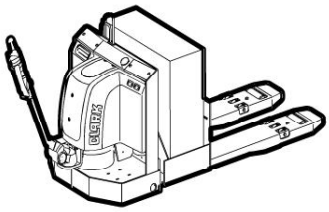
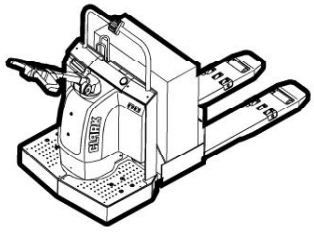
SERVICE MANUAL



PWX 30-40



HWX 30-40

RATED CAPACITY: 3000– 4000kg

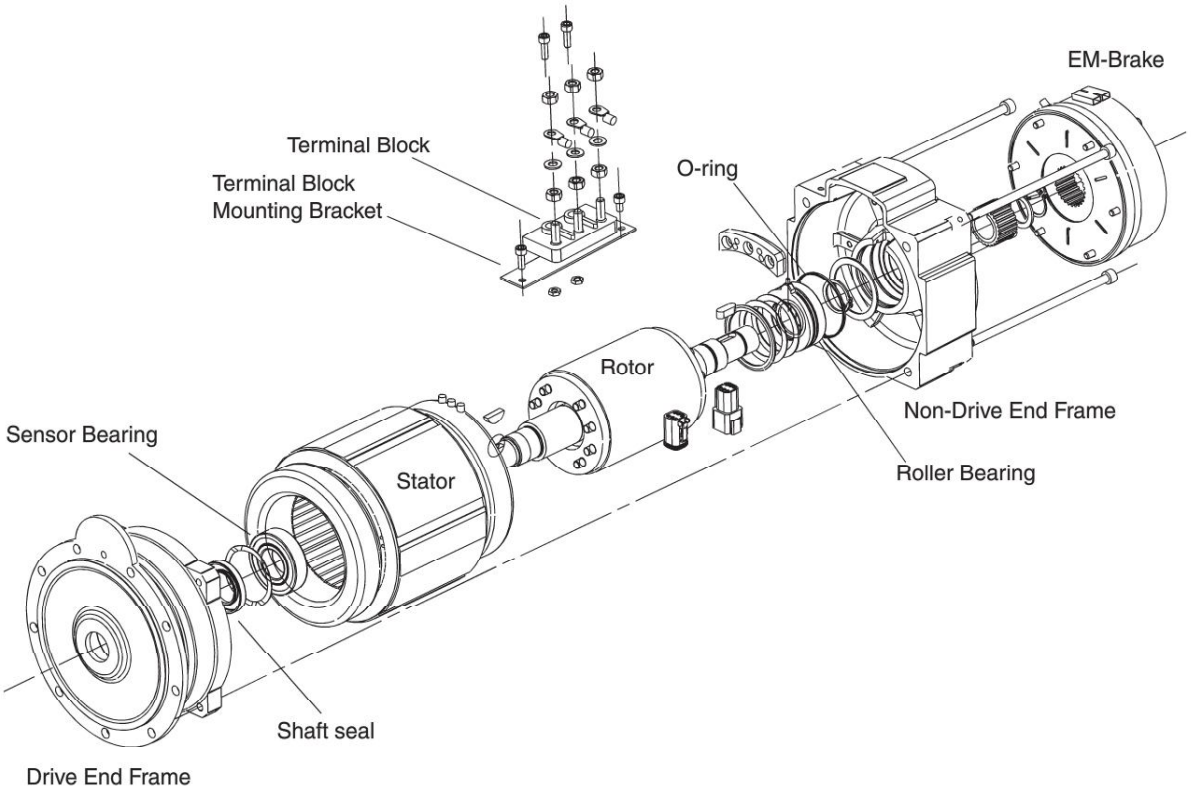
Part No. 3344360
Book No. SM 879
Jul. 2012

CLARK
THE FORKLIFT

(Head office) 202-1 Ojung-Dong, Ojung-Gu,
Bucheon-city, Kyunggi-do, Korea

Contents by Group

Contents are listed here by Group number :



Ball Bearings

Both ball bearings are maintenance free. If it becomes necessary to remove the bearings to repair the motor, they should be replaced. In any case the seals (shaft oil seal and O-ring) must be replaced.

