



VFDB 系列煞車模組說明書

1 一般注意事項

感謝您選用台達 VFDB 動力制動煞車模組。本產品主要應用於三相感應馬達由交流馬達驅動器所驅動，在減速停止時用以吸收由馬達側所回生的能量，藉由 VFDB 制動單元將此能量以熱能的方式消耗在煞車電阻上。本產品在安裝使用前，請詳細參閱本說明書再進行施工配線，以免造成機械或人員的傷害。VFDB 動力制動煞車模組適用於本公司 VFD 所有系列的交流馬達驅動器。VFDB 制動單元需搭配煞車電阻 BR 系列，才能發揮優良的制動特性。詳細的規格及使用方法請繼續參閱本說明書。由於產品精益求精，當內容規格有所修正時，請洽詢代理商或至台達網站 (<http://www.delta.com.tw/industrialautomation/>) 下載最新版本。

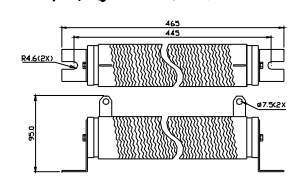
2 規格

VFDB 制動單元規格					
使用電壓等級	690V 級				
型號 VFDB□□□□	6055	6110	6160	6200	
最大適用馬達容量 (KW)	55	110	160	200	
輸出額定	最大放電電流 (A peak) 10%ED	46	92	136	
	連續放電電流 (A)	29	59	86	
	制動起始電壓 (DC)	860/940/980/1020/1080/1120±9V			
電源	600~1120VDC				
保護	每台等效最小電阻	24.5Ω	12.2Ω	8.2Ω	6.9Ω
	過電流 OC 保護電位(A)	70	140	210	250
	充電中顯示	主回路(DC++DC-)電壓在 230VDC 以下熄滅			
	過熱故障輸出	RELAY 接點 3A 250Vac/28Vdc(RA,RC)			
使用環境	安裝場所	屋內(無腐蝕性氣體、金屬粉塵)			
	環境溫度	-10℃~+50℃ (14°F to 122°F)			
	儲存溫度	-20℃~+60℃ (-4°F to 140°F)			
	濕度	90%RH 以下不結露			
振動	20Hz 以下 9.8m/S ² (1G)、20~50Hz 2m/S ² (0.2G)				
機機構造	壁掛型 IP10				

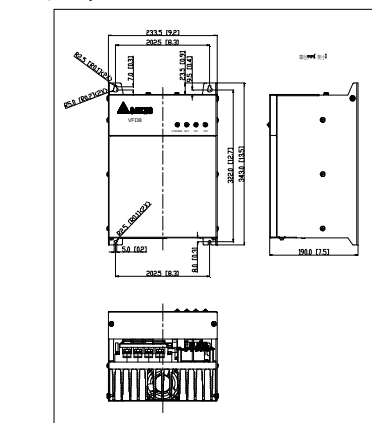
BR 制動電阻規格

型號	規格
BR1K2W033	1200W 33Ω
BR1K5W107	1500W 107Ω
BR1K0W011	1000W 11Ω
BR1K2W133	1200W 133Ω
BR1K5W012	1500W 12Ω
BR1K5W027	1500W 27Ω
BR1K5W011	1500W 11Ω

