



SEW Brakes



Service and Maintenance



Objectives

- Upon completion of this session, you will be able to do the following:
 - Identify the components of an SEW brakemotor
 - Explain the operation of the SEW brakemotor
 - Apply basic troubleshooting procedures

Brake Purpose

■ To Stop Motion

- The brake engages when power is removed from the motor
- The brake applies force to an object in motion until friction either slows or stops the motion.
- Motor slows and finally stops

■ To Prevent Motion

- Brake engages after motor has come to complete stop
- Brake merely holds motor to prevent rotation.

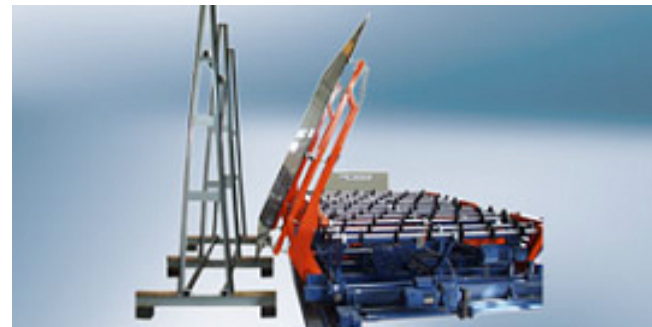


Brake Features

- SEW features:
 - Fail-safe operation
 - Rectifier for conversion of AC into DC current
 - DC controlled brake coil

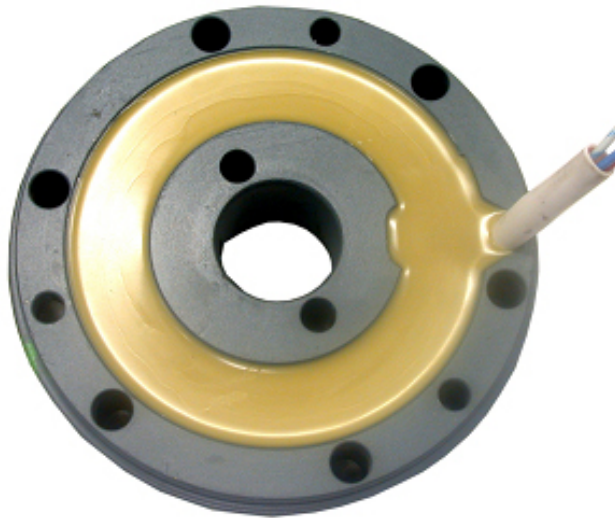
**Without a fail-safe brake,
what would happen to
machinery in the event of
a power loss?**

What about the product?



Brake Operation

- Coil functions like an electromagnet when energized



Brake Coil



Brake Operation

De-energized



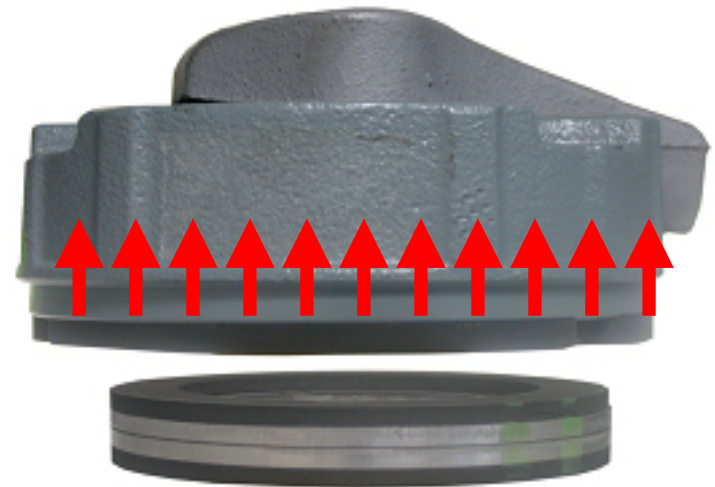
When the coil is de-energized, the springs apply force to the stationary plate.

This force presses against the brake disc to create friction.

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

VIDEO

Energized



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

The magnetic force compresses the springs.

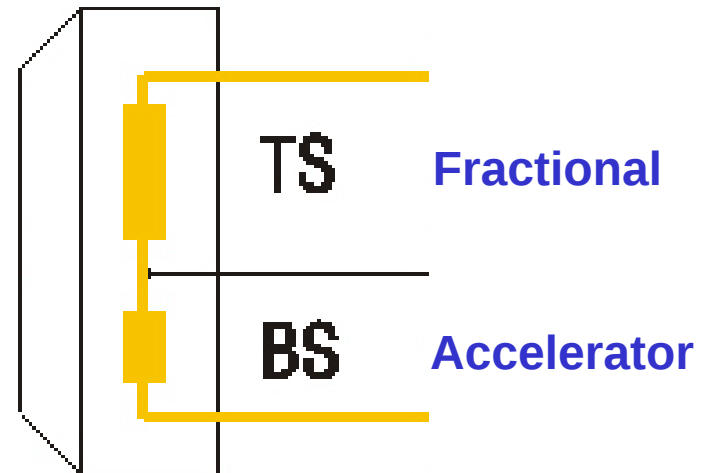
The motor can now rotate freely.

Brake Operation

- **Coil:**
 - The brake coil actually consists of two separate parts: an **Accelerator coil (BS)** and a **Fractional holding coil (TS)**.
 - An SEW brake rectifier controls both coils.



