



HS-105 Series Disperser

OWNERS MANUAL

Warranty

Our products are guaranteed against defective materials and workmanship, we will repair or replace such items as may prove defective at our option. Warranty period is one year on items manufactured by INDCO, except for the MixMaster Series Shakers which carries a two year warranty. On items not manufactured by INDCO, the manufactures warranty applies. All component parts of our products are covered by this warranty, except for normal wear items such as belts or impellers. We cannot be responsible for damage or abuse to equipment caused by improper installation or operation. Warranties can also be voided by unauthorized disassembly of equipment. For warranty repairs, equipment is returned to INDCO at the customer's expense; we will repair and return to customer at our expense. Under no circumstances will we allow labor charges or other expense to repair defective merchandise. This warranty is exclusive and is in lieu of all other warranties, whether express or implied. INDCO shall not be liable for any other damages, whether consequential, indirect, or incidental, arising from the sale or use of its products.



HS-105 SERIES DISPERSER

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Safety

Please follow the below safety precautions. If there are any questions, please call INDCO at 800-942-4383. Please read this complete manual before trying to operate your mixer.

Failure to follow these instructions could result in serious bodily injury or death.

- Never move the unit without a suitable lifting device.
- Have a qualified individual bring power to your unit.
- Always ground the unit.
- Never run the unit with the dispersion blade in open air.
- Never adjust the speed without the unit running.
- Always lockout the power when working on the unit.
- Always use the container holder to restrain the container during operation.

Electric Motor Safety:

Motors should be installed, protected and fused in accordance with latest issue of National Electrical Code, NEMA Standard Publication No. MG 2 and local codes.

Eyebolts or lifting lugs are intended for lifting the motor only. These lifting provisions should never be used when lifting or handling the motor with other equipment (i.e. pumps, gearboxes, fans or other driven equipment) as a single unit. Be sure eyebolt is fully threaded and tight in its mounting hole.

Eyebolt lifting capacity rating is based on a lifting alignment coincident with the eyebolt center-line.

Eyebolt capacity decreases as deviation from this alignment increases. See NEMA MG 2.

Frames and accessories of motors should be grounded in accordance with National Electrical Code (NEC) Article 430. For general information on grounding refer to NEC Article 250.

Rotating parts such as pulleys, couplings, external fans, unusual shaft extensions should be permanently guarded. Keep hands and clothing away from moving parts. Trained, qualified personnel should make electrical repairs only.

Mechanical Variable Speed Drive Safety:

When maintenance is required in the area of the equipment necessitating removal of the guarding, the prime mover should be turned off and "locked out".

The user of variable speed belt drives should be aware of the hazards through misuse of the product or failure to protect against contact with moving parts.

Spring-loaded pulleys should never be disassembled without first receiving instruction from factory.

Rapid acceleration or braking, or shock loading may cause a shaft to fracture due to torsional twist beyond its capacity.

All mounting screws on the pulleys must be kept tight.

Even though each pulley is individually balanced at the factory the system in which the pulleys operate may resonate, particularly at high RPM's over 1800. Sometimes a new belt will reduce vibration levels in a system.

General

The HS-105 series 1/2-Horsepower electric high-speed dispersers are designed for bench top use to process batches up to one-gallon. They are ideal for use in labs, pilot plants, or small-scale production.

Each model comes complete with following standard features:

- Mixing speed range: 600 to 2250 RPM.
- Mixing shaft: 1/2" dia. x 15" with 3" propeller - 316SS.
- Dispersing speed range: 900 to 3400 RPM.
- Dispersing shaft: 3/4" dia. with 2" design 'A' blade - 304SS.
- Adjustable chuck - 5/8".
- Hand knob control for varying speed on T and E models, VFD on N models.
- Pneumatic cylinder lift mechanism.
- Container holder with capacity for up to one-gallon.
- TEFC or Explosion-Proof electric motor.
- 115-volt, TEFC, single-phase models include cord, switch

Installation

Receiving:

Before removing any packing, visually inspect the exterior of the shipment for any sign of damage. Should there be any damage, bring it to the attention of the delivering UPS or truck line and note the same on the receiving ticket. Should there be damage you must place a claim with the truck line.

They are the only ones who will pay for the damage done and you are the only one who can place that claim.

Mounting:

Ensure the unit is securely bolted to your bench top, floor, etc. and is level, square, and plumb. Leave room around the unit for cleaning, inspection and maintenance.

Pre-Start Up Check List:

1. Are all mounting bolts tight?
2. Is disperser blade mounting bolt tight?
3. Has electric motor been wired according to the diagram on the motor label? Is motor grounded?
4. Does motor have emergency stop located as per local code?
5. Bump motor and check rotation, looking down into the container, shaft should rotate clock-wise. If direction is incorrect reverse motor as explained on the motor label.

Operation

CAUTION:

- Never run mixer without an impeller.
- Never run the impeller in open air.
- Never run impeller outside a container.

