

Instructions for Dynamic Braking Unit Module

Preface

Thank you for choosing the Eaton Dynamic Braking Unit Module. Braking units are applied to absorb the motor regeneration energy when a three-phase induction motor stops by deceleration. With a braking unit, the regeneration energy will be dissipated in dedicated braking resistors. To prevent mechanical or human injury, please refer to this instruction sheet before wiring. These braking units are suitable for GVX Series AC Drives 230V/460V/575V. These braking units need to be used in conjunction with Eaton braking resistors to provide the optimum braking characteristics. Eaton 2022, 4045 and 5055 braking units are approved by Underwriters Laboratories, Inc. (UL) and Canadian Underwriters Laboratories (cUL). The content of this instruction sheet may be revised without prior notice. Please consult our distributors or download the most updated version at www.EatonElectrical.com.

Specifications

Table 1. Specifications — Braking Units

Specifications	230V	460V	575V
Model	2022	4045	5055
Max. Motor Capacity (KW)	22	45	55

Output Rating

Max. Discharge Current (A) 10%ED	60	60	60
Continuous Discharge Current (A)	20	18	20
Braking Start-Up Voltage (DC)	330/345/360/ 380/400/ 415±3V	660/690/720/ 760/800/ 830±6V	950±8V

Input Rating

DC Voltage	200 – 400V DC	400 – 800V DC	607 – 1000V DC
Min. Equivalent Resistors for Each Braking Unit	6.8Ω	13.6Ω	15.8Ω

Protection

Heat Sink Overheat	Temperature over 203°F (95°C)
Alarm Output	Relay contact 5A 120V AC/28V DC (RA, RB, RC)
Power Charge Display	Blackout until bus (+ to -) voltage is below 50V DC

Environment

Installation Location	Indoor (no corrosive gases, metallic dust)
Operating Temperature	14°F to 122°F (-10°C to 50°C)
Storage Temperature	-4°F to 140°F (-20°C to 60°C)
Humidity	90% Non-condensing
Vibration	9.8 m/s ² (1G) under 10 Hz 2 m/s ² (0.2G) at 20 to 50 Hz
Mechanical Configuration	Wall-mounted enclosed type IP50

Dimensions

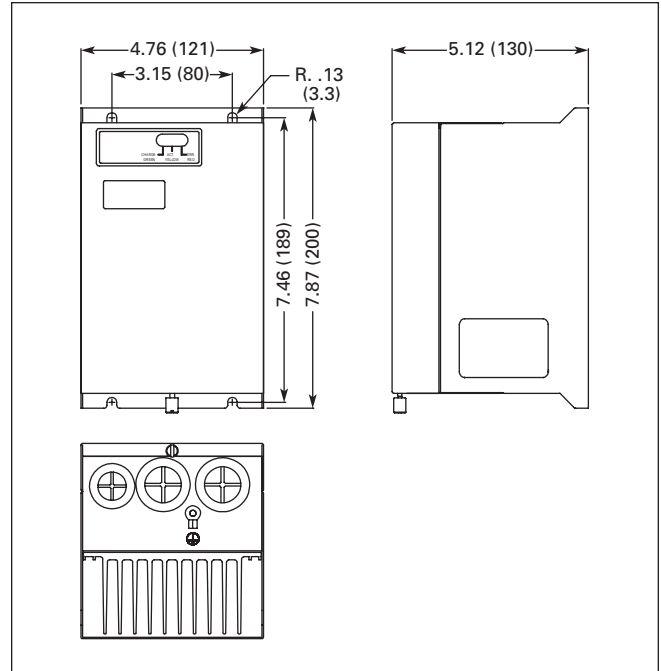


Figure 1. Braking Units — Approximate Dimensions in Inches (mm)

