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VFDB Series Braking Modules Instruction Sheet

VFDB4110, VFDB4160, VFDB4185

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.
The braking unit is intended to be used with Delta 380V-480V motor drives only.

2. Specifications

VFDB Braking Units

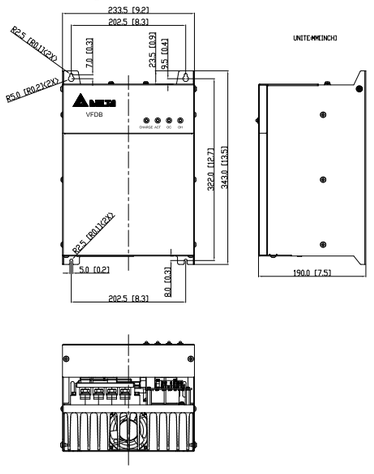
Specification		460V Series		
Model VFDB□□□□		4110	4160	4185
Max. Motor Capacity (KW)		110	160	185
Output Rating	Max. Discharge Current (A) 10%ED	126	190	92
	Continuous Discharge Current (A)	45	50	100
	Braking Start-up Voltage (DC)	618 / 642 / 667 / 690 / 725 / 750 ± 6V		
Input Rating	DC Voltage	DC 535V–680V		
Min. Equivalent Resistor for Each Braking Unit		6Ω	4Ω	3.4Ω
Protection	Over-current level (A)	190	290	340
	Power Charge Display	Blackout until bus (DC+–DC-) voltage is below 100V_{DC}		
	Overheat Alarm Output	Relay contact 3A 250V_{AC} / 28V_{DC} (RA, RC)		
Environment	Installation Location	Indoor (no corrosive gases, metallic dust)		
	Operating Temperature	-10ºC–+50ºC (14ºF–122ºF)		
	Storage Temperature	-20ºC–+60ºC (-4ºF–140ºF)		
	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

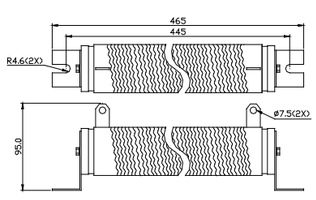
Model no.	Specification
BR1K5W005	1500W 5.0Ω
BR1K2W6P8	1200W 6.8Ω
BR1K2W008	1200W 8.0Ω
BR1K5W012	1500W 12Ω
BR1K2W015	1200W 15Ω
BR1K5W040	1500W 40Ω
BR1K0W050	1000W 50Ω
BR1K0W075	1000W 75Ω

