

VFDB Series Braking Modules Instruction Sheet

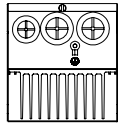
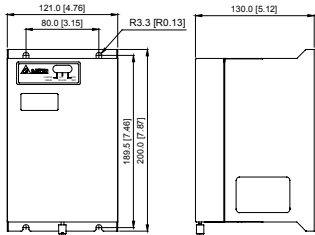
1 Preface

Thank you for choosing DELTA's braking module. 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 230V/460V/575V. VFDB braking units need to be used in conjunction with BR series braking resistors to provide the optimum braking characteristics. VFDB braking units (2015, 2022, 4030, 4045 and 5055) 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 <http://www.delta.com.tw/industrialautomation>.

2 Specifications

		VFDB Braking Units					Braking Resistors	
Specification		230V Series		460V Series		575V Series	Model no.	Specification
Model VFDB-		2015	2022	4030	4045	5055	BR1K5W005	1500W 5.0Ω
Max. Motor Capacity (KW)		15	22	30	45	55	BR1K2W6P8	1200W 6.8Ω
Output Rating	Max. Discharge Current (A) 10%ED	40	60	40	60	60	BR1K2W008	1200W 8.0Ω
	Continuous Discharge Current (A)	15	20	15	18	20	BR1K5W040	1500W 40Ω
	Braking Start-up Voltage (DC)	330/345/360/380/400/415±3V	660/690/720/760/800/830±6V	950±8V			BR1K0W050	1000W 50Ω
Input Rating	DC Voltage	200—400VDC	400—800VDC	607-1000VDC			BR1K0W075	1000W 75Ω
	Min. Equivalent Resistor for Each Braking Unit	10Ω	6.8Ω	20Ω	13.6Ω	15.8Ω		
Protection	Heat Sink Overheat	Temperature over +95°C (203°F)						
	Alarm Output	Relay contact 5A120VAC/28VDC (RA, RB, RC)						
	Power Charge Display	Blackout until bus (←→) voltage is below 50VDC						
Environment	Installation Location	Indoor (no corrosive gases, metallic dust)						
	Operating Temperature	-10°C ~+50°C (-14°F to 122°F)						
	Storage Temperature	-20°C ~+60°C (-4°F to 140°F)						
	Humidity	90% Non-condensing						
	Vibration	9.8m/s² (1G) under 20Hz 2m/s² (0.2G) at 20~50Hz						
Mechanical Configuration		Wall-mounted enclosed type IP50						

3 Dimensions - VFDB Braking Units

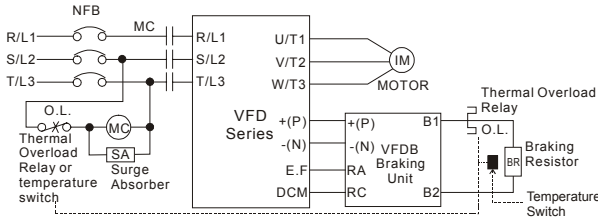


Terminal Wire Gauge

Circuit	Terminal Mark	Wire Gauge AWG (mm²)	Screw	Torque
Power Input Circuit	+(P), -(N)	10~12AWG (3.5~5.5mm²)	M4	18 kgf-cm (15.6 in-lbf)
Braking Resistor	B1, B2	10~12AWG (3.5~5.5mm²)	M4	18 kgf-cm (15.6 in-lbf)
SLAVE Circuit	Output M1, M2 Input S1, S2	20~18AWG (0.25~0.75mm²) (with shielded wires)	M2	4 kgf-cm (3 in-lbf)
Fault Circuit	RA, RB, RC	20~18AWG (0.25~0.75mm²)	M2	4 kgf-cm (3 in-lbf)

5 Basic Wiring Diagram

Operation Explanation: 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. 2. 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. 3. Please refer to the specification of the thermal overload relay. 4. The alarm output terminals (RC, RA, RB) of the braking unit will be activated when the temperature of the heat sink exceeds 95°C. It 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 not 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.