In general the disperser is run at blade tip speeds of 2500 to 5000 feet per minute. The lower ranges are used for agitation or blending operations while the upper ranges are used for dispersions of difficult materials. The middle range is adaptable to a great many solutions and easier dispersions. Experience by the operator will be the best key as to what speed to try first on materials handled at your facility.

Under normal operation the blade is located from 1 to 1.5 blade diameters from the bottom. If this results in an excessive vortex, the blade may be lowered. If the action is a little slow at the above location, the blade may be raised to a limit of 2.5 diameters to obtain a good flow providing the amount of material over the blade is greater than the amount of material beneath. At this point, good action is usually assured in the bottom of the container.

The size of the batch to be processed is generally a function of the viscosity or apparent viscosity and flow characteristics of the material. This model disperser will generally handle batches up to 1-gallon depending on the viscosity. For maximum batch sizes at intermediate viscosity's, we recommend that you try different batches of the material involved.

When adding materials to the container for a test, always introduce the liquid phase first. In most cases, the disperser should be started and solid phase added. However, on some formulations such as enamel, particularly those of colored pigments, it has been found most satisfactory to add vehicle in tank and then add all pigments before turning on motor.

Electronic Speed Control:

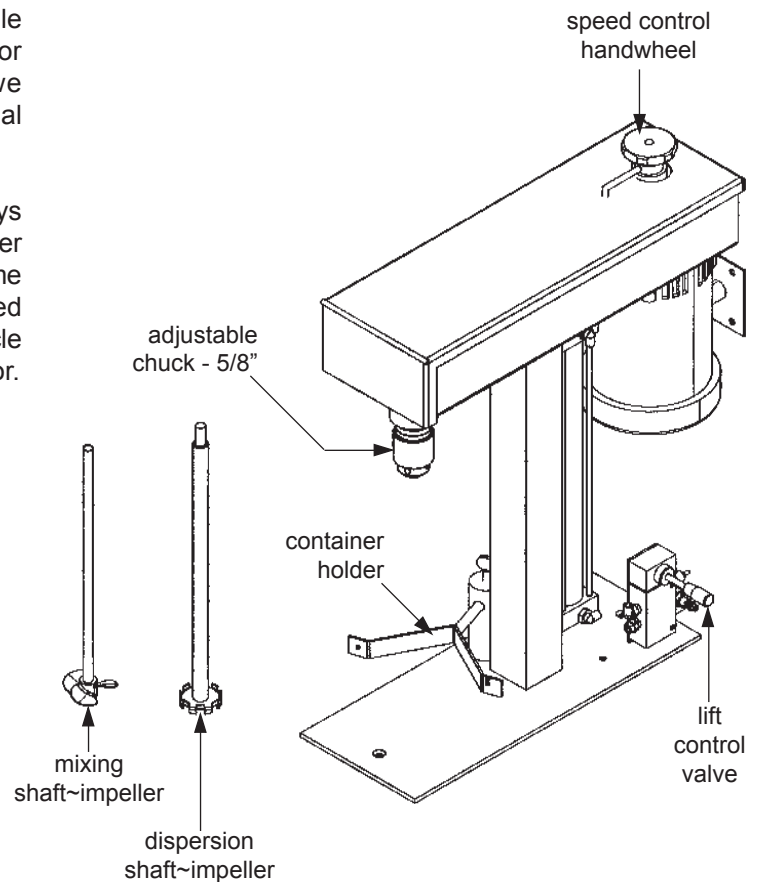
Inverter-Duty models have an electronic variable speed control. Speed range is 330 to 3400 RPM.

Mechanical Speed Control:

The T and E models are equipped with a mechanical variable speed drive,

Turning the hand-wheel knob at the rear of the disperser varies the speed. For best results always stop and start the disperser in the lowest variable speed hand-wheel setting.

DO NOT TURN THE HAND-WHEEL KNOB WHEN THE DISPERSER IS NOT RUNNING !!



Operation

Air Cylinder Operation:

Before connecting your air supply make sure the lift control valve is in the center (off) position. Connect your air supply to the quick connector at the 4-way air valve. Maximum air pressure is 100 PSI. Note that air pressure is used to both raise and lower the cylinder. The following will enable you to adjust the height of the impeller or to install and remove your batch container:

CAUTION: After the air line is installed and before operating the machine for the first time, move the lift control valve to the downward position. This will charge the air cylinder and prevent surging when the lift control valve is moved to the upward position.

