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Introduction - CINC V-02 Separator

The CINC Model V-2 centrifugal separator uses centrifugal force to separate immiscible liquids of different densities. The unit is comprised of a metal housing and stand, with inlet and outlet ports, an observation window, a rotor (its only moving part), and a motor connected to the rotor via a flexible, direct coupling.
Control Pad

An AC inverter drive controller (control pad displayed here) provides for precise control of the rotor.

**Inlet/Outlet Ports**

**Inlets:** One or two fluid streams are introduced into the annular mixing zone. For processes where the two liquid phases are already mixed, either inlet may be used. The second inlet is intended for use in the introduction of a second liquid phase for extraction or washing processes.

**Outlet:** Outlet ports allow for direct gravity outflow of the two separated liquid phases from the CINC unit.
The process fluids are homogenized in the annular mixing zone, and then directed by the bottom vanes towards the rotor inlet. For applications where premixing is not beneficial, an inner sleeve is installed which limits contact of the process fluids with the rotating rotor. This is referred to as the “low-mix” or “low-shear” modification.

The self-pumping rotor moves fluids axially up its diameter, where the generated centrifugal force (100 - 400 g’s) separates the two liquid phases as they flow through the rotor.
The efficiency of the flow and phase separation is a result of the unique, patented rotor and weir design. The adjustability of both the rotor RPM and the heavy phase weir diameter allows the unit to be optimized for the rapid, efficient separation of any two immiscible fluids. These two parameters are readily optimized for a process dependent upon the ratio, flow rate, density difference and viscosity of the process fluids.

**Run Parameters and Technical Data for V-02**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotor Diameter</td>
<td>5 cm (2 in)</td>
</tr>
<tr>
<td>Liquid Throughput (total)</td>
<td>Up to 2000 mL/min (0.03 - 0.53 GPM)</td>
</tr>
<tr>
<td>Size</td>
<td>Footprint 23 x 23 cm (9 x 9 in)</td>
</tr>
<tr>
<td></td>
<td>Height 56 cm (22 in)</td>
</tr>
<tr>
<td></td>
<td>Weight 11.3 kg (25 lbs)</td>
</tr>
<tr>
<td>Fittings/Connections (std)</td>
<td>Inlets 3/8” NPT</td>
</tr>
<tr>
<td></td>
<td>Outlets 3/8” NPT</td>
</tr>
<tr>
<td></td>
<td>Drain port 1/8” NPT</td>
</tr>
<tr>
<td>Power Requirements</td>
<td>Standard - 220V (1 or 3 Ø) power supply</td>
</tr>
<tr>
<td></td>
<td>Optional - 110V</td>
</tr>
<tr>
<td>Normal amperage draw</td>
<td>0.2 - 0.4 A</td>
</tr>
<tr>
<td>Rotor RPM Operating Range</td>
<td>2000 - 6000 RPM (100-900 Gs)</td>
</tr>
</tbody>
</table>

**Warranty**

The separator workmanship and materials are warranted for a period of two years from the date of delivery. This warranty covers parts and labor for repair or replacement, as deemed appropriate by CINC. This warranty is
voided if the separator is damaged; is not properly maintained; or is used in an application for which it was not originally sold. Internal parts are not warranted for replacements as necessary from corrosion or wear from solids. Seals and bearings are warranted for a period of 90 days from the date of delivery. See your purchase agreement for specific terms and conditions.
Installing your V-2 Separator

Uncrate your unit. Verify that the package is complete and that no damage has occurred during shipping.

The CINC units are mounted on a stand assembly that is ready to be anchored at the operation site. The unit should be placed on a surface that is fairly level, and has sufficient strength to support the assembly. Standard installation procedures should be followed for operating rotational equipment.

Install inlet, outlet, and drain fittings. Also install the fluid lines in accordance with the Flow Connection Diagram on the following page.

The outlet lines for the CINC unit must allow unrestricted gravity outflow. Please take precautions to insure that nothing will inhibit the flow of fluids from the unit through the outlet hoses. This includes avoiding the restriction of the outlets by using fittings, bushings, or hose with smaller ID’s than the CINC outlets.

The electrical connections are specified in the TECHNICAL section in this manual. Although the motor controller has built-in over-voltage protection, CINC recommends the use of a surge-protected, dedicated circuit with its own breaker, magnetic contactor or fused disconnect for the power supply of this unit. A qualified electrician should be consulted to verify that the proper power will be supplied.

