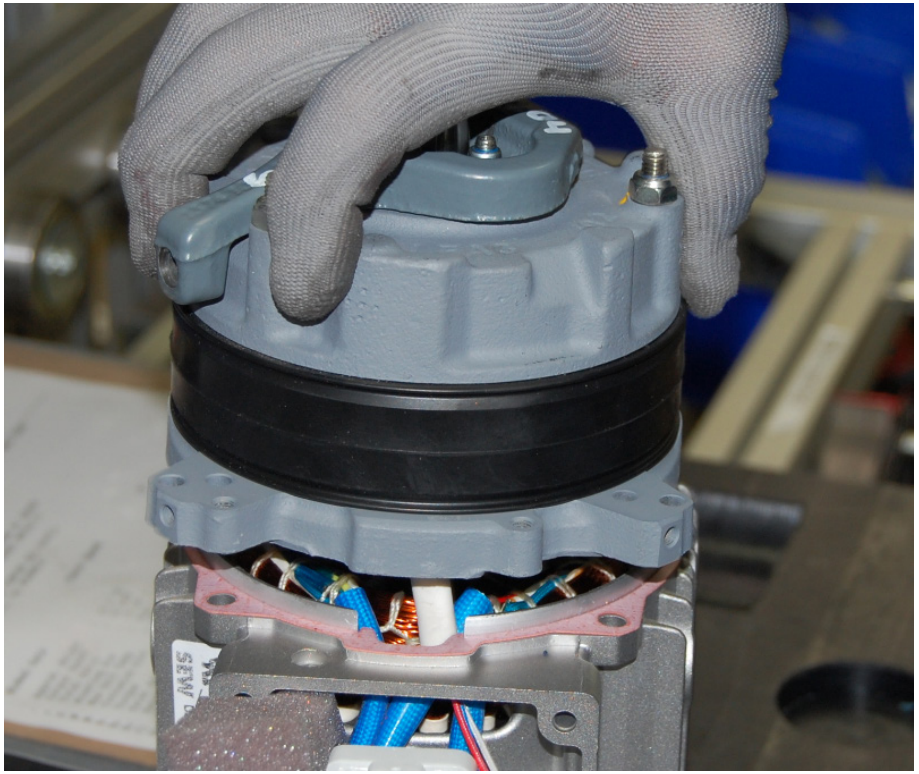
SEW EURODRIVE SERVICE

SEW Brakes

Service and Maintenance



Objectives

- Upon completion of this presentation, you will be able to accomplish the following –

  - Describe the purpose of the SEW brake
  - Explain the operation of the SEW brake
  - Identify the components of an SEW brake
  - 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.

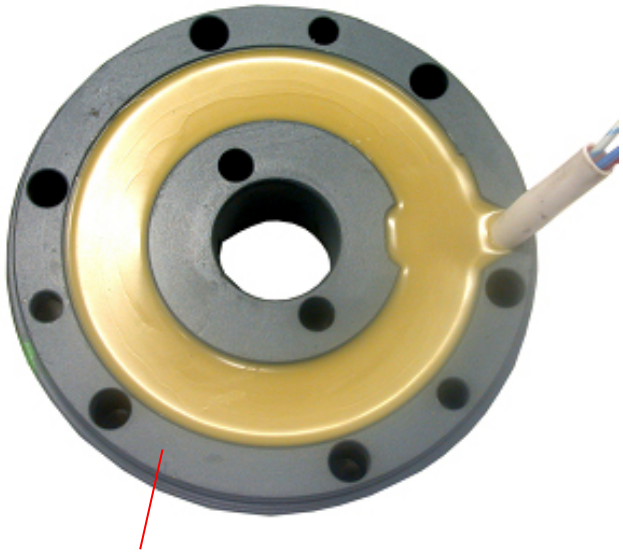
Brake Features

- SEW Brake Features –
  - Fail-safe operation
  - Rectifier for conversion of AC into DC current
  - DC controlled brake coil

Fail-safe operation refers to the brake preventing rotation of the motor despite loss of power

Brake Operation

- The coil functions like an electro magnet when energized



Brake Operation

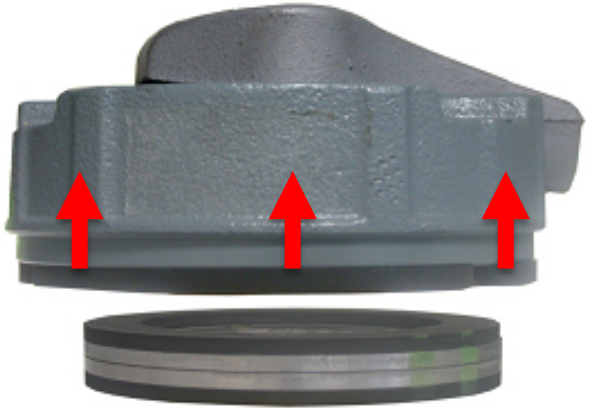
De-energized

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.

Energized



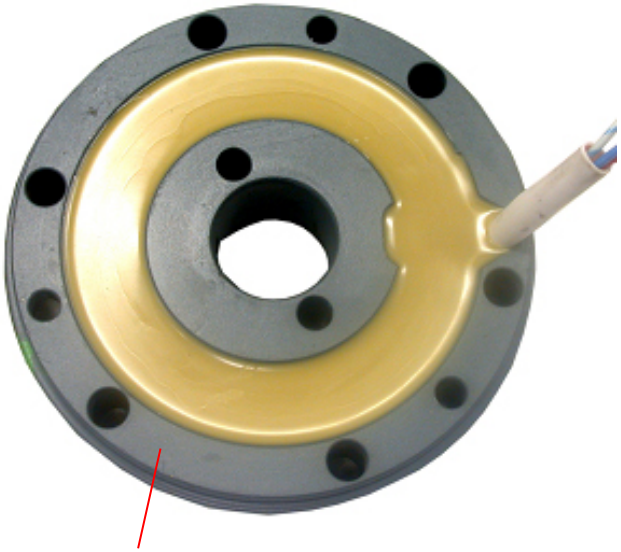
When the coil is energized, its magnetic field pulls the plate towards the coil.

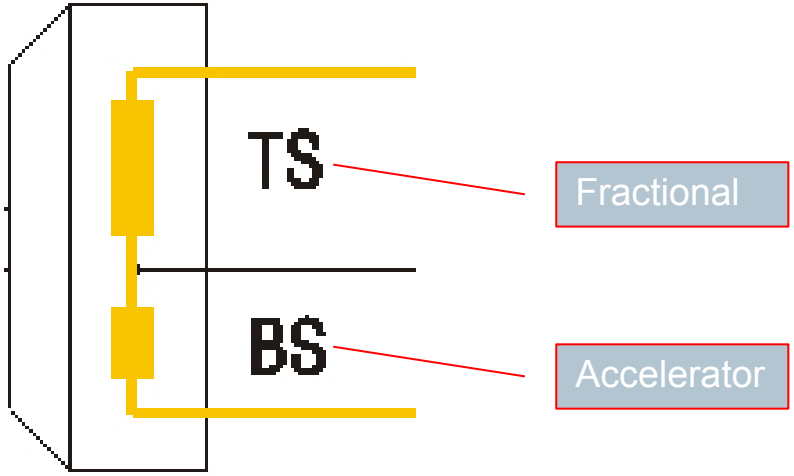
The magnetic force compresses the springs.