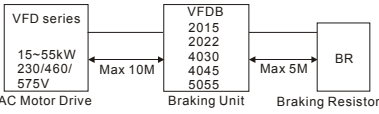


Note1: When using the AC drive with DC reactor, please refer to wiring diagram in the AC drive user manual for the wiring of terminal +(P) of Braking unit.
Note2: **Do NOT** wire terminal -(N) to the neutral point of power system.

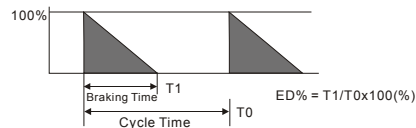
6. Besides using thermal overload relay to be the protection system and braking resistor, temperature switch can be installed on braking resistor side as the protection. The temperature switch must comply with the braking resistor specification or contact your dealer.

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 +(P), -(N), 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.
 - 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.
- Wiring distance**
- 

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

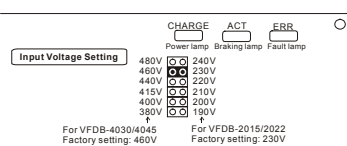
- Regulation of power voltage: the power source of the braking unit is DC voltage from +(P), -(N) terminals of the AC motor drive. It is very important to set the power voltage of the braking unit based on the input power of the AC motor drive before operation. The setting has a great influence on the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

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

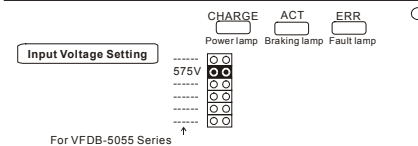
230V Model AC Power Voltage	Braking Start-up voltage DC Bus (+(P), -(N)) Voltage	460V Model AC Power Voltage	Braking Start-up voltage DC Bus (+(P), -(N)) Voltage	575V Model AC Power Voltage	Braking Start-up voltage DC Bus (+(P), -(N)) Voltage
190Vac	330Vdc	380Vac	660Vdc	575Vac	950Vdc
200Vac	345Vdc	400Vac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

NOTE: Input Power With Tolerance ±10%

Input voltage setting for VFDB-2015/2022/4030/4045

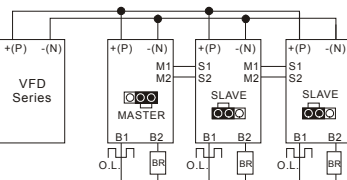


Input voltage setting for VFDB-5055

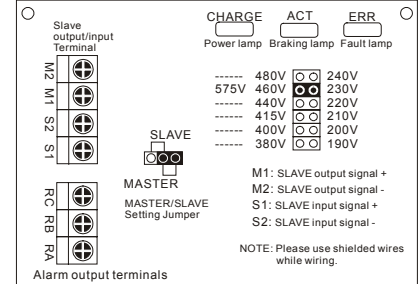


- MASTER/SLAVE setting: The MASTER/SLAVE jumper is set "MASTER" as factory setting. The "SLAVE" setting is applied to two or more braking units in parallel, making these braking units be enabled/disabled synchronously. Then the power dissipation of each unit will be equivalent so that they can perform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

The SLAVE braking application of three braking units is shown as the above 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.



The position of the jumper



5. 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.

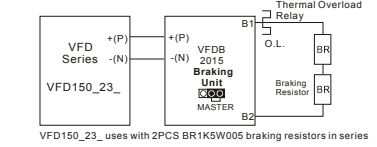
9 All Braking Resistors & Braking Units Use in the AC Drives