Observe all good chemical industry practices for the safe installation and operation of rotational and flow equipment.
Start-Up

Operating the AC Inverter Drive Control Panel

1) Depress the DSPL button until the FREF (green LED), is illuminated on the display section. At this point, simply depress the arrow up (\+)/ or arrow down (/\) to change to the desired frequency (refer to the FREQUENCY TO RPM CONVERSION TABLE in the Technical Appendix section of this manual. Once your desired frequency is set, press the ENTER button.

2) To turn the motor on, depress the RUN button. The unit will ramp up to the set frequency (the ramp-up time has been preset at the factory). To stop the unit, depress the STOP/RESET button, and the unit will ramp down to a complete stop (the ramp down time has also been preset at the factory). You can change frequencies while the unit is running by following the previous instructions above.

Pressing the DSPL button will toggle through a series of menus. The displayed screen is indicated by a lit LED next to the function, on the panel directly below the display window. The only features that will be needed for normal usage are:

**FREF** - When this LED is lit, the displayed value is the set frequency the controller has been programmed to run.

**FOUT** - Displays the actual frequency that the drive is currently running.

**IOUT** - Displays the amperage draw of the motor under current run conditions
Start-Up

All other menu features allow access to the programmable features of this controller. These have all been preset at the factory and SHOULD NOT BE CHANGED. If there are any other questions about the inverter drive controller, please consult the controller manual, or call CINC.

NOTICE!
THE PARAMETERS IN THIS UNIT HAVE BEEN PRESET AT THE FACTORY FOR MAXIMUM EFFICIENCY AND SAFETY.

V-2 Mini Controller Operating Instructions

Power Requirements:

The EMS Mini Controller is a 200 volt class controller that can be run on 200 volt single phase or 200 volt three phase (50 or 60 Hz), with a voltage range of 200 volts to 230 volts. The unit comes with a standard 230 volt single phase NEMA 6-15P plug. An optional 110VAC controller is available.

Running Your V-2 Mini Controller:

1) Verify that your unit is powered with an appropriate power source.

2) Depress the DSPL button until the REF (green LED) is illuminated on the display panel. At this point you can simply press the arrow up (/\ ), or arrow down (\/) to change the frequency. Please refer to the Frequency to RPM Conversion Table in the TECHNICAL APPENDIX. Once the desired frequency is set, press the ENTER button.
3) To run, press the **RUN** button. The unit will ramp up to the set frequency. (Remember, the ramp up time has been pre-set at the factory.) The frequency can be changed while the unit is running by following step 2 (above) of these instructions.

### NOTICE!

**THE PARAMETERS IN THIS UNIT HAVE BEEN PRESET AT THE FACTORY FOR MAXIMUM EFFICIENCY AND SAFETY.**

Running Your V-2 Separator:

1. Check to insure all fittings and hoses are installed properly.
2. Verify all valves are in the proper positions.
3. Make sure the drain port valve is closed.

> If the unit is not originally primed with the heavy phase liquid, some light phase liquid may be observed exiting the heavy phase output until enough heavy phase is retained in the unit to fill the heavy phase underflow. To avoid this, always make sure that all of the fluid in the annulus at start-up is the heavy phase.

4. After setting the frequency on the controller (refer to Operating the AC Inverter Drive Control Panel), start the rotor motor by depressing the run button the VFD Control Panel. Typical rotor speeds for the CINC V-2 unit are 2000 - 4000 RPM (33.6 - 67.1 Hz).

5. Turn on the feed pumps. For the CINC model V-2, the operating flow rates are 0.1 to 2.0 LPM total flow (0.03 to 0.53 GPM).

6. Observe effluent qualities of separated phases. If the desired phase separation is not observed, please refer to Separation section in the TROUBLESHOOTING Section of this manual.


Shut Down

Turning Off Your V-2 Separator

1. Turn the feed pump(s) off.

2. Wait for the output flows to stop.

3. Turn the unit power off by depressing the STOP button on the Control Panel. (refer to Operating the AC Inverter Drive Control Panel).

4. If desired, drain the CINC separator by opening the drain valve. This is recommended if the unit will remain idle for more than 4 hours or is being used with corrosive fluids.

If the CINC unit is going to be idle for more than 8 hours, or used with very corrosive fluids, it is recommended to clean the unit after each use.

