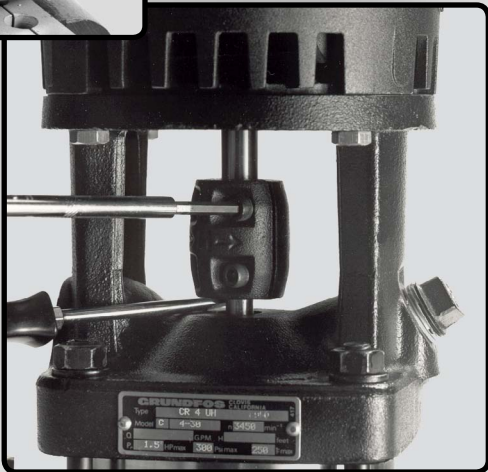
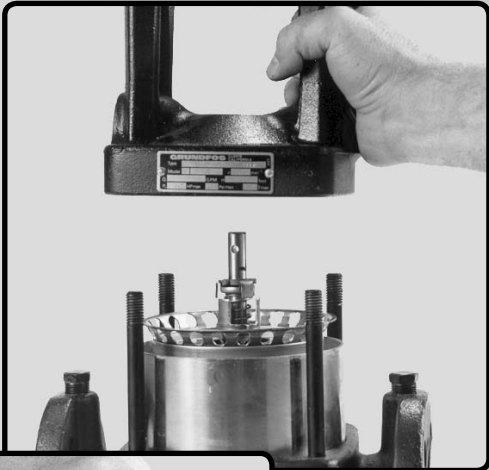


# CR, CRN, CRNG 2•4 Dismantling & Reassembly



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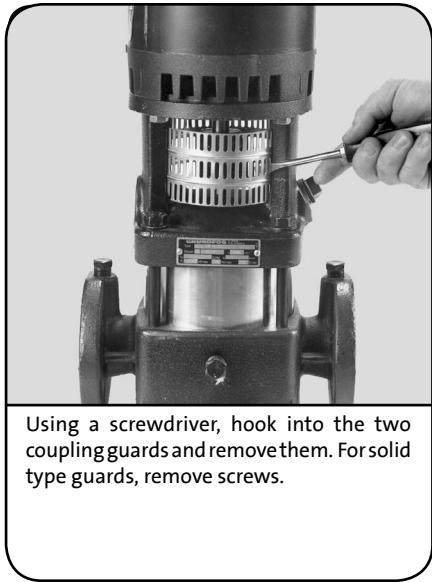
Reassembly Procedures ..... Page 6  
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 Order of Stage Assembly - CRN4/CRN4G .....Page 12

### TORQUES

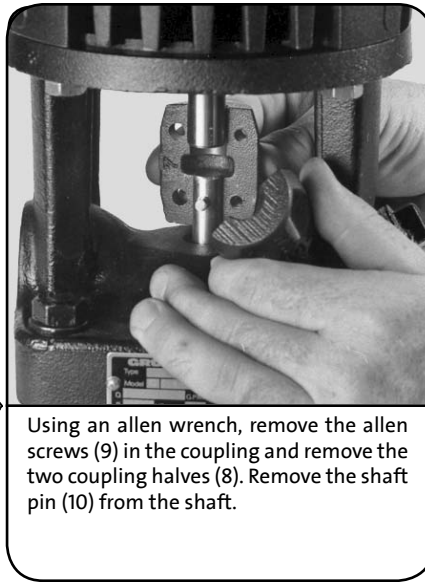
- Shaft Lock Nut (Reassembly step 9)  
9 ft.-lbs./12 Nm
- Staybolt Nut (Reassembly step 17)  
30 ft.-lbs./40 Nm
- Motor Bolt  
 UNC 3/8" bolts..... 10 ft.-lbs./13 Nm  
 UNC 1/2" bolts.....23 ft.-lbs./31 Nm
- Coupling Allen Screws  
 M6 screws..... 10 ft.-lbs./13 Nm  
 M8 screws.....23 ft.-lbs./31 Nm

# Dismantling Procedures CR2 • CR4

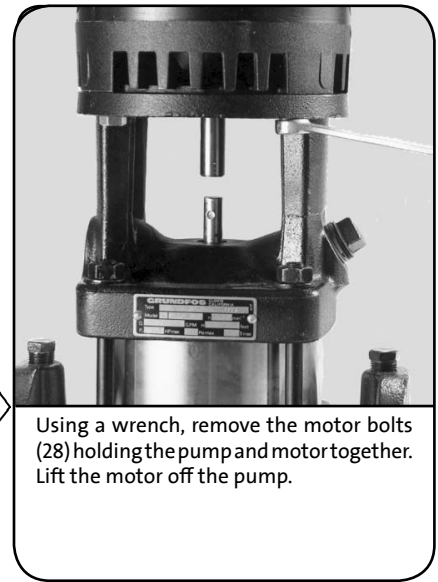
In the instructions that follow, the numbers in parenthesis (7) indicate the position number of that part as it is shown on the Parts List and Kits diagram.



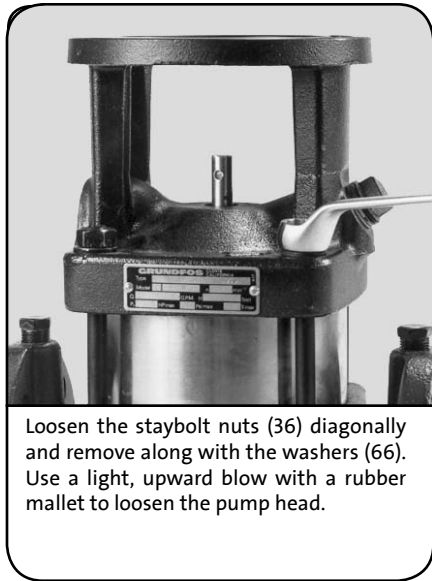
Using a screwdriver, hook into the two coupling guards and remove them. For solid type guards, remove screws.



