net cleaner frame with a safety hook to prevent tearing the rope.



The cleaning process is most efficient when the frame is being pulled upwards in the water. When sinking, the frame will move without control and will therefore not be cleaning particularly efficiently. So, whether using crane or moving the frame manually during cleaning nets with high pressure cleaners, lower the frame as controlled as possible to the bottom of the net. Avoid disturbing the fish! Then raise the frame slowly and controlled to achieve best possible result.

The frame must always be held under water when the machinery is running. For testing the nozzles, however it can be run above water, but only using feed pressure.



7 After use

Regular service and well performed maintenance are important factors for keeping functions running as they should, and for the product to operate according to expectations. By following cleaning and maintenance instructions, the net cleaner will always be ready for use, and service costs will be minimized.

Net cleaning systems are in essence portable equipment. Therefore, to ensure good biosecurity between sites, it will be necessary to disinfect this equipment on a regular basis.



Always keep the machinery clean, dry and in order. Clean off any spills of oil immediately.



Do not use high pressure washers to clean this equipment. This may cause water intruding in to motor, pump and electronics, and thus ruining these components.



Use mild detergents for cleaning, never use strong degreasers.



The entire machine is coated with protection wax to reduce corrosion. After cleaning, always apply a new layer of wax on all surfaces. Applying wax when the machinery is still warm, makes it stick longer and better.



It is mandatory to wear appropriate personal protection gear at all times, when handling chemicals, for instance when executing disinfecting procedures.

7.1 Regular cleaning

Avoid letting salt water dry off inside the system. Rinse through with fresh water after use to prevent corrosion and other damages caused by salt crystals on metal, rubber and other materials. Rinse through with fresh water if the net cleaner is going to be stored for one week or more.

Rinsing the outside with fresh water regularly prevents corrosion in the surfaces. All moving parts, such as hinges, wheels, locks, gas regulators must be lubricated after each fresh water rinse. Check all enamel covered surfaces for scratches, and fill these with lubricant or wax to avoid further corrosion.

- 1 Always run fresh water through the entire system after use, and when net cleaner being stored for one week or more
- 2 Mix 80% water and 20% antifreeze solution and run this through to conserve the system and to lubricate sealings and to reduce the danger of frost damages in case of storing in freezing temperatures. For cold environment storing, increase the amount of antifreeze solution. See instructions on the antifreeze solution bottle
- 3 If there is a chance that the system is exposed to frost, it is important that the amount of water inside is as low as possible, so run the machinery with intake above water until the water is drained out. Run the system without intake water up to 10 seconds!
- 4 Empty pressure hoses and coil them up carefully.



If the net cleaner is not maintained and cleaned properly, this is what it may end up like after some time:



7.1.1 Cleaning the Net Cleaning frame

Do not disconnect the frame from the system before it has been flushed through with fresh water. All hoses and nozzles and other parts need to be rinsed through with fresh water after use.

Remove filth and sprout from the discs, in front and especially between discs and the hubs. Clean the ejectors intakes.

7.2 Disinfection

The disinfectant solution may be suitable to being stored for a period of time without losing its effectiveness. However there will be an element of natural dilution every time a machine is disinfected. Therefore Manufacturer's instructions and recommendation for dilution and storage should be followed at all times.

If the system goes ashore at any time, it should be disinfected and a label applied stating it has been disinfected or placed in a quarantine area until it is disinfected. That way there is no possibility that the system can be taken to another site without it having been disinfected.

If the Hatz Diesel Net Cleaning system stays on board a Vessel it should be disinfected along with all other items that need disinfected between sites.

Procedure:

- 1 Arrange to have a source of diluted disinfectant available to complete the process as well as a manual sprayer filled with the same solution.
- 2 Using the manual sprayer, completely spray all equipment that is being moved from or to site.
- 3 To disinfect the internals, place the inlet filter into the solution of disinfectant and connect all the associated parts together i.e. pump, hose and cleaning rig or lance. The rig or lance should be placed in the same solution as the inlet filter to ensure a closed loop of fluid. The inlet filter must be fully submerged.
- 4 During disinfection, the rig discs must be completely immersed in the disinfectant, or attached so that they do not

rotate out of the water. If it is not completely immersed in the solution, the rig must be completely enclosed to ensure that the solution is not sprayed on personnel or other equipment.



- 5 Carry out pre-start maintenance checks as instructed in section 4 Before use, and start the system at the slowest speed possible.
- 6 Run the system for 2 minutes. This should be sufficient time to get the disinfectant solution through the complete system.
- 7 Stop the system after 2 minutes and carry out the same processes above using a source of fresh water. Ensure all external surfaces are washed down with fresh water, thereafter dry off all water and apply a coat of moisture guard or equivalent.

8 Maintenance



AKVA recommends that the system is disinfected according to instructions in section 7 After use any time it requires maintenance. This will ensure good biosecurity, with no possibility of cross contamination through engineering operations and movements.