3. Dimensions and Mounting Clearance

VFDB Braking Units

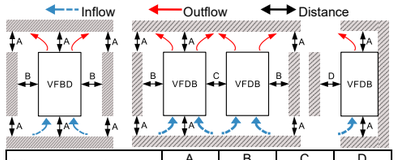


Braking Resistors



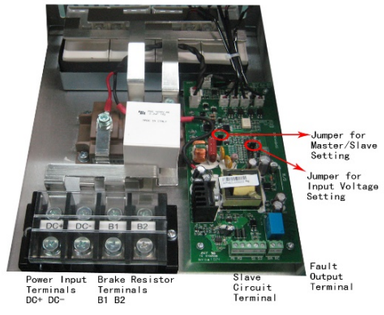
Mounting Clearance

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

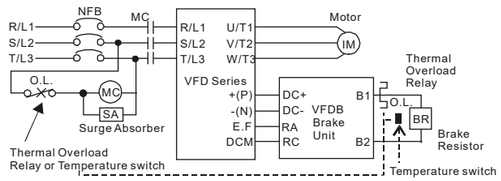


Terminal Wire Gauge

Circuit	Terminal Mark	Wire Gauge AWG (mm^2)	Screw	Torque
Power Input Circuit	DC+, DC-	VFDB4110: 6–2AWG (13.3–33.6 mm^2)	M8	30 kgf-cm (26 in-lbf)
		VFDB4160: 6–2AWG (13.3–33.6 mm2)		
		VFDB4185: 2AWG (33.6 mm2)		
Braking Resistor	B1, B2	VFDB4110: 6–2AWG (13.3–33.6 mm2)	M8	30 kgf-cm (26 in-lbf)
		VFDB4160: 6–2AWG (13.3–33.6 mm2)		
		VFDB4185: 2AWG (33.6 mm^2)		
SLAVE Circuit	Output M1, M2 / Input S1, S2	18–20AWG (0.8–0.5mm^2) (with shielded wires)	M2	4 kgf-cm (3 in-lbf)
Fault Circuit	RA, RC	18–20AWG (0.8–0.5mm^2)	M2	4 kgf-cm (3 in-lbf)

5. Basic Wiring Diagram

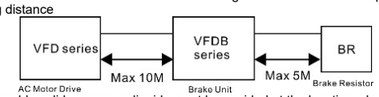
1. For safety, install a thermal overload relay (O.L) between the brake unit and the brake resistor in conjunction with the magnetic contactor (MC) before the drive for additional protection. The thermal overload relay protects the brake resistor from damage due to frequent or continuous braking. Under such circumstances, turn off the power to prevent damage to the brake resistor, brake unit and drive. NOTE: Never use it to disconnect the brake 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 80ºC. 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.



■ Note1: When the AC motor drive is used with DC reactor, please refer to the wiring diagram in the AC drive user manual for wiring terminal DC+ of brake unit.
■ Note2: DO NOT wire terminal DC- to the neutral point of power system.

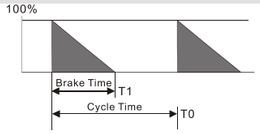
6. Wiring Notice

■ 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 lets 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 driver.
■ 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. 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.

7. Definition for Braking Usage ED%



ED% = T1 / T0 x 100(%)

Explanation:
Brake usage ED (%) is the amount of time needed for the brake unit and brake resistor to dissipate heat generated by braking. When the brake resistor heats up, the resistance increases with temperature, and braking torque decreases 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.

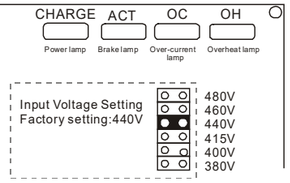
NOTE:
■ Before regulating the power voltage, make sure the power has been turned off. Please set power voltage as the possible highest voltage for unstable power system. Take 380V_{AC} power system for example. If the voltage may be up to 410V_{AC}, 415V_{AC} should be regulated.
■ For DELTA's AC motor 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

460V Model AC Power Voltage	Braking Start-up voltage DC Bus (DC+,DC-) Voltage
380V_{AC}	618V_{DC}
400V_{AC}	642V_{DC}
415V_{AC}	667V_{DC}
440V_{AC}	690V_{DC}
460V_{AC}	725V_{DC}
480V_{AC}	750V_{DC}

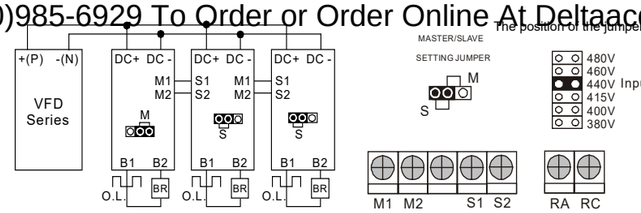
NOTE: Input Power With Tolerance ±10%

Input voltage setting for VFDB 4110/4160/4185



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 below on the left. 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.