The motor can now rotate freely.

Brake Operation

- The brake coil consists of two separate parts –
  1. Accelerator coil (BS)
  2. Fractional holding coil (TS)

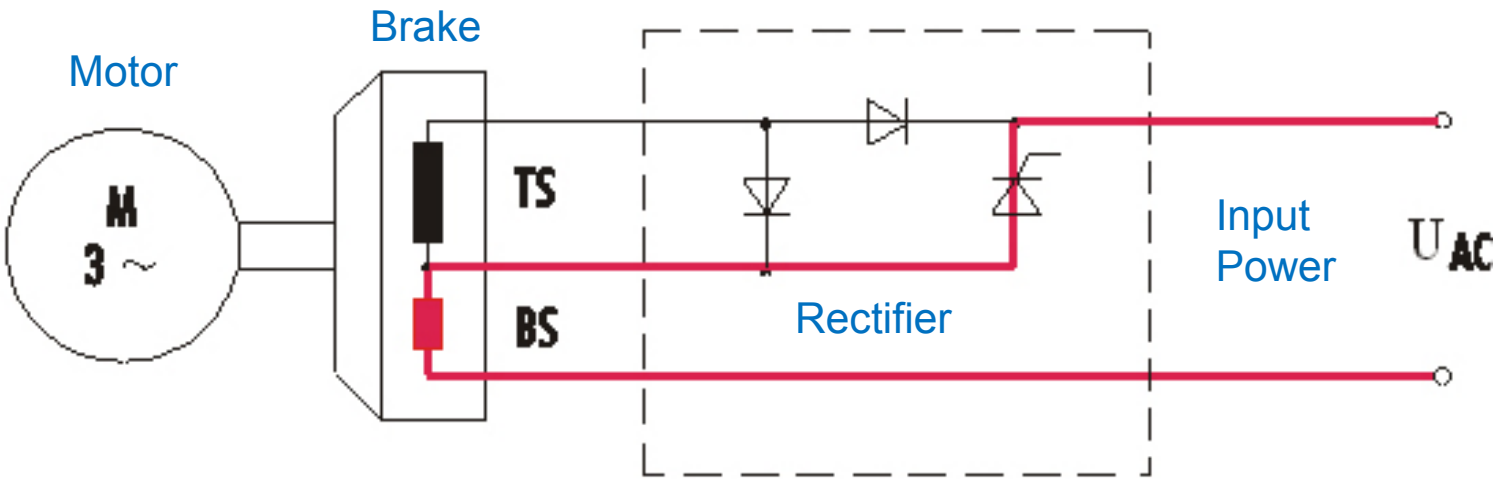




Brake Operation

- Step 1 – The rectifier energizes the Accelerator (BS) coil very quickly due to its low resistance

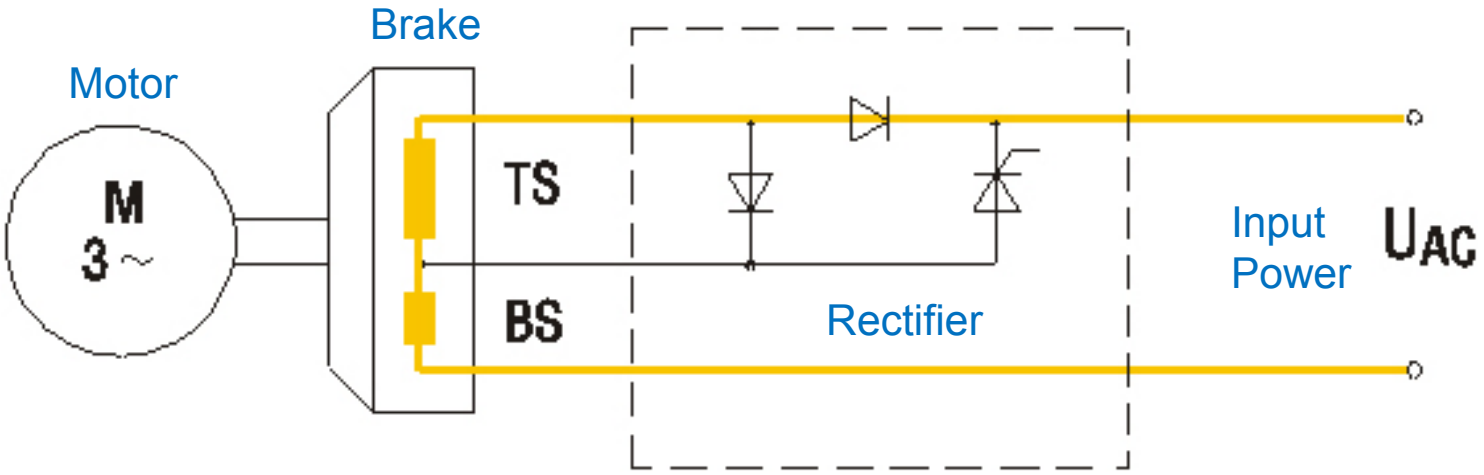
  - Low resistance = High current
  - High current = Strong electromagnetism
  - Strong electromagnetism = Fast reaction



Brake Operation

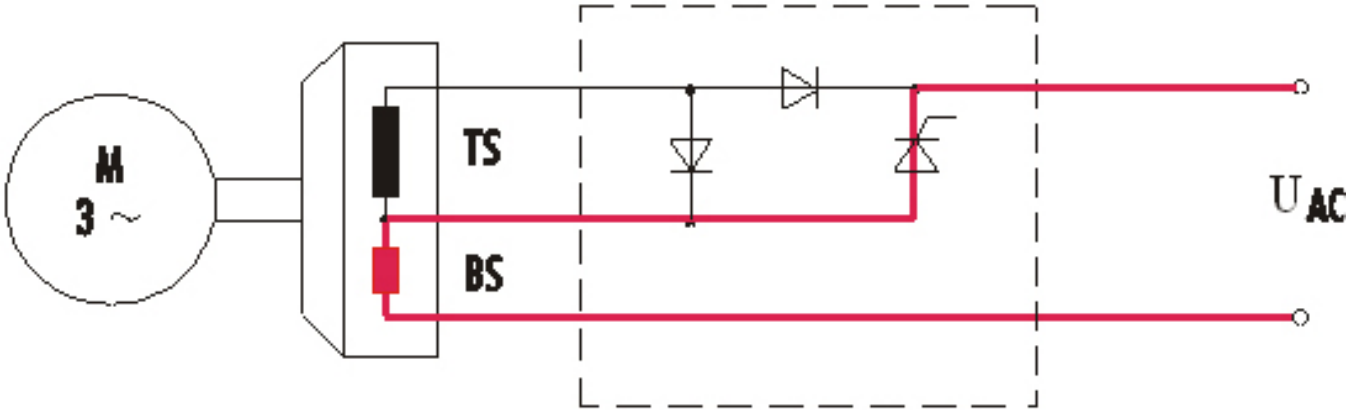
- Step 2 – After 120 *ms*, the rectifier energizes both coils. The combined coils have a higher resistance, allowing the coils to de-energize faster when the power is removed