Individual Parts and Function Explanation

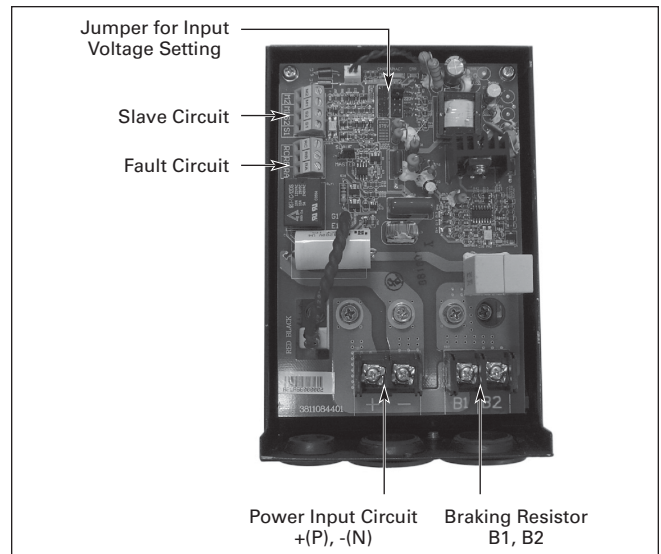


Figure 2. Individual Parts and Function Explanation



Table 2. Terminal Wire Gauge

Circuit	Terminal Mark	Wire Gauge AWG (mm ²)	Screw	Torque
Power Input Circuit	+(P), -(N)	10 – 12 AWG (3.5 – 5.5 mm ²)	M4	15.6 in-lbf (18 kgf-cm)
Braking Resistor	B1, B2	10 – 12 AWG (3.5 – 5.5 mm ²)	M4	15.6 in-lbf (18 kgf-cm)
SLAVE Circuit	Output	20 – 18 AWG (.25 – .75 mm ²) (with shielded wires)	M2	3 in-lbf (4 kgf-cm)
	Input			
Fault Circuit	RA, RB, RC	20 – 18 AWG (.25 – .75 mm ²)	M2	3 in-lbf (4 kgf-cm)

Basic Wiring Diagram

Operation Explanation

- For safety consideration, install an overload relay between the braking unit and the braking resistor. In conjunction with the magnetic contactor (MC) prior to the drive, it can perform complete protection against abnormality.
- The purpose of installing the thermal overload relay is to protect the braking resistor from damage due to frequent braking, or due to the braking unit continuing to operate because of unusual high input voltage. Under such circumstances, just turn off the power to prevent damage to the braking resistor.
- Please refer to the specification of the thermal overload relay.
- The alarm output terminals (RC, RA, RB) of the braking unit will be activated when the temperature of the heat sink exceeds 95°C. This means that the temperature of the installation environment may exceed 50°C, or the braking %ED may exceed 10%ED. With this kind of alarm, please install a fan to force air-cooling or reduce the environment temperature. If the condition is not due to the temperature, the control circuit or the temperature sensor may have been damaged. If this is the case, send the braking unit back to the manufacturer or agency for repair.
- The AC drive and braking unit will be electrified at the same time while turning on the NFB (No-fuse breaker). For the operation/stop method of the motor, please refer to the GVX AC Drive User Manual. The braking unit will detect the inner DC voltage of the AC drive when it stops the motor by deceleration. The extra regeneration will be dissipated away rapidly by the braking resistor in the form of heat. This will ensure the stable deceleration characteristic.

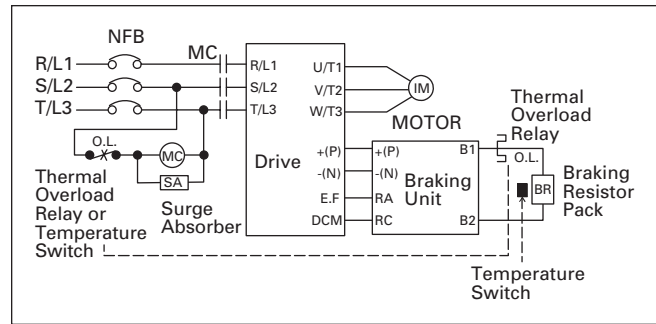


Figure 3. Basic Wiring Diagram

NOTE: When using the AC drive with DC reactor, please refer to wiring diagram in the AC drive user manual for the wiring of terminal +(P) of braking unit.

NOTE: DO NOT wire terminal -(N) to the neutral point of power system.

- Besides using a thermal overload relay as the protection system and a braking resistor, a temperature switch can be installed on the braking resistor side as protection. The temperature switch must comply with the braking resistor specification or contact your dealer.

Wiring Notice

WARNING

- Do not proceed with wiring while power is applied to the circuit.
- The wiring gauge and distance must comply with the electrical code.
- The +(P), -(N) terminals of the AC drive (GVX Series) connected to the braking unit must be confirmed for correct polarity to avoid damage to the drive and the braking unit at power on.
- When the braking unit performs, the wires connected to +(P), -(N), B1 and B2 will generate a powerful electromagnetic field for a moment due to high current passing through. These wires should be wired separately from other low voltage control circuits to avoid interference or mis-operation.
- Inflammable solids, gases or liquids must be avoided at the location where the braking resistor is installed. The braking resistor should be installed in an individual metallic box with forced air-cooling.
- Connect the ground terminal to the Earth Ground. The ground lead must be at least the same gauge wire as leads +(P), -(N).
- Install the braking resistor with forced air-cooling or the equivalent when frequent deceleration braking is performed (over 10%ED).