➡ Observe all good chemical industry practices for the safe installation and operation of rotational and flow equipment.
Trouble Shooting

If after reviewing this table you cannot identify and solve any difficulties you may be having with the operation of your CINC unit, please call for technical assistance at 800-380-CINC, or 775-885-5080.

**Separation - Optimizing Run Conditions and Weir Sizing**

<table>
<thead>
<tr>
<th>Indication</th>
<th>Possible Cause</th>
<th>Corrective Action</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy phase contamination in light phase output</td>
<td>Fluid interface too close to light phase weir in rotor – interface needs to move away from center of rotor</td>
<td>Increase RPM – if large change in RPM is necessary, a weir change is indicated – change to a looser weir (larger ID)</td>
<td>Heavy Phase Weir Change procedure</td>
</tr>
<tr>
<td>Light phase contamination in heavy phase output</td>
<td>Fluid interface too close to heavy phase underflow in rotor – interface needs to move closer to center of rotor</td>
<td>Lower RPM – if large change in RPM is necessary, a weir change is indicated – change to a tighter weir (smaller ID)</td>
<td>Heavy Phase Weir Change procedure</td>
</tr>
<tr>
<td>Contamination seen in both phases</td>
<td>Dispersion band too wide, fluids are not separating fast enough, need more g•seconds.</td>
<td>Longer contact times or larger g-force is necessary for the fluids in the rotor. First attempt to lower the flow rate through the unit. If this does not help, increase the RPM (a tighter weir (smaller ID) may then be necessary).</td>
<td>Heavy Phase Weir Change procedure</td>
</tr>
<tr>
<td>Inconsistent Quality of phase separation</td>
<td>Vapor locking due to inadequate venting</td>
<td>Ensure system is installed per the installation drawing. Check for liquid locking in the discharge lines causing fluid to back-up into the vent(s).</td>
<td>Installation instructions</td>
</tr>
<tr>
<td>Heavy phase discharge flow falls off and light phase flow increases</td>
<td>Solids build-up in rotor restricting heavy phase under-flow</td>
<td>Clean rotor</td>
<td>Cleaning procedures</td>
</tr>
</tbody>
</table>

**Mechanical**

<table>
<thead>
<tr>
<th>Indication</th>
<th>Possible Cause</th>
<th>Corrective Action</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive vibration.</td>
<td>Solids may be building up in the rotor.</td>
<td>Clean the rotor</td>
<td>Cleaning procedure</td>
</tr>
<tr>
<td>CIP Nozzle may be plugged.</td>
<td></td>
<td>CIP System Backflushing</td>
<td>Cleaning procedure</td>
</tr>
<tr>
<td>Bearing noise</td>
<td></td>
<td>Replace bearing and inspect seal</td>
<td>Procedure for specific bearing/seal replacement.</td>
</tr>
<tr>
<td>Liquid seeping/leaking from lower bearing housing</td>
<td>Rotary seal failing</td>
<td>Replace rotary seal and replace lower bearing</td>
<td>Replacing rotary seal procedure</td>
</tr>
<tr>
<td>Liquid seeping/leaking from upper bearing housing</td>
<td>Upper Seal Failing</td>
<td>Replace upper seal and replace upper bearing</td>
<td>Replacing Upper Bearing/Seal procedure</td>
</tr>
<tr>
<td>Liquid seeping/leaking from a sub-assembly mating surface of the housing</td>
<td>O-ring failure</td>
<td>Replace O-ring – ensure replacement O-ring is compatible with the fluids being processed</td>
<td>Assembly drawing s.</td>
</tr>
</tbody>
</table>

V-02 Operating Manual – REV 2/15/99
## Troubleshooting

### Electrical

<table>
<thead>
<tr>
<th>Indication</th>
<th>Possible Cause</th>
<th>Corrective Action</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display on Inverter Drive Controller is not lit.</td>
<td>Power connections to inverter drive have been connected improperly, damaged, or loose.</td>
<td>Check all wiring, plug-ins, and fuses/circuit breakers.</td>
<td></td>
</tr>
<tr>
<td>Lack of proper input voltage</td>
<td>Check input power for proper voltage</td>
<td>Electrical specifications in installation section</td>
<td></td>
</tr>
<tr>
<td>Inverter Drive Controller bad</td>
<td>Replace</td>
<td>Inverter Drive Controller Manual</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** If the Inverter Drive Controller displays an error message refer to the Inverter Drive Controller manual for code definition.