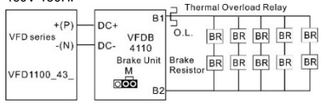
9. Braking Resistors & Braking Units Use in the AC Drives

Voltage	Applicable Motor		125% Braking Torque/ 10%ED						
	HP	KW	Braking Torque (kg-M)	Resistor Value Spec. for Each AC Motor Drive	Braking Unit Part No. and Quantity		Braking Resistors Part No. and Quantity		Max. Discharge Current (A)	Min. Equivalent Resistor Value
460V	150	110	74.5	12000W 6Ω	4110	1	BR1K2W015	10	126	6Ω
	175	132	89.4	18000W 4Ω	4160	1	BR1K5W012	12	190	4Ω
	215	160	108.3	18000W 4Ω	4160	1	BR1K5W012	12	190	4Ω
	250	185	125.3	21000W 3.4Ω	4185	1	BR1K5W012	14	225	3.4Ω
	300	220	148.9	24000W 3Ω	4110	2	BR1K2W015	20	252	3Ω
	375	280	189.6	36000W 2Ω	4160	2	BR1K5W012	24	380	2Ω
	425	315	213.3	36000W 2Ω	4160	2	BR1K5W012	24	380	2Ω
	475	355	240.3	42000W 1.7Ω	4185	2	BR1K5W012	28	450	1.7Ω

10. Wiring Examples of Braking Resistors

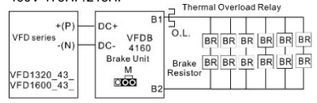
NOTE: Before wiring, please notice equivalent resistors value shown in the column "Equivalent resistors specification for each braking unit" in the above table to prevent damage.

• 460V 150HP



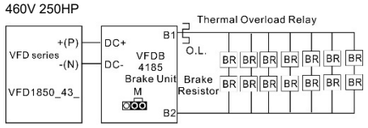
VFD1100_43_uses with 5 BR sets in parallel, which 2 PCS BR1K2W015 are connected in series.

• 460V 175HP/215HP



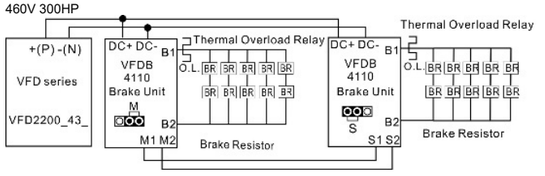
VFD1320_43_uses with 6 BR sets in parallel, which 2 PCS B1K5W012 are connected in series.
VFD1600_43_uses with 6 BR sets in parallel, which 2 PCS B1K5W012 are connected in series

• 460V 250HP



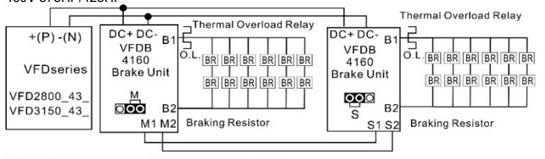
VFD1850_43_ uses with 7 BR sets in parallel, which 2PCS BR1K5W012 are connected in series.

• 460V 300HP



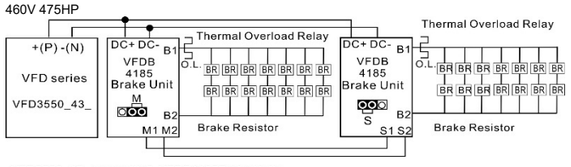
VFD2200_43_ uses with 2 VFDB4110 Brake Units,
Each brake unit uses with 5 BR sets in parallel, which 2 PCS BR1K2W015 are connected in series.

• 460V 375HP/425HP



VFD2800_43_ uses with 2 VFDB4160 Braking Units,
Each braking Unit uses with 6 BR sets in parallel, which 2 PCS BR1K5W012 are connected in series.
VFD3150_43_ uses with 2 VFDB4160 Braking Units,
Each braking Unit uses with 6 BR sets in parallel, which 2 PCS BR1K5W012 are connected in series.

• 460V 475HP



VFD3550_43_ uses with 2 VFDB4185Brake Units,
Each brake unit uses with 7 BR sets in parallel, which 2 PCS BR1K5W012 are connected in series.

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