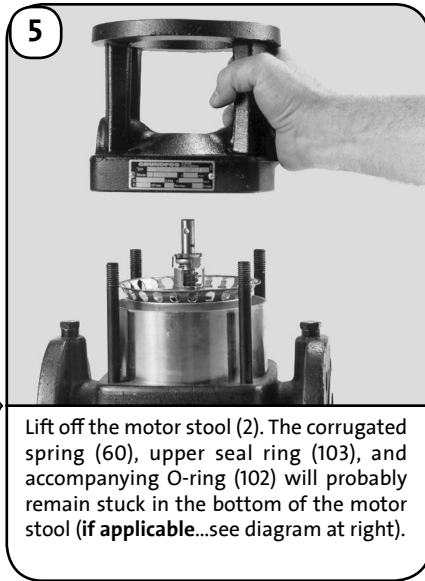
Using an allen wrench, remove the allen screws (9) in the coupling and remove the two coupling halves (8). Remove the shaft pin (10) from the shaft.



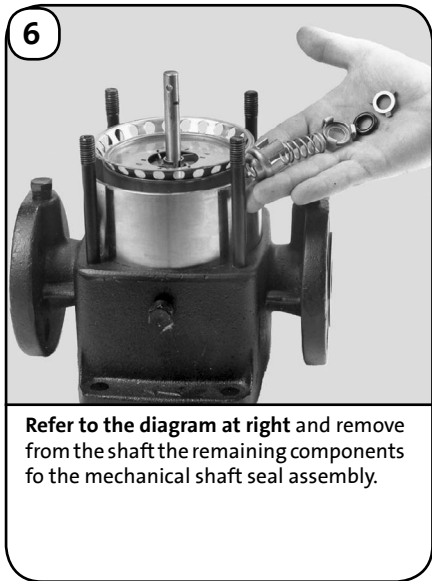
Using a wrench, remove the motor bolts (28) holding the pump and motor together. Lift the motor off the pump.



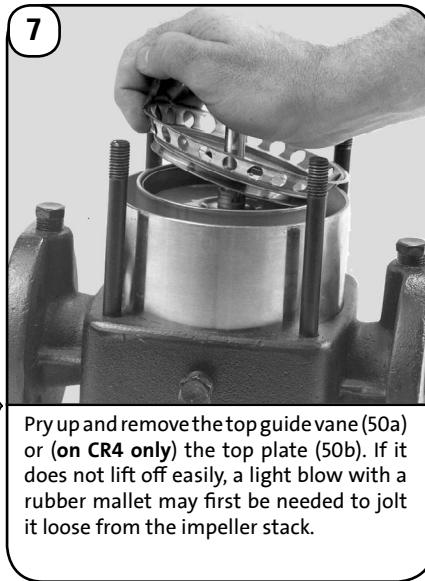
Loosen the staybolt nuts (36) diagonally and remove along with the washers (66). Use a light, upward blow with a rubber mallet to loosen the pump head.



5 Lift off the motor stool (2). The corrugated spring (60), upper seal ring (103), and accompanying O-ring (102) will probably remain stuck in the bottom of the motor stool (if applicable...see diagram at right).



6 Refer to the diagram at right and remove from the shaft the remaining components for the mechanical shaft seal assembly.



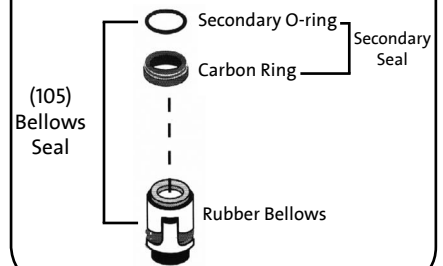
7 Pry up and remove the top guide vane (50a) or (on CR4 only) the top plate (50b). If it does not lift off easily, a light blow with a rubber mallet may first be needed to jolt it loose from the impeller stack.

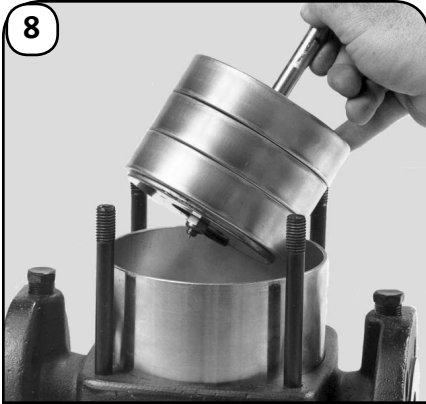
## THE MECHANICAL SEAL ASSEMBLY

Pumps Manufactured Prior To February 1989	Pumps Manufactured Since February 1989
---	--

	(102) O-ring	
	(103) Upper Seal Ring	
	(104) Lower Seal Ring	
	(107) O-ring	
	(111) Upper Seal Driver	
	(108) Seal Spring	
	(112) Lower Seal Driver	

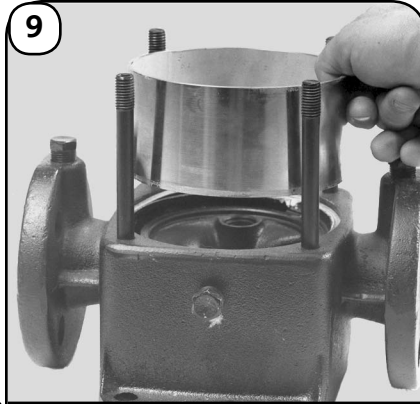
Bellows Type Option Interchangeable  
(CR2: 1 to 11 stage)  
(CR4: 1 to 10 stage)





8

Grab the shaft and lift the impeller stack off the pump. If it is stuck, a light blow with a rubber mallet may be needed to jolt the stack free. The bottom chamber (5a) may remain in the suction/discharge chamber.



9

Lift the outer sleeve (55) off the pump.



10

Place the Shaft Holder for Assembly (material #00SV0040) in a vise. Place the impeller stack in the shaft holder "upside down," tighten the vise, and use a wrench to remove the nut (67), star washer (66), clamp (64c), and spacing pipe (66b...CR4 only).



11

Lift the impeller (49) off the stack. If it is stuck and cannot be removed by hand, jump to step 11a at right. If not, proceed to step 12 below.

