



ULTIMATE WATER JETTING SOLUTION

C-110E C-170E C-200E

Electric Powered Heavy Duty
Cold Water High Pressure Cleaner

USER GUIDE & SPARE PARTS MANUAL



www.densin.com

Introductions

Introductions

Congratulations on your purchase of the DEN-SIN C-110E, C-170E & C-200E High Pressure Cleaner.

Read this user manual before you start up your High Pressure Cleaner the first time.

This document or part of it may not be photocopied, or in any other way reproduced, or translated to other languages without the prior written consent of DEN-SIN.

This machine is a High Pressure Cleaner producing water jet under high-pressure, which is why severe injuries can occur if the safety precautions are not observed. Therefore a full understanding of the contents of this instruction manual is required, in order to prevent injuries to you, objects and persons near by.

Safety

The following symbols are used in this manual to indicate procedures that if not followed, may results in personal injuries or damage to equipment.



WARNING is used to alert the reader of procedures or practice which if not followed correctly could result in personal injuries.



CAUTION is used to alert the reader of procedures or practice which if not followed correctly could result in damage to machine or other equipment.



NOTE is used to highlight important information that may assist the reader carrying out the procedure or understanding the text.

Version 15: Oct 2009

Table of contents

Table of contents

Introductions	1
Table of contents	2
1. Getting acquainted with your High Pressure Cleaner	3
Fast and efficient cleaning	3
Specifications	3
Applications	3
Unpacking	4
Installation	4
Operations	5
2. Safety and protection information	6
General safety & application guidelines	6
Safety devices	6
Important medical information	7
Safety precautions	8
3. Maintenance and troubleshooting	9
Maintenance	9
Trouble shooting	10
Service instructions	12
4. Available accessories	15
Accessories	15
ID-plate	15
5. Spare parts lists	16
Chassis assembly	16
Chassis assembly spare-parts list	17
Pump assembly	19
Pump assembly spare-parts list	20
Un-loader valve assembly	22
Un-loader valve assembly spare-parts list	23
Safety valve assembly C-200E	25
Safety valve assembly spare-parts list C-200E	25
Start up accumulator assembly C-110E	26
Start up accumulator assembly spare-parts list C-110E	26
Lance assembly	27
Lance assembly spare-parts list	28
Trigger gun assembly	29
Trigger gun assembly spare-parts list	30
Complete HP hose w/ Ergo 3000 trigger gun	30
Wiring diagrams	31
Recommended spare-parts	32
6. Declaration and Warranty	33
EU declaration of conformity	33
Warranty	33
7. Spare Parts Request Form	34
8. Maintenance Log Book	35



The information contained in this user guide is subject to change without notice.

I. Getting acquainted with your High Pressure Cleaner

I. Getting acquainted with your High Pressure Cleaner

Fast and efficient cleaning

The DEN-SIN High Pressure Cleaners in the C-110E C-170E C-200E series enables you to get more cleaning done in less time.

This series of DEN-SIN High Pressure Cleaners offers you high performance yet a compact design. The compact design enables the machines to be agile within inconvenient places even at staircases, and the high performance gives you the opportunity to solve an array of cleaning tasks. The High Pressure Cleaners in this series are designed for industrial and offshore use as well as for cleaning contractors. All pump parts, fittings and pipes in contact with water are made of non-corrosive materials. Together with the ceramic pistons, long life seals and stainless steel valves, it ensures long life and high durability.