In general bearings should be replaced at approximately 10,000 operating hours.

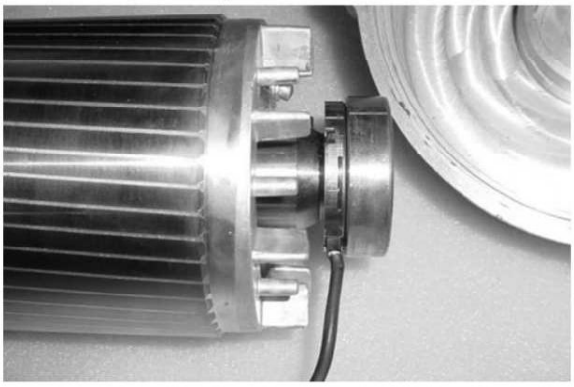
Encoder Bearing

The encoder bearing is used to communicate the motor speed to the controller.

NOTE

The encoder bearing is very sensitive to static electricity. If you are going to be working on the encoder bearing you should have a ground strap on to insure that the encoder bearing does not get damaged.

Replacing Encoder Bearing



In general the encoder bearing should be replaced every time the motor is disassembled.

To replace the encoder bearing:

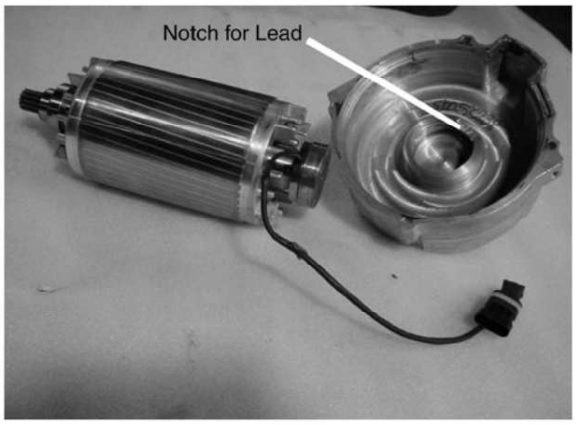
- Turn key OFF.
- Set park brake.
- Disconnect battery.
- Remove the drive motor.
- Remove shim ring.
- Remove EM-brake thru bolts.
- Remove the EM-brake
- Remove terminal block mounting bracket bolts.
- Remove motor thru bolts.
- Remove the non-drive end housing from motor.
- Remove rotor from motor.
- Use a gear puller to remove encoder bearing from the rotor.
- Press new encoder bearing on to rotor at the inner ring with a steady pressure. The inner ring of the bearing must to be pressed against the shaft shoulder.

Motor Reassembly

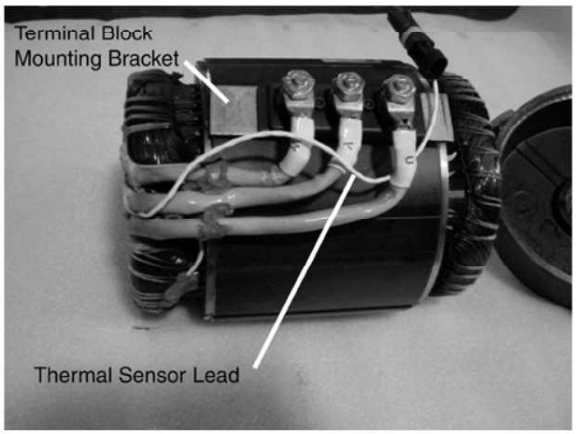
NOTE

The encoder bearing is very sensitive to static electricity. If you are going to be working on the encoder bearing you should have a ground strap on to insure that the encoder bearing does not get damaged.

- Insure that the encoder cables are installed correctly and do not get pinched or touch the rotor.
- Install the end housing carefully onto the encoder bearing and press it on with a steady pressure. The lead from the bearing must located in the notch in the housing frame.



- Install the rotor into the stator housing.
- Tie strap the encoder bearing lead to one of the motor leads to prevent it from being pulled and contacting the rotor.
- Install the drive end onto the motor .