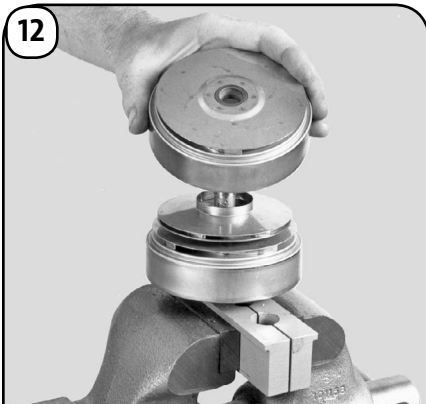
**FOR EXTREMELY TIGHT OR "STUCK" IMPELLER STACKS**

11a

Move the shaft into a hole in the shaft holder through which it can pass freely or replace the shaft holder with the special Shaft Holder for Dismantling (material # 00SV0237). Screw the Punch for Dismantling Shaft (material # 00SV0238) onto the threaded shaft.

Using a rubber mallet, drive the punch down past the hub of the first impeller. The shaft should be able to pass freely through the hole in the shaft holder. Remove the impeller (49) and chamber (4a).

Repeat these steps until you get down to the last impeller. At that time, gently knock the punch down through the hub of the last impeller, making sure to catch the shaft if it falls free. Go to step 14.



12

Remove the chamber (4a). If it is stuck to the rest of the stack, pry it loose by inserting a screwdriver between the chambers.

13

The dismantling procedures from this point on will depend on the type of pump and the number of stages it contains. Refer to the charts on pages 9 - 12 of the Reassembly Procedures to determine what you can expect in the pump you are working with.

Remove all bearing rings (47a) and spacers (64a) you encounter while repeating steps 12-13 until you remove the last impeller.

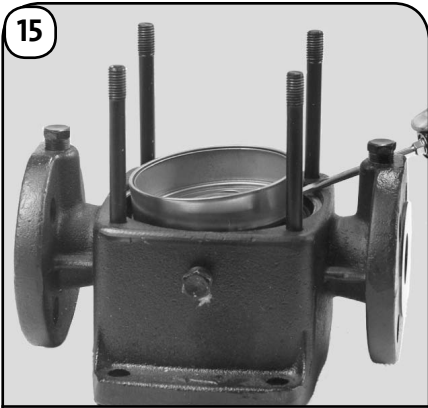
Remove the spacer (61) off the shaft and examine the condition of the shaft stop ring (62) for damage.

At that point, continue



14

For each chamber, use the special Puller for Neck Ring (material # 00SV0239) to work the seal ring retainer loose (65) and remove it. Check the condition of the seal ring (45).



15  
If it has not already been removed, use a screwdriver to pry the bottom chamber (5a) off the suction/discharge chamber (6).



16  
Carefully remove the O-ring (68) off the bottom chamber with your fingers or a screwdriver.



17  
Using a screwdriver, remove the corrugated spring (60) and outer sleeve gasket (37) from the motor stool (2). Remove the outer sleeve gasket (37) from the suction/discharge chamber.

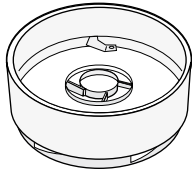


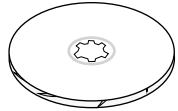
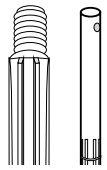





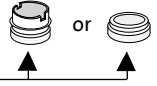



18  
Push the upper seal ring (103) and accompanying O-ring (102) out of the motor stool with your finger or a punch (if they have not already been removed).

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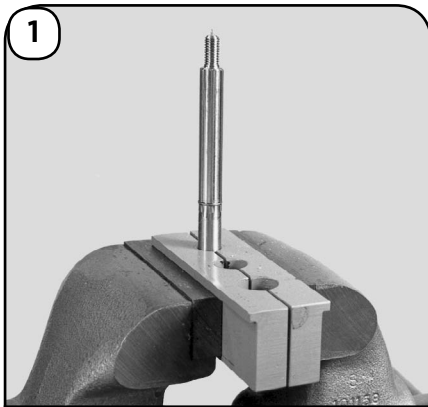
**THE PUMP  
IS NOW  
COMPLETELY  
DISASSEMBLED.**

## When Should A Part Be Replaced ?

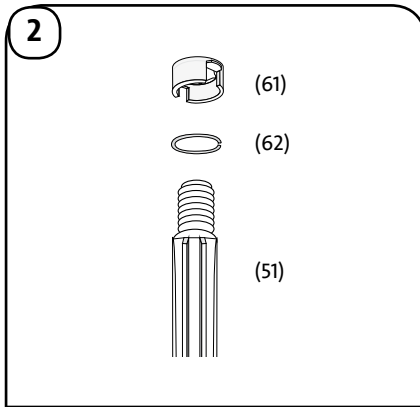
Part	Position(s)	Minimum Operating Condition	
Motor Stool	2	Excessive pitting of these castings could cause leaks. Rusted castings should have all seating areas cleaned to ensure proper seating of O-rings and sleeve gaskets.	
Suction/Discharge Chamber	6		
Chambers	4a, 4	Same as for impellers. The minimum inside diameter for position 4a is 16.2 mm	
Neck Ring	45	Should be free of visible wear on the inside edges Inside diameter for CR2 = 30.6 mm Inside diameter for CR4 = 40.3 mm	
Bearing ring	47a	Minimum outside diameter is 15.7 mm.	
Impellers	49	Should be free from physical markings except for the guide vane welds. Any additional indentations may result from:  (1) <b>Cavitation</b> the implosion of vapor "bubbles" within the impeller stack. Make sure the Net Positive Suction Head Available for the pump meets the minimum Net Positive Suction Head Required for the pump when running at the required flow.  (2) <b>Improper coupling height.</b> If the coupling is not set to the proper height (see step 21 of the Reassembly procedures) the impellers are not suspended as they should be, causing them to rub against the intermediate chamber, causing wear.	
Shaft	51	Smooth area at the top of shaft should be free of fitting grooves. Spline should not be worn.	
Corrugated Spring	60	Should not have any cracks in material.	
Shaft stop ring	62	Should be unblemished and fitted securely (and uniformly) in its recess area in the shaft.	
Spacers	64, 64a, 66, 66b, 69	Should show no signs of gouging or wear at bottom or top.	
Lock Nut	67	Should not be reused....replace.	
O-rings	38, 68, 100, 102, 107	Should be soft and pliable with no visible scars. Since they are easily damaged and fairly inexpensive, it is recommended they be replaced whenever the pump is disassembled.	
Upper seal ring	103	Should be smooth and shiny on its <b>LOWER</b> face with no nicks or gouges.	
Lower seal ring	104	Should be smooth and shiny on its <b>UPPER</b> face with no nicks or gouges.	
Bellows Shaft Seal	105	All components of the assembly should be smooth and free of any nicks or gouges.	