| Inverter Drive Controller shuts off motor and displays an error message indicating an “Over Load”. | Defective Motor          | Remove motor and hand turn the motor shaft. If binding replace motor. | Replacing Drive Motor procedure |
| Improper Assembly                                                         | Remove motor and hand turn the rotor shaft. Check bearing locknut to ensure proper tightening | Maintenance procedure reassembly |                                |
| Rotor bearings/seals problem causing increased motor load.                | Remove motor and hand turn the rotor. If rotor does not turn freely check bearings/seals replace as necessary. | Maintenance procedure for specific bearing/seal replacement. |                                |
| Rotor overloaded with solids increasing motor load.                       | Clean rotor                | Cleaning procedures                                                    |                                |

| Inverter Drive Controller shuts off motor and displays an “Under Voltage” error message. | An extreme surge or dip in the power feed has caused the controller to automatically shut down. | Check to make sure power supply is reliable and has not been interrupted. Refer to controller manual or call CINC if unsure of problem or controller message display. |                                |
| Motor does not START when button is depressed                             | Power connections to motor have been connected improperly, have been damaged, or a loose connection. | Check all wiring, plug-ins, and fuses/circuit breakers and correct problem found. |                                |
| Controller not in correct MODE of operation                               | Place into correct MODE      | Controller Manual                                                      |                                |
| Motor does not START when button is depressed                             | Motor bad                   | Replace motor                                                          | Replacing Drive Motor procedure |
| Motor runs excessively hot, or above specified amperage range (normal amperage draw for your unit is listed in the installation section. | Check amperage draw on motor, if over amperage rating, remove motor from unit and run uncoupled. | If amperage draw is still high, motor is bad and should be replaced. | Controller Manual. Replacing Drive Motor procedure |
|                                                                              | If amperage draw is within suggested range and rotor hand turns freely, rotor could be loaded with solids and need cleaning. | Cleaning procedures |                                |
|                                                                              | If amperage draw is within suggested range and rotor does not hand turn freely, rotor is binding either because of improper assembly or bad bearing. | Maintenance procedure for specific bearing/seal replacement. |                                |
Maintenance

Seal

The lip seal is designed to protect the bearings from vapors and splashed fluids. The seal is designed to operate without service. However, if the seal is damaged and liquid or corrosion is present inside the bearing housing, the bearings and seal should be replaced.

Bearings

The sealed bearings are designed to operate without service or lubrication. However, it is good practice to periodically check for bearing noise, and change bearings if noise or vibration indicates a problem.

Rotor

The rotor is designed to operate for the life of the unit. If the rotor needs to be taken out for any reason, it can be removed and replace by referring to the Assembly Diagrams the Rotor Cleaning procedure.
**Heavy Phase Weir Change**

Please refer to the Assembly Diagrams #s 1, 2, & 3 for identification of listed parts.

1. **DISCONNECT POWER SUPPLY TO UNIT!**

2. Remove screws that attach the motor mount to the bearing housing, then remove the motor and motor mount assembly. *(See Assembly Diagram #1)*

3. Loosen set screw and remove coupling half from rotor shaft. *(See Assembly Diagram #2)*

4. Remove screws that attach the bearing housing to the rotor housing, then lift the bearing housing and rotor assembly from the unit.

5. Grip the rotor with one hand, loosen and remove the bearing nut with a 7/8” box-end wrench (note orientation of the nut) and separate the rotor from the bearing housing.

*USE OF PLIERS, VICE OR OTHER TOOL MAY CAUSE DAMAGE TO THE ROTOR AND WILL VOID THE WARRANTY.*

6. Remove rotor cover from rotor. *(See Assembly Diagram #3)*

7. Remove the heavy phase weir ring and O-ring from the rotor. Clean and inspect the O-ring, replace if damaged. *(See Assembly Diagram #3)*

**Reassembly**

1. Wipe the weir and the weir installation area clean. Place the weir O-ring and weir into position on the rotor. *(See Assembly Diagram #3)*

2. Re-install the rotor cover. *(See Assembly Diagram #3)*
3. Check the underside of the bearing housing to see that the seal ring is in position in the seal, and pushed up against the bearing. (See Assembly Diagram #2)

4. Ensure the Weir, Weir O-Ring and Rotor Cover are in the proper position then, while holding the rotor in the upright position, align and insert rotor into the bearing housing. (See Assembly Diagram #3)

5. Hold the rotor by hand and thread the rotor bearing nut (tapered end of the nut should face the bearing) onto the rotor shaft, and tighten securely (10-15 ft/lbs).