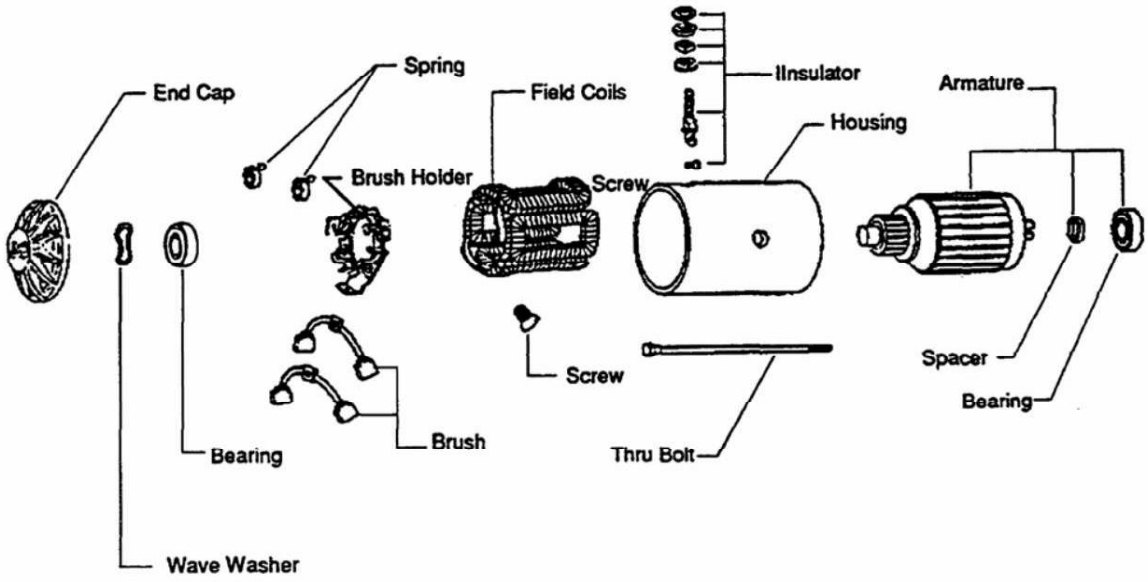


- Install the motor through bolts and tighten.
- Install the terminal block mounting bracket bolts.
- Install the EM brake and thru bolts.
- Install shim ring.
- Reinstall the motor into the truck.

Section 3

Pump Motor Overhaul

ELECTRIC MOTORS(PUMP MOTOR)