Specifications

Model	Motor		Motor Speed rpm	Working Pressure		Flow Capacity		Power Supply Voltage	Dimensions	Weight
	Hp	kW		psi	Bar	gpm	l/m in		LxWxH mm	
C-110E	3.0	2.2	1400	1600	110	2.6	11.7	220/240/1ph/50Hz 110/220/1ph/60Hz	720x480x900	45
C-170E	6.0	4.4	1400	2465	170	3.4	15.2	380/415/3ph/50Hz 220/440/3ph/60Hz	720x480x900	46
C-200E	7.5	5.5	1400	2900	200	3.7	16.5	380/415/3ph/50Hz 220/440/3ph/60Hz	720x480x900	56

Applications

These heavy-duty High Pressure Cleaners are capable of removing any kind of dirt:

Algae off concrete constructions
Paint and graffiti off walls
Dust, dirt, soil & mud off floors
Oil & grease off engines and other mechanical parts
Dirt and salt deposits off ship decks

And with the option for use of accessories even many more jobs are to be dealt with:

Sand-blasting
Drain-cleaning
Dispensing of soaps and chemicals
Sludge pumping
Extra long lances for hard to reach places
Floor cleaning equipment
Rotary brushes



This machine is only to be used for the purposes it is designed for. Any other use shall be considered improper and therefore potentially dangerous. The manufacturer is not to be held responsible for any damages caused by improper use.

I. Getting acquainted with your High Pressure Cleaner

Unpacking

Remove the High Pressure Cleaner and its accessories from the packing material. For transport and packing reasons some accessories may be supplied disassembled.

Make sure all components are present:

- High-pressure machine itself
- Handle bar (partly attached)
- Wing nuts for the handle bar
- Electrical cord (attached)
- High pressure hose with Spray-gun trigger
- Double barrel lance (disassembled)
- Water inlet male hose coupling

Installation

- Attach the handle bar (pos 8, page 16) to the machine using the wing nuts and bolts supplied, align the handle bar according to the cabinet molding.
- Mount the high-pressure hose on to the High Pressure Cleaner (pos. 30 page 20) by pulling back the retainer (pos. 24) on the high-pressure hose coupling, while sliding it on the male part (pos. 30 page 20) positioned on the front of the High Pressure Cleaner.
- Assemble the double barrel spray-lance (pos. 1 page 27). To mount the assembled spray-lance on to the Spray-gun trigger, pull forward the front of the Spray-gun trigger while sliding in the male swivel coupling part (pos. 13 page 27) of the spray-lance.
- Prepare the water supply for the High Pressure Cleaner, by attaching a hose to the supplied low pressure inlet male-coupling. Connect the other end of the water supply hose to a potable water tap. Open the tap.

Notice: Connection to the public mains water supply according to regulations.

- Before starting the machine, bleed out air by pulling the trigger-gun handle until any air has escaped the inlet hose.
- Put the power-plug into a main power supply socket. Turn on the power and the High Pressure Cleaner by turning the knob (pos. 9 page 16) clockwise to the I position.
- The high pressure cleaner is now ready for operation. The spray-gun lance is affected by a recoil force during operation – therefore keep a firm grip with both hands on the Spray-gun handle and the lance. Press the trigger and start cleaning.
- The pressure can be regulated by turning the high-pressure cock on the spray-gun lance. When using chemical injector, pressure must be adjusted to low.



Make sure your local power supply specifications are in accordance with the motors requirement. Refer to the ID-plate on the machine. Do Not run the High Pressure Cleaner without sufficient potable water supply as it can cause cavitation and serious damage to internal pump parts. Do not let the machine recycle the water (running with Spray-gun trigger not activated) for more than a few minutes, this can cause serious damage to the seals.

1. Getting acquainted with your High Pressure Cleaner

Operations



To prevent accidents from happening, ensure the safety of the person(s) who uses the equipment and to protect bystanders and nearby placed inventory or machinery, a few safety precautions needs attention.