  - High resistance = Low current
  - Low current = Weak electromagnetism
  - Weak electromagnetism = Quick coil collapse

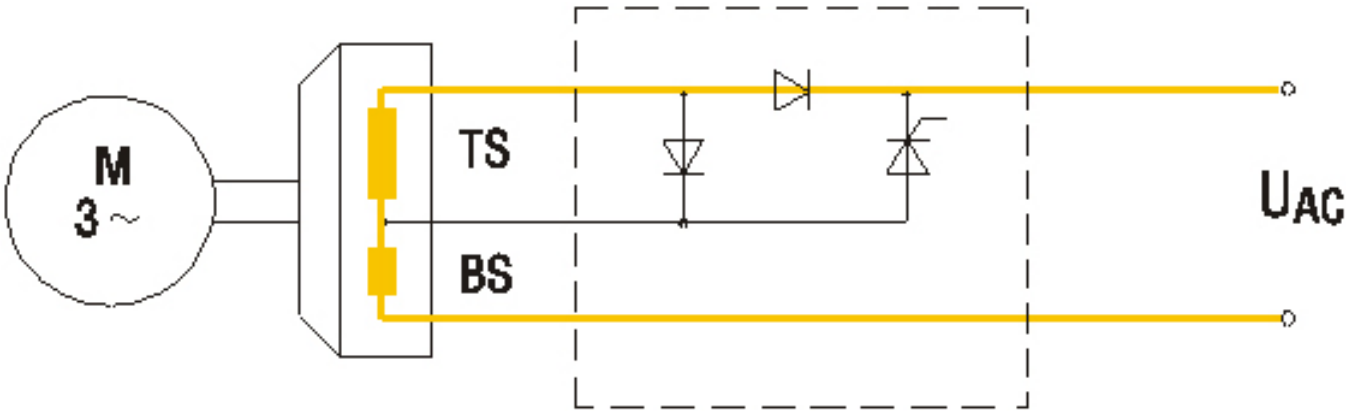


Brake Operation

- Step 1



- Step 2 – 120ms



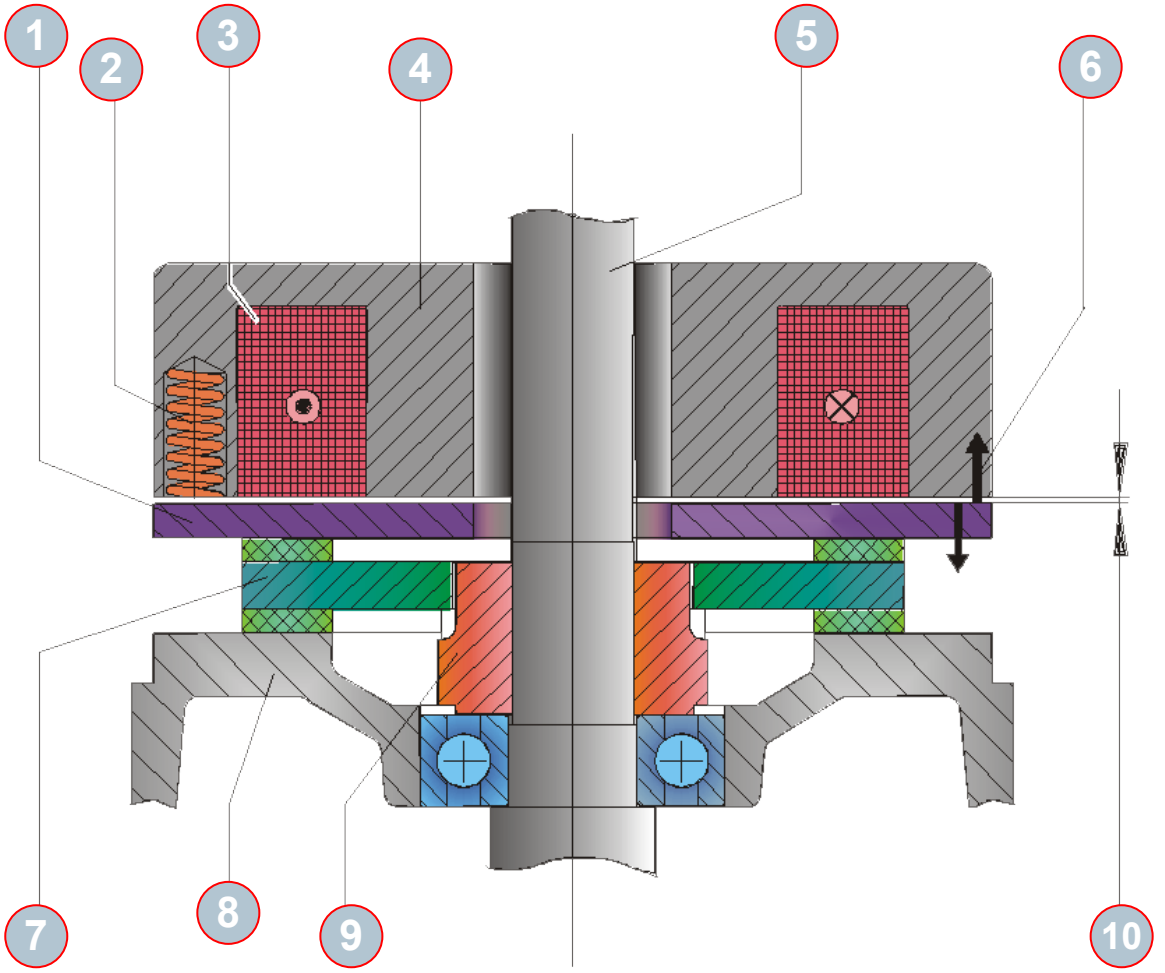
Brake Operation

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

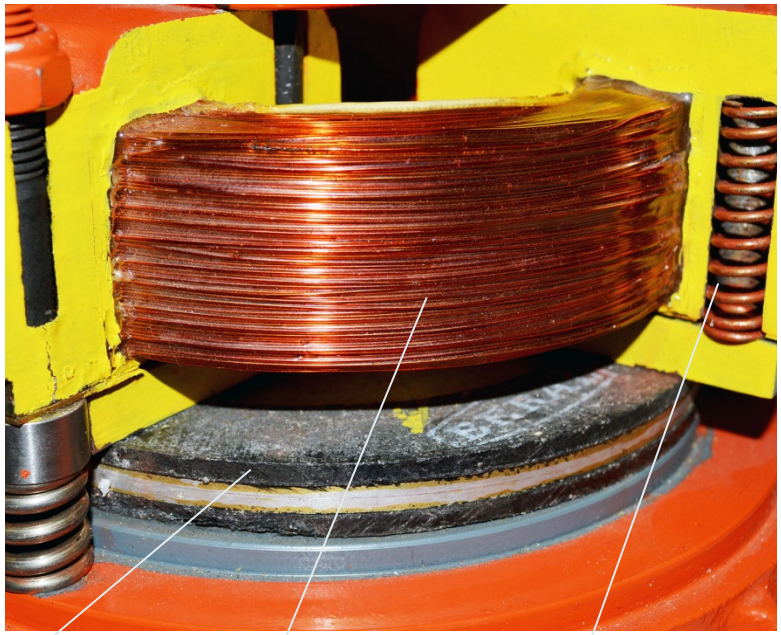
- Stopping
  1. Rectifier de-energizes the brake coil
  2. Brake springs create pressure between stationary disc and brake disc
  3. Friction stops the motor and prevents it from rotating