• Lifting:

1. Move the lift control valve to the up most position. To stop upward motion move valve to center (off) position.

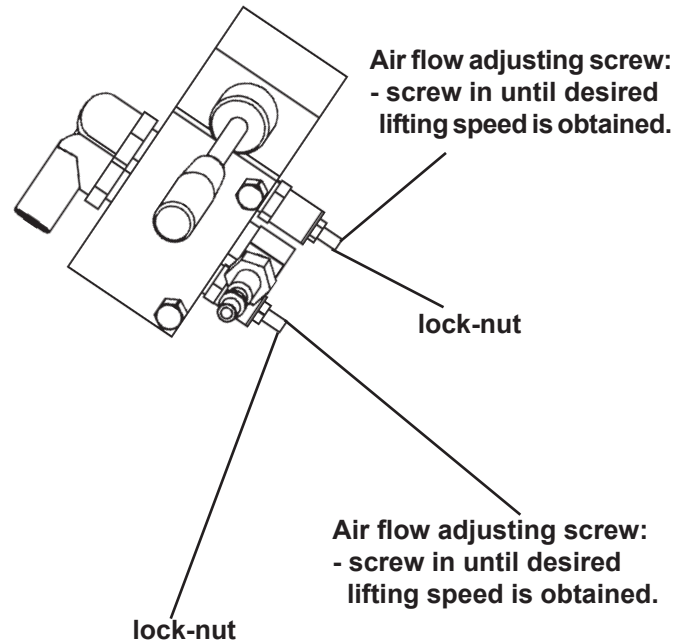
• Hold:

2. To hold the impeller at any height move the lift control valve to the center (off) position.

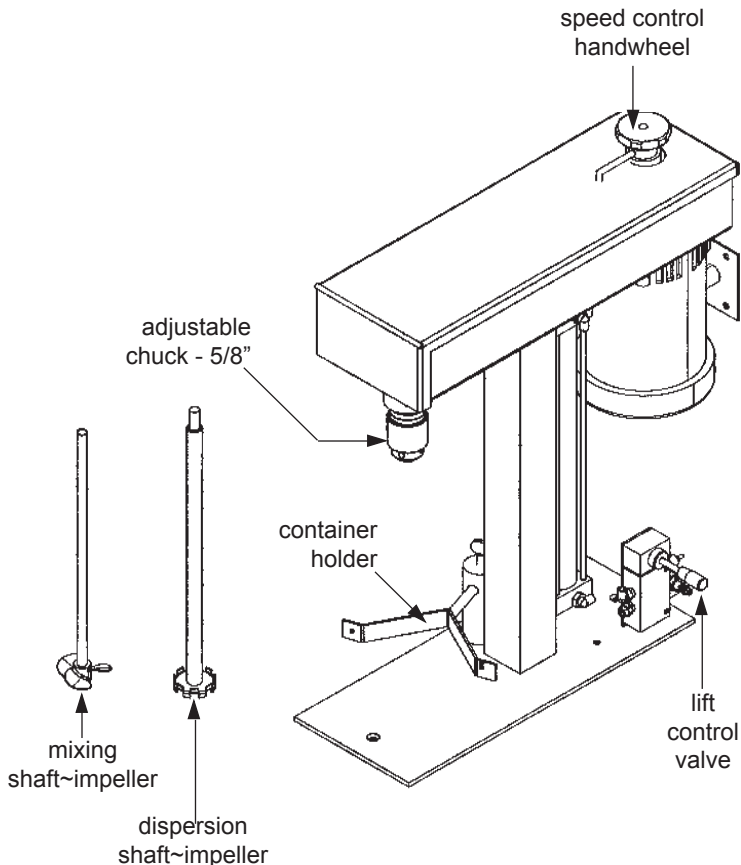
• Lowering:

3. Move the lift control valve to the down most position. To stop downward motion move valve to center (off) position.

• **Air Valve** ~ Cylinder speed control adjustment:
This mixer is supplied with two impeller shaft assemblies.



Once desired raise & lowering speeds are obtained, tighten lock -nuts.



Maintenance

Variable Speed Pulley Drive Maintenance

Lubrication:

Variable speed pulleys requiring lubrication should be run through at least part of their speed range after greasing. Following a definite schedule will help to insure proper functioning of the parts when the speed is adjusted. Opening and closing the pulley flanges distributes the grease and helps to prevent galling and seizing on the sliding surfaces.

The pulleys are packed with:

- ARCO Caldron EP 2 grease

or the following equivalent:

- Texaco Multifak EP 2
- Mobil Mobilux EP 2
- ARCO Litholene HEP 2

Avoid using automotive chassis and other non-interchangeable lubricants.

Maintenance:

To prevent speed drift, a nylon plug contacts the adjusting screw. To increase drag on the adjusting screw, tighten the setscrew over the plug that is located opposite the torque arm, just in front of the hand-wheel. Light oil on the adjusting screw and motor base guide rods will make adjustment easier and help prevent corrosion.

1. Check alignment of the drive at speeds other than "set-up" speed. Misalignment will cause the belt to overheat and wear rapidly.
2. Observe pulley face run-out. A good rule of thumb of .001" per inch of diameter is acceptable.
3. Watch for overload conditions. If the belt loops out or squeals the drive is overloaded. This condition will frequently exist during start-up but should not continue for more than a few seconds. When starting up, particularly if starting several times a day, try to start up slowly by jogging the machine to bring the speed up gradually.
4. Excessive vibration will cause damage to all of the equipment in the drive system. If any doubt exists as to the safe levels of vibration a qualified person should be called in to examine the drive.
5. Lubricated pulleys will stick or freeze if not lubricated properly. The most frequent cause is failure to run the drive through part of its range at the time it is lubricated. The pulley must be lubricated at least once every two weeks and pulley adjusted opened and closed to distribute the grease inside. Small amounts of grease will do. Wipe excess off of belt faces.
6. Use Loctite on set screws where necessary to prevent screws from backing out due to vibration in machine.
7. When belt drive is subjected to cyclic loading, numerous starts and stops or will be running at high speeds continuously (over 1800 RPM) an outboard bearing

General:

Maintaining your mixer is not difficult if you follow these guidelines:

- Keep the mixer clean.
- Check all wiring on a regular basis and repair as needed.
- Unit fails to start: Check power source to unit, check -and/or- reset breaker. If problem continues, disconnect power and have a qualified person make proper repairs.