Brake Coil



Brake Operation

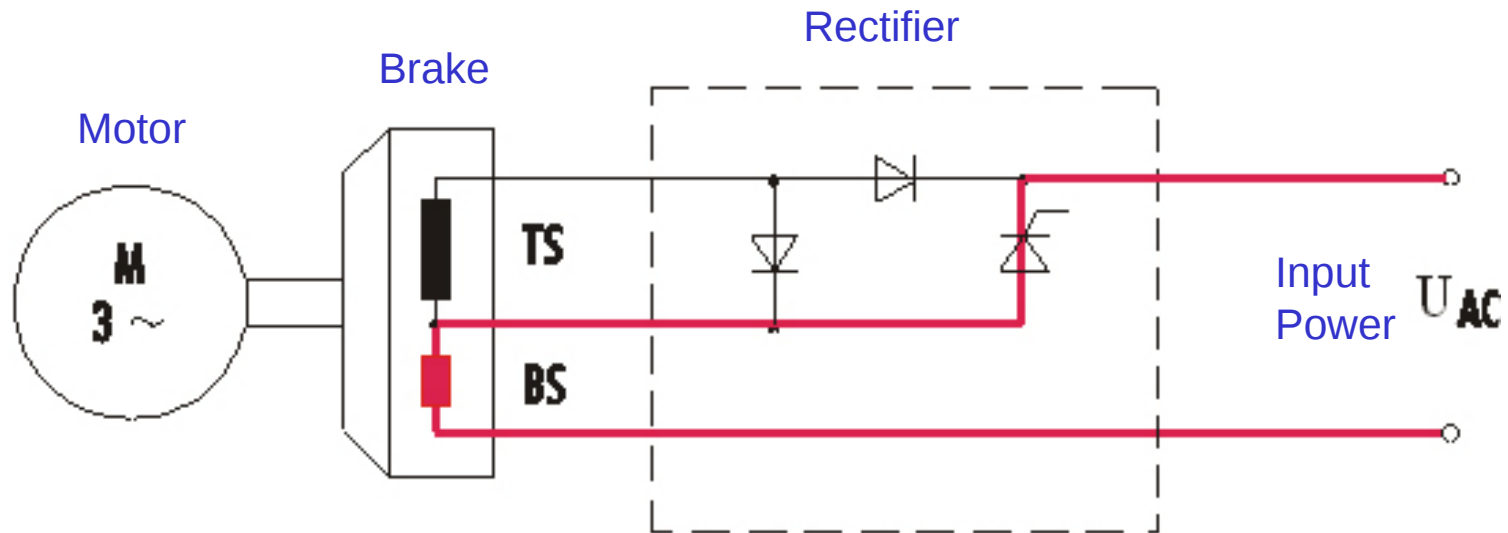
■ Step 1

- Initially, the rectifier energizes the Accelerator (BS) coil very quickly, due to its low resistance.

Low resistance = High Current

High Current = Strong Electromagnetism

Strong Electromagnetism = Fast Reaction



Brake Operation

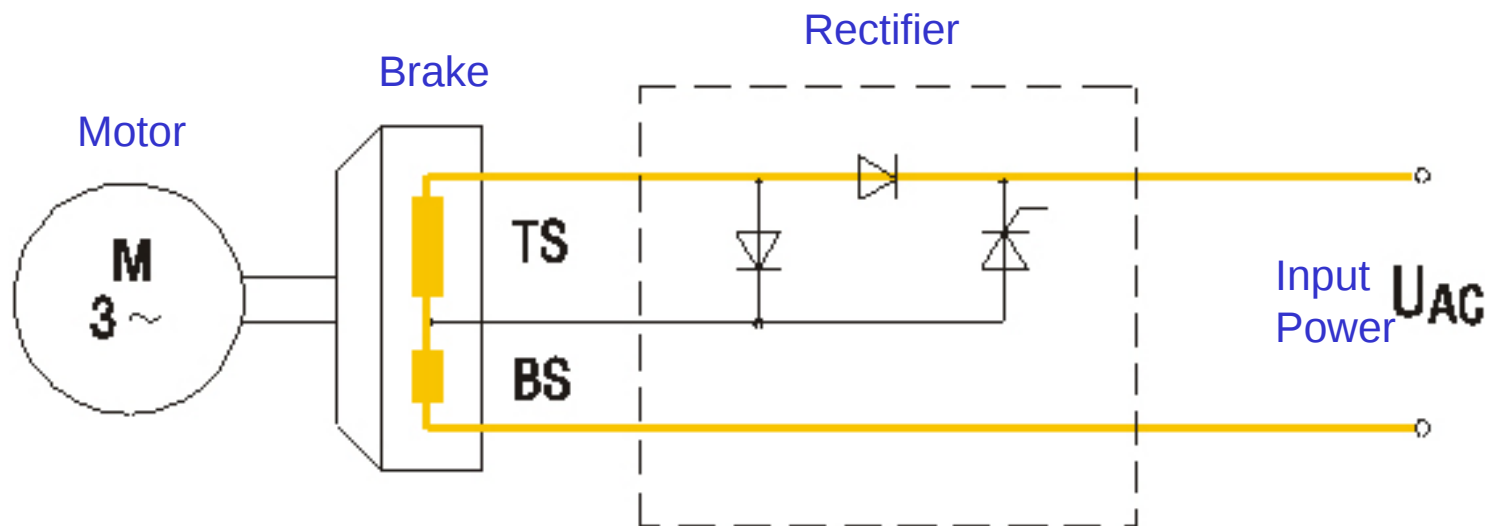
■ Step 2

- After 120 ms, the rectifier energizes both coils. Combined coils have a higher resistance, allowing the coils to de-energize faster when power is removed.

