



ULTIMATE WATER JETTING SOLUTION

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

Electric Powered Heavy Duty
Cold Water High Pressure Cleaner

USER GUIDE & SPARE PARTS MANUAL



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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.

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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 result 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 20: June 2011

Revision History

No.	Date	Revision	Rev.No.
1	11/2010	Change Trigger gun from Ergo1000/1000 to Ergo 2000	18
2	05/2011	C-100E 230V/50Hz, Nozzle changed to 15045, was 1505	19
3	06/2011	Revised Pump Water Seal Kit	20

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

1. 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	Dimensions LxWxH mm	Weight kg
	Hp	kW		psi	Bar	gpm	l/min	Voltage		
C-110E	3.0	2.2	1400	1600	110	2.6	11.7	220-240V/1ph/50Hz 110/220V/1ph/60Hz	720x480x900	45
C-170E	6.0	4.4	1400	2465	170	3.4	15.2	380-415V/3ph/50Hz 220-440V/3ph/60Hz	720x480x900	46
C-200E	7.5	5.5	1400	2900	200	3.7	16.5	380-415V/3ph/50Hz 220-440V/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.

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 26). 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 26) 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.

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****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.



**Spray gun may change without notice*

- 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.



3. Maintenance and troubleshooting

Maintenance

Subject	Matter / Procedure
Lubrication	<p>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.</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>Use a damp cloth to wipe the cabinet and handlebar. Do not use detergent cleaning chemicals.</p> <p>Notice: To prevent electrical shock. DO NOT SPRAY DIRECTLY UPON THE MACHINE WITH HIGH PRESSURE.</p> <p>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.</p>
Inspection	<p>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.</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>

Trouble shooting

Symptom	Cause and Rectification
When the main switch is turned on the High Pressure Cleaner will not run.	<p>Fault somewhere in the power supply.</p> <p>Make sure the socket is inserted correctly. Inspect cord for cracks and wears. Check if fuse is blown, replace if necessary.</p>
The motor is humming but the pump does not start.	<p>Too low voltage, one phase is missing (on three phase model only) High-pressure pump is blocked.</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>The strain filter is clogged or the water supply from the tap is insufficient.</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>The high pressure nozzle is partly clogged.</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>The high-pressure nozzle is clogged or there is dirt in the by-pass valve. The pump sucks air.</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>There is dirt in the valves.</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>

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

When using chemical injector

The High Pressure Cleaner does not suck chemicals	<p><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></p> <p>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.</p>
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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.

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), simple turn the assemblies and pull off.



- 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.



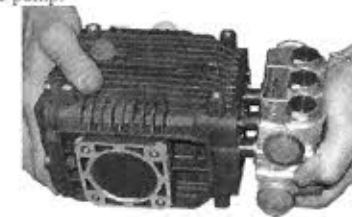
- Remove the plunger rod O-Ring (Pos: 21) with the mechanics pick.
- Remove the washer (Pos: 22). And clean any thread locker that is left on the plunger rod and retaining nut threads.
- To reassemble the plungers, proceed the other way round and tighten the cover screws with a torque wrench. (Referring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

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

4. Available accessories

Accessories

Accessories	part no.:
Chemical injector.	700550021
Rotary brush.	700550462
Foam injector	700550156
Foam lance.	700550464
Foam sprayer.	700550463
Extension hose with quick couplings. from 10 - 50 m	Please inquire
Industrial drain cleaner (1 front, 3 rear jets).	700550508
Container for sandblasting grid, including regulator.	Please inquire
Floor cleaner	700550465
Sludge pump.	700550198-700550201
Filter for suction from vat or tank with 3/4" hose nipple	700520049
Retractable hose reel.	700550208