Brake Components

1. Pressure plate
2. Brake spring
3. Magnet (Coil)
4. Coil body
5. Motor rotor shaft
6. Dampening plate
7. Brake disc
8. Friction disc
9. Brake carrier
10. Brake air gap



Brake Components

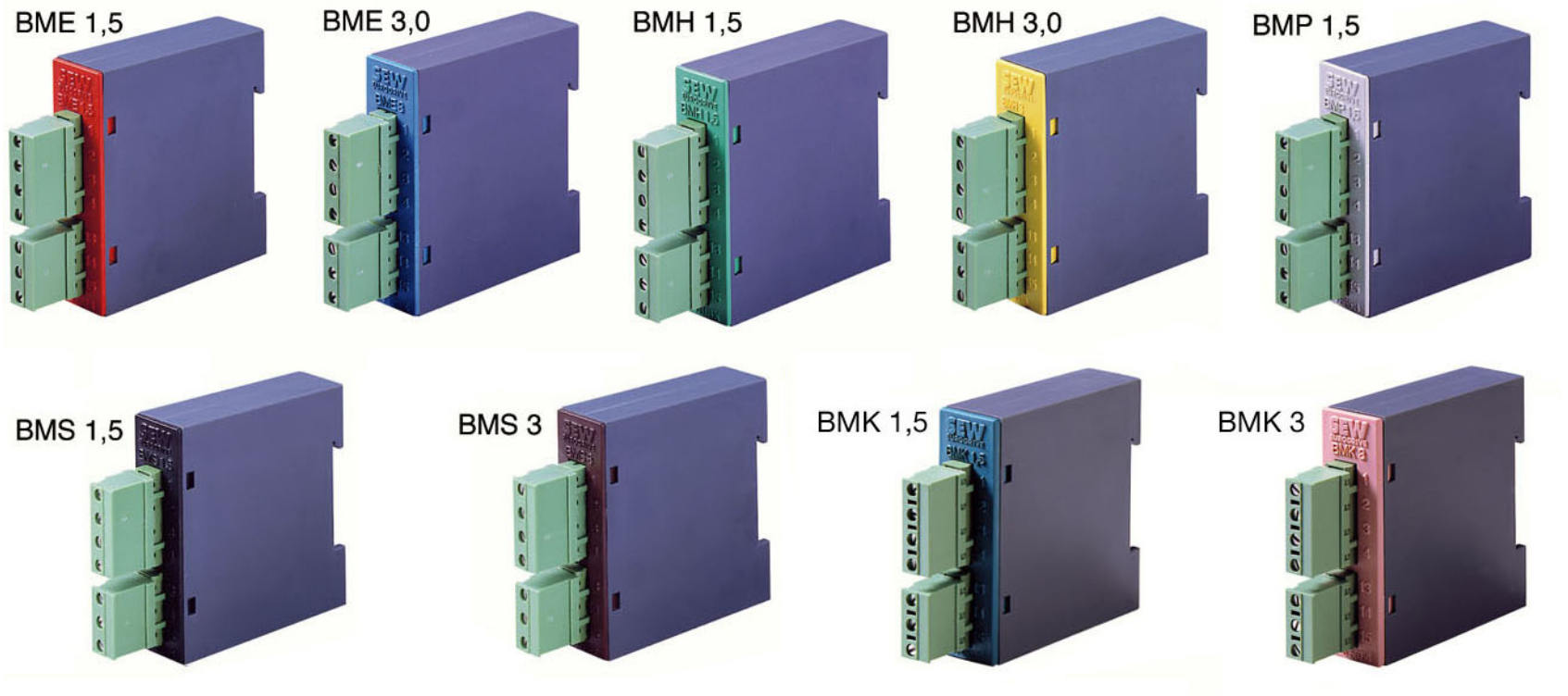


Brake Components

- Rectifiers and relays that mount in Motor Conduit Box

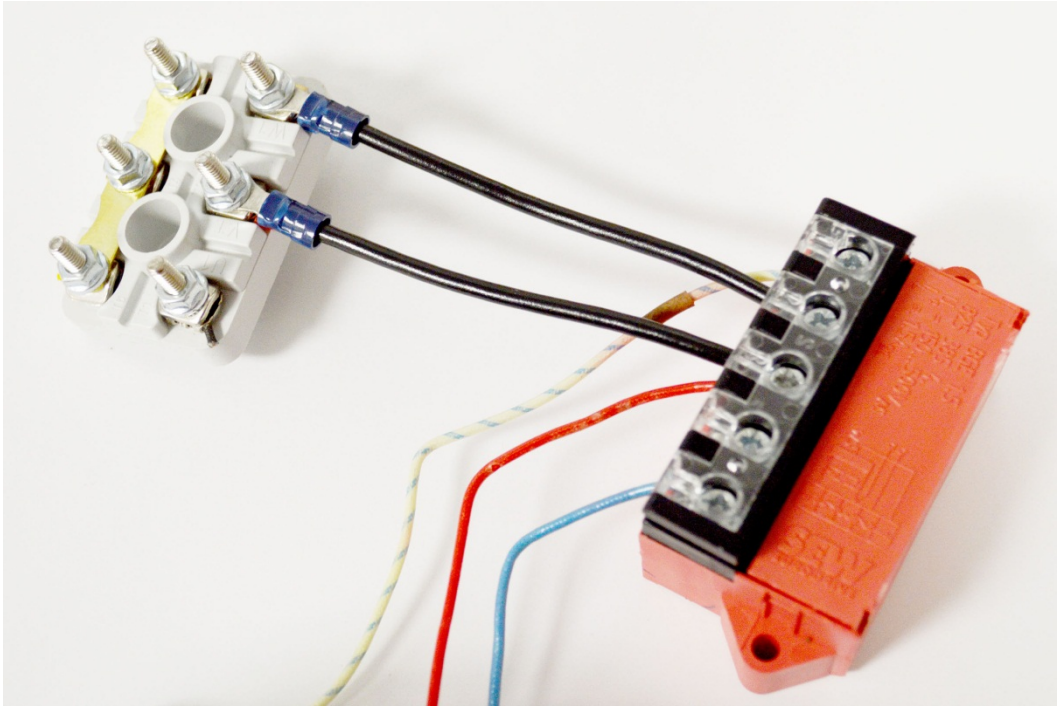
Brake Components

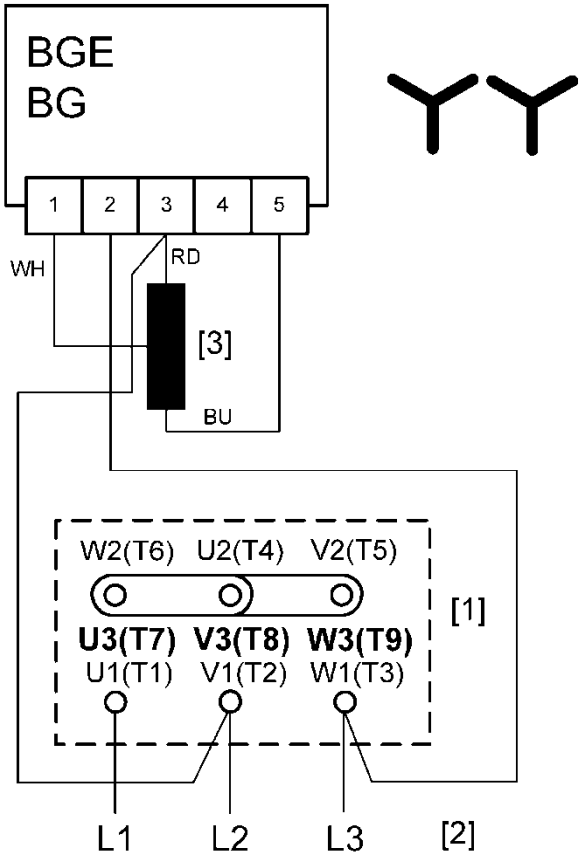
- Rectifiers that mount in Control Panel



Brake Components

- Typical brake wiring configuration





Troubleshooting

- Troubleshooting SEW brakes

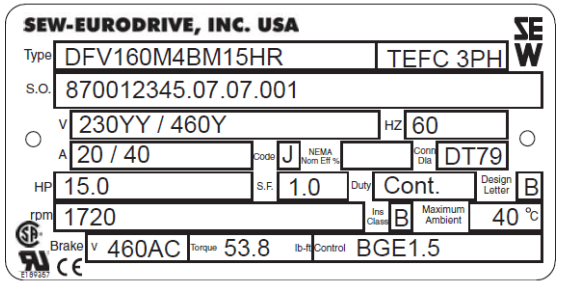
Troubleshooting

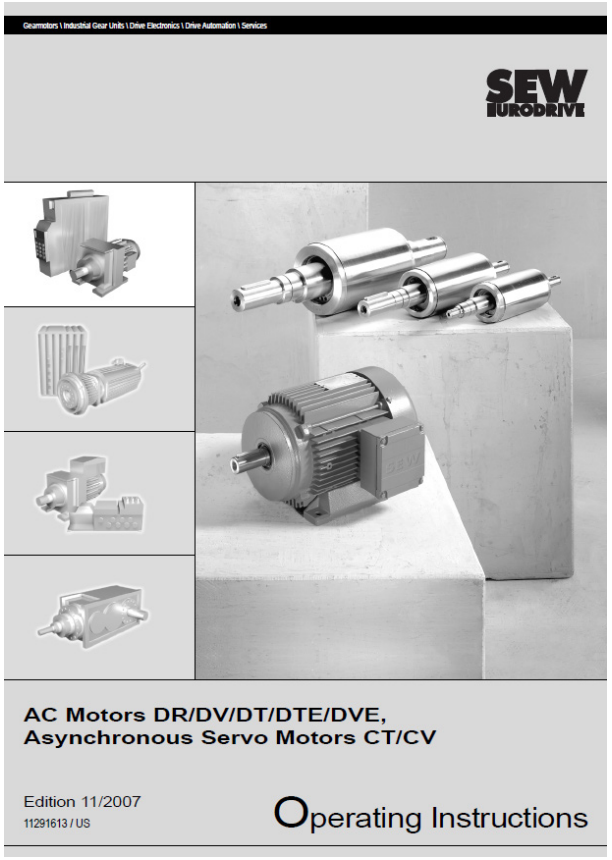
- Always follow the proper lockout/tagout procedures

- Always use the proper safety equipment and PPE

Troubleshooting

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





Troubleshooting

- Common 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.

