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LRP® — Linear Rod Pump Software

LRP® SEW Gear Motor Brake Troubleshooting Guide

Notices

At the time of publication, features of the product described herein are protected by United States Patents numbered 7,168,924 and 7,321,211. Other patents are pending.

The information contained in the manual is considered accurate to the best knowledge of the supplier at the time of publication. The manufacturer assumes no liability for errors that may exist. The supplier reserves the right to change data and specifications without notice.

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Table of Contents

1 Overview 4

1.1 Brake Components 4
1.2 Mechanical Operation 5
1.3 Electrical Operation 6

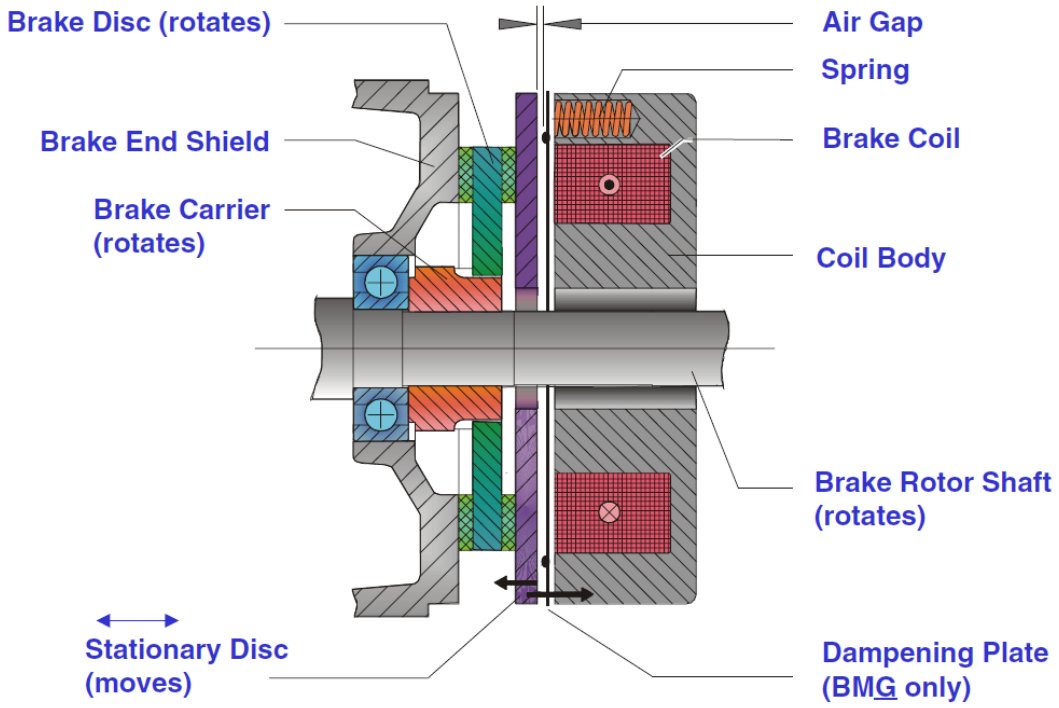
2 Electrical Drawing (Tandem LRP® Unit) 7