Refer to the Parts List and Kits section for a list of material numbers and spare part kits.

## Reassembly Procedures CR2 • CR4



**1**  
Place the Shaft Holder for Assembly (material # 00SV0040) in a vise and place the shaft (51) in the shaft holder (threaded end up). Tighten it so the recess for the stop ring is about 1.5" above the top of the shaft holder.



**2**  
If it was previously removed, replace the stop ring (62) to the shaft in its recessed area. Slip the spacer (61) for the shaft seal onto the shaft. The driving "teeth" should point downwards.



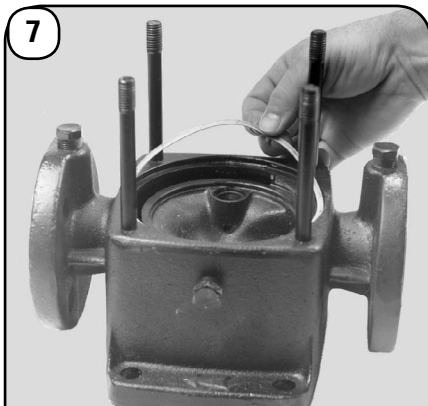
**3**  
Replace any seal rings (45) in the chambers and snap the seal ring retainers (65) into place. The retainer of the chamber and should not spin when properly seated.

**4**  
The reassembly procedures from this point on will depend on the type of pump and the number of stages it contains. Refer to the diagrams on pages 9-12 to determine the proper sequence of impellers (49), chambers (4a or 4), spacers (64a or 64), and bearing rings (47a) needed for the pump you are working with.  
  
Reassemble these stages in the order shown, beginning with the highest number stage and continuing to the first stage.  
  
When you get to the bottom chamber (5a) - the first stage - continue...

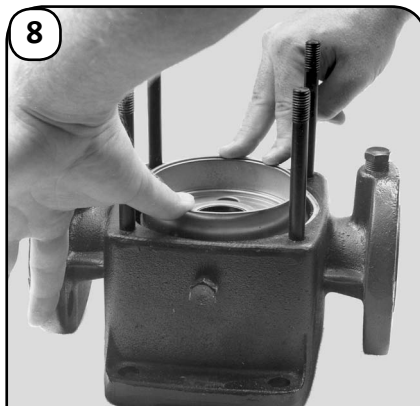


**5**  
Lubricate the O-ring (68) with warm, soapy water and carefully push it over the collar of the circulation hole in the bottom chamber.

**6**  
Lubricate the recess for the outer sleeve gasket in the suction/discharge chamber with an FDA-approved lubricant. Lubricate the recess for the O-ring with warm, soapy water (maximum 5% solution).



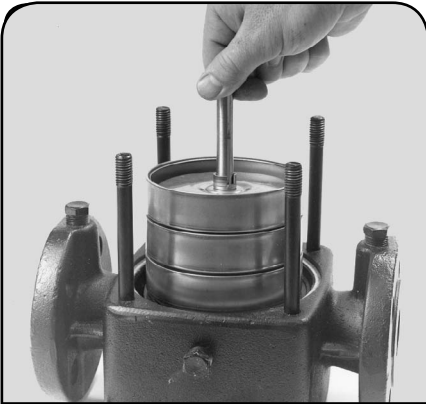
**7**  
Position the outer sleeve gasket (37) in the recess of the suction/discharge chamber (6).



**8**  
Taking care not to disturb the O-ring (68), fit the bottom chamber (5a) in the suction/discharge chamber. Press it down so the circulation hole of the chamber is exactly above the circulation hole of the suction/discharge chamber.



**9**  
Lubricate the threaded end of the shaft with an FDA-approved lubricant. Slip the star washer (66) and nut (67) onto the end of the shaft. Use a wrench to tighten the nut (67) to 9 ft.-lbs. (12 Nm).



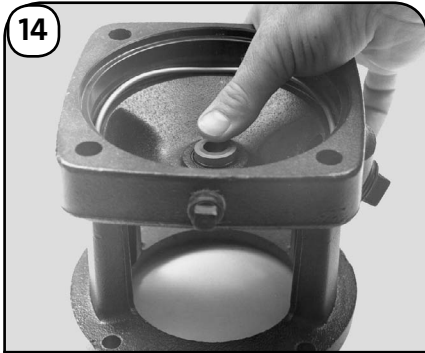
Remove the impeller stack from the shaft holder, turn it over, and fit it onto the bottom chamber.



Fit the outer sleeve (55) over the impeller stack and press the top guide vane (50a) or top plate (50b for CR4 only) into place on the top chamber.



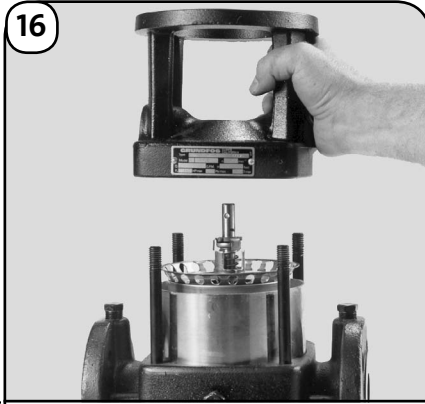
Clean the recessed areas in the motor stool that will hold the seal ring and outer sleeve gasket. Lubricate them with an FDA-approved lubricant. With the ends pointing down, fit the corrugated spring (60) into its recessed area. Spring must be positioned as shown—tips pointing downward and toward 1/4" plug.