Troubleshooting - Rectifier

- Damaged rectifier
  - Incorrect voltage or wiring causes internal damage to rectifier
  - Check the rectifier in a de-energized state using the diode checker on your digital multi-meter
  - All power to diode must be OFF. Diode should be isolated from other components (all wires disconnected!)
  - Multi-meter must be in ⊣◂ (diode checker mode) with the meter's black lead in the COM jack and the meter's red lead in the V Ω ⊣◂ jack.
  - See chart on following page

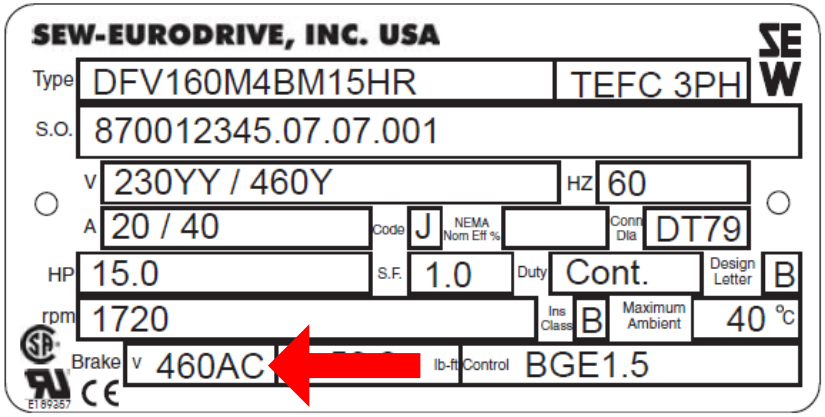
Troubleshooting - Rectifier

Brake Rectifier Diode Check Chart

Type	Black Lead to Terminal	Red Lead to Terminal	Good Reading
BGE 1.5 / 3.0	1	5	≈ 0.5 V dc
	2	5	≈ 2.9 V dc
BG 1.5 / 3.0	1	5	≈ 0.5 V dc
	2	5	≈ 0.5 V dc
BSG	2	5	≈ 0.2 V dc
	4	5	≈ 0.7 V dc
	4	1	≈ 0.5 V dc
	4	2	≈ 0.5 V dc
BMK	3	4	≈ 1.8 V dc
	1	13	0.0 V dc
BME 1.5 / 3.0	2	3	≈ 2.9 V dc
	13	1	0.0 V dc
	14	3	≈ 0.5 V dc
	15	4	0.0 V dc

