

Brake Control Rectifiers

NORD brake control rectifiers convert AC voltage to DC voltage. Rectifiers are used because most applications require AC voltage to power the motor, but DC power is required to power the brake and DC power is not typically available. NORD brake motors typically include the rectifier located inside the terminal box.

Rectifier Advantages

- Individual power source for each brake.
- Compact size, mounted inside the terminal box.
- Multiple types, voltage options and release/engagement modes available.
- Mountable in a separate control cabinet.
- Integral protection against voltage spikes.

Model	Type	Part No.	Color	Input Voltage $V_{AC} \pm 10\%$	Rated Current A_{DC}	
					(40 °C)	(75 °C)
GVE20L	Full-wave	19141000	Black	110-275	1.5	1.0
GVE20V	Full-wave	19141030	Black	110-275	1.5	1.0
GHE40L	Half-wave	19141010	Yellow	200-480	2.0	1.0
GHE40V	Half-wave	19141040	Yellow	200-480	2.0	1.0
GHE50L	Half-wave	19141020	Gray	200-575	2.0	1.0
GHE50V	Half-wave	19141050	Gray	200-575	2.0	1.0
GUE40V	Dual-wave	19140300	Black	190-460	0.7	0.5
PMG500	Push-Hybrid	19140200	Black	200-500	4.0	2.8

Rectifier electronics are sealed for moisture-protection; electronics on models ending with the suffix “V” are resin-encapsulated to provide added protection if water should get into the motor terminal box.

Rectifier Types

Full-wave rectifier [GVE]:

A rectifier in which both the positive and negative half-cycles of the AC input signal are rectified to produce a uni-directional DC current supply to the load or the brake. The output voltage is 90% of the input voltage ($V_{DC} = 0.90 \times V_{AC}$).

Half-wave rectifier [GHE]:

A rectifier in which only alternate half-cycles of the AC input signal are rectified to produce a uni-directional DC current supply to the load or the brake. The output voltage is 45% of the input voltage ($V_{DC} = 0.45 \times V_{AC}$).

Dual Wave Rectifier [GUE]

A rectifier that can be wired as either a full-wave rectifier or a half-wave rectifier depending upon how it is connected to the AC input signal.



IMPORTANT NOTE

If the motor is connected to a frequency inverter, soft start, or is a two-speed motor, then separate AC power must be supplied to the brake rectifier.

Rectifier Types [Ctd.]

PMG 500 Push-Hybrid rectifier [PMG]:

A fast-acting or push-hybrid brake rectifier provides an initial “push” in the form of a timed full-wave brake-release function, which is then followed by a continuous half-wave brake-holding function. There are two ways to apply these rectifiers as follows:

- “Overexcitation” of the brake coil provides faster brake release or improved cycling capacity. The DC voltage of the brake coil is determined based upon using a half-wave rectifier. The output voltage is 45% of the input voltage ($V_{DC} = 0.45 \times V_{AC}$).
- “Reducer-Power Holding” of the brake coil maintains the brake in a released state by using only 25% of the power needed for the initial brake release. This results in very fast brake stopping. The DC voltage of the brake coil is determined based upon using a full-wave rectifier. The output voltage is 90% of the input voltage. ($V_{DC} = 0.90 \times V_{AC}$).

NORD offers additional fast-acting rectifiers besides the PMG 500. For additional details please reference User Manual U35100 - Fast Acting Brake Rectifiers.

NOTICE

In order to prevent rapid wear, the PMG 500 rectifier is required when utilizing the larger 800 Nm (590 lb-ft) and 1200 Nm (885 lb-ft) twin-rotor brakes. The PMG 500 rectifier is wired to “overexcite” the brake during its initial release.

Brake Switching Options

The rectifiers discussed in this manual can be wired to allow brake switching at either the AC power source (input) or the DC power source (output).

- AC switching allows the brake rectifier to be powered directly from the motor’s terminal block with no additional wiring. However, this provides a slower brake stopping time due to the additional time needed to de-energize or collapse the motor’s magnetic field.
- DC switching directly interrupts the current flow in the DC circuit of the brake rectifier. This method of brake switching guarantees faster brake stopping or brake engagement times.



WARNING

When the moving system undergoes a change in height (such as in a lift or incline conveyor application) or if the system tends to speed up or overhaul during normal operation, then DC-switching of the brake is required in order to prevent excessive load movement, drift or falling loads during stopping.

