CARLYLE JOHNSON

MAXITORQ®

MODEL EMA
ELECTRIC MULTIPLE DISC CLUTCH

MAINTENANCE
REPAIR
TROUBLESHOOTING
MANUAL

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SAFETY WARNING

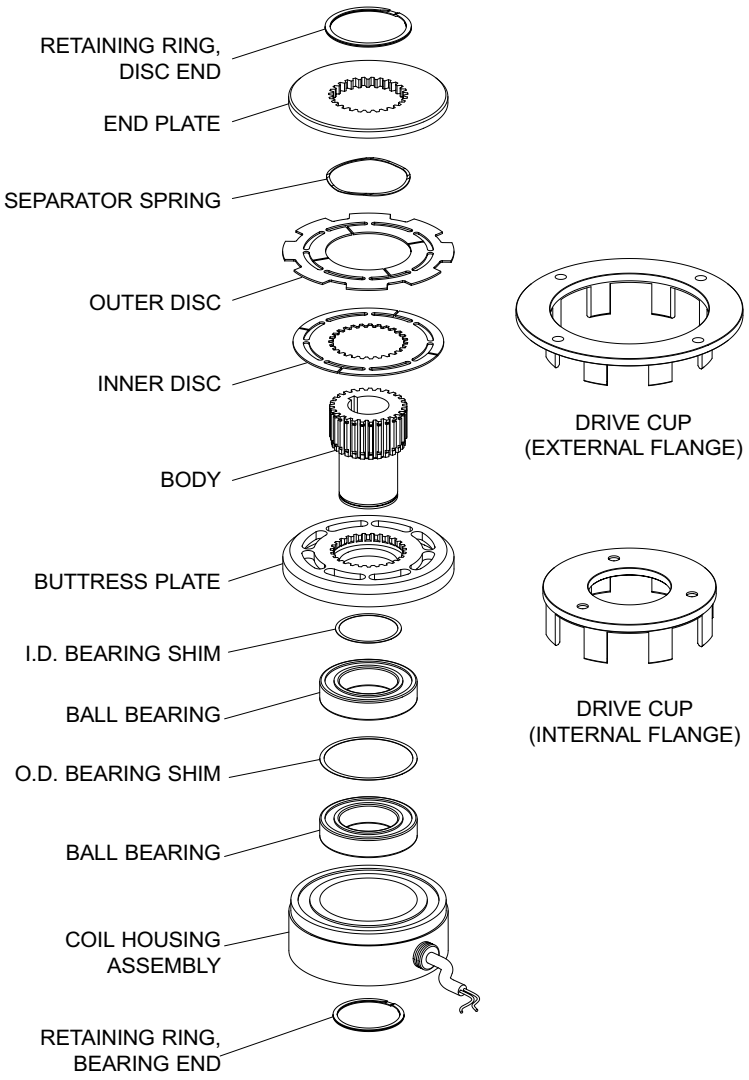
ALWAYS DISCONNECT POWER AND AIR
AND LOCK OUT / TAG OUT MACHINE
BEFORE PERFORMING SERVICE
OR REMOVING/REINSTALLING CLUTCH .

ON-MACHINE MEASUREMENTS
MUST BE PERFORMED
WITH POWER AND AIR DISCONNECTED.

WHERE VOLTAGE READINGS
ARE REQUIRED,
ELECTRICAL METERS MUST BE ATTACHED
WITH POWER AND AIR DISCONNECTED.

CONTENTS

EXPLODED PARTS DIAGRAM



ROUTINE MAINTENANCE

Preventive Maintenance

Maxitorq® multiple disc clutches need little or no maintenance in normal use. Discs on clutches run dry may be washed in kerosene to remove any foreign material and restore clutch performance.

When a clutch is operated in oil, the oil may eventually break down along the friction surfaces. Over time, the hardened surfaces will wear. Discs should be visually inspected from time to time to make sure warping and galling have not occurred. If any such wear is observed, disc replacement is necessary.

Replacement of Clutch Discs

Always replace discs as a set. Do not mix old and new discs on a clutch.

Although springs may be reused if they are still serviceable, frequently they lose their hardness, and clutch performance - particularly disengagement and neutral drag - become a problem. We recommend purchasing a complete disc/spring set to restore like-new performance.