Troubleshooting - Wiring

- Incorrect wiring
  - Refer to wiring diagram paperwork supplied with motor
  - Verify proper wiring using the sticker supplied with motor conduit box lid
  - Refer to the motor nameplate for the correct brake voltage



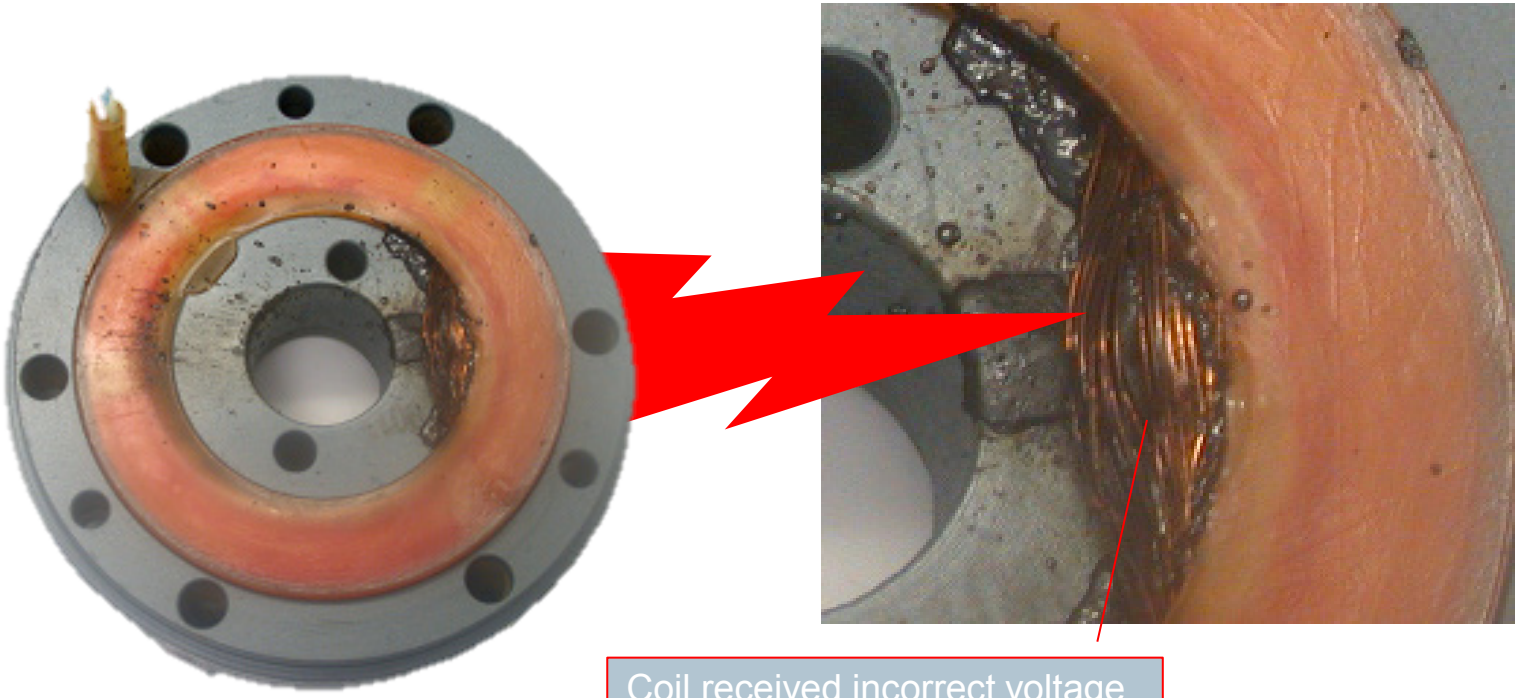
Troubleshooting - Wiring

- 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

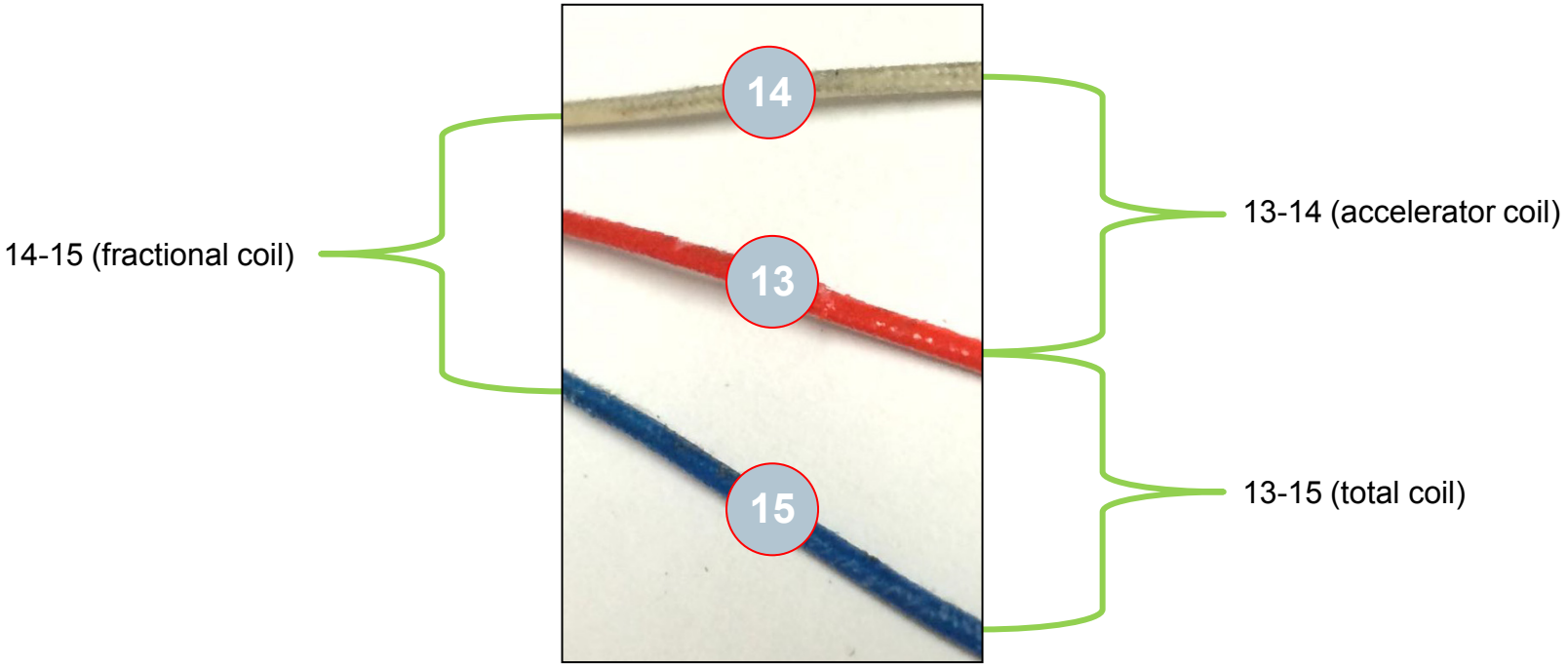
Troubleshooting - Coil

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



Troubleshooting - Coil

- Measure the actual resistances of accelerator coil and fractional 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