Figure 2.1: GVE/GHE Dimensions

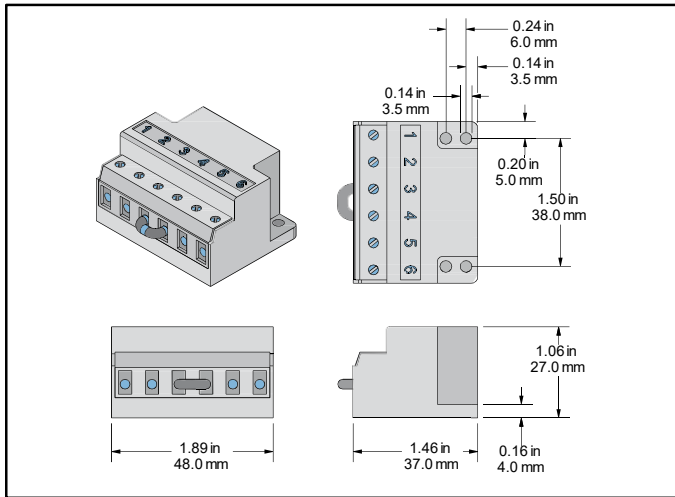


Figure 3.1: GUE Dimensions

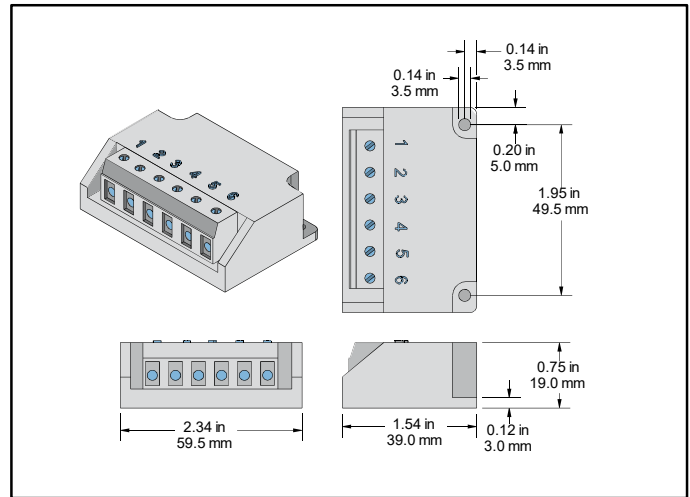


Figure 2.2: GVE/GHE Braking Methods

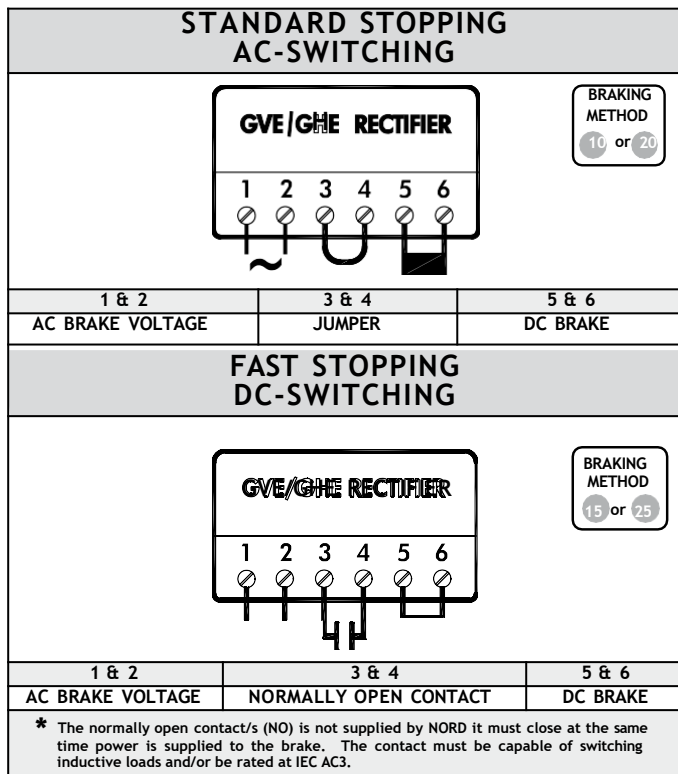
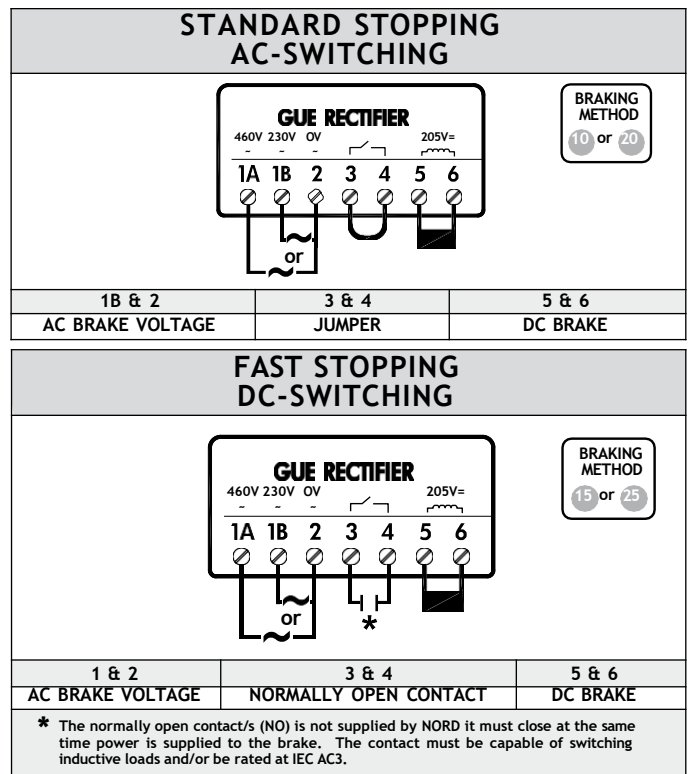


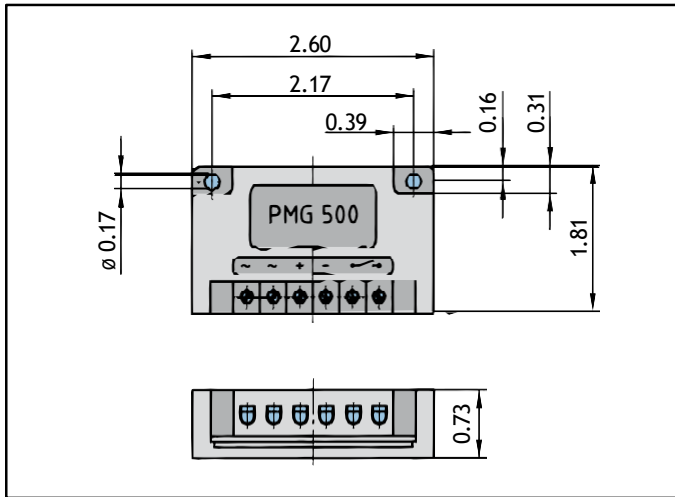
Figure 3.2: GVE/GHE Braking Methods



Braking Method	Break Release (Start)	Brake Engage (Stop)	Power Source
10	Standard	Standard (AC-Switching)	Motor terminals
15	Standard	Fast (DC-switching)	Motor terminals
20	Standard	Standard (AC-Switching)	Separate power
25	Standard	Fast (DC-switching)	Separate power

Braking Method	Break Release (Start)	Brake Engage (Stop)	Power Source
10	Standard	Standard (AC-Switching)	Motor terminals
15	Standard	Fast (DC-switching)	Motor terminals
20	Standard	Standard (AC-Switching)	Separate power
25	Standard	Fast (DC-switching)	Separate power

Figure 4.1: PMG 500 Dimensions



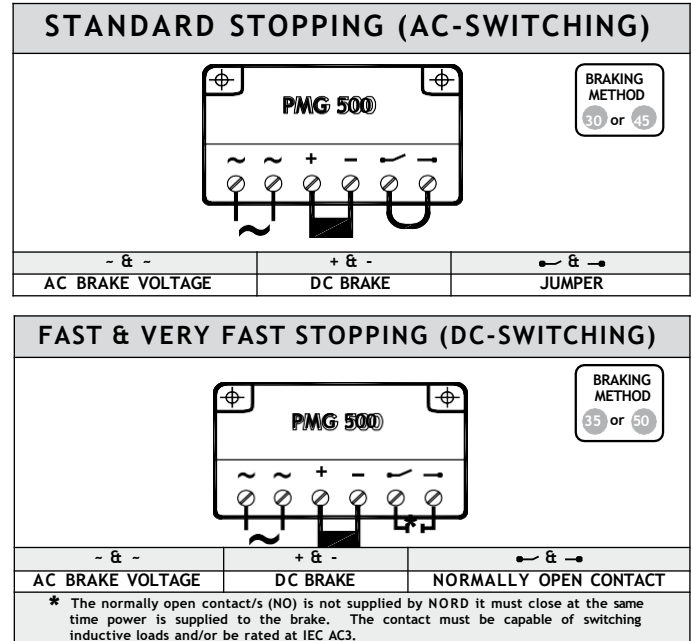
PMG 500 Push-Hybrid Rectifier

The PMG 500 rectifier provides an initial “push” the form of a timed full-wave brake-release function, which is then followed by a continuous half-wave brake-holding function.