Wiring Notice (Continued)

⚠ WARNING

- The ring terminals should be used for main circuit wiring. Make sure the terminals are fastened before power on.

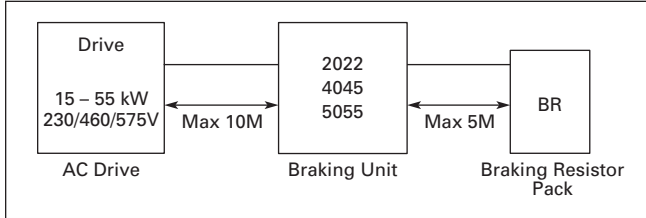


Figure 4. Wiring Distance

- To prevent personal injury, do not connect/disconnect wires or regulate the setting of the braking unit while power is on. Do not touch the terminals of related wiring to any component on PCB or extreme dangerous DC high voltage may cause injury to the user.

Definition for Braking Usage ED%

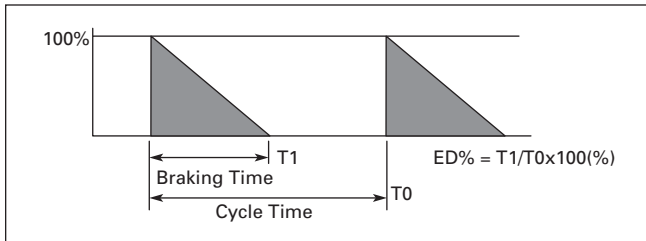


Figure 5. Definition for Braking Usage ED%

Explanation: The definition of the braking usage ED(%) is for assurance of enough time for the braking unit and braking resistor to dissipate away heat generated by braking. When the braking resistor heats up, the resistance would increase with temperature, and braking torque would decrease accordingly.

NOTE: Before regulating the power voltage, make sure the power has been turned off. Set power voltage as the highest possible voltage for unstable power system. Take 380V AC power system for example. If the voltage may be up to 410V AC, 415V AC should be regulated.

NOTE: For GVX Series drives, set the parameter (Over Voltage Stall Prevention) as “close” to disable over-voltage stall prevention, to ensure stable deceleration characteristic. For 5055 braking units, the jumper can only be positioned as shown in Figure 7. Do NOT move the jumper to another place.

The Voltage Settings

- Regulation of power voltage: the power source of the braking unit is DC voltage from +(P), -(N) terminals of the AC drive. It is very important to set the power voltage of the braking unit based on the input power of the AC drive before operation. The setting has a great influence on the potential of the operation voltage for the braking unit. Please refer to **Table 3**.

Table 3. The Selection of Power Voltage and Operation Potential of PN DC Voltage ①

230V Model AC Power Voltage	Braking Start-Up Voltage DC Bus +(P), -(N) Voltage	460V Model AC Power Voltage	Braking Start-Up Voltage DC Bus +(P), -(N) Voltage	575V Model AC Power Voltage	Braking Start-Up Voltage DC Bus +(P), -(N) Voltage
190V AC	330V DC	380V AC	660V DC	575V AC	950V DC
200V AC	345V DC	400V AC	690V DC	—	—
210V AC	360V DC	415V AC	720V DC	—	—
220V AC	380V DC	440V AC	760V DC	—	—
230V AC	400V DC	460V AC	800V DC	—	—
240V AC	415V DC	480V AC	830V DC	—	—