**14** If O-ring type seal assembly, moisten the O-ring (102) with soapy water, fit it onto the upper seal ring (103), and fit both snugly into the recess area in the motor stool (O-ring end first). NEVER strike the seal face with any hard object. When fitting carbon upper seal ring, DO NOT touch seal face. Gently wipe the seal face clean (no solvents!)



**15** Fit the outer sleeve gasket (37) into its recessed area in the motor stool. Press the shaft seal assembly (on the shaft) down a few times to make sure the drivers are still engaged.



**16** Fit the motor stool (2) over the staybolts (26). Make sure the priming plug points in the direction you wish. As you lower the motor stool, make sure the outer sleeve gasket does not catch onto the guide vanes.

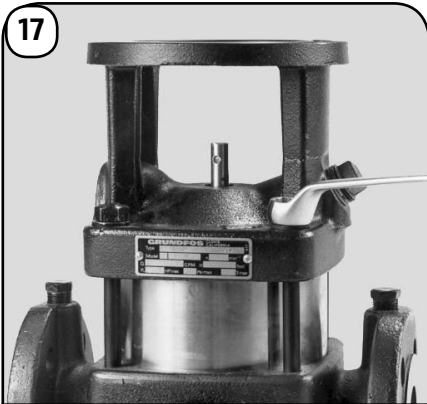
**12 REFER TO THE DIAGRAM AND COMPLETE THESE STEPS:**

**O-Ring Type Shaft Seals:**  
 (a) Fit the lower seal driver (112) onto the shaft, making sure the bottom "teeth" engage with those of the shaft seal spacer (61). Fit the seal spring (108), and upper seal driver (111) onto the shaft.  
 (b) Moisten the O-ring (107) with warm, soapy water. Fit it onto the shaft and press it down against the upper seal driver (111). Make sure it is not damaged as it passes over the shaft pin hole.  
 (c) Press the upper seal driver down against the spring, making sure the drivers engage properly.  
 (d) Fit the lower seal ring (104)—shiny side up—over the upper seal driver (111) so the taps of the seal ring engage with the driver. If the pump will not be put back into service immediately, the shiny side (top) of the lower seal ring (104) should be lubricated with a very small amount of silicon oil to prevent the seal from sticking during storage.

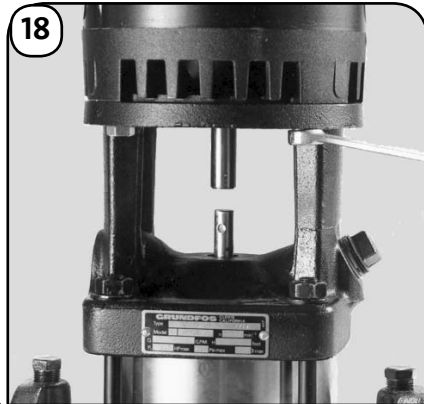
**Bellows Type Shaft Seals:**  
 (a) Moisten the rubber bellows (bottom of 105) with warm soapy water. Slide the seal onto the shaft until it comes in contact with the shaft seal spacer already on the shaft.  
 (b) Fit the secondary O-ring (top of 105) around the carbon ring. To make installation easier, lubricate the seat in the motor stool with warm, soapy water (maximum 5% solution), then press the secondary seal (O-ring end first) into the motor stool. Check visually to make sure the seal is positioned correctly and fits snug and uniformly in the motor stool. Do not put Silicon Oil on this seal type.

**THE MECHANICAL SEAL ASSEMBLY**

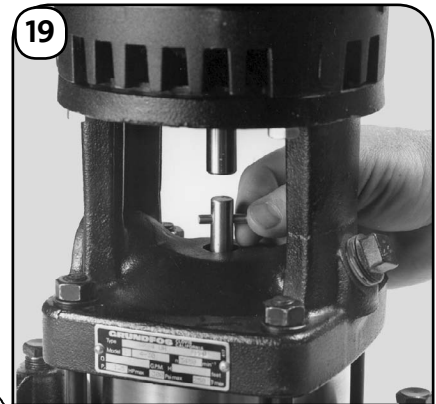
Pumps Manufactured Prior To February 1989		Pumps Manufactured Since February 1989	
	(102) O-ring		
	(103) Upper Seal Ring		
	(104) Lower Seal Ring		
	(107) O-ring		
	(111) Upper Seal Driver		
	(108) Seal Spring		
	(112) Lower Seal Driver		
<b>Bellows Type Option Interchangeable (CR2: 1 to 11 stage) (CR4: 1 to 10 stage)</b>			
	(105) Bellows Seal		Secondary Seal
			Rubber Bellows



17  
Replace the staybolt washers and nuts (sprayed first with food machinery oil) and tighten diagonally to 30 ft.-lbs. (40 Nm).  
① ③ Diagonal tightening (overhead view)  
④ ②



18  
Fit the motor onto the motor stool (2). Replace the screws and tighten diagonally to 10 ft.-lbs. (13 Nm) for UNC 3/8" bolts and to 23 ft.-lbs. (31 Nm) for UNC 1/2" bolts.  
① ③ Diagonal tightening (overhead view)  
④ ②



19  
Fit the shaft pin (10) in the shaft hole.



20  
Fit the two coupling halves (10a) and hand tighten the allen screws into the coupling. Check to make sure the gaps on either side of the coupling are even. Spray the allen screws with food machinery oil.

21 **SETTING THE COUPLING HEIGHT**

- Note the clearance below the coupling
- Raise the coupling higher, as far as it will go
- Lower it halfway back down (½ the distance you just raised it)
- Tighten screws  
M6...10 ft.-lbs. (13 Nm)  
M8...23 ft.-lbs. (31 Nm)

With a screwdriver in one hand and allen wrench in the other, raise the coupling (with the screwdriver) as high as it will go (at least 2 mm higher). Make sure the shaft is moving up and down with the coupling (there will be a little bit of "play" before the shaft moves). Lower the coupling halfway back down the distance you just raised it. Tighten the allen screws two and two (one side at a time). Check to make sure the gaps on either side are even. Check your work by turning the coupling (it should rotate freely). If the shaft is very tight or won't rotate at all, there is a problem (missing spacer, wrong parts, etc.)