- In order to prevent rapid wear, the PMG 500 rectifier is required when utilizing the larger 800 Nm (590 lb-ft) - and 1200 Nm (885 lb-ft) twin-rotor brakes.
- The PMG 500 rectifier is wired to “overexcite” the brake during its initial release. The DC voltage of the brake coil is determined based upon using a half-wave rectifier.

In some applications the PMG rectifier may be used for “Reduced Power Holding” or very fast brake engagement (See user manual U35100 for details).

Figure 4.2: PMG 500 Braking Methods



Braking Method	Break Release (Start)	Brake Engage (Stop)	Power Source
30	Fast (Overexcitation)	Standard (AC Switching)	Motor terminals
35	Fast (Overexcitation)	Fast (DC Switching)	Motor terminals
45	Fast (Overexcitation)	Standard (AC Switching)	Separate power
50	Fast (Overexcitation)	Fast (DC Switching)	Separate power



IMPORTANT NOTE

If the motor is connected to an AC drive, soft start, or is a two-speed motor, the AC power must be supplied to the brake rectifier separately from the motor power.

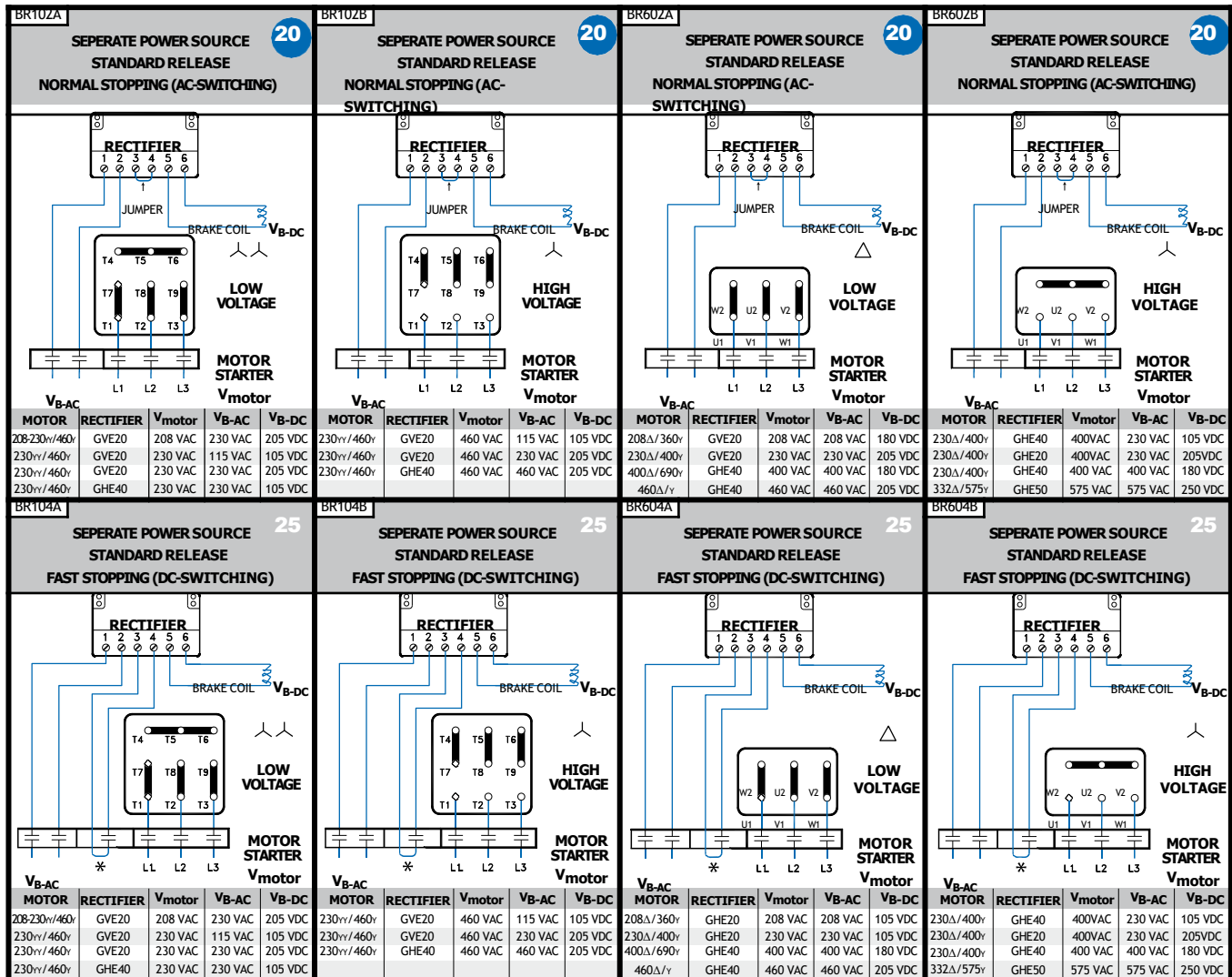
Typical Connection Diagrams

BR101A POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE NORMAL STOPPING (AC-SWITCHING) 10 <table><tr><th>MOTOR</th><th>RECTIFIER</th><th>V_{motor}</th><th>V_{B-AC}</th><th>V_{B-DC}</th></tr><tr><td>208/230V/460V</td><td>GVE20</td><td>208 VAC</td><td>230 VAC</td><td>205 VDC</td></tr><tr><td>230V/460V</td><td>GVE20</td><td>230 VAC</td><td>230 VAC</td><td>205 VDC</td></tr><tr><td>230V/460V</td><td>GHE40</td><td>230 VAC</td><td>230 VAC</td><td>105 VDC</td></tr></table>	MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}	208/230V/460V	GVE20	208 VAC	230 VAC	205 VDC	230V/460V	GVE20	230 VAC	230 VAC	205 VDC	230V/460V	GHE40	230 VAC	230 VAC	105 VDC	BR101B POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE NORMAL STOPPING (AC-SWITCHING) 10 <table><tr><th>MOTOR</th><th>RECTIFIER</th><th>V_{motor}</th><th>V_{B-AC}</th><th>V_{B-DC}</th></tr><tr><td>230V/460V</td><td>GVE20</td><td>460 VAC</td><td>230 VAC</td><td>205 VDC</td></tr><tr><td>230V/460V</td><td>GHE40</td><td>460 VAC</td><td>230 VAC</td><td>105 VDC</td></tr></table>	MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}	230V/460V	GVE20	460 VAC	230 VAC	205 VDC	230V/460V	GHE40	460 VAC	230 VAC	105 VDC	BR101C POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE NORMAL STOPPING (AC-SWITCHING) 10 <table><tr><th>MOTOR</th><th>RECTIFIER</th><th>V_{motor}</th><th>V_{B-AC}</th><th>V_{B-DC}</th></tr><tr><td>230V/460V</td><td>GHE40</td><td>460 VAC</td><td>460 VAC</td><td>205 VDC</td></tr></table>	MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}	230V/460V	GHE40	460 VAC	460 VAC	205 VDC	BR601A POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE NORMAL STOPPING (AC-SWITCHING) 10 <table><tr><th>MOTOR</th><th>RECTIFIER</th><th>V_{motor}</th><th>V_{B-AC}</th><th>V_{B-DC}</th></tr><tr><td>208Δ/360V</td><td>GVE20</td><td>208 VAC</td><td>208 VAC</td><td>180 VDC</td></tr><tr><td>230Δ/400V</td><td>GVE20</td><td>230 VAC</td><td>230 VAC</td><td>205 VDC</td></tr><tr><td>400Δ/690V</td><td>GHE40</td><td>400 VAC</td><td>400 VAC</td><td>180 VDC</td></tr><tr><td>460Δ/Y</td><td>GHE40</td><td>460 VAC</td><td>460 VAC</td><td>205 VDC</td></tr></table>	MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}	208Δ/360V	GVE20	208 VAC	208 VAC	180 VDC	230Δ/400V	GVE20	230 VAC	230 VAC	205 VDC	400Δ/690V	GHE40	400 VAC	400 VAC	180 VDC	460Δ/Y	GHE40	460 VAC	460 VAC	205 VDC
MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}																																																																					
208/230V/460V	GVE20	208 VAC	230 VAC	205 VDC																																																																					
230V/460V	GVE20	230 VAC	230 VAC	205 VDC																																																																					
230V/460V	GHE40	230 VAC	230 VAC	105 VDC																																																																					
MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}																																																																					
230V/460V	GVE20	460 VAC	230 VAC	205 VDC																																																																					
230V/460V	GHE40	460 VAC	230 VAC	105 VDC																																																																					
MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}																																																																					
230V/460V	GHE40	460 VAC	460 VAC	205 VDC																																																																					
MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}																																																																					
208Δ/360V	GVE20	208 VAC	208 VAC	180 VDC																																																																					
230Δ/400V	GVE20	230 VAC	230 VAC	205 VDC																																																																					
400Δ/690V	GHE40	400 VAC	400 VAC	180 VDC																																																																					
460Δ/Y	GHE40	460 VAC	460 VAC	205 VDC																																																																					
BR601B POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE NORMAL STOPPING (AC-SWITCHING) 10 <table><tr><th>MOTOR</th><th>RECTIFIER</th><th>V_{motor}</th><th>V_{B-AC}</th><th>V_{B-DC}</th></tr><tr><td>230Δ/400V</td><td>GVE20</td><td>400 VAC</td><td>230 VAC</td><td>205 VDC</td></tr></table>	MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}	230Δ/400V	GVE20	400 VAC	230 VAC	205 VDC	BR601C POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE NORMAL STOPPING (AC-SWITCHING) 10 <table><tr><th>MOTOR</th><th>RECTIFIER</th><th>V_{motor}</th><th>V_{B-AC}</th><th>V_{B-DC}</th></tr><tr><td>230Δ/400V</td><td>GHE40</td><td>400 VAC</td><td>400 VAC</td><td>180 VDC</td></tr><tr><td>332Δ/575V</td><td>GHE50</td><td>575 VAC</td><td>575 VAC</td><td>250 VDC</td></tr></table>	MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}	230Δ/400V	GHE40	400 VAC	400 VAC	180 VDC	332Δ/575V	GHE50	575 VAC	575 VAC	250 VDC	BR603A POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE FAST STOPPING (DC-SWITCHING) 15 <table><tr><th>MOTOR</th><th>RECTIFIER</th><th>V_{motor}</th><th>V_{B-AC}</th><th>V_{B-DC}</th></tr><tr><td>208Δ/360V</td><td>GVE20</td><td>208 VAC</td><td>208 VAC</td><td>180 VDC</td></tr><tr><td>230Δ/400V</td><td>GVE20</td><td>230 VAC</td><td>230 VAC</td><td>205 VDC</td></tr><tr><td>400Δ/690V</td><td>GHE40</td><td>400 VAC</td><td>400 VAC</td><td>180 VDC</td></tr><tr><td>460Δ/Y</td><td>GHE40</td><td>460 VAC</td><td>460 VAC</td><td>205 VDC</td></tr></table>	MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}	208Δ/360V	GVE20	208 VAC	208 VAC	180 VDC	230Δ/400V	GVE20	230 VAC	230 VAC	205 VDC	400Δ/690V	GHE40	400 VAC	400 VAC	180 VDC	460Δ/Y	GHE40	460 VAC	460 VAC	205 VDC	BR603B POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE FAST STOPPING (DC-SWITCHING) 15 <table><tr><th>MOTOR</th><th>RECTIFIER</th><th>V_{motor}</th><th>V_{B-AC}</th><th>V_{B-DC}</th></tr><tr><td>230Δ/400V</td><td>GVE20</td><td>400 VAC</td><td>230 VAC</td><td>205 VDC</td></tr></table>	MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}	230Δ/400V	GVE20	400 VAC	230 VAC	205 VDC										
MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}																																																																					
230Δ/400V	GVE20	400 VAC	230 VAC	205 VDC																																																																					
MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}																																																																					
230Δ/400V	GHE40	400 VAC	400 VAC	180 VDC																																																																					
332Δ/575V	GHE50	575 VAC	575 VAC	250 VDC																																																																					
MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}																																																																					