- 1) Treat the machine as a high-speed cutting tool.
- 2) Anyone under the age of 18 is NOT allowed to use the machine.
- 3) Always use a proper plug and socket specially designed with ground to earth wiring.
- 4) Only connect to an installation with earth wiring. A certified electrician shall make the installation. It is strongly recommended that the electric supply to the machine include a Residual Current Device/GFCI.
- 5) Always keep the High Pressure Cleaner and its accessories in good working condition. Check the machine for defects, especially the insulation on the electric cable. Do NOT start up the machine if there is any defect. Have the machine serviced.
- 6) When using the High Pressure Cleaner and its accessories, eye protection must be worn to protect against repelling or ricocheting matters causing eye damage.
- 7) Suitable clothing and footwear must be worn while using the equipment to protect the operator. Do not try to clean clothes or footwear with the machine.
- 8) Precautions must be made to keep bystanders away from the working range.
- 9) Do NOT spray-clean on yourself, others or live animals. The high-pressure beams are capable of making severe injuries.
- 10) Do NOT spray at electrical equipment OR the machine itself.
- 11) While repairing or servicing the equipment and its accessories always make sure the machine is turned off and disconnected from the main power supply.
- 12) Only allow instructed personnel to operate the machine.
- 13) Activating the trigger/gun can cause backward force therefore always hold spray lance with both hands.
- 14) When pausing during operation, turned off the main switch of the machine and ensures that the trigger/gun is locked.
- 15) Only use high-pressure hoses, connections and nozzles specified by DEN-SIN.
- 16) **IMPORTANT** – Do not use the machine in a possible explosive environment in accordance with EN-50014.



2. Safety and protection information

2. Safety and protection information

General safety & application guidelines

- 1) It is not allowed to clean asbestos containing surfaces with high-pressure, unless using special equipment.
- 2) Persons under the influence of alcohol, drugs or medicine should not operate the machine.
- 3) Do not touch plug and socket with wet hands.
- 4) This machine has been constructed for use with Nilfisk-ALTO detergents. The use of other detergents or chemicals may cause problems as to the operation and the safety.
- 5) When using detergents the instructions should always be strictly observed.
- 6) Always flush the machine with clean water after use of chemical/detergents.
- 7) Always unplug power supply when cleaning and maintaining the machine.
- 8) Do not use the machine if important parts are damaged – i.e. safety devices, high-pressure hoses, spray handle.
- 9) The user is obliged to observe all national working environment and working safety regulations concerning "operation of high-pressure washers".
- 10) It is not allowed to connect this machine directly to a potable water supply.
- 11) If the machine is to be connected to potable water supply it is strictly necessary to fit the machine with a water break tank, in accordance with EN1717.

Safety devices

The machine is equipped with the following safety devices:

- 1) Stop button. The stop button (pos. 9 page 16) stops the machine when turned anti-clockwise to the 0 position.
- 2) Locking device on spray-gun handle. The locking device prevents the trigger from being activated when pulled out.




- 3) Thermal sensor and over load relay. The thermal sensor and the overload relay protects the motor against overloading. The machine can be switched on again after a few minutes, when the sensor has cooled.

DO	DON' T

2. Safety and protection information

Important medical information

Immediate hospital attention should be given personnel who sustain equipment related injuries while operating the system. In such cases, it is vital that medical personnel be apprised of all facts relevant to such injuries. Therefore, all operating personnel should be provided with waterproof emergency medical alert tags or cards, describing the nature of their work and the possibility of injury inherent in the use of water jetting equipment. The below example of a standard card can be photo copied, laminated and used as medical alert tag.



WARNING


Obtain medical treatment immediately for ANY high-pressure water-jet injuries.

Inform the doctor of the cause of the injury.


Show this card to the doctor.

IMPORTANT MEDICAL INFORMATION

This card is to be carried by personnel working with high-pressure water jetting equipment.



DEN-SIN - a division of Nilisk-Advance Pte Ltd.
 17 Link Road, Singapore 610034
 Tel: +65 6384 1806 Fax: +65 6384 0916



MEDICAL ALERT NOTE TO PHYSICIAN

This patient may be suffering from a water jet injury. Evaluation and management should parallel that of a gunshot injury. The external manifestations of the injury cannot be used to predict the extent of internal damage. Initial management should include stabilization and a thorough neurovascular examination. X-rays can be used to access subcutaneous air and foreign bodies distant from the site of injury. Injuries to the extremities can involve extensive nerve, muscle, vessel damage, as well as cause a distal compartment syndrome. Injuries to the torso can involve internal organ damage. Surgical consultation should be obtained. Aggressive irrigation and debridement is recommended.