Accessories	C110E 50HZ	C110E 60HZ	C170E 50HZ	C170E 60HZ	C200E 50/60HZ
**Double Barrel Lance	700550456	700550456	700550455	700550458	700550456
*Single Barrel Lance	700550449	700550449	700550448	700550451	700550449
**Short Double Barrel Lance	700550488	700550488	700550489	700550491	700550488
Single Barrel Lance with Rotating Nozzle	700551287	700550169	700550170	700551288	700550171
**Double Barrel Contractor Lance with side Regulator Handle	700551286	700551286	700550192	700550194	700551286
Single Barrel Lance with Multi-speed Nozzle	700551289	700550890	700550566	700551290	700550890
Industrial Sandblaster Kit with boron Carbide Nozzle	700550480	700550479	700550478	700550481	700550479

* With Straight Jet Nozzle **With Fan Jet Nozzle

Notice: Always state type of High Pressure Cleaner along with the part no.: when ordering accessories or spare-parts.

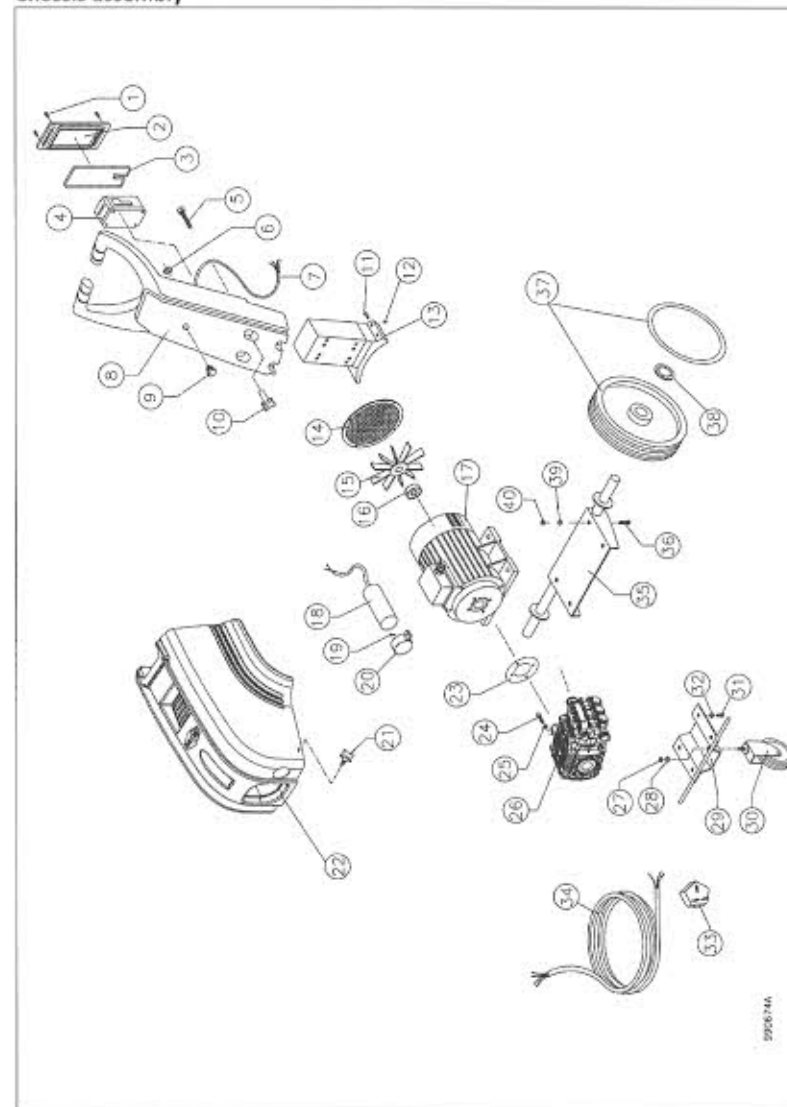
ID-plate

Refer to the identification plate on the machine:



5. Spare parts lists

Chassis assembly



5. Spare parts lists

Chassis assembly spare-parts list

Pos.	Part no.:	Qty.:	Description:
1	700510040	4	Screw
2	700530109	1	Cover For EI-Box
3	700530107	1	Gasket for EI-Box
4	700530005	1	Overload Relay 16A C-110E 230V 50/60Hz C-170/200E 400/440V 50/60Hz
4	700530096	1	Overload Relay 22A C-170/200E 220V 60Hz
4	700530115	1	Overload Relay 27A C-110E 110V 60Hz
5	700510043	4	Bolt M6 x 35
6	700520026	1	Steel lock Ø14
7	700530130	1	Motor Cable C-110E 230V 50/60Hz
7	700530417	1	Motor Cable C-170/200E 230/400/440V 50/60Hz
7	700530371	1	Motor Cable C-110E 110V 60Hz
8	700520057	1	Handle
9	700530108	1	Switch Knob
10	700510050	4	Knob Screw Handle
11	700510051	4	Bolt M6 x 18
12	700510007	4	Locknut
13	700520060	1	Bracket For Handle C-110E C-170E
13	700520061	1	Bracket For Handle C-200E
14	700530239	1	Fan Cover For Motor C-110E C-170E
14	700530240	1	Fan Cover For Motor C-200E
15	700530389	1	Fan plastic C-110E
15	700530390	1	Fan plastic C-170E C-200E
16	700530002	1	Bearing For Motor C-110E C-170E
16	700530238	1	Bearing For Motor C-200E
17	700530530	1	Motor C-110E 230V 50/60Hz
17	700530532	1	Motor C-110E 110V 60Hz
17	700530588	1	Motor C-170E 220-440V 50/60Hz
17	700530685	1	Motor C-200E 400/440V 50Hz
17	700530686	1	Motor C-200E 400/440V 60Hz
17	700530137	1	Motor C-200E 220V 60Hz
18	700530012	1 / 4	Capacitor (1) C-110E 230V (4) C-110E 110V
19	700510002	1 / 4	Screw (1) C-110E 230V (4) C-110E 110V
20	700530011	1 / 4	Holder For Capacitor (1) C-110E 230V (4) C-110E 110V
21	700510010	2	Knob Screw Cabinet
22	700520510	1	Cabinet
23	700530693	1	Gasket for Motor-Pump
24	700510030	4	Bolt M8 x 25
25	700510034	4	Spring washer M8
25A	700510005	4	Flat washer M8
26	700560000	1	Pump complete C-110E 110/220V 60Hz
26	700560001	1	Pump complete C-110E 230V 50Hz
26	700560002	1	Pump complete C-170E 50/60Hz & C-200E 60Hz
26	700560003	1	Pump complete C-200E 50Hz
27	700510068	1	Locknut M12
28	700510067	1	Washer flat M12
29	700520504	1	Bracket For Castor Wheel
30	700520456	1	Castor Wheel With Brake
31	700510009	4	Bolt M8 x 16

Continues

5. Spare parts lists

Continued

Pos.	Part no.:	Qty.:	Description:
32	700510034	4	Spring washer M8
32A	700510005	4	Washer M8
33	700530097	1	3 Pin Plug 13 Amp 1Ph (Optional) C-110E
34	700530007	1	Main Cable C-110E 230V 50/60Hz
34	700530261	1	Main Cable C-110E 110V 60Hz
34	700530015	1	Main Cable C-170E C-200E 415V 50Hz
34	700530370	1	Main Cable C-170E C-200E 230/440V 60Hz
35	700520519	1	Rear Wheel Bracket
36	700510011	4	Bolt M8 x 30
37	700520511	2	Wheel Cover
37A	700520511	2	Wheel
38	700520007	2	Star Lock
39	700510005	8	Washer M8
40	700510004	4	Locknut M8
*	700510178	4	Screw (for fan cover)
*	700530112	1	Closed End Wire Connector
*	700530122	3	Ring Terminal 2.5mm ²

*Not shown