208Δ/360V	GVE20	208 VAC	208 VAC	180 VDC																																																																					
230Δ/400V	GVE20	230 VAC	230 VAC	205 VDC																																																																					
400Δ/690V	GHE40	400 VAC	400 VAC	180 VDC																																																																					
460Δ/Y	GHE40	460 VAC	460 VAC	205 VDC																																																																					
MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}																																																																					
230Δ/400V	GVE20	400 VAC	230 VAC	205 VDC																																																																					
BR603C POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE FAST STOPPING (DC-SWITCHING) 15 <table><tr><th>MOTOR</th><th>RECTIFIER</th><th>V_{motor}</th><th>V_{B-AC}</th><th>V_{B-DC}</th></tr><tr><td>230Δ/400V</td><td>GHE40</td><td>400 VAC</td><td>400 VAC</td><td>180 VDC</td></tr><tr><td>332Δ/575V</td><td>GHE50</td><td>575 VAC</td><td>575 VAC</td><td>250 VDC</td></tr></table>	MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}	230Δ/400V	GHE40	400 VAC	400 VAC	180 VDC	332Δ/575V	GHE50	575 VAC	575 VAC	250 VDC	BR103A POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE FAST STOPPING (DC-SWITCHING) 15 <table><tr><th>MOTOR</th><th>RECTIFIER</th><th>V_{motor}</th><th>V_{B-AC}</th><th>V_{B-DC}</th></tr><tr><td>208/230V/460V</td><td>GVE20</td><td>208 VAC</td><td>230 VAC</td><td>205 VDC</td></tr><tr><td>230V/460V</td><td>GVE20</td><td>230 VAC</td><td>230 VAC</td><td>205 VDC</td></tr><tr><td>230V/460V</td><td>GHE40</td><td>230 VAC</td><td>230 VAC</td><td>105 VDC</td></tr></table>	MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}	208/230V/460V	GVE20	208 VAC	230 VAC	205 VDC	230V/460V	GVE20	230 VAC	230 VAC	205 VDC	230V/460V	GHE40	230 VAC	230 VAC	105 VDC	BR103B POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE FAST STOPPING (DC-SWITCHING) 15 <table><tr><th>MOTOR</th><th>RECTIFIER</th><th>V_{motor}</th><th>V_{B-AC}</th><th>V_{B-DC}</th></tr><tr><td>230V/460V</td><td>GVE20</td><td>460 VAC</td><td>230 VAC</td><td>205 VDC</td></tr></table>	MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}	230V/460V	GVE20	460 VAC	230 VAC	205 VDC	BR103C POWERED FROM MOTOR TERMINAL BLOCK STANDARD RELEASE FAST STOPPING (DC-SWITCHING) 15 <table><tr><th>MOTOR</th><th>RECTIFIER</th><th>V_{motor}</th><th>V_{B-AC}</th><th>V_{B-DC}</th></tr><tr><td>230V/460V</td><td>GHE40</td><td>460 VAC</td><td>460 VAC</td><td>205 VDC</td></tr></table>	MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}	230V/460V	GHE40	460 VAC	460 VAC	205 VDC															
MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}																																																																					
230Δ/400V	GHE40	400 VAC	400 VAC	180 VDC																																																																					
332Δ/575V	GHE50	575 VAC	575 VAC	250 VDC																																																																					
MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}																																																																					
208/230V/460V	GVE20	208 VAC	230 VAC	205 VDC																																																																					
230V/460V	GVE20	230 VAC	230 VAC	205 VDC																																																																					
230V/460V	GHE40	230 VAC	230 VAC	105 VDC																																																																					
MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}																																																																					
230V/460V	GVE20	460 VAC	230 VAC	205 VDC																																																																					
MOTOR	RECTIFIER	V _{motor}	V _{B-AC}	V _{B-DC}																																																																					
230V/460V	GHE40	460 VAC	460 VAC	205 VDC																																																																					