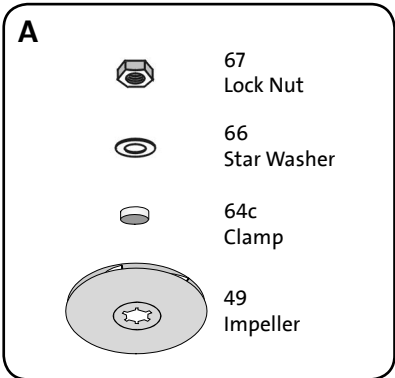
22  
Spring the two coupling guards (7) back into place. For solid type guards, hold guard in place, reinstall screws and torque to 2 ft.-lbs. (2.5 Nm).

**THE PUMP  
IS NOW  
COMPLETELY  
ASSEMBLED.**

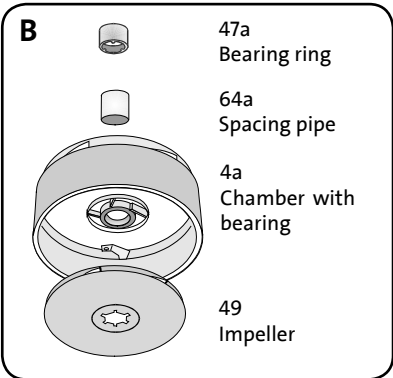


Order of Stage Assembly

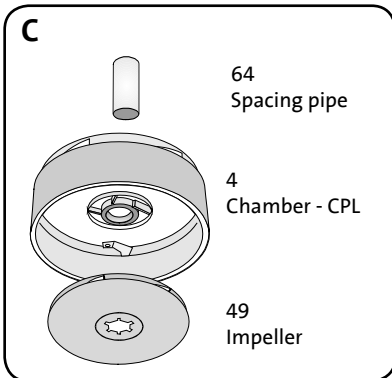
Legend



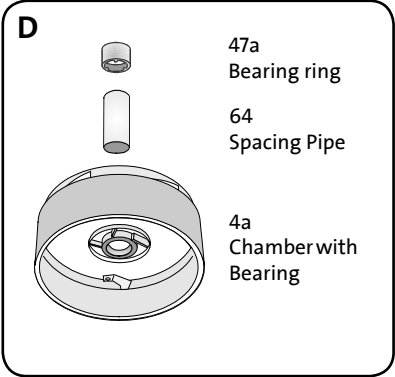
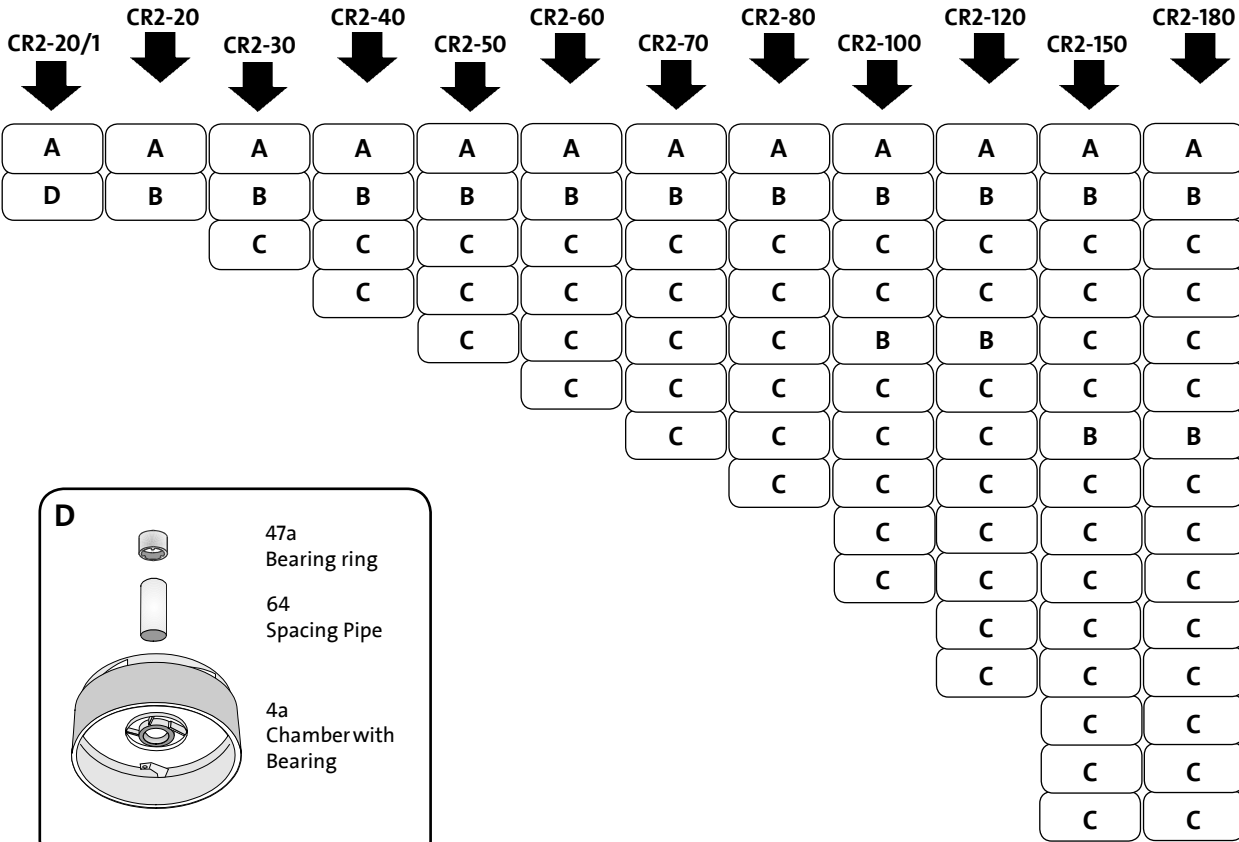
Part Combination A