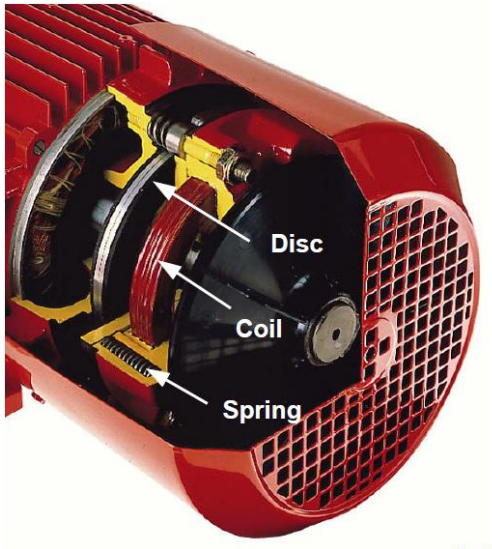
3 Troubleshooting 8

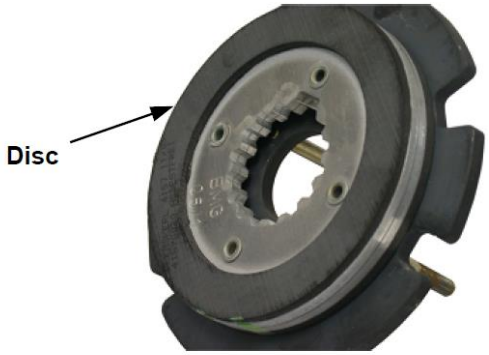
3.1 Overview 8
3.2 Fusing 8
3.3 AC Input Voltage to Rectifier 8
3.4 DC Output Voltage from Rectifier to Brake 8
3.5 Brake Coil 8
3.5.1 Brake Coil Resistance 10
3.6 Mechanical Problem 11
3.6.1 Brake is Mechanically Locked 11
3.6.2 Air Gap is Outside of Tolerance 12
3.6.3 Brake Disk is Worn or Damaged 14

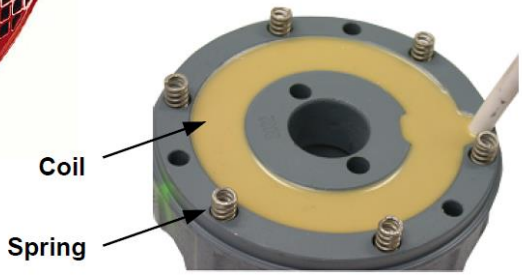
1 Overview

1.1 Brake Components









1.2 Mechanical Operation

The SEW motor brake(s) will engage whenever three phase AC input power is lost or the software digital brake release output is not asserted (commanding the brake to engage), thereby protecting the LRP® unit from unintended motion both on power loss or if the software detects loss of control.

The brake mechanism is spring loaded, so the brakes will engage by default (fail safe). The electric brake coil must be energized continuously to disengage the brake, accomplished with the software digital brake release output.

The digital brake release output is coordinated with the motor-on, allowing the unit to be safely started with the load stopped in mid position.

Brake Engaged:

De-energized

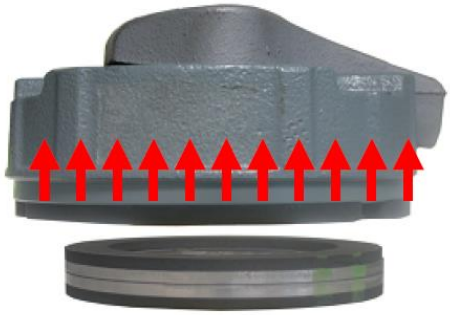
When the coil is de-energized, the springs apply force to the stationary plate.

This force presses against the brake disc to create friction.

Friction stops the motor and/or prevents it from rotating.

Brake Disengaged:

Energized



When the coil is energized, its magnetic field pulls the plate towards the coil.

The magnetic force compresses the springs.

The motor can now rotate freely.

1.3 Electrical Operation

AC input power is converted to DC through the brake rectifier mounted inside the drive enclosure. DC power from the rectifier energizes the brake coil to disengage the brake.