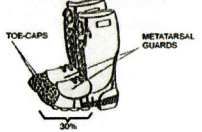

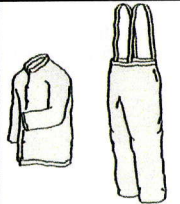
Surgical decompression and exploration may also be necessary. Angiographic irrigation studies are recommended pre-operatively if arterial injury is suspected. Bandages with a hygroscopic solution (MgSO₄) and hyperbaric oxygen treatment have been used as adjunctive therapy to decrease pain, edema and subcutaneous emphysema. Unusual infections with uncommon organisms in immunocompetent patients have been seen; the source of the water is important in deciding on initial, empiric antibiotic treatment, and broad spectrum intravenous antibiotics should be administered. Cultures should be obtained.

2. Safety and protection information

Safety precautions



The following protective clothing and devices should be worn both by personnel operating the water blaster system and equipment and by those working nearby:

Eye protection- Operators must wear visors and goggles to guard against spray and flying debris. A combination of both goggles and visor is advisable. And will protect the eyes and the face during both water-blasting as well as abrasive water-blasting	 <p style="text-align: center;">EYE PROTECTION</p>
Head protection- Helmets must be worn at all time by personnel within the work area. Helmet material must be able to withstand mechanical shock exceeding 10G in 8ms without fracturing.	 <p style="text-align: center;">HEAD PROTECTION</p>
Hand protection- Shear proof gloves must be worn by the operator at all times. A glove combination of a cloth inner lining and a water tight outer layer is preferred.	 <p style="text-align: center;">HAND PROTECTION</p>
Foot protection- Safety footwear with steel toe caps minimum 0.5mm (0.02") thick must be worn. The toe cap must cover at least 30% of the footwear length. Basic safety footwear must also be equipped with metatarsal guards to protect the instep. Safety boots are available in other designs than the illustration.	 <p style="text-align: center;">FOOT PROTECTION</p>
Hearing protection- Operators and other personnel exposed to noise levels of more than 90-dBa for more than 1 hour must wear suitable ear protection. Ear plugs or ear muffs are usually sufficient.	 <p style="text-align: center;">HEARING PROTECTION</p>
Body protection- Waterproof garments protect the operator only from spray and flying debris. They do NOT deflect direct jet impact. Therefore, an operator must take care never to point a water-jet either at them selves or other personnel.	 <p style="text-align: center;">PROTECTIVE CLOTHING</p>

3. Maintenance and troubleshooting

3. Maintenance and troubleshooting

Maintenance

Subject	Matter / Procedure
Lubrication	<p><i>Before starting the pump, check the oil level in the pump. Change the oil after the first 50 working hours and then after every 500 working hours.</i></p> <p>Renewal of oil: Turn off the High Pressure Cleaner. Dismount the hexagon screw at the bottom of the pump housing (pos. 28 page Error! Bookmark not defined.). Allow the oil to drain into a waste oil-tray. Remount the hexagon screw and add oil through the oil inlet on top of the pump (pos. 14 page Error! Bookmark not defined.) until the red point of the oil control glass has been reached. Approx. 0.4kg of oil, type SAE 15W40, is to be used.</p> <p>Notice: Do not dispose of used oil in drain.</p>
Cleaning	<p><i>Use a damp cloth to wipe the cabinet and handlebar. Do not use detergent cleaning chemicals.</i></p> <p>Notice: To prevent electrical shock. DO NOT SPRAY DIRECTLY UPON THE MACHINE WITH HIGH PRESSURE.</p> <p><i>Occasionally clean the fan cover positioned at the back of the motor to ensure sufficient airflow. Do NOT operate the machine with damaged or removed fan cover.</i></p>
Inspection	<p><i>To prevent electrical shock and spills of leaking water. Check electrical cord and high pressure hose for wear and cracks. Keep coupling parts free of dirt to ensure long life of O-ring seals preventing water leaks.</i></p> <p>Notice: To prevent damage on hoses and cord, be careful not to have them run over by heavy vehicles or squeezed in door openings etc. Replace if necessary.</p>
Storage	<p>Be sure the cleaner is kept frost-free, if not possible flush the pump of the cleaner with antifreeze fluids.</p>