SEW EURODRIVE SERVICE

Troubleshooting - Coil

Brake Coil Resistance Values

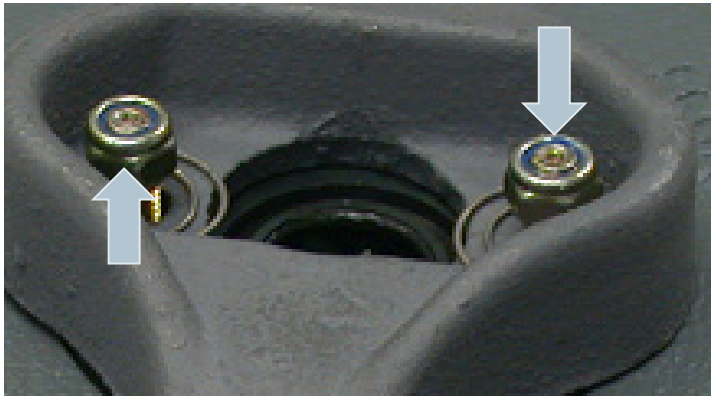
Nominal voltage V_N		BE05 / BE1		BE2		BE5		BE11		BE20		BE30 / BE32		BE60 / BE62		BE120 / BE122	
V_{AC}	V_{DC}	R_B	R_T	R_B	R_T	R_B	R_T	R_B	R_T	R_B	R_T	R_B	R_T	R_B	R_T	R_B	R_T
24 (23-26)	10	0.77	2.35	0.57	1.74	-	-	-	-	-	-	-	-	-	-	-	-
60 (57-63)	24	4.85	14.8	3.60	11.0	2.20	10.5	1.20	7.6	1.1	7.1	-	-	-	-	-	-
120 (111-123)	48	19.4	59.0	14.4	44.0	8.70	42.0	4.75	30.5	3.3	28.6	2.1	15.8	-	-	-	-
147 (139-159)	60	31.0	94.0	23.0	69.0	13.8	66	7.7	43.5	5.4	36.0	3.7	27.5	-	-	-	-
184 (174-193)	80	48.5	148	36.0	111	22.0	105	12.0	76.0	8.4	57	5.3	39.8	-	-	-	-
208 (194-217)	90	61.0	187	45.5	139	27.5	132	15.1	96	10.6	71.7	6.7	50	3.95	32.5	-	-
230 (218-243)	96	78.0	235	58.0	174	34.5	166	19.0	121	13.3	90.3	8.4	63	5.0	41.0	8.0	29.9
254 (244-273)	110	97.0	295	72.0	220	43.5	210	24.0	152	16.7	134	10.6	79.3	6.3	52.0	10.1	37.2
290 (274-306)	125	122	370	91	275	55.0	265	30.0	191	21.1	143	13.3	100	5.6	64.0	12.7	47.4
330 (307-343)	140	154	470	115	350	69.0	330	38.0	240	26.5	180	16.8	126	9.9	80.0	20.1	75.1
360 (344-379)	160	194	590	144	440	87.0	420	47.5	305	33.4	227	21.1	158	12.6	101	-	-
400 (380-431)	180	245	740	182	550	110	530	60	380	42.1	286	26.6	199	15.8	128	25.3	94.6
460 (432-484)	200	310	940	230	690	138	660	76	480	52.9	360	33.4	251	19.9	163	31.8	119
500 (485-542)	220	385	1180	290	870	174	830	95	600	66.7	453	42.1	316	25.5	205	40.1	150
575 (543-600)	250	490	1480	365	1100	220	1050	120	760	83.9	570	53.0	398	31.5	260	50.5	189

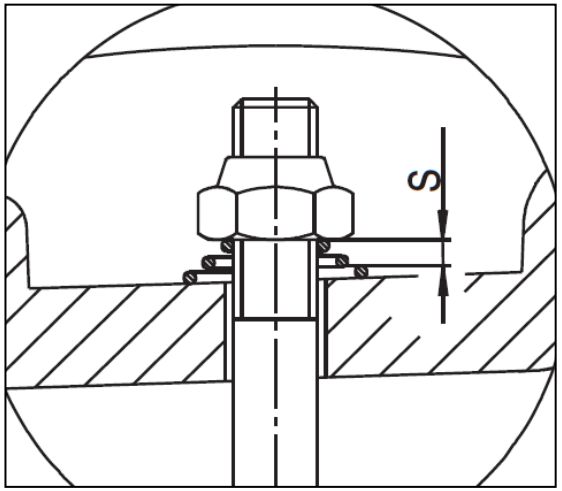
R_B accelerator coil resistance at 68°F in Ω
R_T coil section resistance at 68°F in Ω
V_N nominal voltage (nominal voltage range)

Troubleshooting – Hand Release

- Brake is mechanically locked
  - Verify the free play on the release arm
  - Adjust the locking nuts to achieve the correct floating clearance

Brake	Floating clearance s [mm]
BE05, BE1, BE2, BE5	1.5
BE11, BE20, BE30/32, BE60/62, BE120/122	2