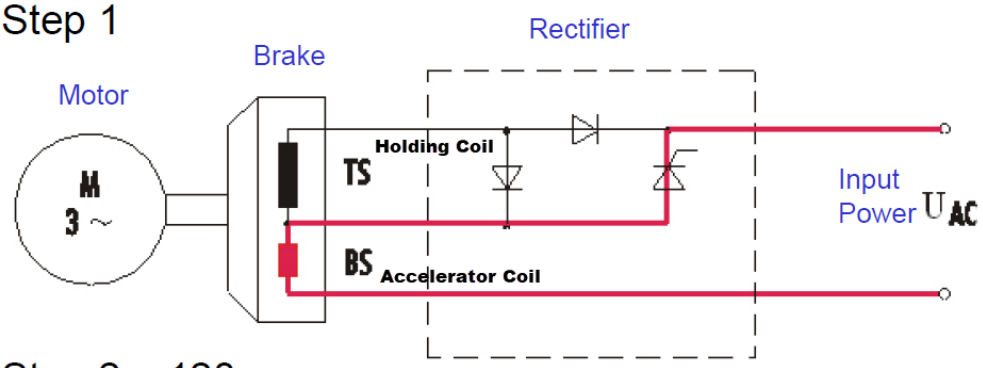
The electric brake coil must be energized continuously to maintain brake disengagement.

Loss of AC power will engage the brake (brake is spring loaded to mechanically engage by default).

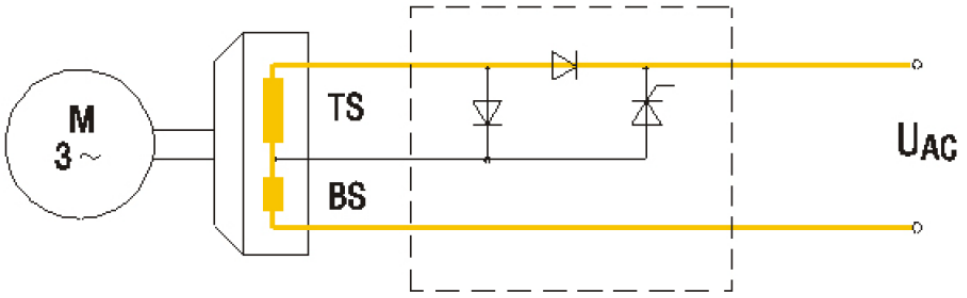
The controller can engage or disengage the brake via an AC contactor connected to digital output 5 “brake release,” coordinating the brake release with motor-on and allowing the controller to engage the brake during certain fault conditions. The controller will also set the brake after the unit parks during normal operation.

The brake coil consists of two separate coils, an Accelerator Coil and a Fractional Holding Coil. To release the brake, the rectifier will initially energize the Accelerator Coil (BS). After 120ms, the rectifier will energize both coils (and hold continuously to keep the brake disengaged).