6. Wipe the underside of the bearing housing and the mating surface of the housing clean. Check to see that the O-ring is in place. Align and insert the rotor and bearing housing assembly into the housing. Install screws and tighten securely. (See Assembly Diagram #1)

7. Install rotor coupling onto rotor shaft. Align set screw with flat on rotor shaft and tighten. (See Assembly Diagram #2)

8. Rotate the rotor by hand to verify that it rotates freely.

9. Install rubber coupling flex sleeve onto the rotor coupling.

Align and install the motor and motor mount assembly onto the upper bearing housing. Install screws and tighten securely.

Reconnect power supply to unit.
Replacing Rotor Bearings

Please refer to the Assembly Diagrams #s 1, 2, & 3 for identification of listed parts.

1. DISCONNECT POWER SUPPLY TO UNIT!

2. Remove screws that attach the motor mount to the bearing housing, then remove the motor and motor mount assembly.

3. Loosen set screw and remove coupling half from rotor shaft.

4. Remove screws that attach the bearing housing to the rotor housing, then lift the bearing housing and rotor assembly from the unit.

5. Grip the rotor with one hand, loosen and remove the bearing nut with a 7/8” box-end wrench (note orientation of nut) and separate the rotor from the bearing housing.

USE OF PLIERS, VICE OR OTHER TOOL MAY CAUSE DAMAGE TO THE ROTOR AND WILL VOID THE WARRANTY.

6. Remove the bearing retainer snap ring.

7. Place the bearing housing on support blocks, and apply sufficient pressure against the seal ring to remove the bearing assembly.

Reassembly

1. Wipe all the bearing assembly components and the bearing housing clean.

2. Check the seal at this time for wear or damage. If the seal appears damaged or cracked it should be replaced.

PLEASE NOTE THE POSITION AND DIRECTION OF THE EXISTING SEAL BEFORE REMOVING.
3. If necessary to replace the seal, do so now. Insert new seal until it rests firmly against shoulder in the upper bearing housing.

4. Insert the seal ring into the seal from the top (bearing side of housing).

5. Apply a light coating of grease to all components and then install one bearing, the inner and outer bearing spacers, followed by the bearing pre-load spring, and the second bearing into the bearing housing (See Assembly Diagrams).

6. Apply a light amount of downward pressure to the top bearing to expose the snap ring groove and install the bearing retainer snap ring. Assure that it is fully seated in the snap ring groove of the housing by pressing the upper bearing down against the pre-load spring.

7. Check the under side of the bearing housing to see that the seal ring is in position in the seal, and pushed up against the bearing.

8. Ensure the weir, weir o-ring and rotor cover are in the proper position (See Assembly Drawing #3) then, while holding the rotor in the upright position, align and insert rotor into the bearing housing.

9. Hold the rotor by hand and thread the rotor bearing nut (tapered end of the nut should face the bearing onto the rotor shaft, and tighten securely, 10-15 ft/lbs).

10. Wipe the under side of the bearing housing and the mating surface of the housing clean. Check to see that the O-ring is in place.

11. Align and insert the rotor and bearing housing assembly into the housing. Install screws and tighten securely. Install rotor coupling onto rotor shaft. Align set screw with flat on rotor shaft and tighten.

12. Rotate the rotor by hand to see that it rotates freely.
13. Install rubber coupling flex sleeve onto the rotor coupling.

14. Align and install the motor and motor mount assembly onto the upper bearing housing. Install screws and tighten securely.

15. Reconnect power supply to unit.
Replace Motor

Please refer to the Assembly Diagrams #s 1, 2, & 3 for identification of listed parts.

1. Disconnect power supply to unit.

2. Remove motor power cable connector from the motor.

3. Remove screws that attach the motor mount to the upper bearing housing.

4. Remove motor mount assembly.

5. Remove the screws that attach the motor to the motor mount.

6. Loosen the set screws on the motor coupling half, and remove the coupling.

Reassembly

1. Turn the replacement motor upside down and install the coupling with key on the motor shaft. Check that the top of the coupling is flush with the end of the motor shaft and, tighten the set screws securely.

2. Place the motor mount on the motor, install screws and securely.

3. Wipe the top of the bearing housing and the bottom of the motor mount flange clean.

4. Carefully place the motor mount assembly over the bearing housing, aligning and engaging the coupling and flex sleeve. At this time be sure the motor mount is fully contacting the bearing housing.