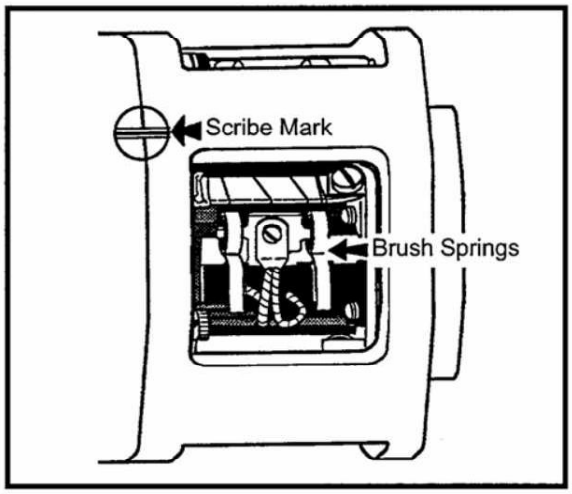


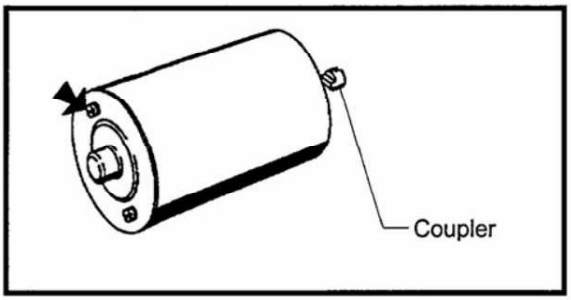
Pump Motor

Disassembly

- Remove the cover band from the commutator end of the motor (if so equipped). Use a brush hook to reach into the motor and lift the brush springs. Pull the brushes out of the brush holders. Either position the brushes outside the motor or move the brush retaining screws and remove the brushes from the motor.
- Scribe or center punch locating marks in the end heads and the frame. Although locating marks are not always necessary because of locating pins in some motors, they can save a lot of time when the motor does not have locating pins.
- Remove the commutator end head retaining screws or bolts. Almost all motors have a slip fit bearing at the commutator end, and the end head can be removed with very little trouble. On motors that have a shaft extension on both ends of the armature, the attachment on the commutator end of the shaft must be removed before the end head can be separated from the motor.
- Remove the drive end head retaining bolts or screws, if necessary. Some of the smaller pump motors retain the drive end head with the motor through bolts. Separate the armature and drive end head as an assembly from the frame and field coil assembly.
- Separate the armature from the drive end head. This operation is usually accomplished by pressing the armature out of the drive end bearing. On some of the larger motors, the end head and bearing will have to be removed with a puller. When a puller is used, protect the end of the armature shaft with a nut or a thick flat washer. If the shaft, coupling, or spline is damaged when removing the end head, the armature or the drive spline usually has to be

replaced. Use caution and do not damage the armature.





- Separate the bearing from the end head. On larger motor the bearing is retained with a snap ring. Remove the snap ring, then press the bearing out of the end head.
- There will be occasions when it will be necessary to remove ventilating fans and/or drive splines from armature shafts. The ventilating fans are, for the most part cast iron or cast aluminum. Once these fans have been pressed onto the armature, they must be heated to be removed without damage.

Remove Fan

A puller is installed and a slight pressure exerted against the fan. Use a small propane torch to heat the area of the fan around the shaft. When the fan becomes loose on the shaft, as evidenced by the puller becoming loose, it should be removed as quickly as possible.

Remove Retaining Pin

Press or drive the spline retaining pin out of the shaft and spline.

Remove Spline

Use a hammer and chisel or drift punch to drive the spline out of the shaft.

CLEANING & INSPECTION

Prior to any testing or inspection, except bearings and armature, should be thoroughly cleaned with a good grade petroleum base cleaning solvent and dried with compressed air.

The armature should be blown off with compressed air to remove the brush dust and dirt from around the commutator and windings.

Bearings should be wiped clean with a cloth and never submerged in a solvent. Submerging bearings in a solvent will deteriorate internal lubrication which cannot be replaced.

Visual Inspection

After the motor components have been thoroughly cleaned and dried, they should be inspected for the following:

- Drive End Head
  Check bearing recess for any signs of wear.
  Check mounting holes for any stripped or crossed threads or broken studs.
- Commutator End Head
  Check bearing recess for any signs of wear.
  Check brush holder insulation for cracks or any signs of burning. Check brush holders and springs for wear.
- Oil Seal (where applicable)
  If upon disassembly of the motor, the field coils or commutator are oily, a faulty oil seal is indicated. A good service practice is to replace the oil seal whenever the motor is overhauled. The oil seal seat on the armature should be checked for rough spots, grooves or scars.

Bearings

- Check bearings by turning them with your fingers. Fell for binding or gritty effects and excessive

looseness or wobble. A good bearing should also have a small amount of drag or stiffness caused by the lubrication. If the bearing turns freely, it should be replaced.

- Ball bearings that have been pulled off of shafts, pressed out of end heads, or side loaded in such a way as to apply pressure on the balls and races must be replaced. Although the bearings may appear or fell good, the bearing races have been brindled and will fail within a relatively short period of service.

Frame and Field Assembly

- Check the condition of all insulation. If the insulation on the field coils appear blackened or charred, the serviceability of the coils is questionable. Burned or charred insulation is a result of coil overheating due to overloading conditions, grounded or shorted coil windings. Check condition of all other insulation such as brush rigging, under coil connections and around terminal studs.

Armature

- Where the spline was removed from the armature shaft, remove all the old grease and any metal chips or fillings that may be present.
- Install and Drill Spline
  The new spline is pressed into the shaft and the retaining pin hole is drilled through the new spline. New spines have installation instructions calling out a dimension for spline installation. After the hole has been drilled through the spline, the armature and spline should be blown out with dry compressed air to remove all metal chips and fillings.
- Check Security of Fan
  When the fan is reassembled on the shaft, make sure it is a tight fit. Use a "Locite Retaining Compound 40" or equivalent on the inside of the fan hub when reassembling fan. After the motor has been separated into all its major subassemblies, the components should be cleaned and inspected for wear or damage.
- Check the shaft bearing journals, splines or keyways for wear. Check windings commutator connections and commutator bars for any signs of burning. If deep burned sections are evident, either in the brush track or on the riser ends of the conunutator bars, an open or, short circuit in the armature windings is indicated.
- Loose commutator bars will usually be indicated by excessive wear or burning on one bar. The commutator can be checked for loose bars by lightly tapping all of the bars with the handle of a plastic or wooden handled screwdriver. A contrasting dull thud or vibration will indicate a loose bar in which case, the armature must be replaced.
- Place the annatum in a lathe and clean the commutator with "00" or finer sandpaper to determine whether or not the commutator needs resurfacing. Light pitting and wear can be removed with the sandpaper. Excessive pitting and wear will have to be removed by resurfacing the commutator.