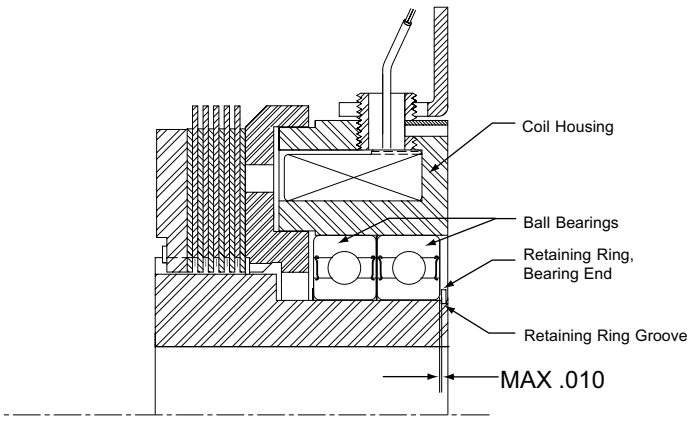
Follow Disassembly Instructions 1 through 3 ONLY. Assemble following Reassembly Instructions 10 through 13 ONLY.

Replacement of Bearings or Coil Housing Assembly

Follow Disassembly Instructions 1 through 8. Assemble following Reassembly Instructions 1 through 13.

Always replace ***Ball Bearings*** if replacing ***Coil Housing Assembly***. The shim between the bearings may be reused if it is not damaged.

SETTING AIR GAP



GENERAL TROUBLESHOOTING ISSUES

1 Check for worn parts. Obviously damaged or worn parts must be replaced to insure correct clutch operation. Determine whether this wear is due to normal operation over a long period of use, or improper installation, maintenance, or clutch contamination. Replacing worn parts will provide only temporary improvement if a more fundamental problem is present and goes undetected.

2 Check alignment of clutch and drive cup. Review the paragraph on ***Alignment*** . Improper alignment will asymmetrically load the clutch and drive cup support bearings, causing premature wear, and possibly interfering with clutch operation.

3 Check for contamination of clutch discs. Discs in dry applications may become contaminated with oils from adjacent bearings or other external sources, which will prevent the clutch from transmitting full torque. Slippage is frequently caused by such contamination. Clean the discs as outlined under ***Contamination***.

4 Check clearances and air gap. Check that the relationship of the drive cup to the Buttress Plate meets our specifications as outlined under ***Alignment*** . Also verify that when the clutch is disengaged, it will rotate freely with no binding or interference. Check the topic ***Air Gap*** .

5 Check fuses and electrical power. If the circuit is fused, check that the fuse is good. If fuse is being replaced, be sure the proper type fuse is installed in accordance with the equipment manufacturer's specifications. If no specifications are available, see the section on ***Fuse*** for recommended fuse application.

If the fuse is OK, or if no fuse is in the circuit, verify that power is reaching the clutch. To operate correctly, the clutch must receive voltage within 10% of the nominal rated voltage of the clutch coil.

6 Check for missing or damaged parts. If the clutch has been subjected to repair, removal, and reinstallation, check to see if the clutch has been reassembled correctly. Review the parts diagram included in this manual and replace or repair any damaged or missing parts.

SPECIFIC TROUBLESHOOTING ISSUES

Clutch Fails to Engage / No Torque Transmitted when Power Applied

Check the following items with the clutch installed:

1 Alignment
2 Fuse
3 Coil
4 Electrical Connection
5 Drive Cup Engagement

Remove the clutch to check the following:

6 Contamination
7 Drive Cup Wear
8 Disc Wear
9 Air Gap

Clutch "Slips"/Only Partial Torque Transmitted when Power Applied

Check the following items with the clutch installed:

1 Alignment
2 Clutch Voltage

Remove the clutch to check the following:

3 Contamination
4 Drive Cup Wear
5 Disc Wear
6 Air Gap
7 Springs

SPECIFIC TROUBLESHOOTING ISSUES

"Neutral Drag"/Clutch Transmits Torque when Disengaged

NOTE: A small amount of torque is transmitted in the neutral "disengaged" position. This is normal with multi-disc clutches. At very low speeds, up to 2% of the static torque may be transmitted. At high neutral speeds, this value will fall to 1% or less. If significant torque transmission is evident when the clutch is disengaged, the clutch should be repaired.

Check the following items with the clutch installed:

1 Alignment

2 Residual Magnetism

Remove the clutch to check the following:

3 Contamination

4 Drive Cup Wear

5 Air Gap

6 Springs

MAINTENANCE/REPAIR PROCEDURES

Air Gap

The permanent air gap between the stationary Coil Housing and the Buttress Plate is established by machined tolerances when manufactured. It should not be disturbed. However disassembly and reassembly of the clutch requires verification that the original clearances are restored.

The air gap should be verified before Loctite is applied to the I.D. of the Ball Bearings for permanent assembly.

Check the clearance between the Retaining Ring Groove on the bearing end of the clutch body, and the lower Ball Bearing. See the diagram at the bottom of Page 3. The maximum clearance allowed is .010". If greater, the clutch has not been reassembled correctly. Install additional I.D. Bearing Shims to correct. Up to 4 may be used. If installation of 4 shims does not reduce the clearance to < .010", clutch is assembled incorrectly or worn beyond repair. Reverify assembly. If no problem can be located and the proper clearance cannot be restored, contact the factory for assistance.