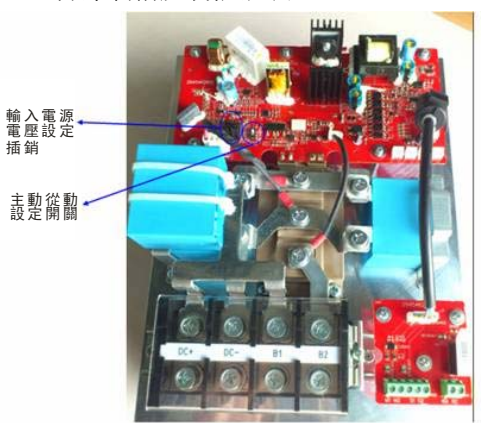
3 尺寸- 煞車電阻



3 尺寸- 制動單元



4 各部名稱及功能說明



電源輸入端子 煞車電阻端子 連動回 故障輸出端子

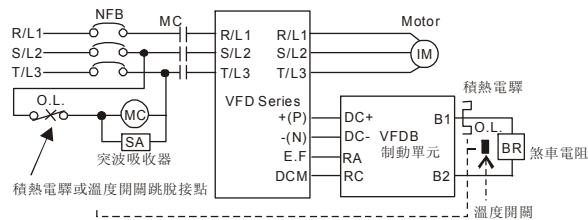
各端子使用線徑

回路名稱	端子記號	導線線徑 AWG (mm ²)	螺絲規格	扭力
電源輸入回路	DC+,DC-	3~4AWG (26.67~21.15mm ²) (For VFDB6055&VFDB6110) 2~3AWG (33.62~26.67mm ²) (For VFDB6160&VFDB6200)	M8	50kgf-cm (43 in-lbf)
煞車電阻回路	B1,B2	3~4AWG (26.67~21.15mm ²) (For VFDB6055&VFDB6110) 2~3AWG (33.62~26.67mm ²) (For VFDB6160&VFDB6200)	M8	50 kgf-cm (43 in-lbf)
連動回路	輸出	18~20AWG (0.8~0.5mm ²) (需用屏蔽線)	M2	4 kgf-cm (3 in-lbf)
	輸入			
故障回路	RA,RC	18~20AWG (0.8~0.5mm ²)	M2	4 kgf-cm (3 in-lbf)
接地點		8~10AWG(8.37~5.26mm ²)	M5	25kgf-cm(21.5in-lbf)

5 基本配線圖

動作說明：

- 在安裝制動單元的應用中為了安全的考慮，在制動單元與煞車電阻之間加裝一積熱電驛 (O.L)；並與交流馬達驅動器前端的電磁接觸器 (MC) 作一連鎖的異常保護。
- 加裝積熱電驛的主要目的是為了保護煞車電阻不因煞車頻繁過熱而燒毀，或是因輸入電源電壓異常過高導致制動單元連續導通燒毀煞車電阻。此時只有將交流馬達驅動器的電源關閉才可避免煞車電阻燒毀。
- 積熱電驛規格的選用請參考實際所用積熱電驛的性能參數及煞車電流。
- 制動單元中的故障輸出端子 (RA、RC) 在散熱裝置溫度高于 80℃ 時會動作，表示安裝環境溫度可能超過 50℃ 以上，或是煞車制動 ED% 超過 10%ED；若是此類的故障請自行加裝風扇強制風冷或改善環境溫度。若非溫度原因，可能控制電路受損或溫度傳感器故障，此時請送廠維修。

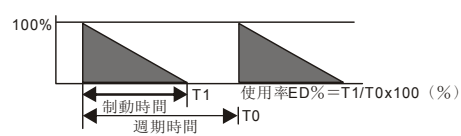


- 當交流馬達驅動器有加裝直流電抗器(DC Reator)時,其煞車模組的電源輸入回路DC+端的配線方法,可參考交流馬達驅動器手冊。
- 請勿將電源輸入回路DC-端,接至電力系統的中性點。

6 配線注意事項

- 進行配線施工時務必確認相關回路電源均為關閉狀態；配線的線徑及距離亦務必按照規定選用及施工。
- 交流馬達驅動器 (VFD) 連接至制動單元 (VFDB) 的 DC+、DC- 端子有極性之分，千萬要確認再確認，否則電源一開啓制動單元立即炸毀，請務必注意。
- 制動單元在執行煞車時，DC+、DC-、B1、B2 因有大電流通過所連接的導線瞬間將產生能量很大的電磁場；故在初期配線施工規畫時，應與其它低電壓的控制線路分離配線，以免造成不必要的干擾或誤動作。
- 煞車電阻安裝的場所不能有任何易燃性的物體、氣體、液體，最好能安裝在獨立的金屬箱內並加以風扇散熱。
- 制動單元的接地工程 230V 級請依第三種接地施工，460V 級請依特別第三種接地施工，690V 級請依特別第三種接地施工。
- 在減速煞車頻繁的場合 (超過 10%ED) 煞車電阻請加裝風扇強制風冷或其它冷却設備。
- 在通電中嚴禁修改任何配線及制動單元內部設定，更嚴禁在通電中碰觸相關配線的端子及 PCB 板中的任一組件，以免因通電中遭極度危險的直流高壓感電造成人員傷害。