3. Maintenance and troubleshooting

Trouble shooting

Symptom	Cause and Rectification
When the main switch is turned on the High Pressure Cleaner will not run.	<i>Fault somewhere in the power supply.</i>
The motor is humming but the pump does not start.	<p>Make sure the socket is inserted correctly. Inspect cord for cracks and wears. Check if fuse is blown, replace if necessary.</p> <p><i>Too low voltage, one phase is missing (on three phase model only) High-pressure pump is blocked.</i></p> <p>Check the mains voltage. Check the connection box voltage with a meter. With the machine turned off, turn the motor, at the fan, if it remains blocked check the pump.</p>
The pressure drops and the High Pressure Cleaner works irregularly.	<p><i>The strain filter is clogged or the water supply from the tap is insufficient.</i></p> <p>Clean the strain water filter. If there isn't enough water-flow through the tap, the machine should suck from a filled water vat or tank.</p>
The pump continuously stops and starts, when the spray-gun trigger is activated.	<p><i>The high pressure nozzle is partly clogged.</i></p> <p>Turn off the High Pressure Cleaner, dismantle the high-pressure nozzle and remove the extraneous matter. Replace if damaged.</p>
The high pressure cleaner does not reach the proper working pressure when the spray-gun handle is activated.	<p><i>The high-pressure nozzle is clogged or there is dirt in the by-pass valve. The pump sucks air.</i></p> <p>Turn off the High Pressure Cleaner. Clean the nozzle. Inspect the low pressure supply. or while the spray-gun trigger is activated turn the machine on again. Repeat the procedure again; now with the trigger released. If the problem still occurs, the by-pass valve should be dismantled and the extraneous matter removed.</p>
The High Pressure Cleaner only works with approximately 2/3 of the maximum pressure, and the high-pressure hose is vibrating.	<p><i>There is dirt in the valves.</i></p> <p>Turn off the High Pressure Cleaner. Dismantle the valve bolts and the valves, remove the dirt and check to ensure the valve flaps are movable and fits tightly.</p>

(Continues)

3. Maintenance and troubleshooting

(Continued)

Symptom	Cause and Rectification
Noisiness	<i>The pump sucks air. One or more valve springs are broken or down. Extraneous matter in the valves. Crankcase or motor bearings worn out.</i> Inspect the low-pressure supply. Replace springs. Clean the valves. Replace the bearings.
Water in the oil	<i>The O-ring casing is worn out. High moisture in the air (condensing inside the crankcase) The seals are completely worn out.</i> Check or replace the O-ring. Renewal of the crankcase oil more often. Replace the seals.

When using chemical injector

The High Pressure Cleaner does not suck chemicals	<i>The chemical container is empty. The High Pressure Cleaner has not been set to low-pressure (on the double barrel lance cock). The low-pressure nozzle is clogged, or partly clogged. The non-return valve of the chemical injector is stuck.</i> Ensure the chemical container contains sufficient fluid for proper suction. Set the spray-lance to low pressure by turning the cock on the lance counterclockwise. Clean or replace the low-pressure nozzle. Clean, correct or replace the non-return valve of the chemical injector.
--	--



NOTE

For any further inconveniences, not mentioned in this user guide or any damages of the machine, we strongly suggest you to make contact with your dealer for the repair or possible replacement of any original spare-parts.

3. Maintenance and troubleshooting

Service instructions

Detach the high pressure hose, dump back hose, inlet hose, safety valve, and parts on the pump head before serving the pump.

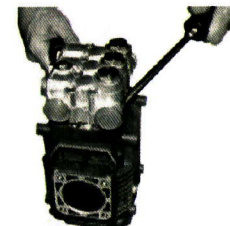
(Please refer to Pump assembly (Page 17) unless otherwise stated.)