- Step 1



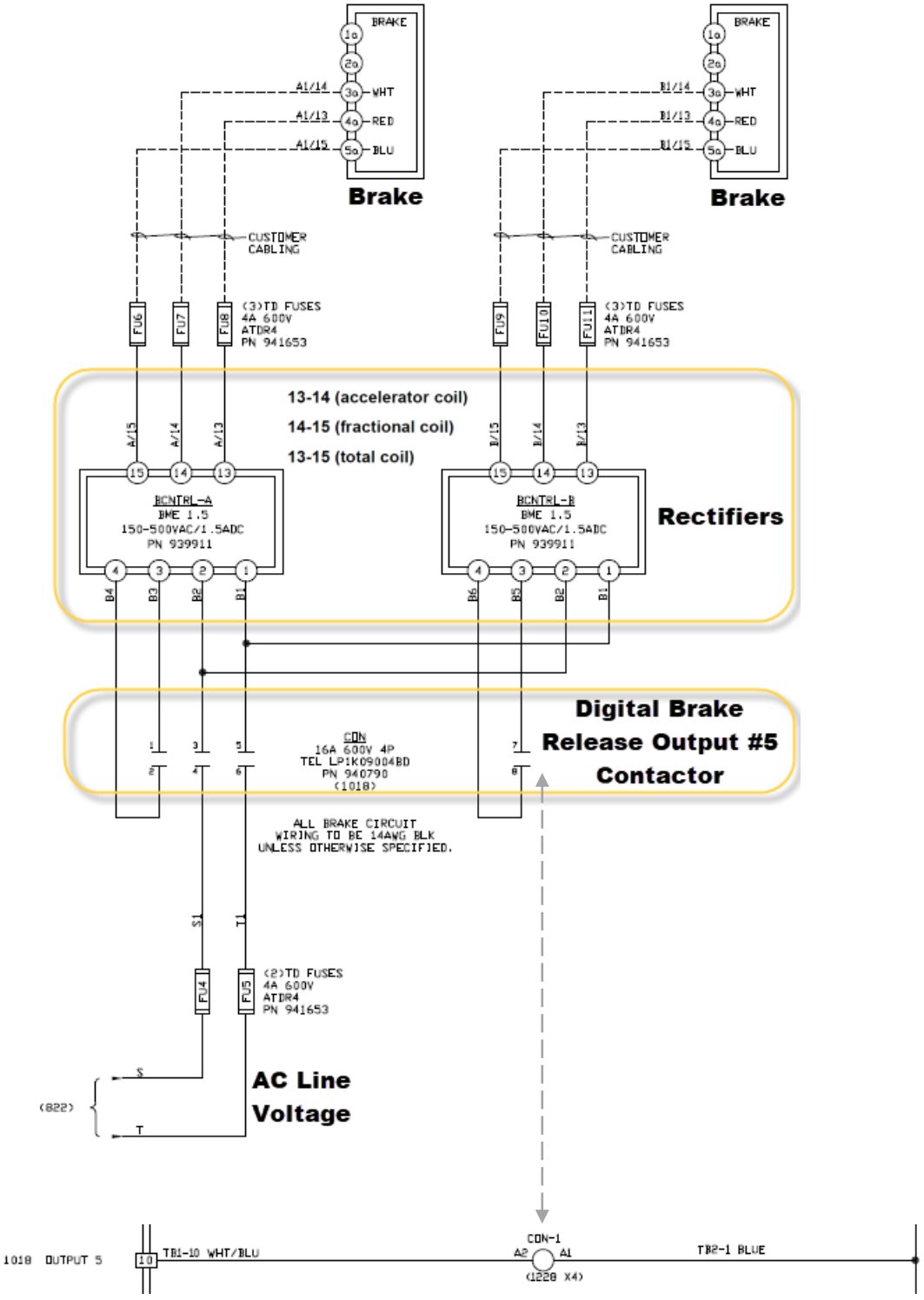
- Step 2 – 120ms



Brake Coil

Rectifier

2 Electrical Drawing (Tandem LRP® Unit)



3 Troubleshooting

Caution
High Voltage. Take proper precautions. Use proper PPE.

Caution
Stored Energy. Potential energy can be stored when brake is engaged.

3.1 Overview

If a brake does not properly disengage, the drive will typically generate an inverter RMS or motor RMS fault when attempting to run. Check the following:

Note: An easy way to check for proper brake release is to run the LRP® Stoke ID Pulse and check for movement at the polished rod.

3.2 Fusing

Check fuses on AC input to rectifier and DC output from rectifier to brake. If a fuse is blown, check for damage to rectifier. Verify proper wiring in the enclosure and to motor. Check for short to ground at rectifier outputs 13, 14 and 15. Go to “Brake Coil” section to check the resistance of the brake coils.

3.3 AC Input Voltage to Rectifier

See electrical drawing on previous page.

Verify AC voltage at the input of the digital brake release contactors across S1 and T1.

While attempting to run the unit, verify AC voltage at in the input to the rectifiers (output of brake release contactors) across rectifier B1 and B2. If there is no voltage, verify that the digital brake release contactor is closing.

On tandem LRP® unit, check both inputs.

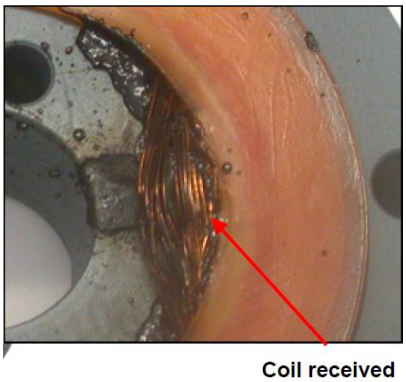
3.4 DC Output Voltage from Rectifier to Brake

While attempting to run the unit, verify DC output voltage from the rectifier to the brake (inside control enclosure) across rectifier 13 and 15. See Table 3-5, Brake Coil Table for voltage (typically ~200 volts DC for 460 volt AC input).