After achieving proper air gap clearance, clutch must turn freely when disengaged, with no interference.

Drive Cup Engagement

Drive cup must fully engage all outer discs. Adjust alignment of drive cup if necessary or repair/replace external components or clutch mounting to correct any deficiency.

Drive Cup Alignment

Clutch and Drive Cup must be concentric within .005 T.I.R. Misalignment may be caused by improper clutch mounting; improper mounting or support of Drive Cup; worn bearings supporting Drive Cup; improperly installed or missing anti-rotation strap; or if rigid conduit is used in providing electrical service to clutch, it may be distorting the alignment of the clutch.

Clearance between Drive Cup fingers and Buttress Plate must be approximately 1/16" around the entire circumference. This dimension must be uniform around the circumference of the Drive Cup.

Drive Cup Wear

Improper alignment, support, worn bearings, or extreme service may eventually wear “grooves” into the fingers of the Drive Cup. This will interfere with the compression and separation of discs, preventing proper engagement/disengagement of the clutch. If any such wear is evident, replace the Drive Cup, and if needed, its supporting mechanism. Any further damage to clutch discs may require disc replacement. Verify alignment after reassembly.

MAINTENANCE/REPAIR PROCEDURES

Fuse

If the circuit is fused, check the fuse condition. If the fuse is blown, replace with the same type/rating as specified by the equipment manufacturer.

If no specifications are given, use a fuse which will tolerate an inrush current approximating 135% of the nominal rating of the clutch coil.

NOTE: Always follow the manufacturer's recommendation for fuse replacement. The fuse protects upstream equipment in the machinery, not the clutch. Use the table on Page 12 ONLY if no manufacturer's instructions are given.

Coil

Check the coil resistance for open or shorted condition. Follow the table on Page 12 for nominal resistance. Coil leads must be disconnected from power source before taking resistance reading. Shorted or open coils must be replaced.

The Coil Housing Assembly includes the coil and its housing. The coil is encapsulated in epoxy resin, and must only be repaired by the factory. A complete replacement Coil Housing Assembly may be purchased, or the failed assembly may be returned to the factory for coil replacement.

Clutch Voltage

Attach a voltmeter to the clutch with the power OFF. When power is applied to the clutch, it must be ± 10% of the nominal voltage rating of the coil. If sufficient power is not being applied to the clutch, full engagement and full torque transmission will not take place. Repair or replace power supply to assure good clutch actuation.

Disc Contamination

Disc contamination of clutches run dry may be caused by oils from external sources or other debris. Discs may be flushed with kerosene to remove oils or other contaminants, and restore normal operation.

Bearings in the vicinity of the clutch – for example used to support Drive Cup – should be adequately shielded to prevent clutch disc contamination. Clutches run in oil must not contain extreme pressure additives. We recommend ATF oils such as Dexron II for this application.

MAINTENANCE/REPAIR PROCEDURES

Disc Wear

After extended use, clutch discs will wear to the point where replacement is necessary. In a dry application, if normal operation is not restored to a slipping clutch with kerosene flushing, then disc replacement is necessary.

In oil-bathed applications, oil will eventually break down along the friction surfaces. Over time, the hardened surfaces become worn to a point where warping or galling occurs. This damage can be clearly seen by checking the disc surfaces, and requires prompt disc replacement to maintain good clutch performance.

Always replace discs and springs as a set. The factory can supply disc/spring kits.

Separator Springs

If the clutch transmits excess torque when in neutral, separator springs may be worn or bent. Springs should be replaced under these circumstances.

Proper spring performance is achieved when discs are uniformly spaced in the disengaged position.

Contact the factory to purchase replacement springs. It is a good idea to replace the discs at the same time, to restore the clutch to like-new performance.

Residual Magnetism

Occasionally, after installation of a new or rebuilt clutch, the clutch may build up residual magnetism after the first few cycles, and fail to disengage properly when power is removed. This condition can be easily overcome by reversing the power leads to the coil, energizing the clutch momentarily, then restoring the leads to their original polarity. The clutch should now fully engage when power is applied, and fully disengage when power is removed from the coil.

Electrical Connections

Check that all electrical connections are properly made. There is no polarity to the clutch leads - either one may be considered positive (+).