High resistance = Low Current

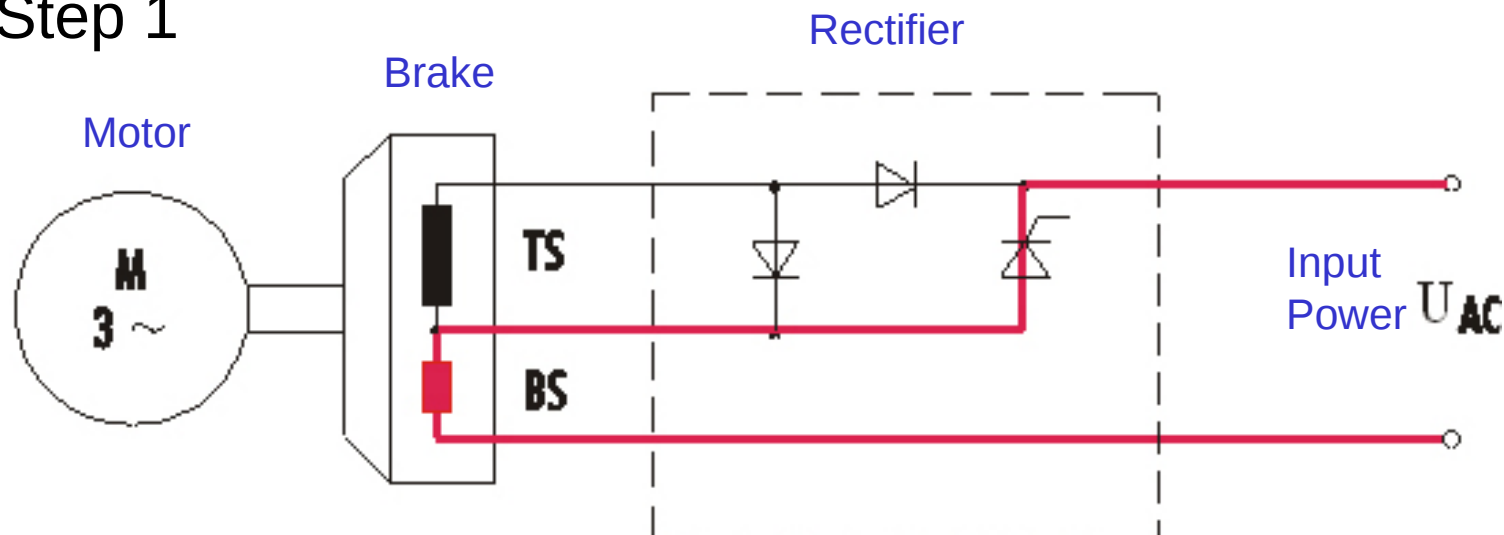
Low Current = Weak Electromagnetism

Weak Electromagnetism = Quick Coil Collapse

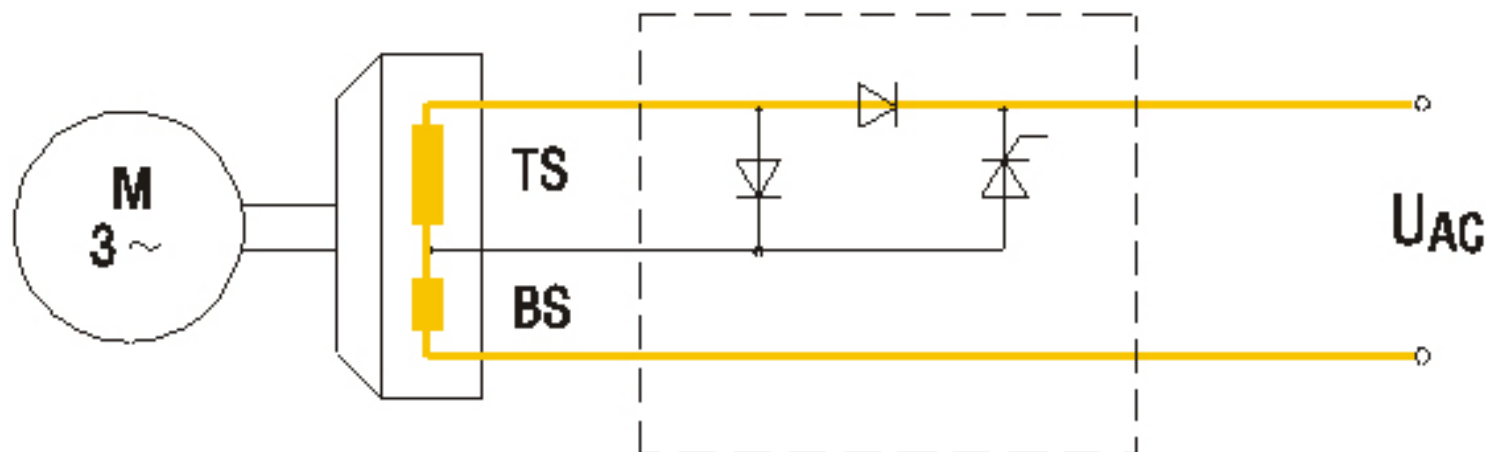


Brake Operation

■ Step 1



■ Step 2 – 120ms



Brake Operation

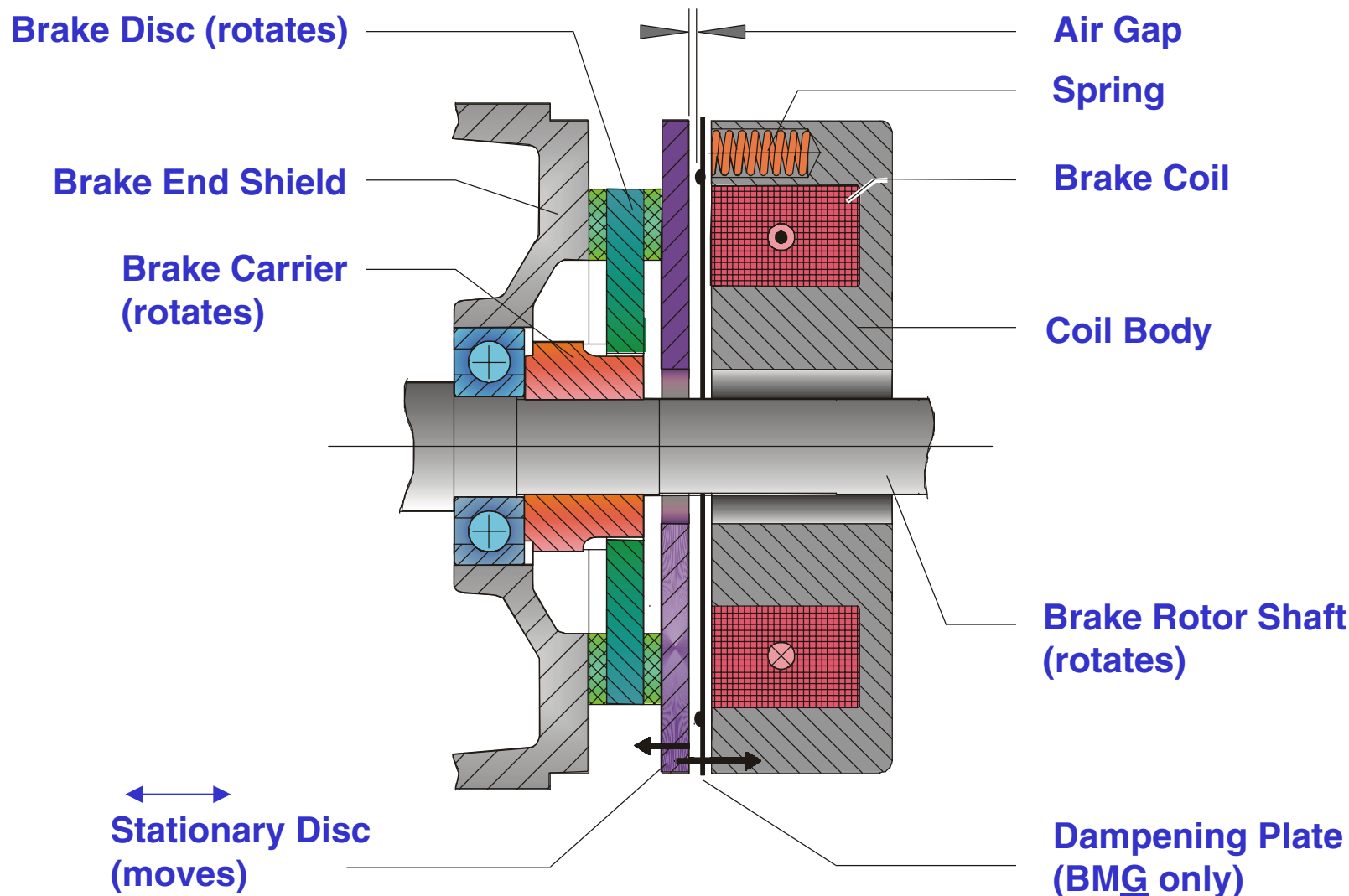
■ Starting

1. The rectifier energizes the brake coil.