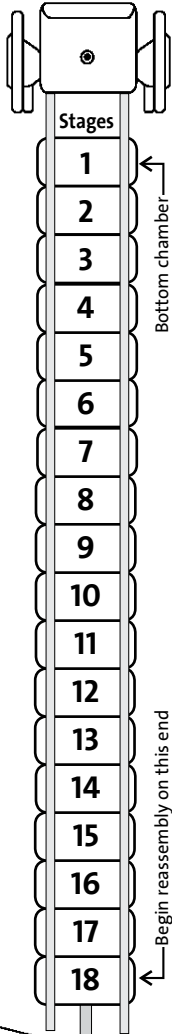
Part Combination B



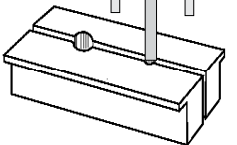
Part Combination C



Part Combination D

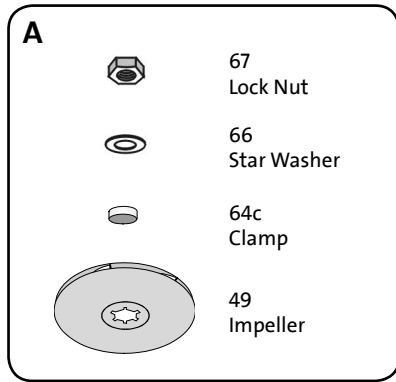


**NOTE:** Since proper reassembly of the impeller stages must be done "upside down," this chart has been arranged that way for your convenience.