7 煞車使用率 ED% 的定義

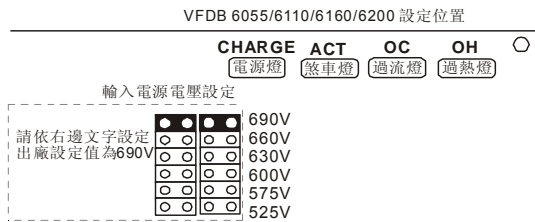


8 設定與調整

- 電源電壓的調整：制動單元的電力來源是接受交流馬達驅動器+ (P)、- (N)兩端供應的直流電源。因此，在配線完成準備運轉時，依交流馬達驅動器的輸入電源來設定制動單元的電源電壓是非常重要的步驟；此設定將會影響制動單元動作電壓的電位，下表為各個電壓動作電位。
- 設定電源電壓時，請務必先將電源關閉後才可更改設定值。若在電源電壓不穩定的區域，請將電源電壓設定在可能出現的最高電壓。例如：575Vac 的電源系統，若電壓變動達到 620Vac，請設定在 630Vac。
- 使用本公司 VFD 系列交流馬達驅動器，請將參數的過電壓失速防止功能設定為關閉狀態，使失速防止功能失效，如此可得穩定的減速特性。

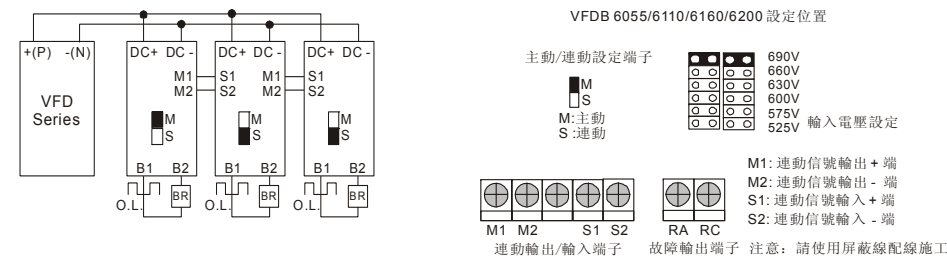
電源電壓的選擇與 PN 直流電壓的動作電位

690V 級 AC 電源	制動開始電壓 DC+、DC- 電壓	母線 DC 電壓
525Vac	860Vdc	
575Vac	940Vdc	
600Vac	980Vdc	
630Vac	1020Vdc	
660Vac	1080Vdc	
690Vac	1120Vdc	



注：容許輸入電源有±10%的變動

- 主動(M)/連動(S)的設定：制動單元在出廠時均設定在“MASTER”主動煞車的位置。“SLAVE”連動位置的功能主要是應用於兩台以上制動單元并聯的應用，可使每一台制動單元同時動作同時截止，如此每一台的消耗功率均為相等充分發揮每台的制動功能。如下圖所示為三台制動單元連動制動的應用；當配線完成後需將第一台設為“M”主動的設定，其餘的一定將開關設定在“S”連動的位置上，如此即可完成動力制動系統的配線。



9 制動單元與放電電阻適用一覽表

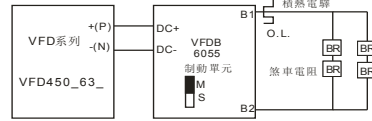
電壓	適用馬達		125%制動能力/ 10%ED				最大制動轉矩限制						
	HP	KW	制動轉矩 (kg-m)	制動單元		每台變頻器等效煞車電阻規格	每個制動單元對應之制動電阻		煞車電流 (A)	最小電阻限制(Ω)	最高煞車電流限制(A)	最大峰值功率 (KW)	
				VFDB 型號	用量		料號	用量					
690V	60	45	25.1	6055	1	4800W 33Ω	BR1K2W033	4	2 并聯 2 串聯	34	30.2	37	41.6
	75	55	30.5	6055	1	6000W 26.7Ω	BR1K5W107	4	4 并聯	42	24.5	46	51.2
	100	75	37.2	6110	1	7200W 22.1Ω	BR1K2W133	6	6 并聯	50	20.2	55	62.0
	125	90	50.8	6110	1	9000W 17.8Ω	BR1K5W107	6	6 并聯	62	16.5	68	76.2
	150	110	60.9	6110	1	12000W 13.3Ω	BR1K5W107	8	8 并聯	84	12.2	92	103.2
	175	132	74.5	6160	1	14400W 11.1Ω	BR1K2W133	12	12 并聯	101	10.1	111	124.0
	215	160	89.4	6160	1	18000W 8.9Ω	BR1K5W107	12	12 并聯	125	8.2	136	152.7
	275	200	108.3	6200	1	21000W 7.6Ω	BR1K5W107	14	14 并聯	148	6.9	162	181.8