2. The brake coil attracts the stationary disc, removing pressure between stationary disc and brake disc.
3. Motor rotates freely.

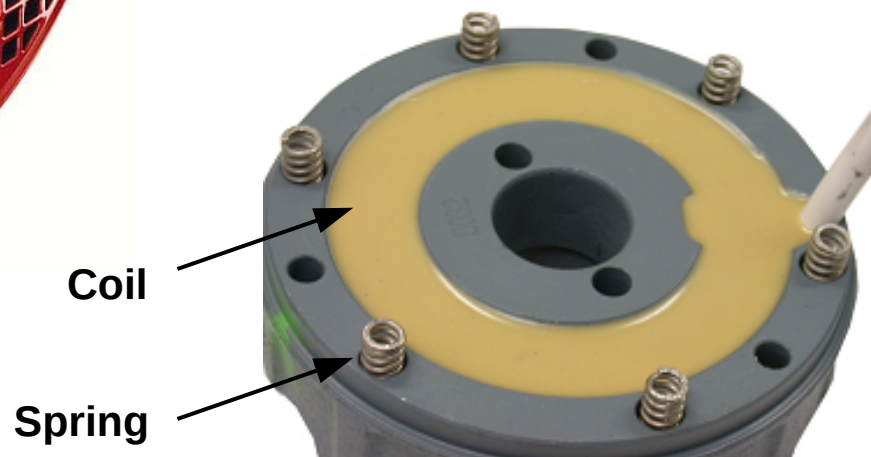
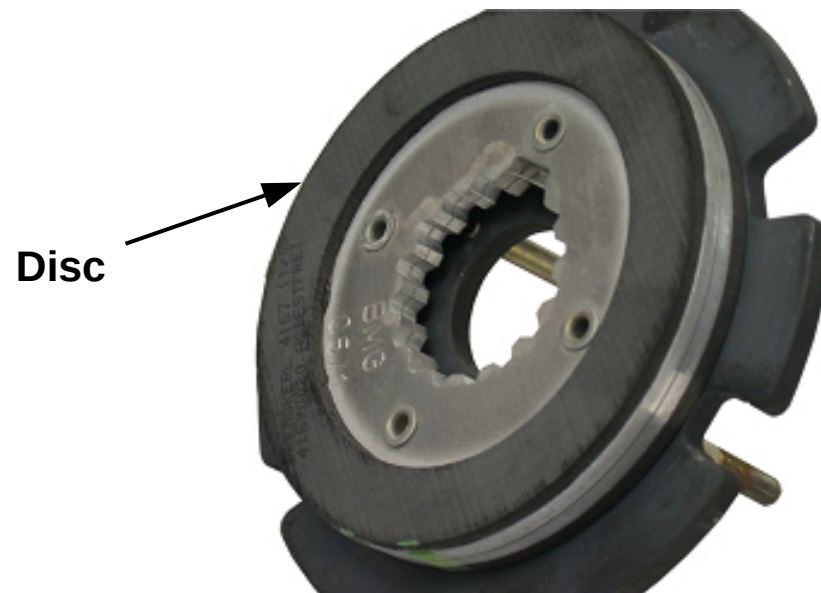
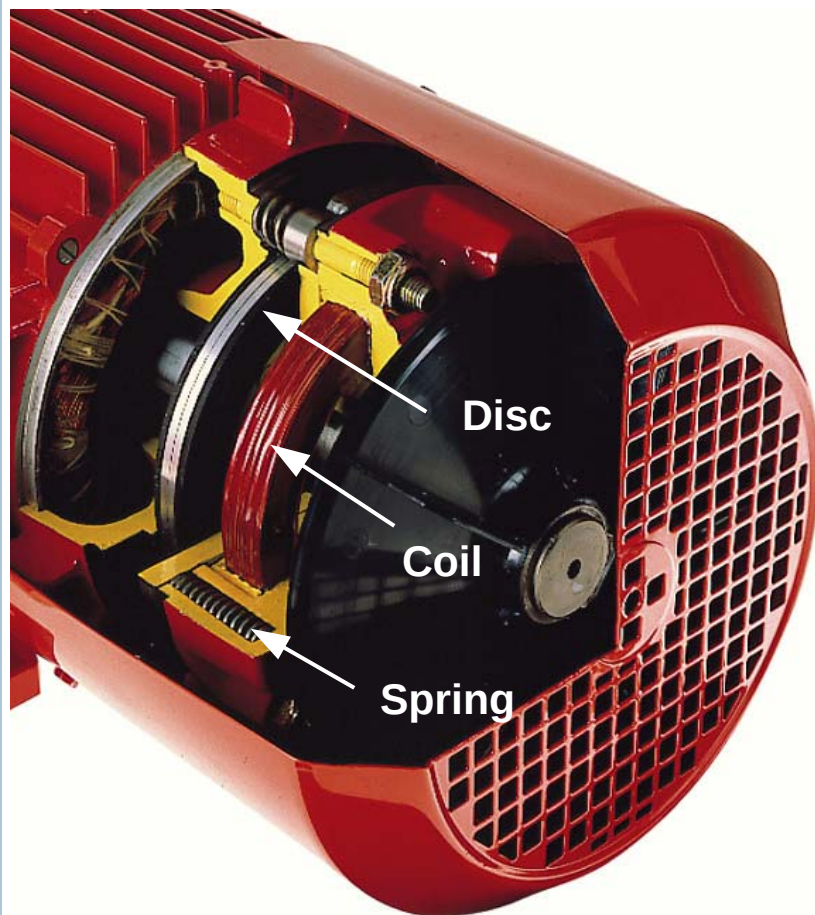
■ Stopping

1. Rectifier de-energizes the coil.
2. Brake springs create pressure between stationary disc and brake disc.
3. Friction stops motor and prevents it from rotating.