On tandem LRP® unit, check both outputs.

3.5 Brake Coil

Excessive voltage can cause a brake coil to fail.



Coil received
wrong voltage

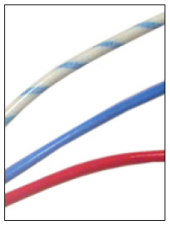
3.5.1 Brake Coil Resistance

Check electrical resistance across brake coil. Turn power off. Disconnect fuses. See Table 3-5, Brake Coil Table for proper coil resistance.

Ra = Accelerator coil resistance, across terminals 13-14

Rf = Fractional coil resistance, across terminals 14-15

Total coil resistance across terminals 13-15



13-14 (accelerator coil)

14-15 (fractional coil)

13-15 (total coil)

Accelerator coil winding resistance	**= ¼ of winding resistance**
Fractional coil winding resistance	**= ¾ of winding resistance**
Total coil winding resistance	**= sum of accelerator and holding coil resistance**

Motor Frame Brake Size Brake Torque (lb-ft)		DT71-80 BM(G)05 0.89 - 3.7	DT80 BM(G)1 4.4 - 7.4	DT90-100 BM(G)2 3.7 - 14.8	DT100 BM(G)4 17.7 - 29.5	DV112-132S BM(G)8 7.00 - 55.3	DV132M-160M BM15 18.4 - 110.6	DV160L-225 BM30/31/32/62 36.9 - 442.5	DV250-280 BMG61/122 147.5 - 885
BRAKE VOLTAGE AC (to rectifier V_n)	DC	$R_a(\Omega)$ $R_f(\Omega)$	$R_a(\Omega)$ $R_f(\Omega)$	$R_a(\Omega)$ $R_f(\Omega)$	$R_a(\Omega)$ $R_f(\Omega)$	$R_a(\Omega)$ $R_f(\Omega)$	$R_a(\Omega)$ $R_f(\Omega)$	$R_a(\Omega)$ $R_f(\Omega)$	$R_a(\Omega)$ $R_f(\Omega)$
—	24	4.4 13.4	3.9 12.1	3.4 10.2	2.7 8.2	1.4 7.5	0.8 5.0	0.67 5.0	—
105 - 116	48	17.6 53.4	15.6 48.1	13.6 40.5	10.9 32.7	5.7 29.8	3.1 20.1	2.2 16.8	—
186 - 207	80	55.6 169	49.5 152	42.9 128	34.5 103	17.9 94.2	9.8 63.5	7.1 53.0	—
194 - 217	80	—	—	—	—	—	—	—	4.0 32.6
208 - 233	96	70.0 213	62.3 192	54.0 161	43.4 130	22.5 119	12.4 80.0	8.9 66.7	—
218 - 243	96	—	—	—	—	—	—	—	5.0 41.0
330 - 369	147	176 534	157 481	136 405	109 327	56.5 298	31.1 201	22.3 168	—
344 - 379	147	—	—	—	—	—	—	—	12.6 103
370 - 414	167	221 672	197 606	171 510	137 411	71.2 375	39.2 253	28.1 211	—
380 - 431	167	—	—	—	—	—	—	—	15.8 130
415 - 464	185	279 846	248 762	215 643	173 518	89.6 472	49.3 318	35.4 266	—
432 - 484	185	—	—	—	—	—	—	—	19.9 163
465 - 522	208	351 1066	312 960	271 809	218 652	113 594	62.1 401	44.6 334	—
485 - 542	208	—	—	—	—	—	—	—	25.1 205

Voltage
AC - The voltage shown is the nameplate AC brake voltage supplied to the brake rectifier.
DC - The voltage shown is the effective DC voltage required by the brake coil. The measured voltage from the rectifier will be 10-20% lower than that shown.