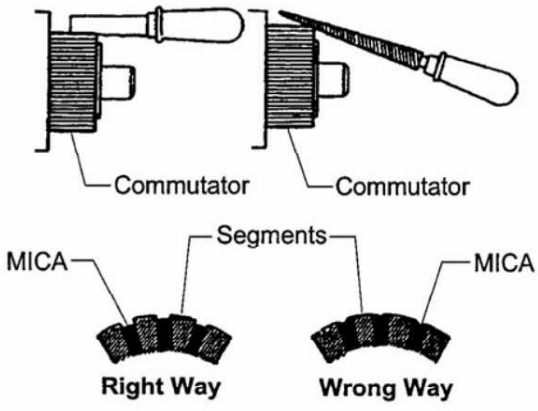
NOTE

The individual service pages contain a minimum commutator diameter dimension. The commutator must be turned below this diameter. To do so will impede the operation of the motor and possibly reult in motor component damage.

Commutator Undercutting

Most armatures have the mica undercut. However, if the armature does not have the mica unercut, this operation should not be done. The decision to undercut or not is determined by the type and grade of brush used in that particular motor. The mica should be undercut to a depth equal to the width of the mica. This is usaully l/32 inch but may vary in some motors.

- After the commutator has been undercut, the armature should be placed in a lathe and the commutator lightly sanded with No. 00 sandpaper to remove any bums left from undercutting, the commutator should be blown clean with dry compressed air.



TESTING

Frame and Field Assembly

After thorough inspection, the Frame and Field Assembly should be checked for grounded open or shortedcircuits. Grounded and open circuits can be checkedusing a test light. Most commercial growlers incorporate a test light as shown in opposite illustration.

Grounded Circuit

- Touch one test lead to a clean bare metal spot on the frame and check all terminals with the other lead. If a grounded condition exists, the test light will light.

Open Circuit

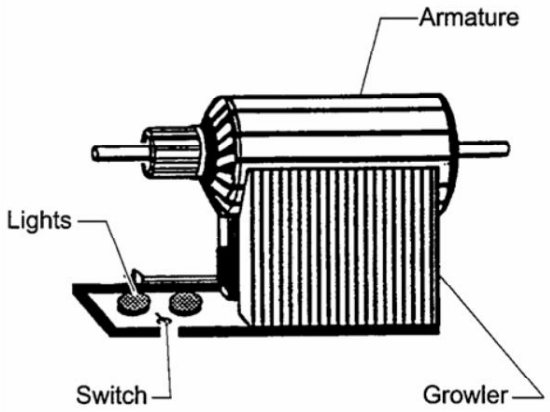
- Check between all connecting terminals with test leads. If the bulb fails to light, an open circuit is indicated.

Shorted Circuit

- Shorted wingdings in series coils are very difficult to detect. Generally, if the coil insulation is sound and these are no signs of overheating, the coil can be presumed good. The individual service pages list the service pages winding resistance. The resistance of the series coils is usually so low a special ohmmeter or ohmmeter attachment is needed to check it.
  Shunt coils can be tested with an ohmmeter for proper resistance or with a battery, of the specified voltage, for proper current draw.

Armature

- Check the armature for grounded circuits by placing one test lead of the test lamp on the commutator and the other test lead on the armature shaft. If the test light lights, the armature is grounded.



- There are two different electrically connected types of armatures used in motors. Each type requires a different method of testing for shorted circuits.
- The individual service pages specify the type of armature used in that particular motor series.

NOTE

If armature has been turned and undercut prior to testing, check for and remove any connect buildup or filings between commutator bars and at the commutator riser. This condition will cause an armature to short. This condition usually results form a dull undercutting tool.