* The normally open contact/s (NO) is not supplied by NORD. It must close at the same time power is supplied to the brake. The contact must be capable of switching inductive loads and/or be rated IEC AC3.

 = Braking Method

Typical Connection Diagrams



* The normally open contact/s (NO) is not supplied by NORD. It must close at the same time power is supplied to the brake. The contact must be capable of switching inductive loads and/or be rated IEC AC3.

= Braking Method

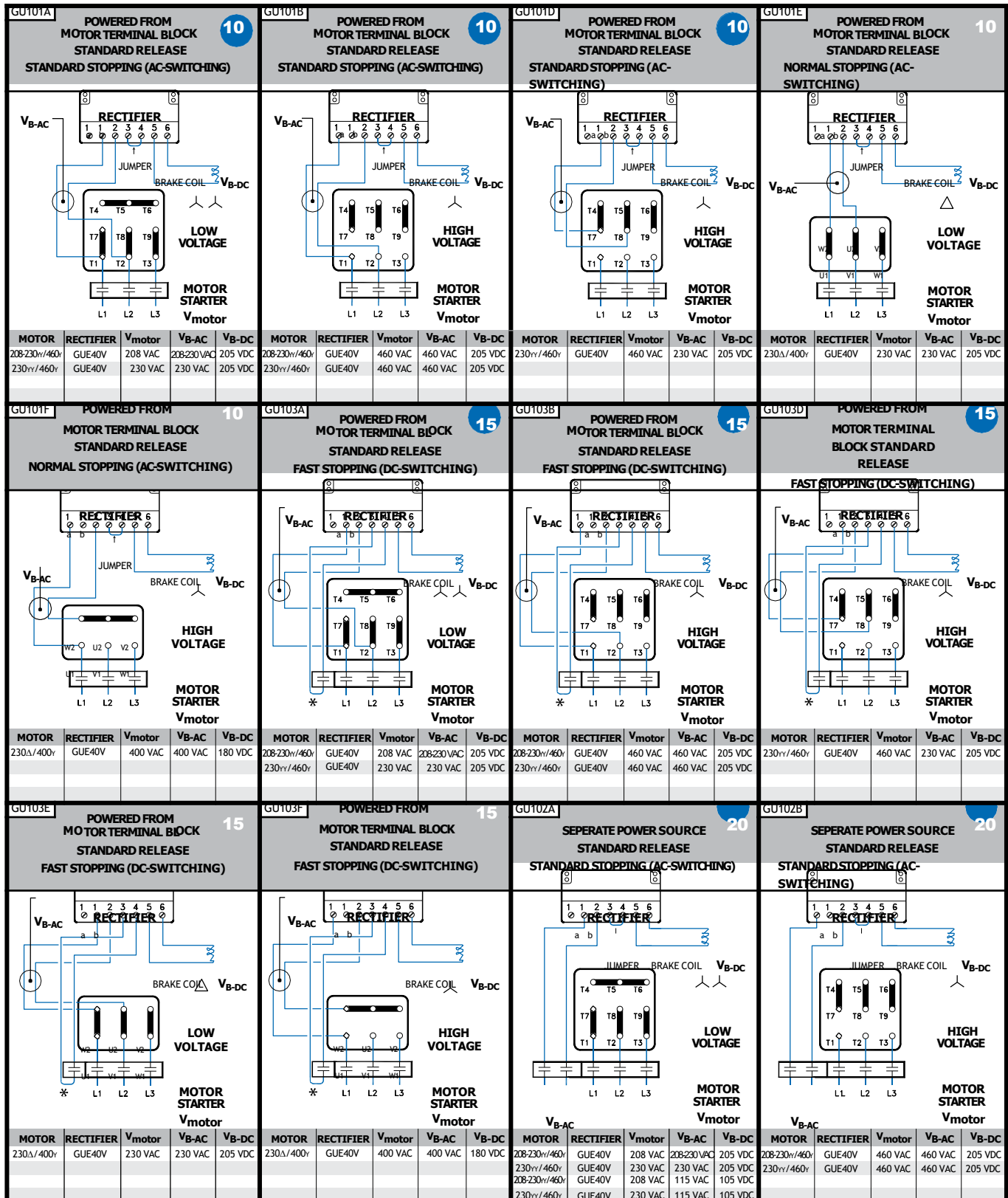
MOTOR BRAKES INSTALLATION & MAINTENANCE



RETAIN FOR FUTURE USE

U35000 - 7 of 12

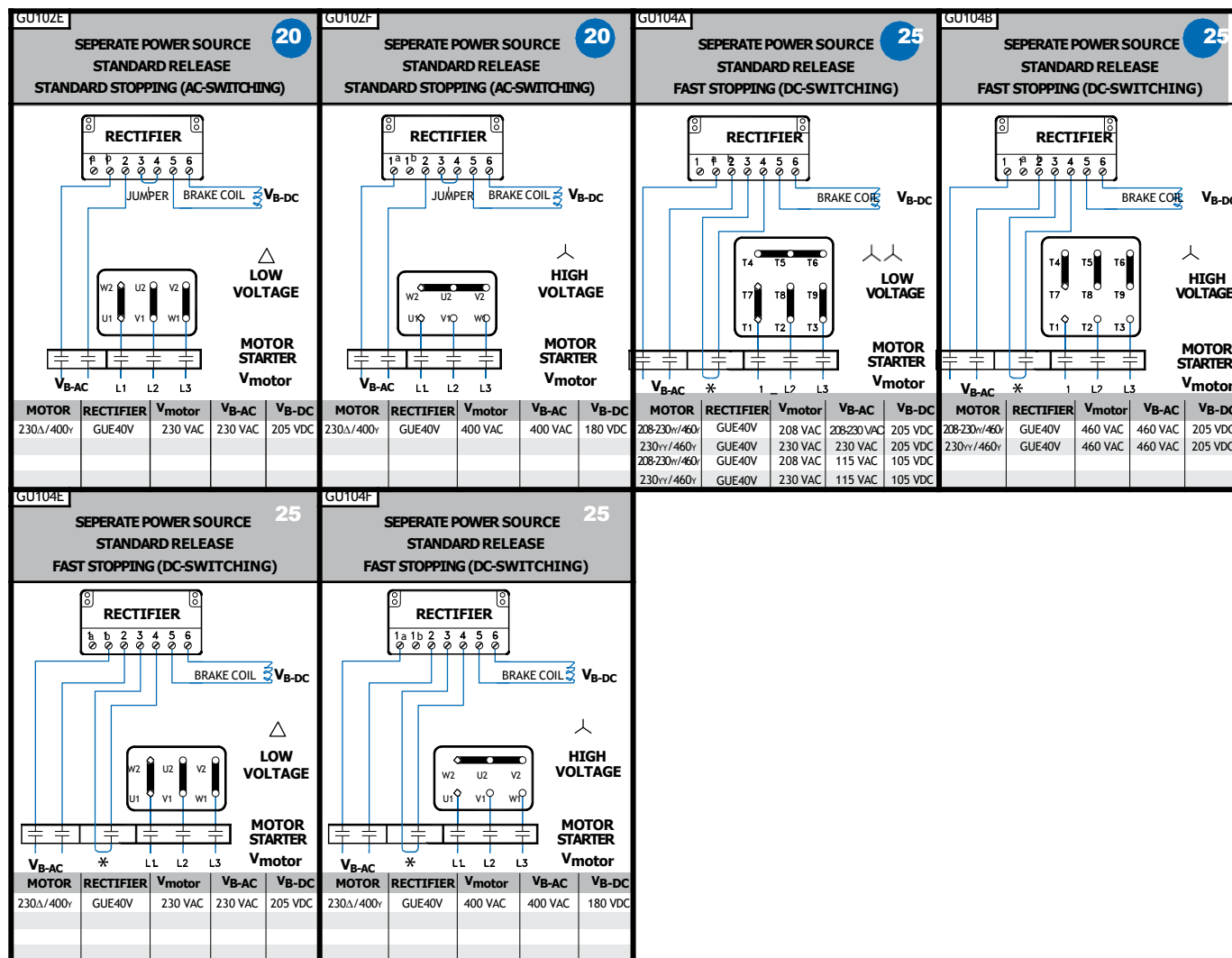
Typical Connection Diagrams



* The normally open contact/s (NO) is not supplied by NORD. It must close at the same time power is supplied to the brake. The contact must be capable of switching inductive loads and/or be rated IEC AC3.

