VFDB Series Braking Modules Instruction Sheet

VFDB6055, VFDB6110, VFDB6160, VFDB6200

1. Preface

VFDB braking units are applied to absorb the motor regeneration energy when the three-phase induction motor stops by deceleration. With VFDB 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. VFDB braking units are suitable for DELTA AC Motor Drives VFD Series 460V. VFDB braking units need to be used in conjunction with BR series braking resistors to provide the optimum braking characteristics. The content of this instruction sheet may be revised without prior notice. Please consult our distributors or download the most updated version at http://www.deltaww.com/iadownload_acmotordrive.

2. Specifications

VFDB Braking Units

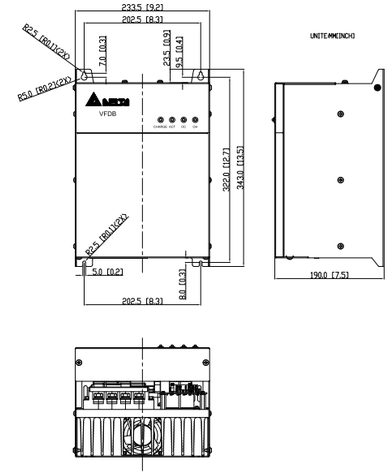
Specification		690V Series			
Model VFDB□□□□		6055	6110	6160	6200
Max. Motor Capacity (KW)		55	110	160	200
Output Rating	Max. Discharge Current (A peak) 10%ED	46	92	136	162
	Continuous Discharge Current(A)	29	59	86	107
	Braking Start-up Voltage (DC)	860 / 940 / 980 / 1020 / 1080 / 1120 ± 9V			
Input Rating	DC Voltage	600–1120 V_{DC}			
Min. Equivalent Resistor for Each Braking Unit		24.5Ω	12.2Ω	8.2Ω	6.9Ω
Protection	Over-current level (A)	70	140	210	250
	Power Charge Display	Blackout until bus (DC+–DC-) voltage is below 230V_{DC}			
	Overheat Alarm Output	RELAY contact 3A 250V_{AC} / 28V_{DC} (RA, RC)			
Environment	Installation Location	Indoor (no corrosive gases, metallic dust)			
	Operating Temperature	-10°C–+50°C (14°F–122°F)			
	Storage Temperature	-20°C–+60°C (-4°F–140°F)			
	Humidity	Less than 90%RH Non-condensing			
	Vibration	9.8m/S^2 (1G) under 20Hz 、2m/S^2 (0.2G) at 20–50Hz			
Mechanical Configuration		Wall-mounted enclosed type IP10			

Braking Resistors

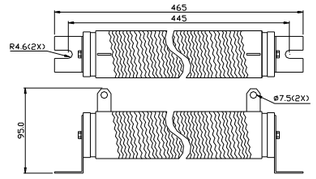
Model no.	Specification
BR1K2W033	1200W 33Ω
BR1K5W107	1500W 107Ω
BR1K0W011	1000W 11Ω
BR1K2W133	1200W 133Ω
BR1K5W012	1500W 12Ω
BR1K5W027	1500W 27Ω
BR1K5W011	1500W 11Ω

3. Dimensions and Mounting Clearance

VFDB Braking Units

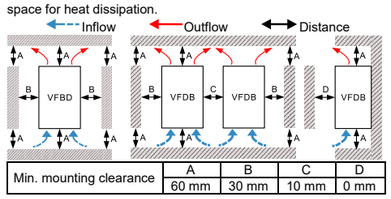


Braking Resistors



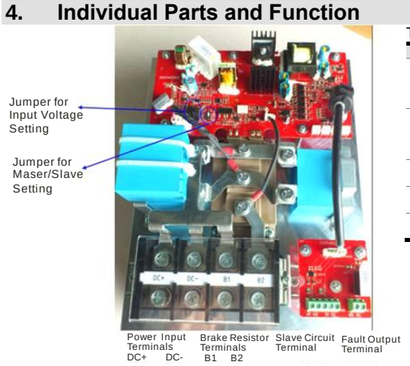
Mounting Clearance

Install the brake unit in an upright position and leave appropriate space for heat dissipation.