Blade Changing:

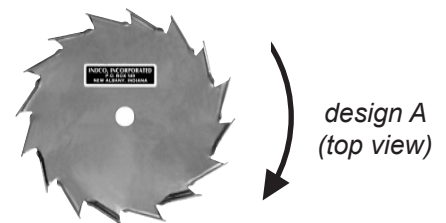
ENSURE POWER TO UNIT IS OFF OR DISCONNECTED!

Remove the bolt from the bottom of the shaft, remove and



Blade Rotation:

Ensure the mixer shaft will rotate in a clock-wise direction, looking downward into the container. Care must be taken to ensure blade is rotating in the correct direction. Look for arrow on blade or consult factory.



Inverter Control Data

If your HSL Series mixer has the electronic variable speed control, see the FACTORY owners manual, enclosed with mixer.

Electric Motor Data, fixed speed

General:

Electric motors are wired to operate in a Clockwise rotation, when viewed from top of mixer looking downward into the mixing container.

The mixers are supplied with the following power connections:

- 115 volt single-phase totally enclosed (TEFC) motors are wired at our factory for correct rotation. All single-phase TEFC models are equipped with cord, plug and switch assembly that are ready to operate.

- 230/460 volt three-phase and all explosion-proof motors must be field wired for proper rotation. Three-phase and explosion-proof models are equipped with motor leads only. Refer to the connection diagrams on the motor.

- DC Variable-speed models, the speed controller is mounted and pre-wired directly to mixer.

- 115 volt single-phase totally enclosed (TEFC) motors are wired at our factory for correct rotation. These models are equipped with cord, plug and switch assembly that are ready to operate.

- 230 volt single-phase totally enclosed (TEFC) motors are wired at our factory but have no plug.

Described below are the most commonly used electric motor enclosure types on your INDCO mixer:

TEFC = Totally Enclosed Fan Cooled - no ventilation openings in housing (but not airtight, waterproof, or explosion-proof). Includes an external fan, in a protective shroud, to blow cooling air over the motor. Used in locations which are dirty or dusty.

TENV = Totally Enclosed Non-Ventilated - no ventilation openings in housing (but not airtight, waterproof, or explosion-proof). Relies on convection for cooling.

EP - Explosion-Proof - a totally enclosed design to withstand an internal explosion of specified gases or vapors and not allow the internal flame or explosion to escape. Explosion-Proof motors are individually rated for specific gases, vapors & conditions. Most INDCO EP motors are Class I, Group D & Class II, Group F & G rated.

Warning:

These instructions must be followed to ensure safe and proper installation, operation and maintenance of the motor. They should be brought to the attention of all persons who install, operate or maintain this equipment. Failure to follow instructions and safe electrical procedures could result in serious injury or fatality. Disconnect all power and discharge all capacitors before servicing. Install and ground per local and national codes. Consult qualified personnel with questions or if repairs are required.

Electrical Connections:

If your new mixer has not been supplied with a power cord assembly by INDCO, see information below and consult your local electrician or electrical code for proper size requirements.

1. All wiring, fusing and grounding must comply with National Electrical Codes and local codes.
2. To determine proper rotation and voltage connections, refer to the information and diagram on the nameplate, separate connection plate or decal. If the plate or decal has been removed, contact INDCO or the motor manufacturer for assistance.
3. Use the proper size of line current protection and controls as required by the National Electrical Code and local codes. Recommended use is 125% of full load amps as shown on the nameplate for motors with 104°F (40°C) ambient and a service factor over 1.0. Recommended use is 115% of full load amps as shown on the nameplate for all other motors. Do not use protection with larger capacities than recommended. Three phase motors must have all three phases protected.

Location:

In selecting a location for the motor, consideration should be given to environment and ventilation. A motor with the proper enclosure for the expected operating condition should be selected.

The ambient temperature of the air surrounding the motor should not exceed 104°F (40°C) unless the motor has been especially designed for high ambient temperature applications. The free flow of air around the motor should not be obstructed.

The motor should never be placed in a room with hazardous process, or where flammable gases or combustible material may be present, unless it is specifically designed for this type of service.

1. Drip proof (open) motors are intended for use indoors where atmosphere is relatively clean, dry and noncorrosive.
2. Totally enclosed motors may be installed where dirt, moisture and corrosion are present.
3. Totally enclosed – severe duty motors are recommended for extreme environmental conditions.
4. Explosion proof motors are built for use in hazardous locations as indicated by Underwriters' label on motor. Consult UL, NEC and local codes for guidance.