Servicing the valves:

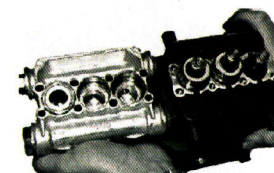
1. Remove the valve cap (Pos: 2).
2. Inspect the valve cap O-Ring (Pos:1) for any damage, replace if necessary.
3. Use the needle nose pliers to remove the valve (Pos: 3).
4. Use a small probe to move the poppet up and down to assure that the valve is functioning properly and that no debris is stuck in the valve (Pos: 3).
5. To reassemble the valves proceed the other way round and tighten the cover screws with a torque wrench. (Referring to torque specification)

Servicing the Packing/Seals:

1. Remove the bolts (Pos: 38) on the head (Pos: 36) of the pump.
2. Place the screwdrivers between the head (Pos: 36) and crankcase (Pos: 9) of the pump, lifting one up and the other down. The head should start to lift off of the plungers (Pos: 23).

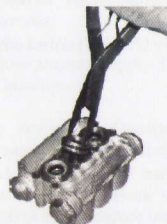


3. When you remove the head, some of the water seals have stayed on the plungers (Pos: 23) and some in the head (Pos: 36). To remove the seals from the plungers (Pos: 23), simply turn the assemblies and pull off.



3. Maintenance and troubleshooting

- If the seal assemblies (Pos: 30-33) are in the head (Pos: 36) use the reversible pliers to grab the seal retainer on the outside ring, twist the retainer in either direction and lift out.

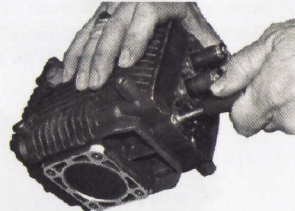


- Pull out the guide ring (Pos: 31) with your finger.
- Pull the high-pressure seal (Pos: 30) and support ring (Pos: 7) out of the head with your finger.
- The low-pressure seal (Pos: 33) is located in the brass seal retainer. Using the mechanics pick, go in between the seal and retainer and pull the seal straight out.
- Remove the seal retainer O-Ring (Pos: 32) with mechanics pick.
- To reassemble the packing and seals proceed the other way round and tighten the cover screws with a torque wrench. (Referring to torque specification)

Servicing the Plungers (Pos: 23):

Recommend to replace Piston kits, Support Rings kits, and Water Seals kits whenever servicing the plungers.

- Remove the plunger retainer nut (Pos: 25).
- Insert the gasket scraper between the copper washer (Pos: 24) and plunger (pos: 23) to remove the washer (Pos: 22).
- Twist and pull the plunger off the plunger rod.

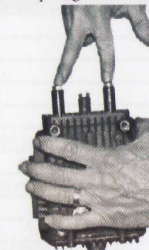


- Remove the plunger rod O-Ring (Pos: 21) with the mechanics pick.
- Remove the washer (Pos: 22). And clean any thread locker that is left on the plunger rod and retaining nut threads.
- To reassemble the plungers, proceed the other way round and tighten the cover screws with a torque wrench. (Referring to torque specification)

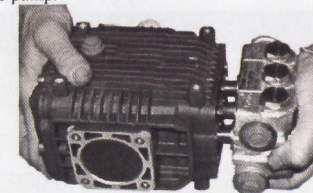
3. Maintenance and troubleshooting

Pump head (Pos: 36) to drive end (Pos: 9) Installation:

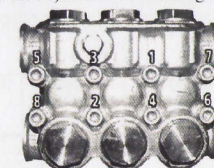
- Turn the crankshaft to align the plungers as shown.



- Place the head evenly onto the plungers and push it until it makes contact with the drive end of the pump.



- Torque the head bolts (Pos: 38) as shown in the tightening sequence diagram.



Torque Specification:

Descriptions	Head (Pos: 38)	Piston Nut (Pos: 25)	Valve Cap (Pos: 2)
In .lbs	133	106	442
Kg.m/N.m	15	12	50