Brake Coil Resistance - values must be measured with the brake coil disconnected from the rectifier.
R_a - Accelerator coil resistance in Ω, measured from the red to the white brake coil wire at 20° C.
R_f - Fractional coil resistance in Ω, measured from the white to the blue brake coil wire at 20° C.

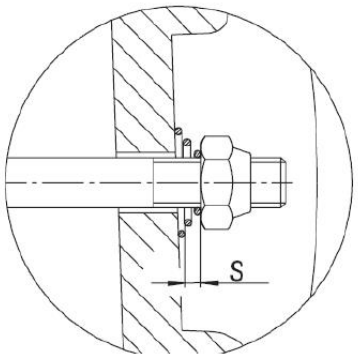
Table 3-5, Brake Coil Table

3.6 Mechanical Problem

If the brake is electrically functional, but will not disengage, check for mechanical problem.

3.6.1 Brake is Mechanically Locked

- Verify the free play on the release arm. Loosen the locking nuts as needed to achieve 1.5 – 2.0 mm gap. (S Dimension)



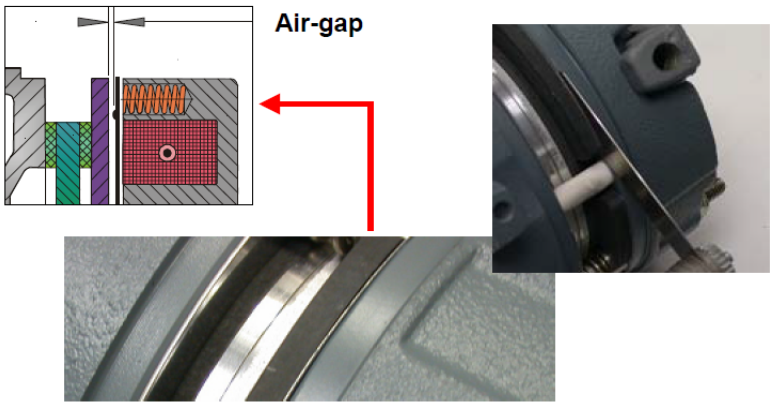
Caution!

There must always be clearance on the lever.

Note: The brake release mechanism is not used to change the brake's torque setting.

3.6.2 Air Gap is Outside of Tolerance

- Insufficient air gap between the dampening plate (BMG brakes) and the brake coil. (For BM brakes, there is no dampening plate, so air gap lies between stationary disc and brake coil).

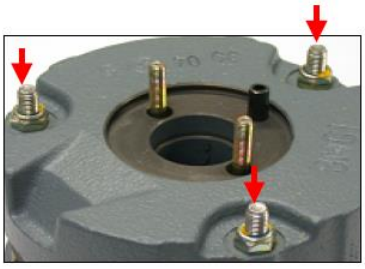


Motor Size	Brake Size	Air Gap
DT71 - DT100	BM(G)05 - BM(G)4	0.010"-0.024" (0.25-0.6 mm)
DV112 - DV225	BM(G)8 - BM31	0.012"-0.047" (0.3-1.2 mm)
DV180 - DV225	BM32-BM62 Double Disc	0.016"-0.047" (0.4-1.2 mm)
DV250 - DV280	BMG61	0.012"-0.047" (0.3mm - 1.2mm)
	BMG122 Double Disk	0.016"-0.047" (0.4mm-1.2mm)

Table 3-6, Brake Air Gap Table

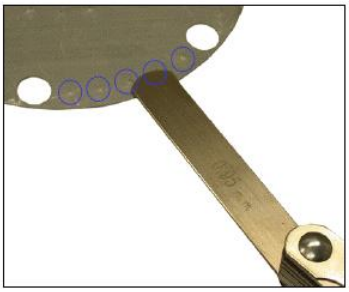
Adjust the Brake Air Gap (Method 1)