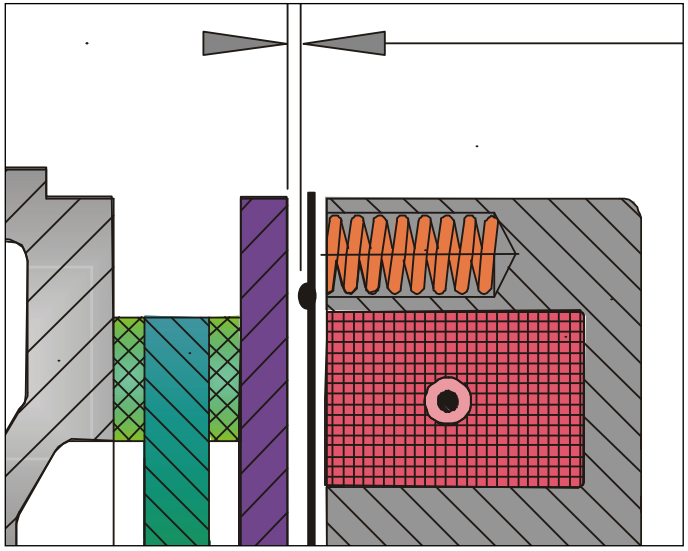


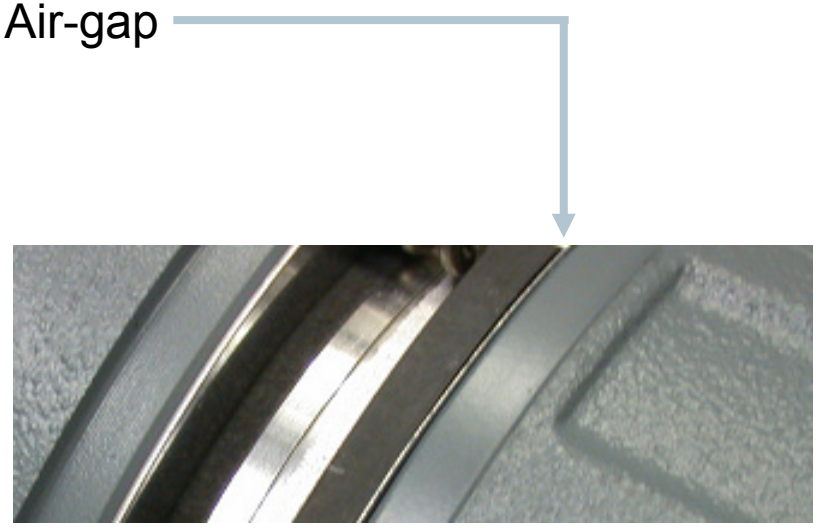


Caution!
There must always be clearance on the lever.
Note: The brake release mechanism is not used to change the brake's torque setting.

Troubleshooting – Air Gap

- Out of tolerance brake air gap
  - Too much air gap and the brake will not release
  - Insufficient air gap and the brake will not release





Troubleshooting – Air Gap

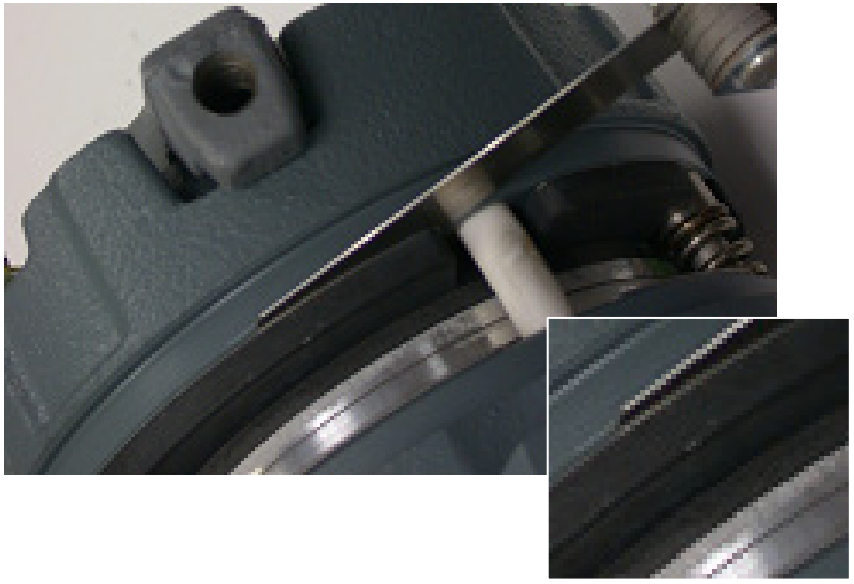
- Obtain correct value for air gap

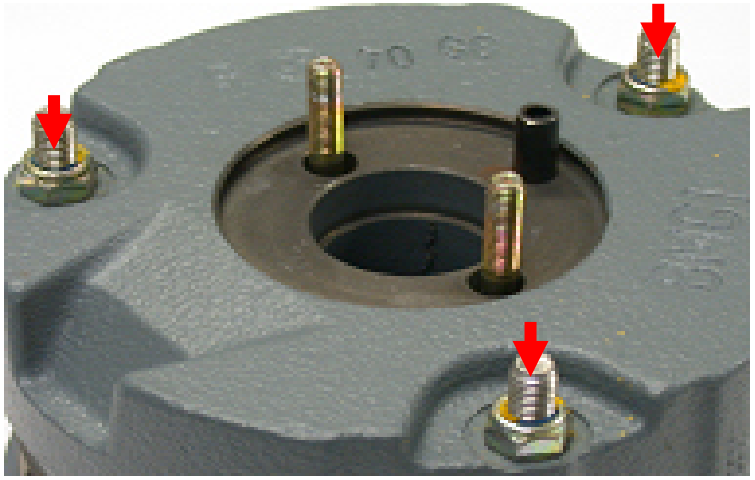
Brake type	Working air gap – in / [mm]	
-	**Min.**	**Max.**
BE05/BE1/BE2	.01 / [0.25]	.024 / [0.60]
BE5	.01 / [0.25]	.035 / [0.90]
BE11/BE20/BE30/BE60	.012 / [0.30]	.047 / [1.20]
BE32/BE62	.016 / [0.40]	.047 / [1.20]
BE120	.024 / [0.60]	.047 / [1.20]
BE122	.031 / [0.80]	.047 / [1.20]

Look up the correct values in the SEW Motor Operating Instructions

Troubleshooting – Air Gap

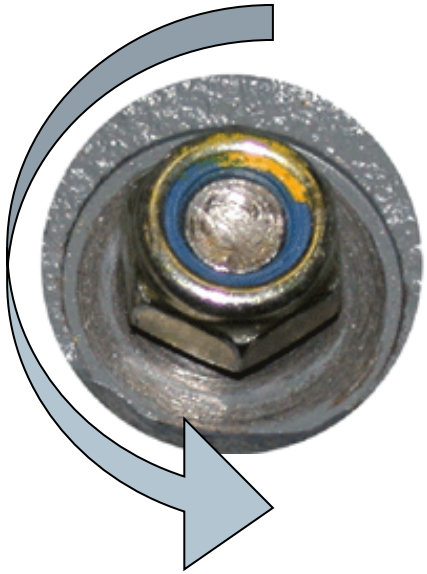
- Adjustment Method 1
  1. Insert feeler gauge (minimum value set) between dampening plate and coil or between pressure plate and coil
  2. Adjust (3) hex nuts until the feeler gauge feels snug equally around the brake





Troubleshooting – Air Gap

- Adjustment Method 2
  1. Tighten the three adjustment nuts equally to establish zero air gap
  2. Loosen the adjustment nuts equally ½ turn



Troubleshooting – Brake Disc

- Brake disc is worn or damaged
  - Sliding friction cause carbon based brake disc to wear
  - High cycle rates require more frequent disc replacement
  - Overheating can cause pressure plate to warp

Troubleshooting – Brake Disc

- Check thickness of brake disc
  1. Measure the thickness of the brake disc with calipers
  2. Replace disc if out of tolerance
  3. Reinstall new disc or current disc if within tolerance range

Brake type	Thickness in / [mm]
BE05/BE1/BE2/BE5	.354 / [9]
BE11/BE20/BE30/BE32/BE60/BE62	.394 / [10]
BE120/BE122	.473 / [12]

Conclusion

This presentation provided a basic overview of SEW Brakes and should enable you to achieve the following –

1. Describe the purpose of the SEW brake
2. Explain the operation of the SEW brake
3. Identify the components of an SEW brake
4. Apply basic troubleshooting procedures

For more detail information and maintenance of SEW mechanical products please visit our website at –

http://www.seweurodrive.com/s_training/index.php5