① Input power with tolerance ±10%

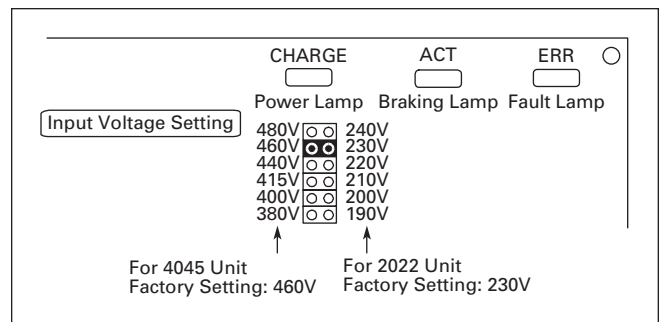


Figure 6. Input Voltage Setting for 2022/4045 Braking Unit

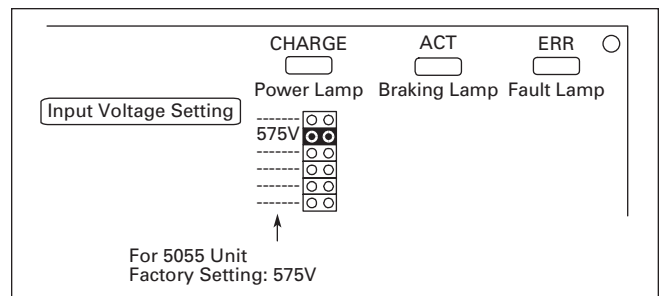


Figure 7. Input Voltage Setting for 5055 Braking Unit

- MASTER/SLAVE setting: The MASTER/SLAVE jumper is set “MASTER” as factory setting. The “SLAVE” setting is applied to two or more braking units in parallel, making these braking units enabled/disabled synchronously. Then the power dissipation of each unit will be equivalent so that they can perform the braking function completely.

The SLAVE braking application of three braking units is shown in Figure 8. After wiring, the jumper of first unit shall be set as “MASTER” and that of others must be set as “SLAVE” to complete the system installation.