CLUTCH DISASSEMBLY

1. Place the clutch on a workbench with the ***Coil Housing*** on the bottom.
2. Remove the ***Retaining Ring***, ***Disc End*** from the top of the ***Body***.
3. Remove the ***End Plate, Discs,*** and ***Separator Springs***.
4. Turn the clutch over, and support the assembly on the ***Buttress Plate***.
5. Remove the ***Retaining Ring, Bearing End*** from the ***Body*** where it protrudes through the ***Coil Housing***.
6. Press the ***Body*** out from the ***Coil Housing.*** This will allow removal of the ***I.D. Bearing Shim(s)*** and the ***Buttress Plate*** from the ***Body.***
7. To remove the ***Ball Bearings***, turn the ***Coil Housing*** over so that the epoxy resin side is facing DOWN.
8. Support the ***Coil Housing*** - DO NOT ALLOW PRESSURE TO BE APPLIED TO THE EPOXY RESIN AREA OF THE HOUSING - and press out the ***Ball Bearings*** and ***O.D. Bearing Shim.*** Because pressure must be applied to the inner race when pressing out bearings, ***Ball Bearings*** may not be reused once removed.

CLUTCH REASSEMBLY

1. Support the ***Coil Housing*** so that the epoxy resin side is facing up.
2. Apply Loctite 271 sparingly to the O.D. of the first ***Ball Bearing*****,** and press into the ***Coil Housing.*** MAKE SURE THE BEARING IS FULLY SEATED. WARNING!! DO NOT PUT THE TWO BEARINGS TOGETHER WITH A SHIM BETWEEN THEM AND ATTEMPT TO PRESS THEM IN AS A SINGLE UNIT. The ***Ball Bearings*** will not seat squarely using this procedure, and the clutch will be damaged in use.
3. Insert a single ***O.D. Shim*** on top of the first ***Ball Bearing.***
4. Apply Loctite 271 sparingly to the O.D. of the second ***Ball Bearing*****,** and press into the ***Coil Housing.*** MAKE SURE THE BEARING IS FULLY SEATED.
5. Assemble the ***Buttress Plate*** to the ***Body,*** and place the same number of ***I.D. Bearing Shims*** on the smooth end of the body as were removed during disassembly. The shim I.D. is the same size as the I.D. of the ***Bearing.***
6. Press the ***Body*** into the ***Coil Housing***.
7. Turn the clutch over and observe the relationship of the retaining ring groove on the ***Body*** to the lower ***Ball Bearing.*** Make sure there will be less than .010” clearance between the ***Retaining Ring, Bearing End*** when installed, and the ***Ball Bearing.*** If the clearance exceeds .010”, press the ***Body*** out and install additional ***I.D. Bearing Shims*** to reduce the clearance to less than .010”. Up to four (4) shims may be installed if necessary (If more than four shims are required, the clutch may be improperly assembled. Check the assembly procedures carefully, and if necessary, contact the factory for assistance).
8. When the proper clearance has been achieved, press out the ***Body***, and apply Loctite 271 sparingly to the I.D. of the ***Ball Bearings***. Press the ***Body*** back into the ***Coil Housing*** for permanent assembly.
9. Install the ***Retaining Ring, Bearing End*** on the ***Body.***
10. Install an ***Inner Disc***. ***Inner Discs*** differ from ***Outer Discs*** in that they have smaller O.D. and have a toothed I.D. to fit over the spline on the ***Body***.
11. Install an ***Outer Disc***, with a ***Separator Spring*** in the center.
12. Continue installing the discs, alternating between ***Inner Discs*** and ***Outer Discs*** until all discs and springs have been installed. Most (but not all) standard clutches have five ***Outer Discs***.
13. Install the ***End Plate,*** and the ***Retaining Ring, Disc End*****.** Clutch assembly is now complete. The clutch body should turn freely without any binding or interference.

CLUTCH ELECTRICAL CHARACTERISTICS

Clutch Model	24v DC Coil				100v DC Coil			
	Coil Power (watts)	Current Draw (amps)	Fuse Size (amps)	Coil Resistance (ohms)	Coil Power (watts)	Current Draw (amps)	Fuse Size (amps)	Coil Resistance (ohms)
EMA 0265	48	2.0	2 1/2	12	33	0.3	1	299
EMA 0325	48	2.0	2 1/2	12	49	0.5	1	204
EMA 0375	40	1.7	2 1/2	15	41	0.4	1	244
EMA 0425	41	1.7	2 1/2	14	48	0.5	1	208
EMA 0475	58	2.4	3	10	62	0.6	1	161
EMA 0625	58	2.4	3	10	64	0.6	1	157
EMA 0800	68	2.8	4	9	78	0.8	1 1/4	128
EMA 0950	96	4.0	5	6	97	1.0	1 1/2	103
EMA 1150	89	3.7	5	7	115	1.1	1 1/2	87

NOTE: Always follow equipment manufacturer's recommendation on fuse type/size.
Use the above chart only if fuse size is not specified.
Use a fuse which will tolerate an inrush current of 135% of nominal rating.

NOTES

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