Changing Rotation:

1. Keep hands and clothing away from rotating parts.
2. Before the motor is coupled to the load, determine proper rotation.
3. Check rotation by jogging or bumping. Apply power to the motor leads for a short period of time, enough to just get motor shaft to rotate a slight amount to observe shaft-rotating direction.
4. Three phase – interchange any two (2) of the three- (3) line

Electric Motor Data, fixed speed (continued)

Operation:

1. Ensure that voltage and frequency stamped on motor nameplate corresponds with that of the power line.
2. Check all connections to the motor with the wiring diagram.
3. Be sure rotor turns freely when disconnected from the load. Any foreign matter in the air gap should be removed.
4. Leave the motor disconnected from the load for the initial start. Check for proper rotation. After the machine is coupled to the load, check the nameplate amps are not exceeded.

Shut down the motor if the above parameters are not met or if any other noise or vibration disturbances are present. Consult NEMA guidelines or the equipment manufacture if any questions exist before operating equipment.

Allowable Voltage & Frequency Range:

If voltage and frequency are within the following range, motors will operate, but with somewhat different characteristics than obtained with correct nameplate values.

1. Voltage: Within 10% above or below the value stamped on the nameplate. On three phase systems the voltage should be balanced within 1%. A small voltage unbalanced will cause a significant current unbalance.
2. Frequency: Within 5% above or below the value stamped on the nameplate.
3. Voltage and frequency together: Within 10% (providing frequency above is less than 5%) above or below stamped on the nameplate.

Cleanliness:

Keep both the interior and exterior of the motor free from dirt, water, oil and grease. Motors operating in dirty places should be periodically disassembled and thoroughly cleaned. **NOTE:** Explosion proof motors should only be

Temperature Limits - Insulation Classification

Below are the temperature limits for some electric motors.

Most INDCO mixers have insulation class 'B' and some have class 'F' ratings.

Class	Maximum Ambient	Maximum Heat Rise	Maximum Operating Temperature
A	104°F	117°F	221°F
B	104°F	162°F	266°F
F	104°F	207°F	311°F
H	104°F	252°F	356°F

Full Load Current Specifications

Note: The following table is a general guide only and are for normal duty applications. The exact specifications for any given motor can vary from those listed below, see actual motor nameplate for exact specifications.

1-phase, 60Hz, AC electric motors:				3-phase, 60Hz, AC electric motors:			
HP	RPM	115 Volt, Full Load AMPS	230 Volt, Full Load AMPS	HP	RPM	230 Volt, Full Load AMPS	460 Volt, Full Load AMPS
1/4	1800	5.8	2.9	2	1800	6.8	3.4
1/3	1800	7.2	3.6	3	1800	9.6	4.8
1/2	1800	9.8	4.9	5	1800	15.2	7.6
3/4	1800	13.8	6.9	7.5	1800	22.0	11.0
1	1800	16.0	8.0	10	1800	28.0	14.0
1.5	1800	20.0	10.0	15	1800	42.0	21.0
2	1800	24.0	12.0	20	1800	54.0	27.0
3	1800	34.0	17.0				

Condensation Drain Plugs:

All explosion proof and some totally enclosed motors are equipped with automatic drain plugs, they should be free of oil, grease, paint, grit and dirt so they don't clog up. The drain system is designed for normal floor (feet down) mounting. For other mounting positions, modification of the drain system may be required, consult the manufacture.

Service:

Warning - Disconnect power before working on motor or driven equipment. Motors with automatic thermal protectors will automatically restart when the protector temperature drops sufficiently. Do not use motors automatic thermal protectors in applications where restart will be hazardous to personnel or equipment.

Caution - Over greasing bearings can cause premature bearing and/or motor failure. The amount of grease added should be carefully controlled.

Note - If lubrication instructions are shown on the motor nameplate, they will supersede this general instruction. Some electric motors are pre-greased with a polyurea mineral oil NGLI grade 2-type grease unless stated otherwise on the motor nameplate. Some compatible brands of polyurea mineral base type grease are: Chevron SRI #2, Rykon Premium #2, Shell Oil Dolium R or Texaco Polystar RB.

Motors are properly lubricated at time of manufacture. It is not necessary to lubricate at the time of installation unless the motor has been in storage for a period of 12 months or longer.