5. Install the motor mount screws and tighten securely.
6. Re-connect motor power cable connector to the motor.

7. Resume operations per the procedures in the “Start-up” section.

**Rotor Cleaning**

Please refer to the Assembly Drawing #s 1, 2, & 3 for identification of listed parts.

1. Disconnect power supply to Unit!

2. Remove screws that attach the motor mount to the bearing housing, then remove the motor and motor mount assembly.

3. Loosen set screw and remove coupling half from rotor shaft.

4. Remove screws that attach the bearing housing to the rotor housing, and then lift the bearing housing and rotor assembly from the unit.

5. Grip the rotor with one hand, loosen and remove the bearing nut with a 7/8” box-end wrench and separate the rotor from the bearing housing.

> **NOTE THE PROPER ORIENTATION OF THE BEARING NUT.**

6. Remove rotor cover from rotor.

7. Remove the heavy phase weir ring and O-ring from the rotor. Clean and inspect the O-ring, replace it if damaged.

8. Hold the rotor sleeve in one hand and the rotor head in the other hand, and then unscrew the rotor assembly – right hand thread. (See photo below.)
USE OF PLIERS, VICE OR OTHER TOOL MAY CAUSE DAMAGE TO THE ROTOR AND WILL VOID THE WARRANTY.

9. Remove the Vane package from the rotor sleeve, now the rotor head, sleeve and vane package can be cleaned.

10. The rotor head should be carefully inspected for any build up of processed materials, especially in the heavy phase underflows and the light phase discharge channels. (See photos.)

11. Clean and inspect the rotor sleeve O-ring, replace it if damaged. (See photo.)

12. Ensure the mating threads of both the rotor head and sleeve are clean prior to re-assembly.

Reassembly

1. Insert the vane package into the rotor sleeve, align the index nub of the vane package with the index slot in the rotor sleeve. When properly aligned the top of the vane package will sit slightly lower than the top of the rotor sleeve and will not be able to be rotated within the rotor sleeve. (See photos following.)
INDEX NUB OF VANE PACKAGE FULLY ENGAGED & SITTING BELOW UPPER EDGE OF ROTOR SLEEVE.

INDEX NUB ON VANE PACKAGE LAYING UPPER EDGE OF ROTOR SLEEVE PRIOR TO INDEXING.

INDEX NOTCH IN ROTOR PRIOR TO INDEX OF VANE PACKAGE.
2. Place the rotor head on top of the rotor sleeve and screw them together by hand until they are full seated. (See photos on previous page.)

> **USE OF PLIERS, VICE OR OTHER TOOL MAY CAUSE DAMAGE TO THE ROTOR AND WILL VOID THE WARRANTY.**

3. Wipe the weir and the weir installation area clean. Place the weir O-ring and weir into the position on the rotor.

4. Re-install the rotor cover.

5. Check the under side of the bearing housing to see that the seal ring is in position in the seal, and pushed up against the bearing.

6. Ensure the weir, weir O-ring and rotor cover are in the proper position (Reference Assembly Diagram #3) then, while holding the rotor in the upright position, align and insert rotor into the bearing housing.

7. Hold the rotor by hand and thread the rotor bearing nut (tapered end of the nut should face the bearing) onto the rotor shaft, and tighten bearing nut securely (10-15 ft/lbs), with 7/8” box-end wrench.

> **USE OF PLIERS, VICE OR OTHER TOOLS THE ROTOR MAY CAUSE DAMAGE TO THE ROTOR AND WILL VOID THE WARRANTY.**

8. Wipe clean the under side of the bearing housing and the mating surface of the housing. Check to see that the O-ring is in place. Align and insert the rotor and bearing housing assembly into the housing. Install screws and tighten securely.

9. Install rotor coupling onto rotor shaft. Align set screw with flat on rotor shaft and tighten.

10. Rotate the rotor by hand to verify that it rotates freely.

11. Install rubber coupling flex sleeve onto the rotor coupling.
12. Align and install the motor and motor mount assembly onto the upper bearing housing. Install screws and tighten securely.