Brake Components



Brake Components



Brake Components

- Rectifiers and relays that mount in **Motor Conduit Box**

BG 1



BG 1,5



BG 3,0



BGE 1,5



BGE 3,0



BSG 1,5



UR 15



SR 11



Brake Components

- Rectifiers that mount in **Control Panel**

BME 1,5



BME 3,0



BMH 1,5



BMH 3,0



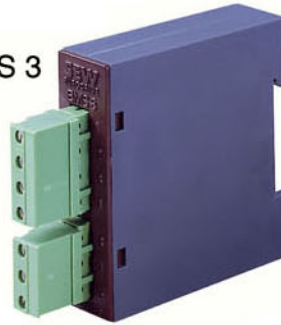
BMP 1,5



BMS 1,5



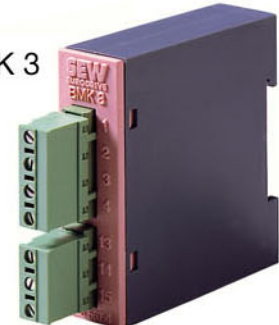
BMS 3



BMK 1,5

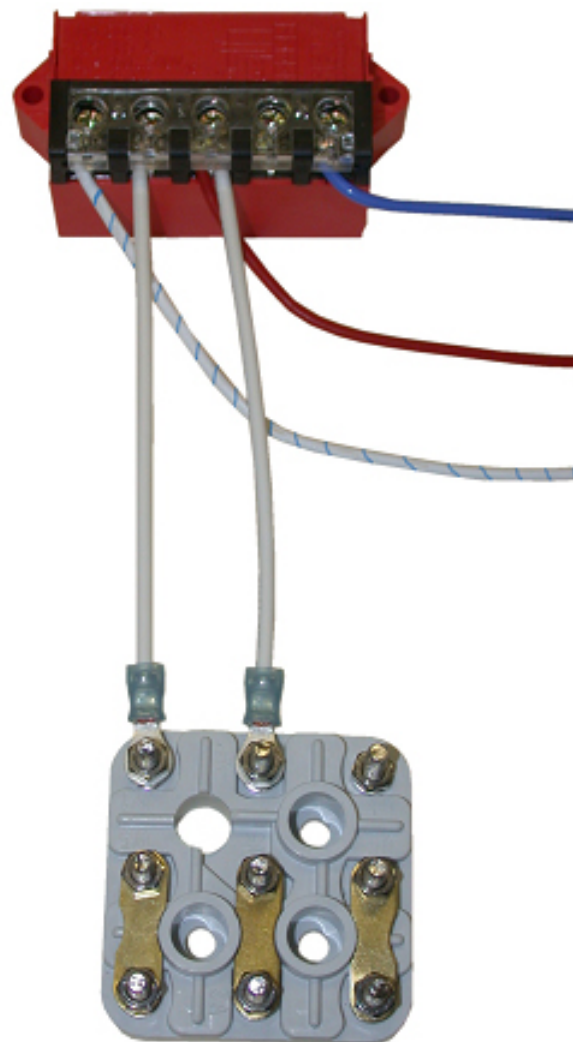
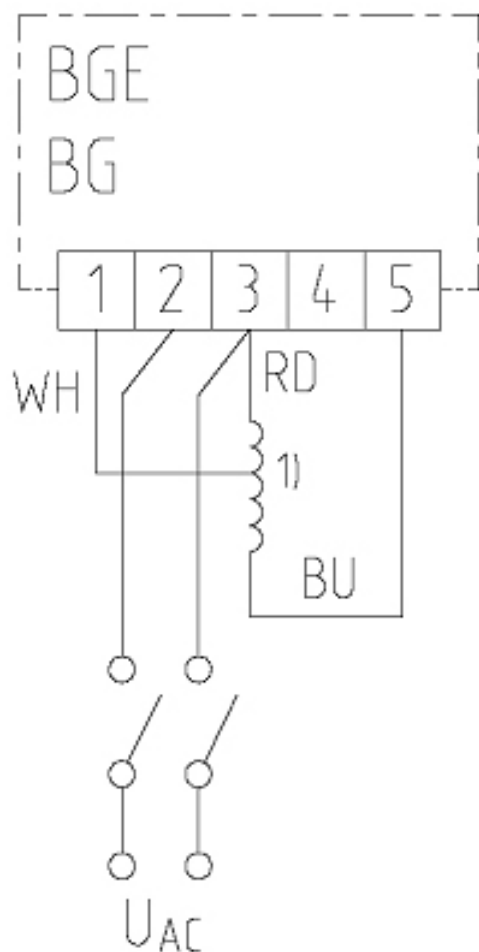


BMK 3



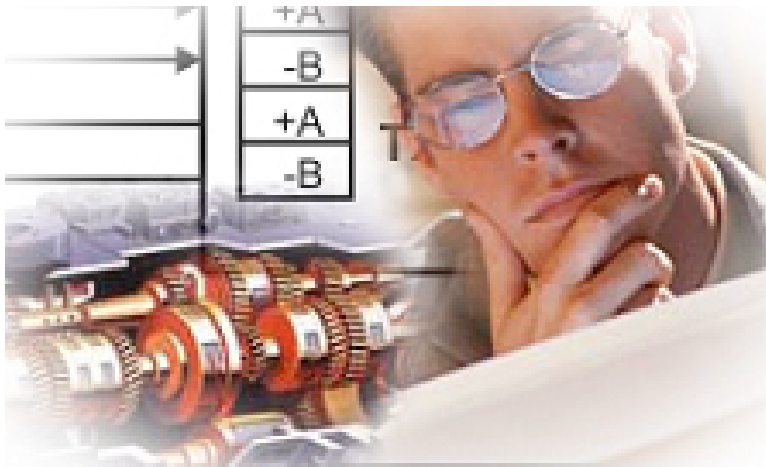
Brake Components

- Typical wiring diagram



Troubleshooting

- Troubleshooting an SEW brake



Troubleshooting

- Always follow the proper lockout/tagout procedures.
- Use the proper safety equipment at all times