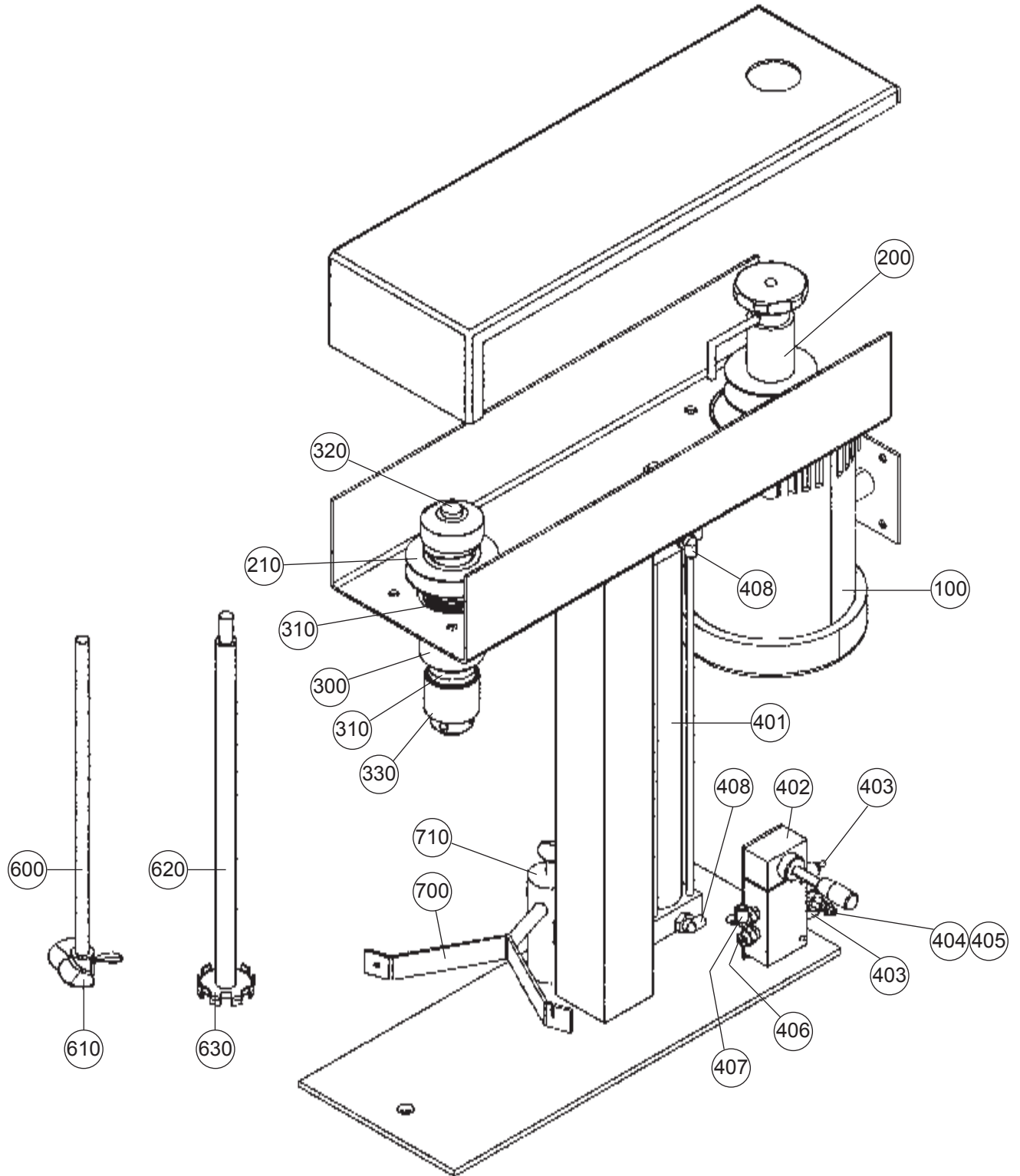
Electric Motor - Troubleshooting

Problem or Complaint	Possible Cause	Remedy
<p>Motor is NEW (or basically new) and has a cord, plug, and switch by INDCO. It does not start or run.</p>	<ol style="list-style-type: none"> 1. Switch is bad, or switch could have been damaged in shipment. Could also have a damaged cord (partially cut or torn, insulation on cord missing, etc.). 2. User could be trying to run motor on the wrong voltage or wrong phase. 3. Motor's internal starter switch or capacitor could be defective. (A tip here is that when turned on, the motor hums but does not turn. Also, sometimes the motor shaft can be spun manually, and the motor will then take off and run normally). 4. Motor could have taken a blow in shipping, and fan could be jammed inside fan cover or against motor body. (Fan cover will likely be cracked or broken). 5. If mixer is gear-drive, or has another type of transmission on it (hydrostatics, pulleys, etc.), check to ensure the problem is not in the transmission. Might not be a problem with the motor at all. 	<ol style="list-style-type: none"> 1. Replace switch, cord, or both as necessary. 2. Reconnect motor to correct phase or voltage electrical supply. 3. <u>Motor cannot be repaired by the user or by INDCO.</u> Replace motor with a new one. 4. Remove fan cover and fan. Turn on motor to make sure it runs now that damaged parts are removed. We can send new fan and cover. (NOTE: Do not run motor for more than a few minutes without fan to cool it!!). 5. Replace or repair components as necessary.
<p>Motor is NEW (or basically new) and was wired up by <u>USER</u>. It does not start or run.</p>	<ol style="list-style-type: none"> 1. Installer may not have followed the directions on the motor nameplate correctly with regards as to how to wire up the motor. May have wired at the wrong <u>voltage</u> or wrong <u>phase</u>, may have wired <u>backwards</u>, may have not <u>taped off</u> the proper leads, etc. 2. See above Section (where INDCO wired the motor). 	<ol style="list-style-type: none"> 1. Re-examine motor nameplate for correct information and re-wire motor. 2. See above Section (where INDCO wired the motor).
<p>Motor started to smoke, got hot to the touch, and/or developed a burning smell after running a while. May or may not shut off automatically.</p>	<ol style="list-style-type: none"> 1. Motor is <u>probably</u> being overloaded. If motor/mixer is new, then check to see if it was sized correctly (viscosity, S.G., tank volume, HP, direct vs. gear drive, etc.) If it is not new, maybe customer put a new impeller on it recently, or tried to put the mixer into a larger tank or is using it with a thicker liquid. 2. If motor is new, then it could be a bad motor. If the mixer <u>is sized properly</u> for the customer's task (ask a Sales Engineer for help if needed!), then this is a distinct possibility. <p>TIP: Motors DO get hot normally! See information on Temperature Limits - Insulation Classification for details.</p>	<ol style="list-style-type: none"> 1. Replace motor on mixer with one appropriate to the customer's task. Alternately, replace impellers with a size that the present motor will handle, or reduce batch size, etc. 2. Replace motor. TIP: If the same thing happens a second time, then it was probably NOT the motor. Look harder at application. Might be prudent to replace motor with a size larger if there is any concern.
<p>Motor pulling too many amps (more amps than allowed on the motor nameplate)</p>	<ol style="list-style-type: none"> 1. Just another way of stating that the motor is probably being overloaded. 2. Could be a bad motor (same as previous). 	<ol style="list-style-type: none"> 1. Same remedy as previous. 2. Same as above.