8.1 Overview oil

- Oil for motor and pump is 10W-40
- Oil in motor: 2-2.2 litres
- Oil in pump: 1 litre

Use dip sticks and oil see glass to make sure that the oil amounts are correct.

8.2 Motor maintenance

External cleaning: once a week

Oil check: every day

Oil change: First time after 25h use, thereafter every 250h

Change oil filter: First time after 25h use, thereafter every 250h

Air filter: change oil after 250h, check oil every day

8.3 Check diesel filter



- 1 Unscrew the filter
- 2 Check for impurities
- 3 Change filter if it is clogged.

8.4 Change oil filter



Use filter forceps to remove the motor's oil filter.

- 1 Place the forceps around the filter cup and turn to the left to release the filter
- 2 Take out the old filter
- 3 Clean the cup with a clean cloth
- 4 Insert the new filter
- 5 Reattach the filter cup and fasten it using only hand power.

8.5 Ventilating the diesel system

If air appears in the diesel system, it needs to be ventilated out of the system.

Air can appear in the system after:

- the system has ran out of diesel
- diesel filter has been changed
- other work is done to the system



The ventilation handle is placed next to the diesel filter. Press the handle upwards several times, until a smooth resistance is felt.

8.6 Pump maintenance

Cleaning: once a week

Oil check: every day

Oil change: first time after 25h use, thereafter every 250h

Vents: when required

Pressure gaskets: when required

Pistons: when required

8.7 Feeding pump maintenance

Impeller inspection: when required, but at least once a year

Impeller change: when required

Change ball bearings and gaskets: when required

Impeller is controlled visually by unscrewing the cover and looking inside to make sure that everything is ok.

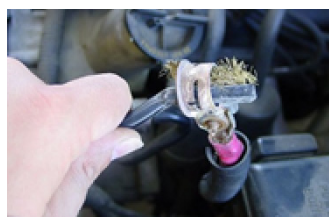
8.8 Battery maintenance

Battery level and poles checked every six months. When the poles become dirty, quick discharging of the battery may become a problem because the power may leak. Therefore, clean battery poles are important for optimal charge.

Before cleaning, the poles must be removed from the battery.



Use protection gloves and goggles to avoid being hurt by the very corrosive battery acid.



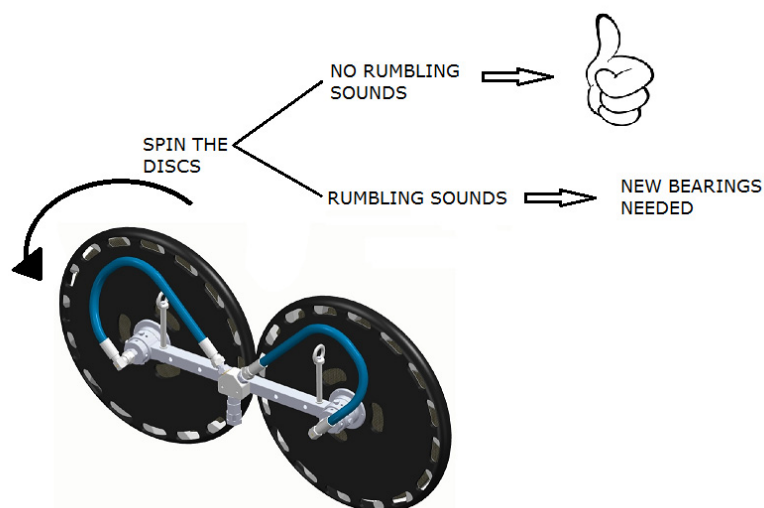
Use a steel brush to clean the poles.

Brush and clean the poles until they are shiny and clean.

Blow off any scrapings.

8.9 Net cleaning frame maintenance

Change ball-bearing when required. To test if bearings must be changed, spin the discs manually one by one and listen for rumbling sounds. When the bearings are ok, there should be no sounds, and if any rumbling sounds appear during this test, the bearings in the tested disc must be changed.



Run the system with feed pressure to check the frame nozzles' condition.

Make sure to check all nozzles, and clean them if necessary.

Hoses and hose couplings must be checked every six months.

8.10 First time maintenance

Parameter	Checked/ changed after	Execution date	Execution by (signature)
Oil change, pump	25h		
Oil change, motor	100h		
Change oil filter	100h		
Change air filter	250h		
Change diesel filter	500h		
Check level/clean poles battery	6 months		
Inspection, impeller	1 year		
Function test, pump	1 year		

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Appendix B - Deviation form



Make copies of this form before filling anything in.

Deviation no.:	
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Unit:	Producer:	Prod.no.:	Purchase year:

Deviation description:

--

Follow up proposition:

--

Date and signature, declarer:

--

Follow up directed:

--

Status:

--

New action for deviation no.:

--

Date and signature, follow up:

--

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