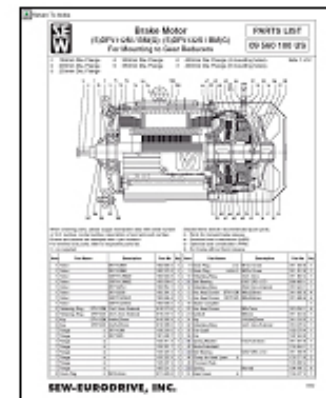
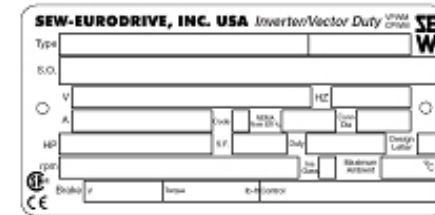


OSHA STANDARD 1910.147



Troubleshooting

- Resources needed
 - Nameplate data from motor
 - Brakemotor operating instructions
 - Motor/Brakemotor parts list
 - Digital multi-meter



Troubleshooting

■ Possible Faults

- Rectifier is damaged.
- Rectifier is wired incorrectly.
- AC brake voltage is incorrect or not applied.
- Brake coil is damaged or malfunctioning.
- Brake is mechanically locked.
- Air gap is outside of tolerance.
- Brake disc is worn or damaged.

FAULT

■ ■ ■

Troubleshooting

- Brake rectifier is damaged
 - Incorrect voltage or wiring of the rectifier causes internal or external damage

**Rectifier received
incorrect voltage**



**Components are
damaged**



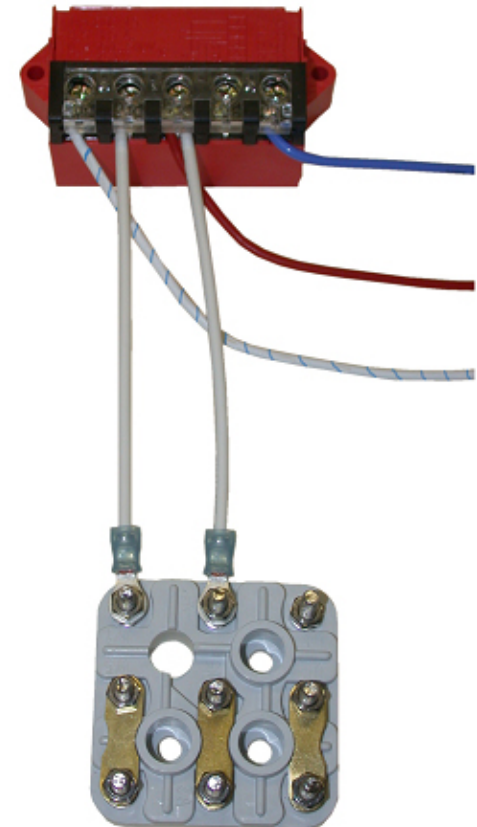
Troubleshooting

- Rectifier is wired incorrectly.
 - Refer to nameplate for correct type of connection (Conn Dia)
 - Refer to the operating instructions for wiring diagrams

SEW-EURODRIVE, INC. USA Inverter/Vector Duty VPWM CPWM **SEW**

Type					
S.O.					
V		HZ			
A		Code	NEMA Nom Eff %	Conn Dia	
HP		S.F.	Duty	Design Letter	
rpm			Ins Class	Maximum Ambient	°C
Brake	V	Torque	lb-ft	Control	

SP® CE



Troubleshooting

- AC brake voltage is incorrect or not applied
 - Refer to nameplate for correct brake voltage

SEW-EURODRIVE, INC. USA Inverter/Vector Duty VPWM CPWM **SEW**

Type

S.O.