<p>Motor is creating or throwing sparks.</p>	<ol style="list-style-type: none"> 1. If sparks are coming from FAN COVER or FAN AREA, there is probably a piece of loose metal striking the inside of the fan housing. 2. If sparks are coming from JUNCTION BOX or other cover where electrical connections are housed, there could be a loose connection, or arcing caused by missing insulation or wire nut, etc. 3. If motor has ODP enclosure, and sparks are visible in motor winding area, this is probably NORMAL. ALL motors produce "sparks" in and around the windings as part of their normal operation. In totally enclosed motors, however, you just cannot 	<ol style="list-style-type: none"> 1. Remove debris. Replace broken parts. 2. Open junction box, repair loose connection or wiring.

Electric Motor - Troubleshooting (continued)

Problem or Complaint	Possible Cause	Remedy
<p>Motor runs fine when no load is applied. When loaded, it loses power and tries to stall.</p>	<ol style="list-style-type: none"> 1. If motor is new, see above under possible overload situation, or possible bad motor. 2. If motor is older, and motor is AC, then it is probably worn out or in need of rebuilding. 3. If motor is older, and motor is DC, then it probably needs new brushes. Brushes are present in all DC motors. (AC motors do not have brushes). 	<ol style="list-style-type: none"> 1. Repair as mentioned previously, or examine customer application more closely. 2. Replace motor. NOTE: INDCO cannot <i>rebuild</i> electric motors, although it can be done. If customer wants to pursue this, they can check their local Yellow Pages under "Electric Motor Repair". Alternately, we can refer them to a factory-authorized repair facility if we have the brand name of the motor. 3. Replace brushes. Inspect brush holders while servicing, they wear with time as well.
<p>Motor shocks the user when they touch it.</p>	<ol style="list-style-type: none"> 1. Motor ground is faulty. If motor is new, then the grounding wire was not secured adequately. If the motor is older, the ground wire has probably worn or shaken loose. 	<ol style="list-style-type: none"> 1. Repair or reattach ground wire, or replace cord if necessary.
<p>Exterior of electric motor is rusting.</p>	<ol style="list-style-type: none"> 1. If the paint has chipped or worn off of the motor, this is <u>normal</u>. Much of the electric motor body is either cast iron or steel. The paint used by most motor manufacturers is a epoxy-base or lacquer-base, which are pretty durable, but they could eventually come off. 	<ol style="list-style-type: none"> 1. Clean or buff rust off, and re-paint the motor (if it is a problem). If it IS a serious problem, consider an <i>ALL-STAINLESS</i> motor.
<p>Electric motor (or whole mixer) appears to vibrate at more than normal levels.</p>	<ol style="list-style-type: none"> 1. If report of problem is seen primarily at a specific speed or within a specific speed range, it could be the normal harmonic frequency vibration that is integral to any machine. Basically, ALL rotating parts have a fairly specific point at which they will not rotate smoothly...that is, without <i>some level</i> of vibration. There is going to be an RPM (or fairly narrow RPM range) where you will notice an increase in vibration. This is even more common to witness on <i>variable speed</i> mixers. It is also much more pronounced when running the mixer dry (out of liquid, in free air). 2. Could be a bad chuck or coupler attached to the motor, could be a bent mixing shaft, or could be a propeller or blade which needs to be balanced better. 3. Possible that motor shaft is bent. Would <u>probably</u> only happen if motor was brand new would have taken a blow during shipping to bend it, or <u>dropped</u>. 	<ol style="list-style-type: none"> 1. DO NOT OPERATE A MIXER WITH THE SHAFT & IMPELLER OUT OF LIQUID! Damage to motor, shaft, bearings, etc. will result! If vibration is distressing, and mixer is variable speed, try to avoid the rather small "band" of the speed range at which the most vibration is seen (basically, operate mixer at <u>either</u> higher <u>or</u> lower speeds than the higher-vibration "band"). 2. Replace the faulty part. Test to see if <u>shaft</u> is bent by removing and rolling it across a flat table or floor. Chuck or coupler could be visibly off-center or wobbling. May have to switch out parts until problem is solved. 3. Replace motor (probably out of the question to