= Braking Method

Typical Connection Diagrams

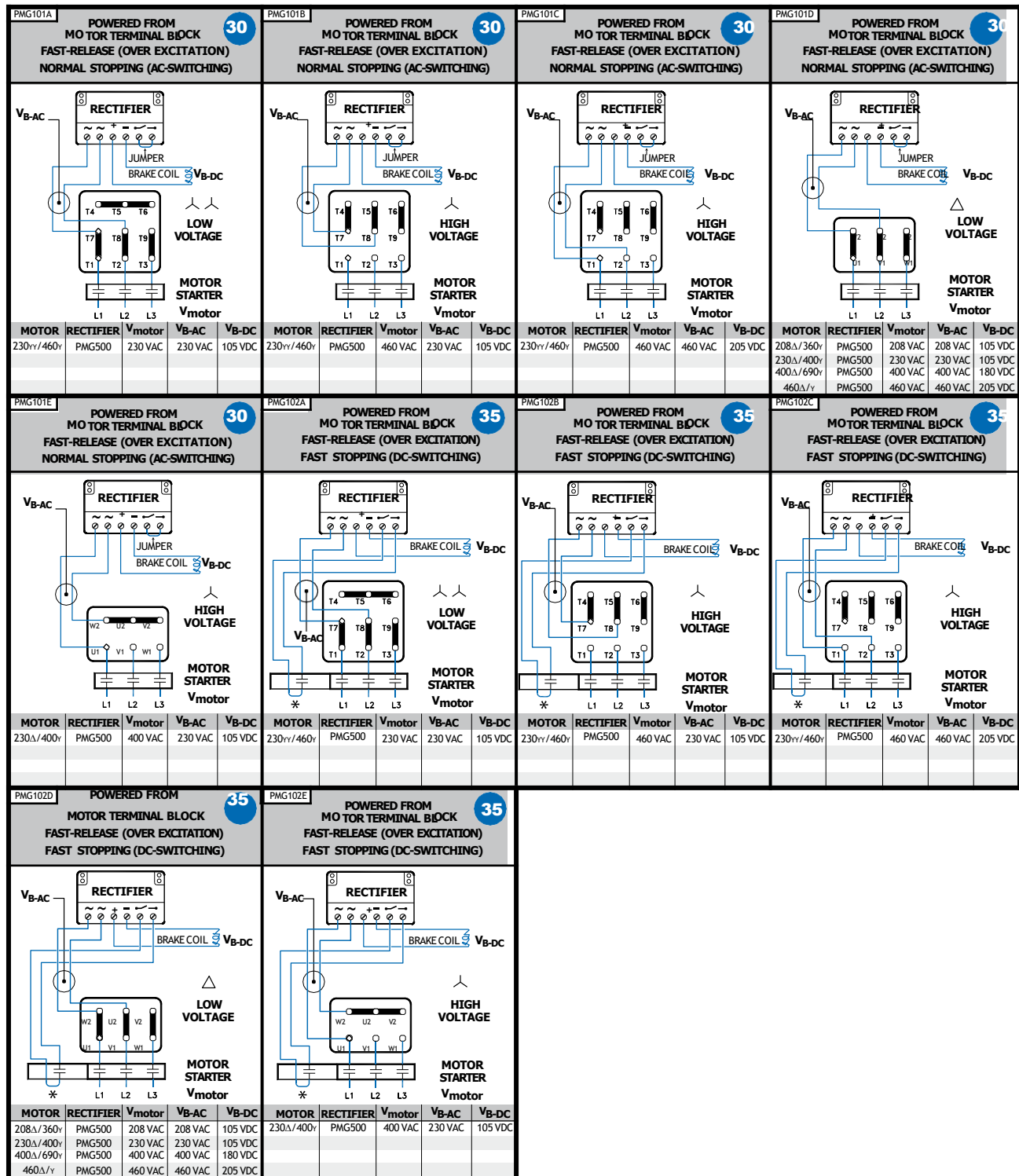


* The normally open contact/s (NO) is not supplied by NORD. It must close at the same time power is supplied to the brake. The contact must be capable of switching inductive loads and/or be rated IEC AC3.