V HZ

A Code NEMA Item Eff % Conn Dia

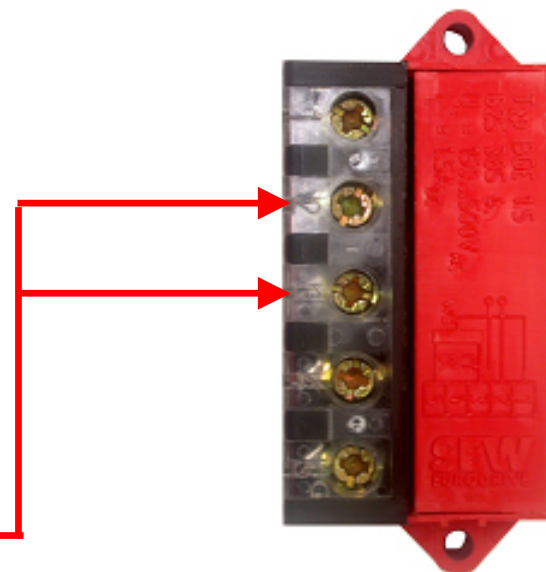
HP S.F. Duty Design Letter

rpm Ins Class Maximum Ambient °C

Brake V **460 AC** Torque lb-ft/Control

CE

AC Voltage that should be applied to the brake rectifier



Troubleshooting

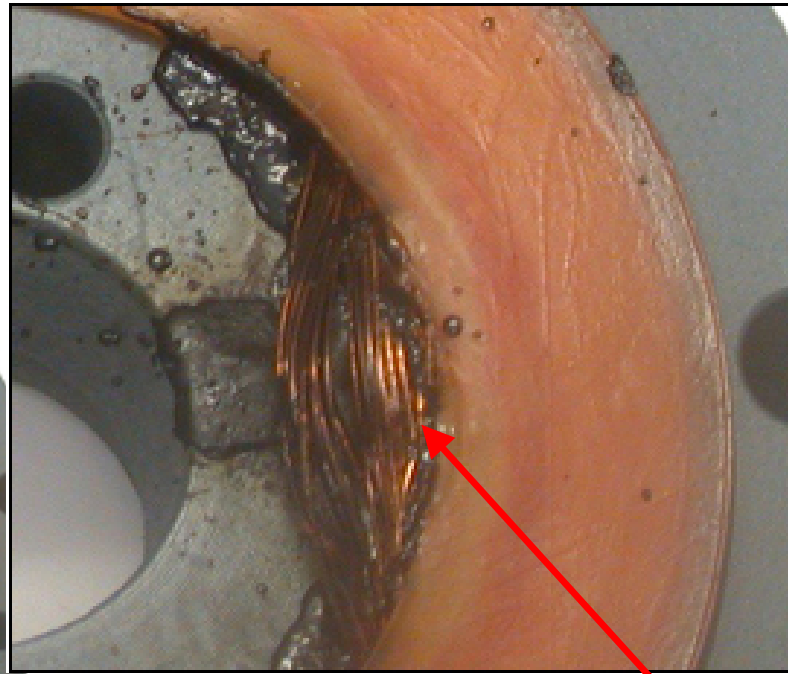
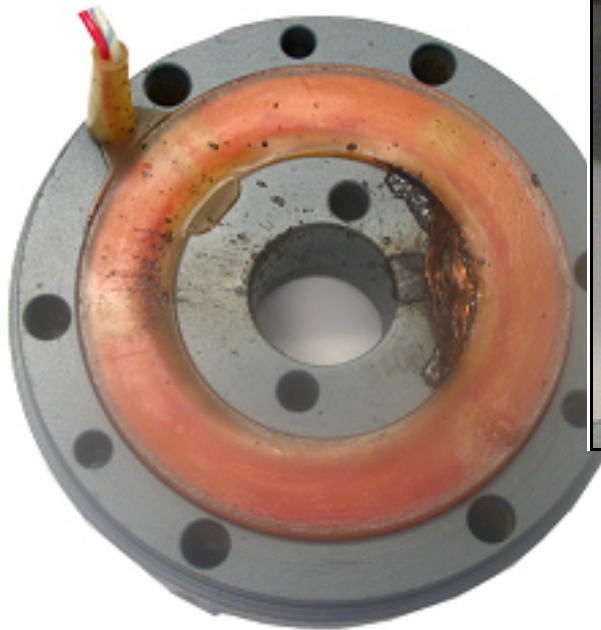
- Check voltage at brake contactor
 - If rectifier power does not come from motor terminals, measure the voltage at the brake contactor



- Check the activation of the brake contactor
 - Verify that the brake contactor functions properly and changes position when energized

Troubleshooting

- Brake coil is damaged or malfunctioning
 - Wrong voltage applied to brake coil causes internal and external damage



**Coil received
wrong voltage**

Troubleshooting

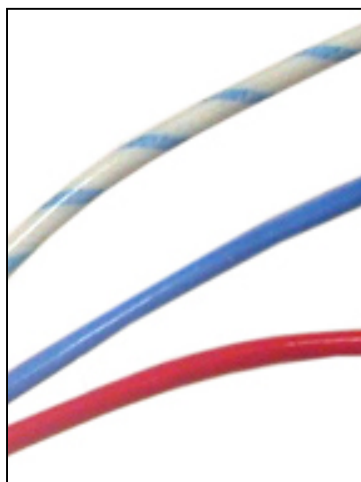
■ Obtain normal coil resistances

Look up the correct values in the SEW Brakemotor Operating Instructions.

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		$R_b(\Omega)$	$R_b(\Omega)$	$R_b(\Omega)$	$R_b(\Omega)$	$R_b(\Omega)$	$R_b(\Omega)$	$R_b(\Omega)$	$R_b(\Omega)$
AC (to rectifier V_r)	DC	$R_r(\Omega)$	$R_r(\Omega)$	$R_r(\Omega)$	$R_r(\Omega)$	$R_r(\Omega)$	$R_r(\Omega)$	$R_r(\Omega)$	$R_r(\Omega)$
—	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_b - Accelerator coil resistance in Ω, measured from the red to the white brake coil wire at 20° C. R_r - Fractional coil resistance in Ω, measured from the white to the blue brake coil wire at 20° C.									

Troubleshooting

- Measure the actual resistances of accelerator coil and fractional coil



← 14-white w/
blue stripe

← 15-blue

← 13-red

13-14 (accelerator coil)

14-15 (fractional coil)

13-15 (total coil)

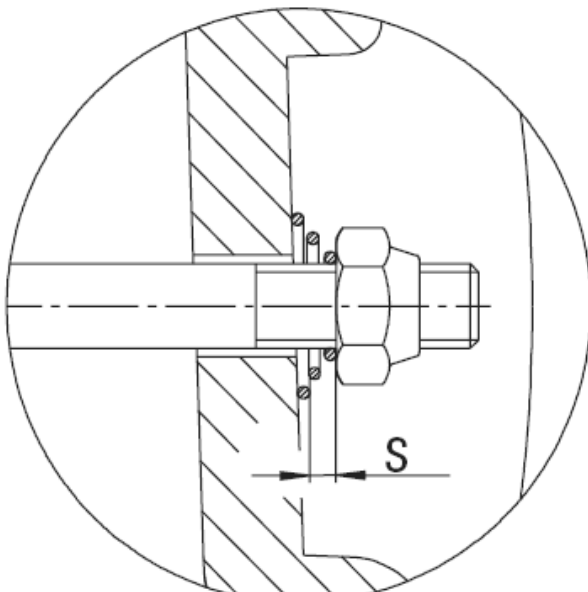
Accelerator coil winding resistance = $\frac{1}{4}$ of winding resistance

Fractional coil winding resistance = $\frac{3}{4}$ of winding resistance

Total coil winding resistance = sum of accelerator and holding coil resistance

Troubleshooting

- 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)



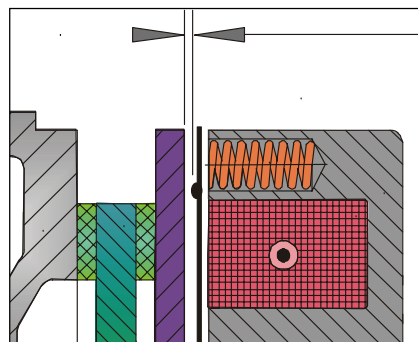
Caution!

There must always be clearance on the lever.

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

Troubleshooting

- 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).



Air-gap



Troubleshooting

- Obtain correct value for air gap.