Voltage	Applicable Motor		Full- load Torque kg-M	Resistor Value Spec for Each AC Motor Drive	Braking Unit Model VFDB No. of Units Used	Braking Resistors Model and No. of Units Used	Braking Torque 10%ED	Min. Equivalent Resistor Value for Each AC Motor Drive	Typical Thermal Overload Relay Value
	HP	kW							
230V	20	15	8.248	3000W 10Ω	2015	1	BR1K5W005	2	125
	25	18.5	10.281	4800W 8Ω	2022	1	BR1K2W008	4	125
	30	22	12.338	4800W 6.8Ω	2022	1	BR1K2W6P8	4	125
	40	30	16.497	6000W 5Ω	2015	2	BR1K5W005	4	125
	50	37	20.6	9600W 4Ω	2015	2	BR1K2W008	8	125
460V	20	15	8.248	1500W 40Ω	4030	1	BR1K5W040	1	125
	25	18.5	10.281	4800W 32Ω	4030	1	BR1K2W008	4	125
	30	22	12.338	4800W 27.2Ω	4030	1	BR1K2W6P8	4	125
	40	30	16.497	6000W 20Ω	4030	1	BR1K5W005	4	125
	50	37	20.6	9600W 16Ω	4045	1	BR1K2W008	8	125
575V	60	45	24.745	9600W 13.6Ω	4045	1	BR1K2W6P8	8	125
	75	55	31.11	12000W 10Ω	4030	2	BR1K5W005	8	125
	100	75	42.7	19200W 6.8Ω	4045	2	BR1K2W6P8	16	125
	20	15	8.248	3000W 60Ω	5055	1	BR1K0W020	3	125
	25	18.5	10.281	4000W 50Ω	5055	1	BR1K0W050	4	125
575V	30	22	12.338	6000W 40Ω	5055	1	BR1K2W008	5	125
	40	30	16.497	6000W 34Ω	5055	1	BR1K2W6P8	5	125
	50	37	20.6	7500W 25Ω	5055	1	BR1K5W005	5	125
	60	45	24.745	12000W 20Ω	5055	1	BR1K2W008	10	125
	75	55	31.11	12000W 17Ω	5055	1	BR1K2W6P8	10	125
575V	100	75	42.7	15000W 12.5Ω	5055	2	BR1K5W005	10	125

10 Wiring Examples of Braking Resistors

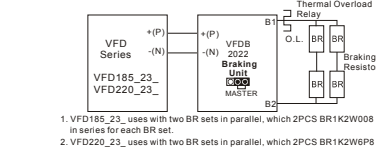
NOTE: Before wiring, please notice equivalent resistors value shown in the column "Equivalent resistors specification for each braking unit" in the above table to prevent damage.

230V 20HP



VFDB 2015_23_ uses with 2PCS BR1K5W005 braking resistors in series

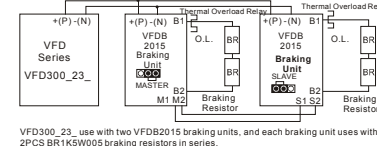
230V 25HP/30HP



1. VFDB 2022_23_ uses with two BR sets in parallel, which 2PCS BR1K2W008 braking resistors in series for each BR set.

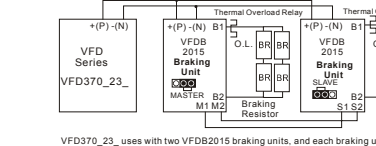
2. VFDB 2022_23_ uses with two BR sets in parallel, which 2PCS BR1K2W6P8 braking resistors in series for each BR set.

230V 40HP



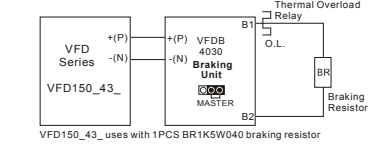
VFDB 2015_23_ uses with two VFDB 2015 braking units, and each braking unit uses with 2PCS BR1K5W005 braking resistors in series.

230V 50HP



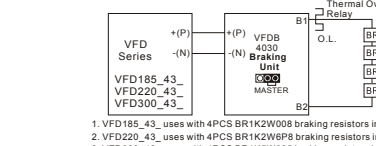
VFDB 2015_23_ uses with two VFDB 2015 braking units, and each braking unit uses with two BR sets in parallel, which 2PCS BR1K2W008 braking resistors in series.