Parts List - HSL Series



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Item	Description	Part No.	Qty.
<u>ELECTRIC MOTOR</u>			
100.	1/2 - HP, 1-speed - Explosion-Proof - 115VAC - single phase	MTR-1/2-56C-1-EP	1
100.	1/2 - HP, 1-speed - TEFC - 115VAC - single phase	MTR-1/2-56C-1-TEFC	1
100.	1/2 - Inverter Duty - three phase	MTR-1/2-56C-3-TENV	1
101	Cord 18/3 - 6' with plug (not shown)	CPG-INLINE-18/3	1
100.	1/2-HP, AC Inverter w/Control, TEFC, 115/230VAC, 1-phase Cord 18/3 - 6' with plug (not shown)	MTR-1/2-AC-CONTROLLER CPG-18/3	1 1
<u>DRIVE COMPONENTS</u>			
Mechanical Variable Speed Drive			
200.	Driver pulley w/ adjustable hand knob	HDW-M34-PULLEY	1
210.	DriveN pulley, spring loaded	HDW-3405X34	1
220.	V-Belt, 1/2" x 41" (not shown)	HDW-BELT-HSLA	1
Electronic Variable Speed Drive			
200.	Driver pulley, 4.5" diameter (1.4 to 1 ratio)	HDW-HSLN-DRIVERPULLY	1
201.	Split taper bushing, 5/8" shaft (not shown)	HDW-HSLN-SPLTB-DRVR1	
210.	DriveN pulley, 3.2" diameter	HDW-HSLN-DRIVENPULLY	1
211.	Split taper bushing, 3/4" shaft (not shown)	HDW-HSLN-SPLTB-DRVN1	
220.	Gear-Belt, 1" x 45" (not shown)	HDW-BELT-HSLAN	1
300.	Bearing housing	CPL-HSL-01	1
310.	Sealmaster bearing	HDW-ER12T	2
320.	Shaft, DriveN, 3/4" dia. w/ 1/2-20 threaded end	HDW-HSL-SHAFT DR PUL	1
330.	Chuck, adjustable - 5/8"	HDW-JC600	1
340.	Chuck key (not shown)	HDW-JCKEY-5/8	1
<u>AIR CYLINDER LIFT</u>			
401.	Air Cylinder, 2" dia. - 15" travel	HDW-HSD-ACYL	1
402.	3-Position spool valve	HDW-E2181-1000	1
403.	Brass muffler for spool valve	HDW-SPCMUF	2
404.	Elbow, street, brass - 1/4"NPT	HDW-2202P-4-4	1
405.	Quick release coupler - 1/4" MNPT	HDW-1/4-M-QCPLUG	1
406.	Push connect, straight - 1/4" tube x 1/4"MNPT	HDW-W69ML-4-4	1
407.	Push connect, 90° elbow - 1/4" tube x 1/4"MNPT	HDW-W369ML-4-4	1
408.	Push connect, 90° elbow - 1/4" tube x 3/8"MNPT	HDW-W369ML-4-6	2
409.	Air line tube - 1/4" (not shown)	HDW-EB-43-050	2-ft
<u>IMPELLERS & SHAFTS</u>			
600.	Mixing propeller shaft, 316SS, 1/2" x 15" long	SS115	1
610.	Mixing propeller, 3" dia., 3-blade, 316LSS, 1/2" bore w/ setscrews	MP350	1
620.	Dispersion blade shaft, 316SS, 3/4" x 16½" long w/bolt	SHF-HSD16.5	1
630.	Dispersion blade, 2" dia. design 'A', 304SS, 1/2" center hole	DB2A	1
<u>CONTAINER HOLDER</u>			
700.	Container holder - 'Y'	HDW-CH-14	1
710.	Mount, container holder	HDW-CH006	1
720.	Chain, 32" (not shown)	HDW-CH-CHAIN	1
730.	Spring (not shown)	HDW-E42C	1
<u>TACHOMETER, (mechanical) obsolete - not shown</u>			
	Tachometer dial	HDW-5202-11	1
	Small adapter - metal	HDW-2001-1600A	1
	Drive coupling, large thread	HDW-2001-1600C	1
	Mounting plate, 1/4" x 2" plate, 6-3/4" long with 2" ears	HDW-HSL-TACHMOUNT	1