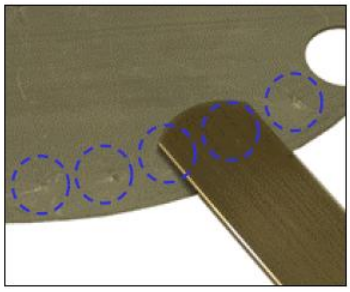
1. Insert feeler gauge between dampening plate and coil (BMG) or between stationary plate and coil (BM).
2. Tighten (3) hex nuts until there is minimal air gap (clearance) equally around the disc



Attention:

When using a feeler gauge on a BMG brake, measure from a dimple on the dampening plate!





Adjust the Brake Air Gap (Alternate Method 2)

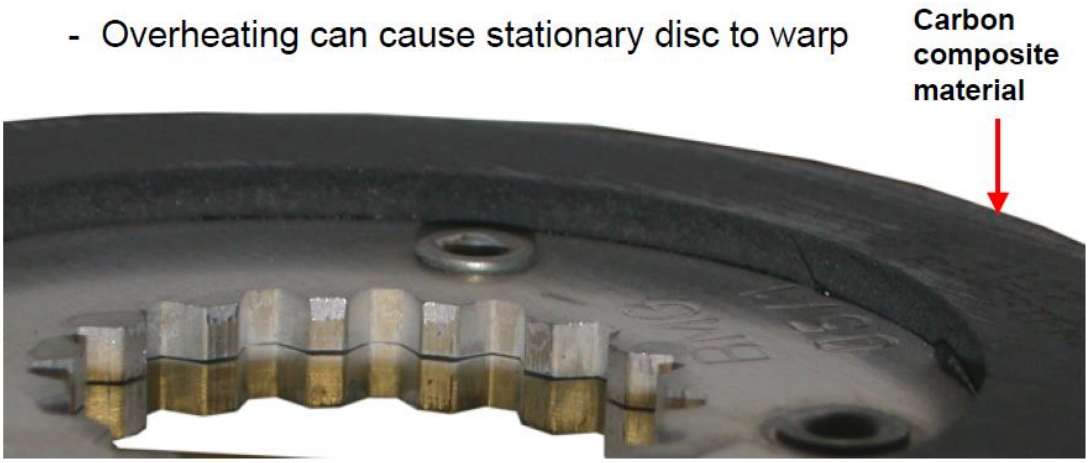
1. Tighten the three adjustment nuts equally to establish zero air gap.
2. Loosen the adjustment nuts according to the figures below.

Brake Size	Degree of Rotation	Approximate Rotation Amount
BM(G)05, BM(G)1	160°	7/16 Turn
BM(G)2, BM4	135°	3/8 Turn
BM(G)8	180°	1/2 Turn
BM15, BM30, BM31	145°	2/5 Turn
BM32, BM62	135°	3/8 Turn
BMG61, BMG122	145°	2/5 Turn

Note: Chart is based on the middle air gap tolerance. However, all SEW brakes fall within the air gap tolerance range if the degree of rotation is ½ turn.

3.6.3 Brake Disk is Worn or Damaged

- Sliding friction causes carbon-based brake disc to wear
- High cycle rates require more frequent disc replacement
- Overheating can cause stationary disc to warp



- Check thickness of brake disc

Motor Size	Brake Size	Min. Disc (26) Thickness
DT71 - DT100	BM05 - BM4	0.354" (9mm)
DV112 - DV225	BM8 - BM62	0.394" (10mm)
DV250 - DV280	BMG61 - BMG122	0.472" (12mm)

1. Measure the brake disc with calipers to determine the actual disc thickness.
2. If the disc is below tolerance, replace it.
3. If the disc is acceptable, reinstall it according to the parts list and operating instructions.

Keywords:
Linear Rod Pump
LRP
Brake
SEW