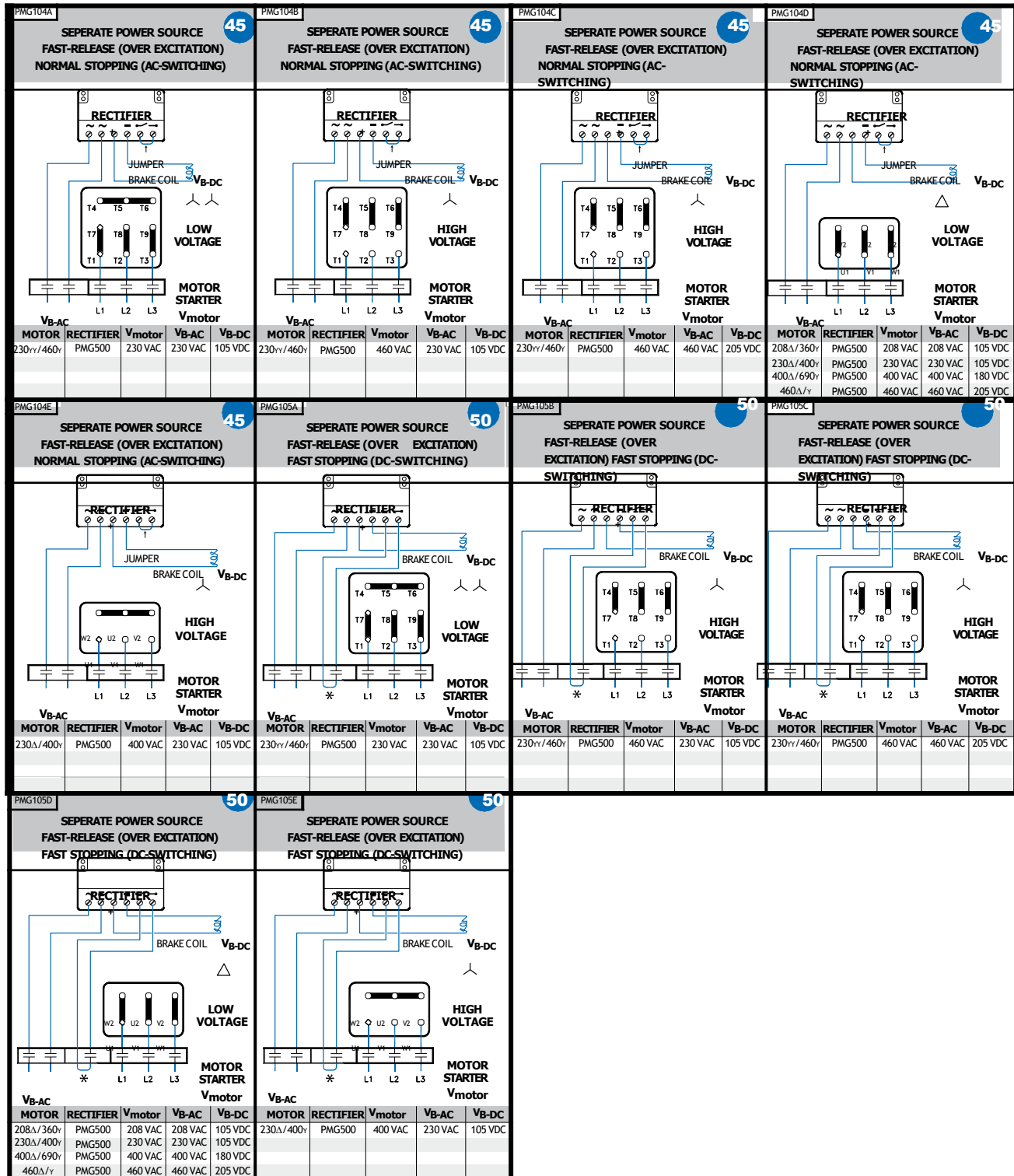
= Braking Method

Typical Connection Diagrams



* The normally open contact/s (NO) is not supplied by NORD. It must close at the same time power is supplied to the brake. The contact must be capable of switching inductive loads and/or be rated IEC AC3.

 = Braking Method



* The normally open contact/s (NO) is not supplied by NORD. It must close at the same time power is supplied to the brake. The contact must be capable of switching inductive loads and/or be rated IEC AC3.

= Braking Method

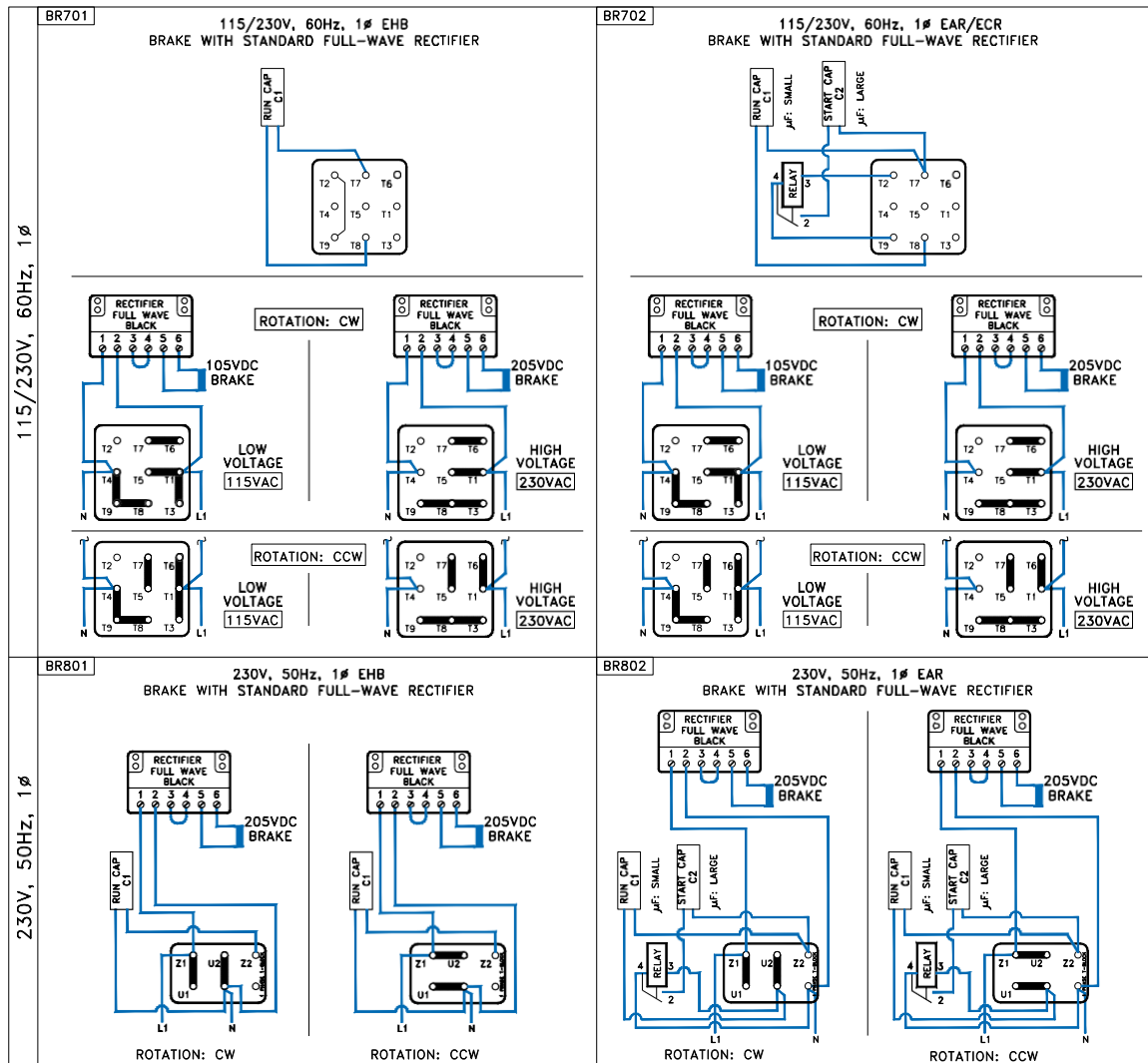
MOTOR BRAKES INSTALLATION & MAINTENANCE



RETAIN FOR FUTURE USE

U35000 - 11 of 12

Typical Connection Diagrams - Single Phase Motors



MOTOR BRAKES INSTALLATION & MAINTENANCE

Troubleshooting Information

Troubleshooting	Cause	Remedy
Brake doesn't release	Air gap too large	Check air gap and adjust
	Brake not receiving electrical power	Check electrical connection
	Failed rectifier	Replace rectifier
	Brake is getting too warm	Use fast response (FR) rectifier
	Voltage to brake coil too small	Check connection voltage of brake coil
	Rectifier supply voltage from inverter	Rectifier voltage must be from separate source. (Inverter output voltage varies)
Brake release is delayed	Air gap too large	Check air gap and adjust
	Voltage to brake coil too small	Check connection voltage of brake coil
Brake does not engage	Voltage to coil too large	Check connection voltages of brake windings
	Hand release is adjusted incorrectly	Adjust to correct air gap
	Anchor plate mechanically blocked	Remove mechanical blockage
Brake engagement is delayed	Voltage to coil too large	Check connection voltage of brake windings
	Brake is switched to AC side	Use DC switching