Min. mounting clearance	A	B	C	D
	60 mm	30 mm	10 mm	0 mm

4. Individual Parts and Function

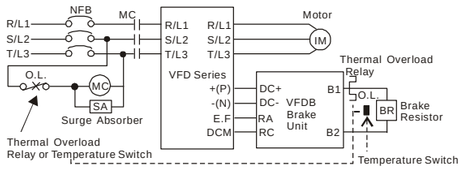


Terminal Wire Gauge

Circuit	Terminal Mark		Wire Gauge	Screw	Torque
Power Input Circuit	DC+, DC-		VFDB6055 & VFDB6110: 3–4AWG (26.67–21.15mm2) VFDB6160 & VFDB6200: 2–3AWG (33.62–26.67mm2)	M8	50kgf-cm (43 in-lbf)
Braking Resistor	B1, B2		VFDB6055&VFDB6110: 3–4AWG (26.67–21.15mm2) VFDB6160&VFDB6200: 2–3AWG (33.62–26.67mm2)		
SLAVE Circuit	Output	M1, M2	18–20AWG (0.8–0.5mm²) (with shielded wires)	M2	4 kgf-cm (3 in-lbf)
	Input	S1, S2			
Fault Circuit	RA, RC		18–20AWG (0.8–0.5mm²)		
Ground Point	⏚		8–10AWG (8.37–5.26mm²)	M5	25kgf-cm (21.5in-lbf)

5. Basic Wiring Diagram

1. 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 braking unit keeping operating resulted from unusual high input voltage. Under such circumstance, just turn off the power to prevent damaging the braking resistor.
2. Please refer to the specification of the thermal overload relay.
3. The alarm output terminals (RA, RC) of the braking unit will be activated when the temperature of the heat sink exceeds 90oC. It means that the temperature of the installation environment may exceed 50oC, 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 isn't due to the temperature, the control circuit or the temperature sensor may have been damaged. At this time, please send the braking unit back to the manufacturer or agency for repair.
4. The AC Motor 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 user manual of the AC Motor Drives VFD Series. The braking unit will detect the inner DC voltage of the AC motor 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. It can ensure the stable deceleration characteristic.
5. Besides using thermal overload relay to be the protection system and braking resistor, temperature switch can be installed on braking resistor side as the protection. The temperature switch must comply with the braking resistor specification or contact your dealer.

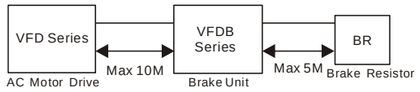


- When the AC motor drive is used with DC reactor, please refer to the wiring diagram in the AC motor drive for user manual for wiring terminal DC+ of brake unit.
- DO NOT wire terminal DC- to the neutral point of power system.

6. Wiring Notice

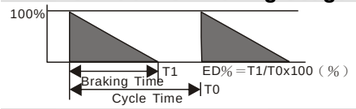
WARNING

- 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 motor drive (VFD Series), connected to the braking unit (VFDB), must be confirmed for correct polarity lest the drive and the braking unit be damaged when power on.
- When the braking unit performs braking, the wires connected to DC+, DC-, B1 and B2 would 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 lest they make interference or mis-operation.
- To prevent personal injury, do not connect / disconnect wires or regulate the setting of the braking unit while power on. Do not touch the terminals of related wiring and any component on PCB lest users be damaged by extreme dangerous DC high voltage.
- Do not connect DC reactor between the braking unit and the DC-bus capacitor of the AC motor drive.
- Wiring distance



- Inflammable solids, gases or liquids must be avoided at the location where the braking resistor is installed. The braking resistor had better be installed in individual metallic box with forced air-cooling.
- Connect the ground terminal to the Earth Ground, please comply with local regulations. The ground lead must be at least the same gauge wire as leads +(P), -(N).
- Please install the braking resistor with forced air-cooling or the equivalent when frequent deceleration braking is performed (over 10%ED).
- The ring terminals are suggested to be used for main circuit wiring. Make sure the terminals are fastened before power on.
- Twist the wires between AC motor drive and braking unit to reduce leakage inductance.

7. Definition for Braking Usage ED%



Explanation:
The definition of the barking 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.