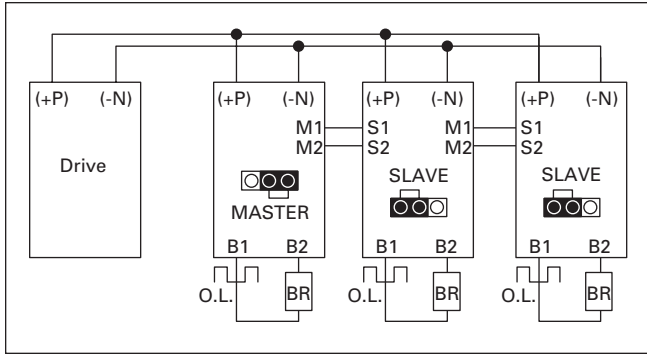


Figure 8. SLAVE Braking Application

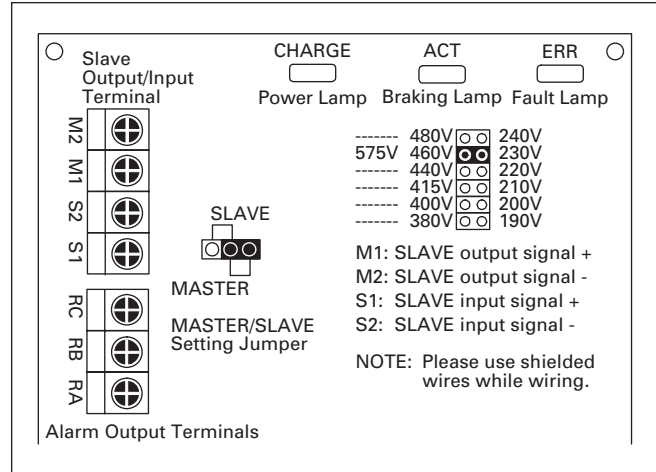


Figure 9. The Position of the Jumper

All Braking Resistors and Braking Units Used in the AC Drives

Table 4. Braking Specifications

Applicable Motor		Full Load Torque of System Nm	Total Resistance and Wattage Applied to Drive	Braking Unit/No. of Units Used	Braking Resistor Kit P/N and No. of Units in Kit	Braking Torque @ 10% ED with Kit
hp	kW					
230 Voltage						
1	0.75	0.427	80W 200 Ω	①	① K13-000034-0821	1 125%
2	1.5	0.849	300W 100 Ω	①	① K13-000034-0861	1 125%
3	2.2	1.262	300W 100 Ω	①	① K13-000034-0861	1 125%
5	3.7	2.080	400W 40 Ω	①	① K13-000034-0825	1 125%
7-1/2	5.5	3.111	500W 30 Ω	①	① K13-000034-0826	2 125%
10	7.5	4.148	1000W 20 Ω	①	① K13-000034-0862	① 125%
15	11	6.186	2400W 13.6 Ω	①	① K13-000034-0863	① 125%
20	15	8.248	3000W 10 Ω	GBM2022	1 K13-000034-0864	1 125%
25	18.5	10.281	4800W 8 Ω	GBM2022	1 K13-000034-0865	1 125%
30	22	12.338	4800W 6.8 Ω	GBM2022	1 K13-000034-0866	1 125%
40	30	16.497	6000W 5 Ω	GBM2022	2 K13-000034-0867	2 125%
50	37	20.6	9600W 4 Ω	GBM2022	2 K13-000034-0868	2 125%
460 Voltage						
1	0.75	0.427	80W 750 Ω	①	① K13-000034-0841	1 125%
2	1.5	0.849	300W 400 Ω	①	① K13-000034-0843	1 125%
3	2.2	1.262	300W 250 Ω	①	① K13-000034-0843	1 125%
5	3.7	2.080	400W 150 Ω	①	① K13-000034-0844	1 125%
7-1/2	5.5	3.111	500W 100 Ω	①	① K13-000034-0845	2 125%
10	7.5	4.148	1000W 75 Ω	①	① K13-000034-0846	3 125%
15	11	6.186	1000W 50 Ω	①	① K13-000034-0869	① 125%
20	15	8.248	1500W 40 Ω	GBM4045	1 K13-000034-0870	1 125%
25	18.5	10.281	4800W 32 Ω	GBM4045	1 K13-000034-0871	1 125%
30	22	12.338	4800W 27.2 Ω	GBM4045	1 K13-000034-0872	1 125%
40	30	16.497	6000W 20 Ω	GBM4045	1 K13-000034-0873	1 125%
50	37	20.6	9600W 16 Ω	GBM4045	1 K13-000034-0874	1 125%
60	45	24.745	9600W 13.6 Ω	GBM4045	1 K13-000034-0875	1 125%
75	55	31.11	12000W 10 Ω	GBM4045	2 K13-000034-0876	2 125%
100	75	42.7	19200W 6.8 Ω	GBM4045	2 K13-000034-0877	2 125%

① Contact Eaton.

Table 4. Braking Specifications (Continued)

Applicable Motor		Full Load Torque of System Nm	Total Resistance and Wattage Applied to Drive	Braking Unit/No. of Units Used	Braking Resistor Kit P/N and No. of Units in Kit			Braking Torque @ 10% ED with Kit
hp	kW							
575 Voltage								
1	0.75	0.427	300W 400 Ω	①	①	①	1	125%
2	1.5	0.849	300W 250 Ω	①	①	①	1	125%
3	2.2	1.262	400W 150 Ω	①	①	①	2	125%
5	3.7	2.08	400W 150 Ω	①	①	①	2	125%
7-1/2	5.5	3.111	500W 100 Ω	①	①	①	2	125%
10	7.5	4.148	500W 100 Ω	①	①	①	1	125%
15	11	6.186	500W 100 Ω	①	①	①	①	125%
20	15	8.248	4000W 75 Ω	GBM5055	1	①	1	125%
25	18.5	10.281	4000W 50 Ω	GBM5055	1	①	1	125%
30	22	12.338	6000W 40 Ω	GBM5055	1	①	1	125%
40	30	16.497	6000W 40 Ω	GBM5055	1	①	1	125%
50	37	20.6	8000W 25 Ω	GBM5055	1	①	1	125%
60	45	24.75	8000W 25 Ω	GBM5055	1	①	1	125%
75	55	31.11	12000W 20 Ω	GBM5055	1	①	1	125%
100	75	42.7	16000W 12.5 Ω	GBM5055	2	①	2	125%

① Contact Eaton.

Wiring Examples of Braking Resistors

Before wiring, please note equivalent resistors value shown in the column "Min. Equivalent Resistors for Each Braking Unit" in **Table 1** to prevent damage.

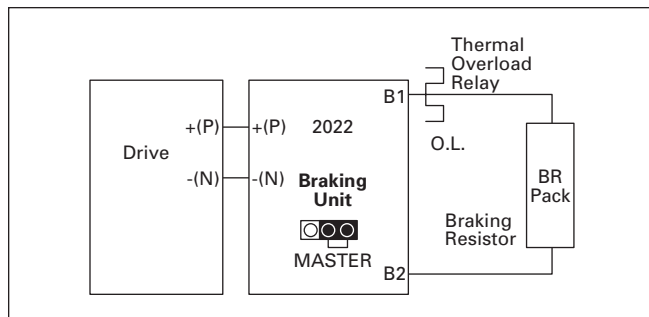


Figure 10. 230V 20, 25, 30 hp

1. 230V 20 hp GVX drive with one GBM 2022 and one K13-000034-0864.
2. 230V 25 hp GVX drive with one GBM 2022 and one K13-000034-0865.
3. 230V 30 hp GVX drive with one GBM 2022 and one K13-000034-0866.