13. Reconnect the power supply.

**Changing Standard/Low Mix Mode Bottom Plate**

1. **DISCONNECT POWER SUPPLY TO UNIT!**

2. Block in all process fluids.

3. Drain liquid from separator.

4. Should flushing be required, see the “Cleaning Procedures” section of the manual.

5. Remove the bottom plate mounting screws and bottom plate assembly.

6. Clean and inspect the bottom plate o-ring and mating surfaces. If the o-ring is damaged replace it at this time.

Note: The bottom plate assembly is either a low mix or standard mix version, refer to the Photo for identification.
7. Install the desired version of the bottom plate.

8. Install screws and tighten securely.

9. Reconnect power supply to unit.

10. The separator is now ready to resume operation.
Assembly Diagram 1 REV-B - with Observation Window Option

V-02 Assembly Diagram 1
With Observation Window
Assembly Diagram 2 REV-B

V-02 Assembly Diagram 2
Assembly Diagram 3 REV-B

- Rotor Cover
- Weir
- O-Ring
- Rotor Head
- Vane Package
- Rotor Sleeve
# V-02 Parts List

## MODEL V02 SEPARATOR PARTS LIST

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<th>Part Description</th>
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### V-02 316L Spare Part Kit Description

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<td>Housing O-ring, Parker 2-041, Teflon</td>
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Technical Appendix

Theory of Centrifugal Separation

The separation performance of the CINC separator is measured by the effluent quality of one or both of the output fluid phases. There are several parameters that need to be considered in optimizing the performance of the CINC unit for a specific process. These parameters include viscosity and density of the two liquid phases (at the process temperature), the input ratios, the total flow rate, and the rotor speed (RPM).

How efficiently two fluids will separate in a centrifuge is best described by Stokes Law:

\[ V_c = \frac{d^2 (\rho_H - \rho_L)}{18 \eta_{avg}} \cdot r \omega^2 \]

where:
- \( V_c \) = the centrifugal settling velocity
- \( d \) = liquid droplet diameter
- \( \rho_H \) = density of heavy phase
- \( \rho_L \) = density of light phase
- \( r \) = radial distance of liquid from rotor axis
- \( \omega \) = angular velocity (RPM of rotor)
- \( \eta_{avg} \) = average viscosity of processed fluids

The settling velocity, \( V_c \), is an important parameter in phase separation, as it is a measure of how rapidly two immiscible phases will separate. From this equation, the parameters that will result in the most efficient phase separation (largest \( V_c \)) can be evaluated. Parameters that would increase \( V_c \) include: larger droplet size, increasing the density difference between two phases, high RPM, and low viscosity. The converse is also true - less efficient phase separation is observed in systems with: smaller droplet size, small density differences, low RPM, and viscous fluids. One parameter that the operator can readily control when optimizing the CINC equipment is the RPM. Another is fluid residence time while in the rotor, which is directly controlled by feed rate. Lowering the feed rate can improve the quality of
both separated phases by allowing more time to achieve efficient separation.

Because the CINC separator was originally designed to operate as a contactor, fluids are premixed in the annulus between the housing and the spinning rotor. Although higher RPM’s (ω) result in more g-forces inside the rotor, they also result in more mixing in the annulus, and therefore smaller droplet size (d). As a result of this, an increase in RPM’s will sometimes result in no improvement to separation efficiency (Vc does not increase), as the increased angular momentum (ω) is being offset by a decreasing droplet size (d). Therefore, if better phase separation is needed, increasing the rotor speed will sometimes be of benefit (greater g-forces generated), but sometimes not (smaller droplet size). This must be determined for each set of application conditions and the fluids processed.

To improve separation for shear sensitive fluids, or in applications where pre-mixing is of no benefit, CINC has developed a low-mixing option that minimizes mixing in the annulus. This option, referred to as the low-mixing sleeve, allows operation at higher RPM’s with minimal increase in mixing. The low mixing sleeve is recommended for applications where separation is the most important (e.g. oil/water separation, phases already premixed, shear sensitive fluids).

The following conversion table is for your reference. A laminated copy of this chart is included in the control box accompanying your separator.

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<th>HZ.</th>
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RPM vs. G-Force Correlation Chart
**Residence Time vs. Flowrate**

**Residence Time vs. Flowrate (V-02)**

![Graph](image1)

**Residence Time vs. Flowrate (V-05)**

![Graph](image2)
Residence Time vs. Flowrate (V-20)
Linear Velocity Chart

Linear Velocity on Outside Diameter of Rotor (Correlation to Mixing)

- Linear Velocity (Feet/Second)
- RPM

Lines:
- 500 g Line
- 200 g Line