460V 20HP



VFDB 4030_43_ uses with 1PCS BR1K5W040 braking resistor

460V 25HP/30HP/40HP

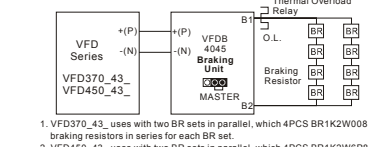


1. VFDB 4030_43_ uses with 4PCS BR1K2W008 braking resistors in series

2. VFDB 4030_43_ uses with 4PCS BR1K2W6P8 braking resistors in series

3. VFDB 4030_43_ uses with 4PCS BR1K5W005 braking resistors in series

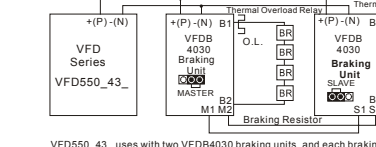
460V 50HP/60HP



1. VFDB 4045_43_ uses with two BR sets in parallel, which 4PCS BR1K2W008 braking resistors in series for each BR set.

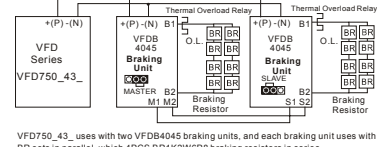
2. VFDB 4045_43_ uses with two BR sets in parallel, which 4PCS BR1K2W6P8 braking resistors in series for each BR set.

460V 75HP



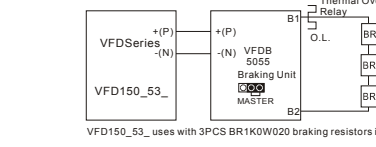
VFDB 4030_43_ uses with two VFDB 4030 braking units, and each braking unit uses with 4PCS BR1K5W005 braking resistors in series.

460V 100HP



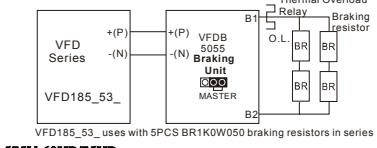
VFDB 5055_43_ uses with two VFDB 5055 braking units, and each braking unit uses with two BR sets in parallel, which 4PCS BR1K2W6P8 braking resistors in series.

575V 20HP



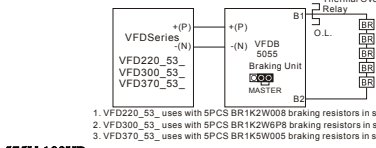
VFDB 5055_43_ uses with 3PCS BR1K0W020 braking resistors in series

575V 25HP



VFDB 5055_53_ uses with 5PCS BR1K0W050 braking resistors in series

575V 30HP/40HP/50HP

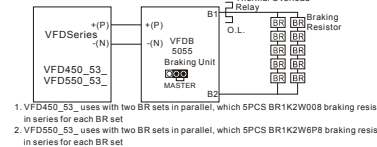


1. VFDB 5055_53_ uses with 5PCS BR1K2W008 braking resistors in series

2. VFDB 5055_53_ uses with 5PCS BR1K2W6P8 braking resistors in series

3. VFDB 5055_53_ uses with 5PCS BR1K5W005 braking resistors in series

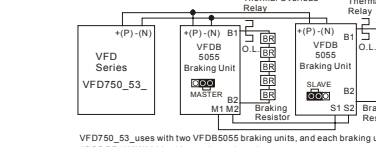
575V 60HP/75HP



1. VFDB 5055_53_ uses with two BR sets in parallel, which 5PCS BR1K2W008 braking resistors in series for each BR set

2. VFDB 5055_53_ uses with two BR sets in parallel, which 5PCS BR1K2W6P8 braking resistors in series for each BR set

575V 100HP



VFDB 5055_53_ uses with two VFDB 5055 braking units, and each braking unit uses with 5PCS BR1K5W005 braking resistors in series.