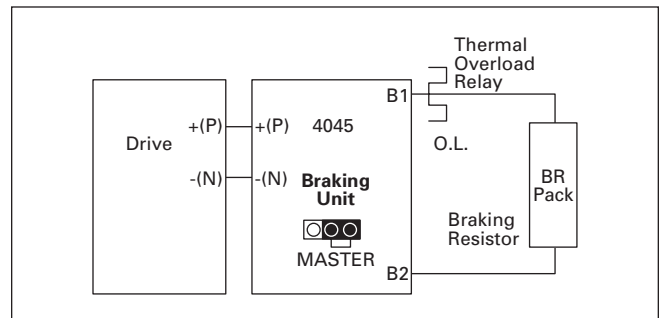


Figure 11. 460V 20, 25, 30, 40, 50, 60 hp

1. 460V 20 hp GVX drive with one GBM 4045 and one K13-000034-0870.
2. 460V 25 hp GVX drive with one GBM 4045 and one K13-000034-0871.
3. 460V 30 hp GVX drive with one GBM 4045 and one K13-000034-0872.
4. 460V 40 hp GVX drive with one GBM 4045 and one K13-000034-0873.
5. 460V 50 hp GVX drive with one GBM 4045 and one K13-000034-0874.
6. 460V 60 hp GVX drive with one GBM 4045 and one K13-000034-0875.

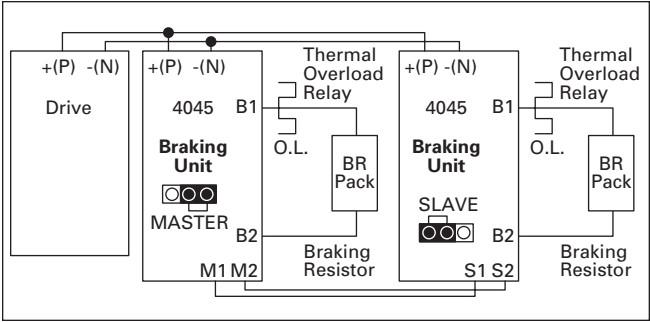


Figure 12. 460V 75, 100 hp and 230V 40, 50 hp

1. 460V 75 hp GVX drive with two GBM 4045 and two K13-000034-0876.
2. 460V 100 hp GVX drive with two GBM 4045 and two K13-000034-0877.
3. 230V 40 hp GVX drive with two GBM 2022 and two K13-000034-0867.
4. 230V 50 hp GVX drive with two GBM 2022 and two K13-000034-0868.

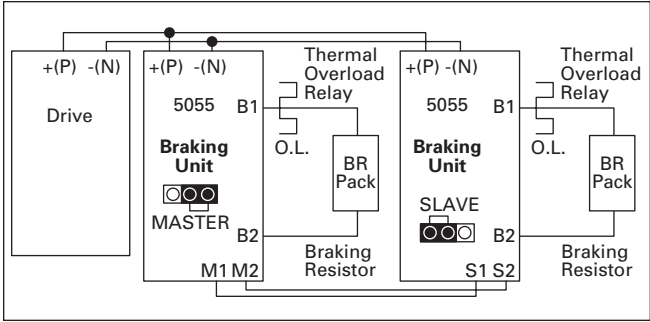


Figure 14. 575V 100 hp

1. Please contact Eaton.

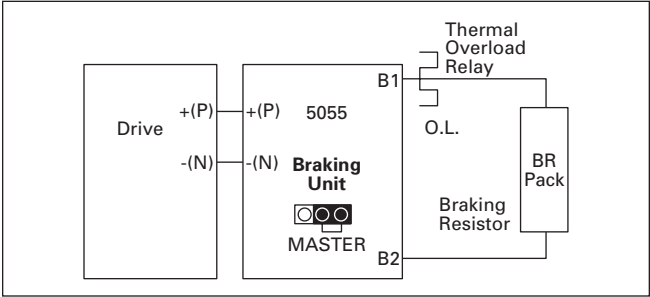


Figure 13. 575V 20, 30, 40, 50, 60, 75 hp

1. Please contact Eaton.

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