8. The Voltage Settings

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

NOTE:

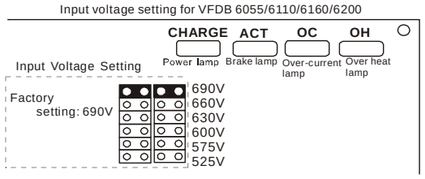
- Before regulating the power voltage, make sure the power has been turned off. Please set power voltage as the possible highest voltage for unstable power system. Take 575V_{AC} power system for example. If the voltage may be up to 620V_{AC}, 630V_{AC} should be regulated.
- For DELTA's AC motor drive VFD Series, please set parameter (Over Voltage Stall Prevention) as "close" to disable over-voltage stall prevention, to ensure stable deceleration characteristic.

The Selection of Power Voltage and Operation Potential of PN DC Voltage

690V Model AC Power Voltage	Braking Start-up voltage DC Bus (DC+、DC-) Voltage
525 V_{AC}	860 V_{DC}
575 V_{AC}	940 V_{DC}
600 V_{AC}	980 V_{DC}
630 V_{AC}	1020 V_{DC}
660 V_{AC}	1080 V_{DC}
690 V_{AC}	1120 V_{DC}

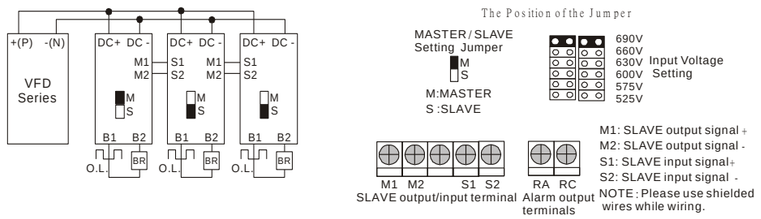
NOTE: Input Power with Tolerance ±10%

Input voltage setting for VFDB 6055/6110/6160/6200



2. 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 be 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 as the below diagram. 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.



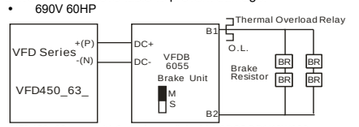
9. Braking Resistors & Braking Units Use in the AC Drives

Voltage	Applicable Motor HP	KW	125% Braking Torque / 10%ED: Braking Torque (kg-m)	Equivalent Brake Resistor Spec. for Each AC Motor Drive	Braking Unit VFDB	Qty.	Braking Resistor Part No.	Qty.	Connection	Braking Current (A)	Max. Braking Torque: Min. Resistor Value (Ω)	Max. Braking Current (A)	Max. Peak Power (kW)
690V	60	45	25.1	4800W 33Ω	6055	1	BR1K2W033	4	2 in parallel, 2 in series	34	30.2	37	41.6
	75	55	30.5	6000W 26.7Ω	6055	1	BR1K5W107	4	4 in parallel	42	24.5	46	51.2
	100	75	37.2	7200W 22.1Ω	6110	1	BR1K2W133	6	6 in parallel	50	20.2	55	62.0
	125	90	50.8	9000W 17.8Ω	6110	1	BR1K5W107	6	6 in parallel	62	16.5	68	76.2
	150	110	60.9	12000W 13.3Ω	6110	1	BR1K5W107	8	8 in parallel	84	12.2	92	103.2
	175	132	74.5	14400W 11.1Ω	6160	1	BR1K2W133	12	12 in parallel	101	10.1	111	124.0
	215	160	89.4	18000W 8.9Ω	6160	1	BR1K5W107	12	12 in parallel	125	8.2	136	152.7
	350	250	135.4	27000W 6Ω	6160	2	BR1K5W012	9	14 in parallel	184	5.5	202	226.7
	425	315	169.3	36000W 4.5Ω	6160	2	BR1K5W012	12	3 in parallel, 3 in series	250	4.1	270	302.4
	550	400	213.3	42000W 3.85Ω	6200	2	BR1K5W027	14	4 in parallel, 3 in series	280	3.6	308	345.0
	600	450	240.3	54000W 3Ω	6160	3	BR1K5W012	12	7 in parallel, 2 in series	370	2.8	403	451.7
	750	560	304.7	54000W 2.75Ω	6200	3	BR1K5W011	12	4 in parallel, 3 in series	396	2.6	436	488.3

10. Wiring Examples of Braking Resistors

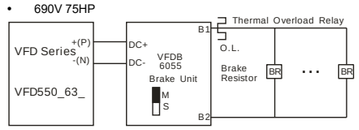
NOTE: Before wiring, please notice equivalent resistors value shown in the column "Braking Resistors & Braking Units Use in the AC Drives" in the above table to prevent damage.