Equalizer Winding Connections

- This type of armature cannot be tested on a growler like the standard winding connection armatures. The equalizer connections are made between commutator bars and will cause the armature to test shorted.
- The only practical method of testing these armatures is perform a light load test after the motor has been completely assembled. If the motor does not meet or exceed all parts of the light load specification, replace the armature.

Standard Winding Connections

These armatures are tested on a growler using a steel strip or hacksaw blade to locate any shorted windings.

- Rotate the armature in the growler while holding the strip or blade over the armature so that it passes

over each armature core slot. If a winding is shorted, the strip or blade will vibrate.

FRAME AND FIELD SERVICE NOTES

If the inside of the motor is exceptionally dirty and there is evidence of a grounding condition caused by the dirt, the inside of the motor can be given an additional coat of insulating varnish. Red glyptol can be used if a better material is not available, however, we recommend using a class "F" Polyurethane air drying insulating varnish. This is readily available under various brand names from electrical repair or parts houses in aerosol type dispensers.

Before spraying field coils, make sure they are absolutely clean and dry. Protect brush rigging, pole shoe faces and end head seats to keep varnish off.

FIELD COIL INSTALLATION

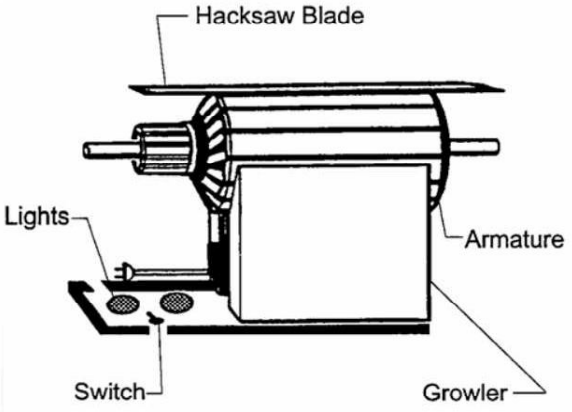
Good solder connections are important due to the vibration characteristics encountered by these motors which can cause cold or poorly soldered connections to break.

- Prior to installing thefield coils, the connections which require soldering shouldbe buffed or wire brushed clean to remove any oxidation. The connections should then be tinned with a soldering iron.

NOTE

We do not recommend using a soldering gun or torch. Soldering guns cannot provide the heat concentration required and soldering torches can damage the insulation.

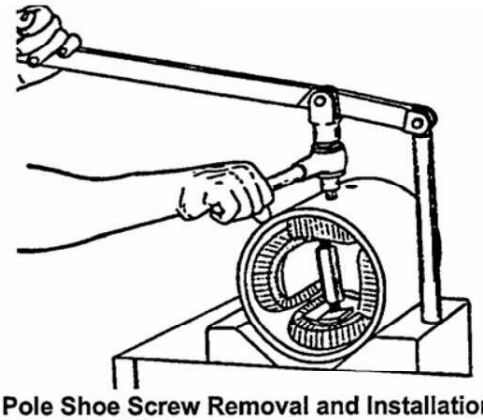
- After Field coil installation, connect the solder joint making sure the solder is flowing properly to avoid a cold soldered joint.



NOTE

There, is an optional method of connecting field coils which provides a mechanical connection prior to soldering. This method facilitates soldering and results in a stronger connection for added vibration protection.

- After tinning and installing the field coils in the frame, align the coil straps and drill an 1 1/64" hole (#18 drill) through both straps. Insert a # 8/32 brass screw and nut or a brass pop rivet and solder the connection. After the connection has been made, check the clearance between it and the end head to prevent grounding the connection when the end head is installed.



Pole Shoe Screw Removal and Installation (Field Coil Removal and Installation)

ASSEMBLY AND TESTING

After the motor components have been thoroughly cleaned, tested and repaired or replaced, assemble the unit.

Bearing Installation

- Whenever ball bearings are pressed into an end head or onto a shaft always press against the race that is absorbing the pressure. Press on the outer race when installing into end heads and against the inner race when installing onto a shaft.
- After assembly, the motor should be connetted as specified in test connections, and tested to the specifications contained on the individual motor page.
- Some motors are tested at a voltage different from the specified or rated voltage of the motor. This is done to avoid excessive current draw and/or excessive free running R.P.M.

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