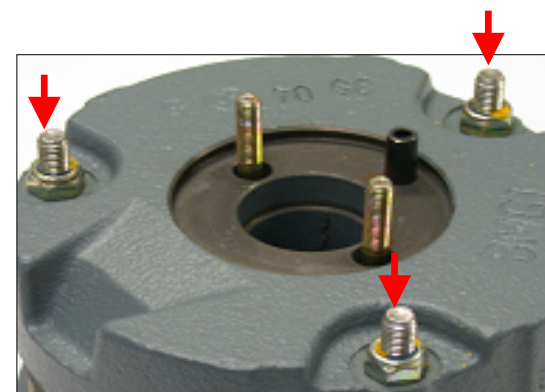
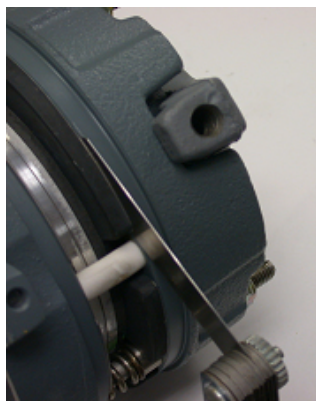
Look up the correct values in the SEW Brakemotor Operating Instructions.

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)

Troubleshooting

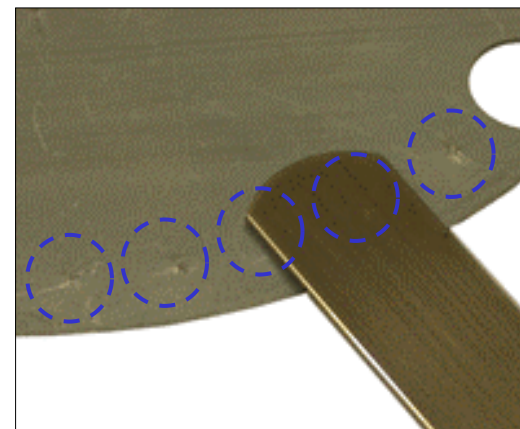
■ Adjust the Brake Air Gap (Method 1)

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!



Troubleshooting

■ 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 1/2 turn.

Troubleshooting

- Brake disc 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

Carbon
composite
material



Troubleshooting

■ 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.



Review

- What are the components of an SEW brake?

SHOW ME

- How does an SEW brake function?

SHOW ME

- What possible faults could occur when an SEW brake does not operate properly?

SHOW ME

Brake Operation

■ Starting

1. The rectifier energizes the brake coil.
2. The brake coil attracts the stationary disc, removing pressure between stationary disc and brake disc.
3. Motor rotates freely.

■ Stopping

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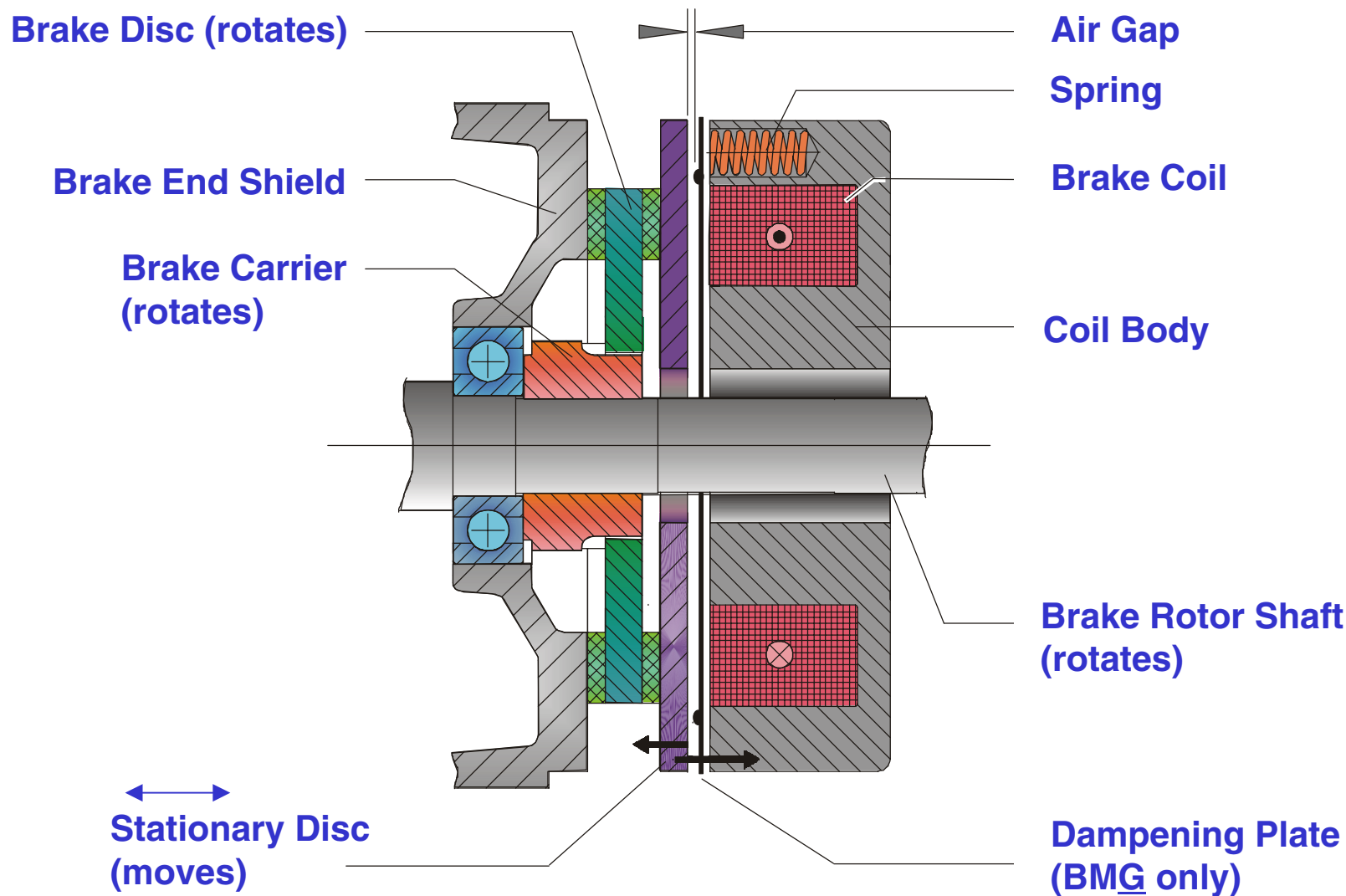
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Brake Components



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