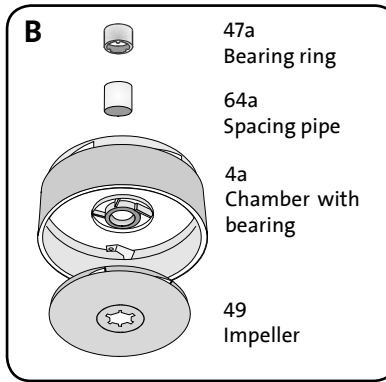


## Order of Stage Assembly

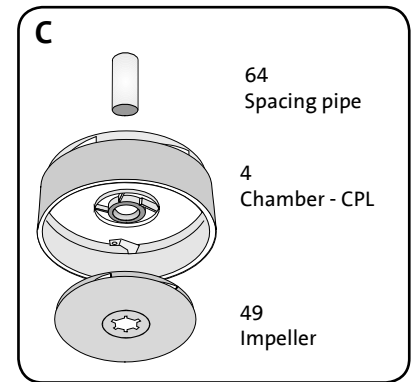
### Legend



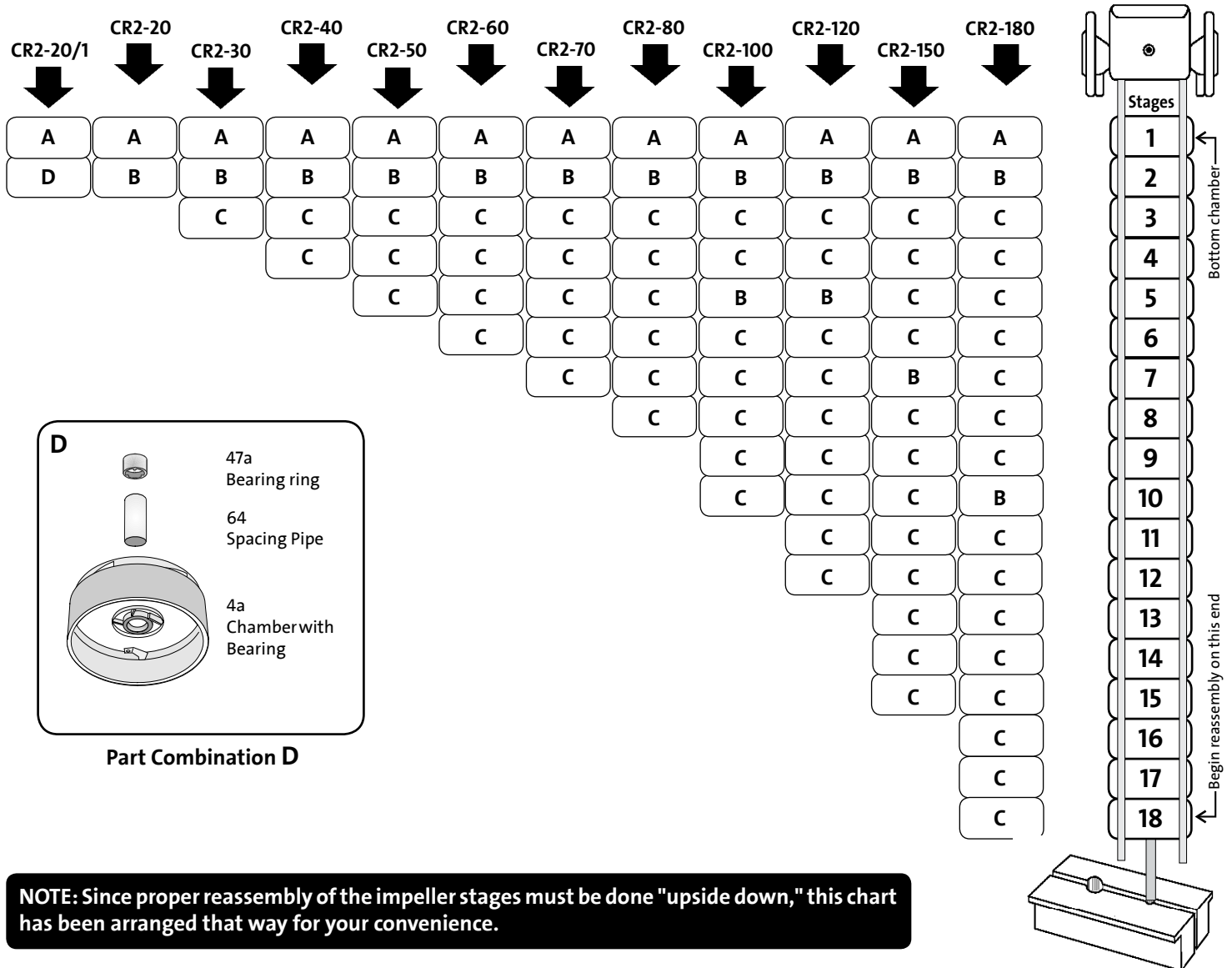
Part Combination A



Part Combination B



Part Combination C

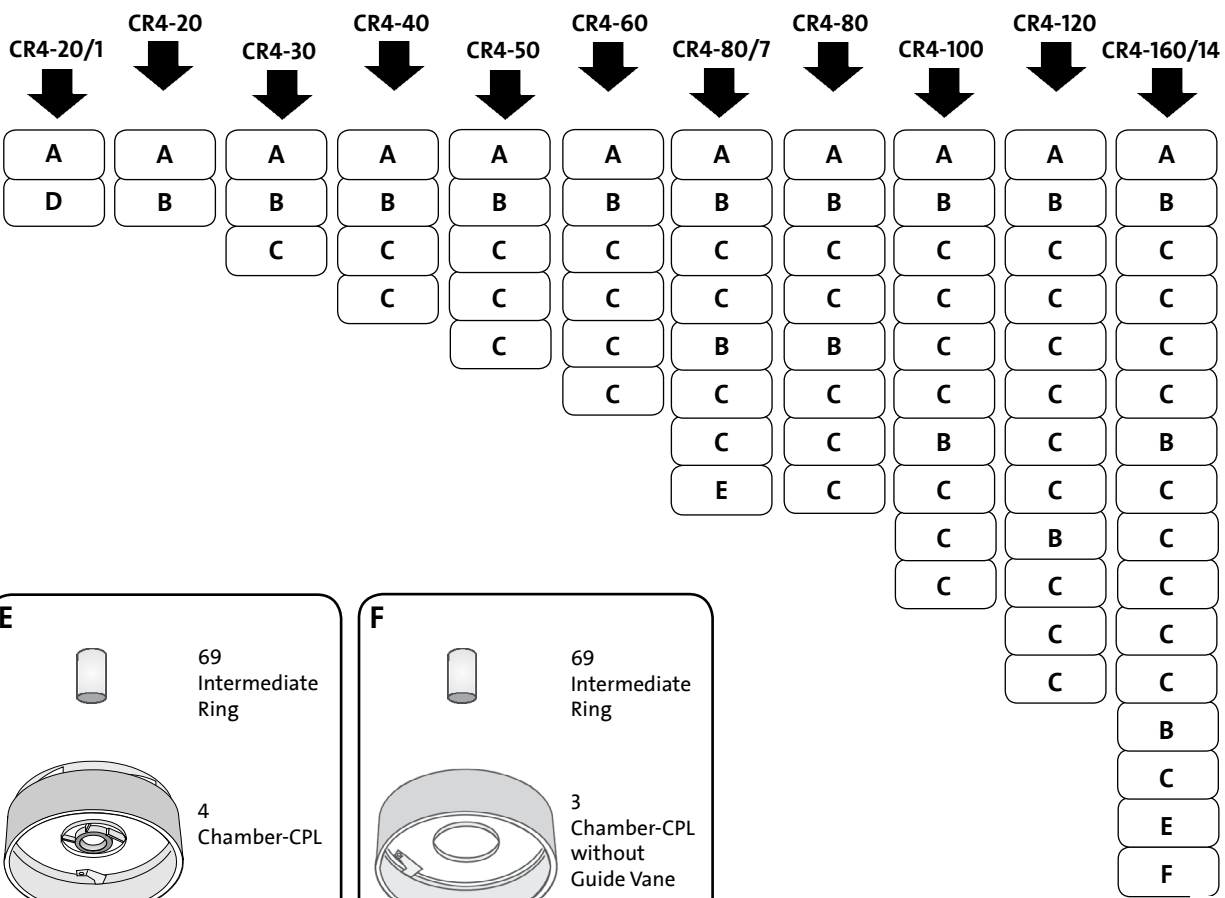




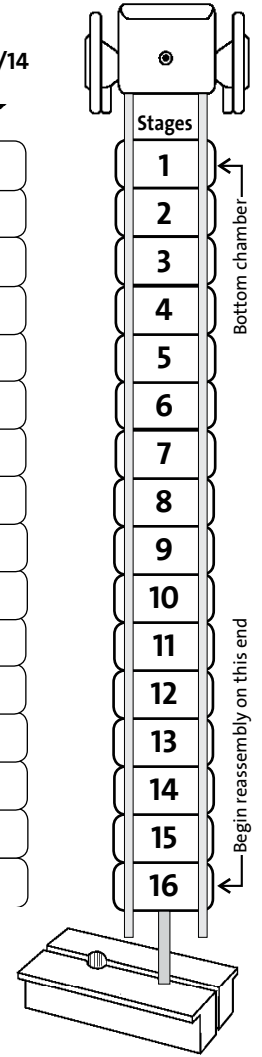
### Order of Stage Assembly

#### Legend

<p><b>A</b></p> <p>67 Lock Nut 66 Star Washer 64c Clamp 66b Spacing Pipe 49 Impeller</p> <p><b>Part Combination A</b></p>	<p><b>B</b></p> <p>47a Bearing ring 64a Spacing pipe 4a Chamber with bearing 49 Impeller</p> <p><b>Part Combination B</b></p>	<p><b>C</b></p> <p>64 Spacing pipe 4 Chamber - CPL 49 Impeller</p> <p><b>Part Combination C</b></p>	<p><b>D</b></p> <p>47a Bearing ring 69 Intermediate Ring 4a Chamber with bearing</p> <p><b>Part Combination D</b></p>
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<p><b>E</b></p> <p>69 Intermediate Ring 4 Chamber-CPL</p> <p><b>Part Combination E</b></p>	<p><b>F</b></p> <p>69 Intermediate Ring 3 Chamber-CPL without Guide Vane</p> <p><b>Part Combination F</b></p>
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**NOTE: Since proper reassembly of the impeller stages must be done "upside down," this chart has been arranged that way for your convenience.**



SM-DR-C24 0403

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