- 690V 60HP



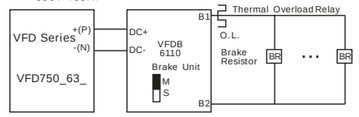
VFD450_63_ uses with 2 sets in parallel, which 2PCS BR1K2W033 are connected in series.

- 690V 75HP



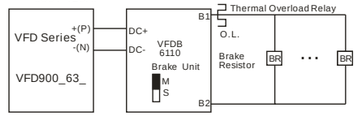
VFD550_63_ uses with 4PCS BR1K5W107 in parallel.

- 690V 100HP



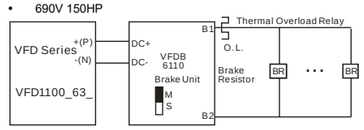
VFD750_63_ uses with 6PCS BR1K2W133 in parallel.

- 690V 125HP



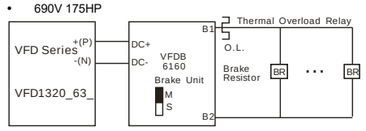
VFD900_63_ uses with 6PCS BR1K5W107 in parallel.

- 690V 150HP



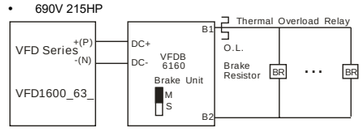
VFD1100_63_ uses with 8PCS BR1K5W107 in parallel.

- 690V 175HP



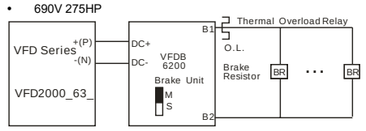
VFD1320_63_ uses with 12PCS BR1K2W133 in parallel.

- 690V 215HP



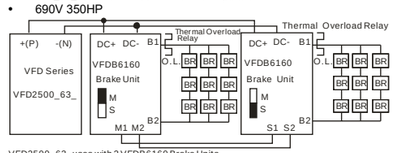
VFD1600_63_ uses with 12PCS BR1K5W107 in parallel.

- 690V 275HP



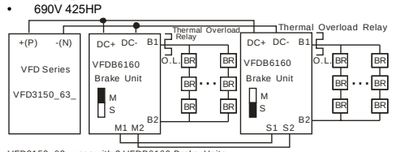
VFD2000_63_ uses with 14PCS BR1K5W107 in parallel.

- 690V 350HP



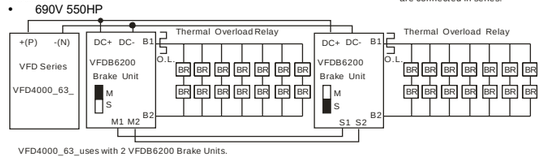
VFD2500_63_ uses with 2 VFDB6160 Brake Units.
Each Brake Unit uses with 3 BR sets in parallel, which 3PCS BR1K5W012 are connected in series.

- 690V 425HP



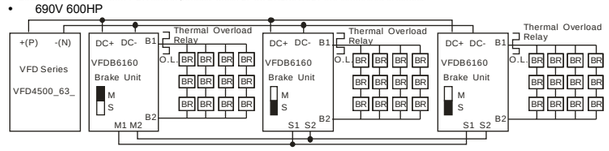
VFD3150_63_ uses with 2 VFDB6160 Brake Units.
Each Brake Unit uses with 4BR sets in parallel, which 3PCS BR1K5W012 are connected in series.

- 690V 550HP



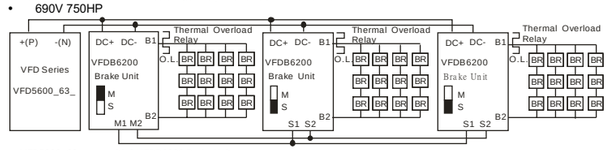
VFD4000_63_ uses with 2 VFDB6200 Brake Units.
Each Brake Unit uses with 7 BR sets in parallel, which 2PCS BR1K5W027 are connected in series.

- 690V 600HP



VFD4500_63_uses with 3 VFDB6160 Brake Units.
Each Brake Unit uses with 4BR sets in parallel, which 3PCS BR1K5W012 are connected in series.

- 690V 750HP



VFD5600_63_ uses with 3 VFDB6200 Brake Units.
Each Brake Unit uses with 4 sets in parallel, which 3 PCS BR1K5W011are connected in series.