電壓	適用馬達		125%制動能力/ 10%ED						最大制動轉矩限制				
	HP	KW	制動轉矩 (kg-m)	制動單元		每台變頻器等效煞車電阻規格	每個制動單元對應之制動電阻		煞車電流 (A)	最小電阻限制(Ω)	最高煞車電流限制(A)	最大峰值功率 (KW)	
				VFDB 型號	用量		料號	用量					
690V	350	250	135.4	6160	2	27000W 6Ω	BR1K5W012	9	3 并 3 串聯	184	5.5	202	226.7
	425	315	169.3	6160	2	36000W 4.5Ω	BR1K5W012	12	4 并聯 3 串聯	250	4.1	270	302.4
	550	400	213.3	6200	2	42000W 3.85Ω	BR1K5W027	14	7 并聯 2 串聯	280	3.6	308	345.0
	600	450	240.3	6160	3	54000W 3Ω	BR1K5W012	12	4 并聯 3 串聯	370	2.8	403	451.7
	750	560	304.7	6200	3	54000W 2.75Ω	BR1K5W011	12	4 并聯 3 串聯	396	2.6	436	488.3

10 制動電阻配線圖例

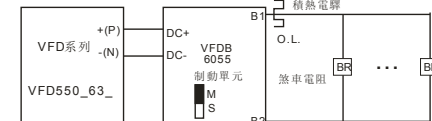
在配線前，注意：每台煞車模組的等效煞車電阻不能低於每台制動單元最小等效電阻值 (參閱制動單元與放電電阻適用一覽表)。

690V 60HP



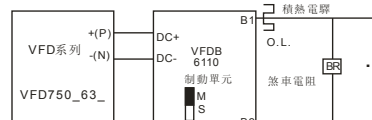
VF450_63_使用BR1K2W033 4PCS, 每2PCS串聯後再並聯接線

690V 75HP



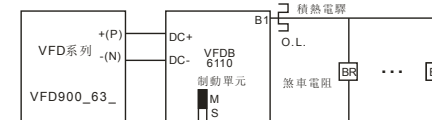
VF550_63_使用BR1K5W107 4PCS, 並聯接線

690V 100HP



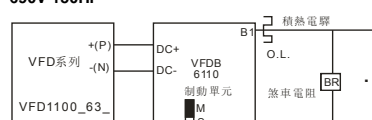
VF750_63_使用BR1K2W133 6PCS, 並聯接線

690V 125HP



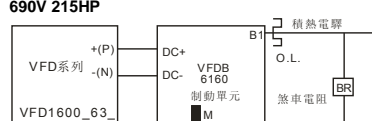
VF900_63_使用BR1K5W107 6PCS, 並聯接線

690V 150HP



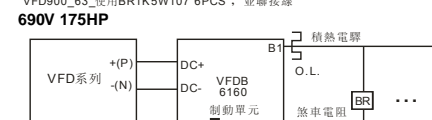
VF1100_63_使用BR1K5W107 8PCS, 並聯接線

690V 215HP



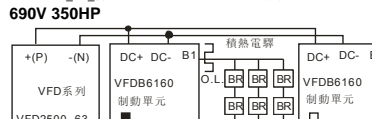
VF1600_63_使用BR1K5W107 12PCS, 並聯接線

690V 250HP



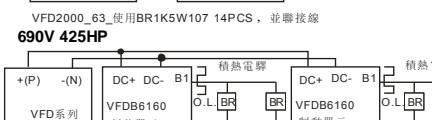
VF1320_63_使用BR1K2W133 12PCS, 並聯接線

690V 350HP



VF2500_63_使用2台VFDB6160制動單元
每台使用BR1K5W012 9PCS, 每3PCS串聯後再並聯接線

690V 550HP



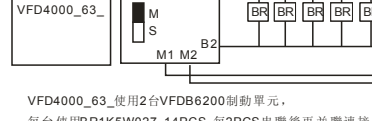
VF3150_63_使用2台VFDB6160制動單元
每台使用BR1K5W012 12PCS, 每3PCS串聯後再並聯接線

690V 600HP



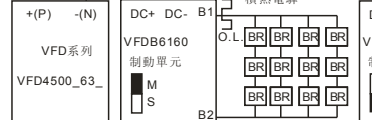
VF4000_63_使用2台VFDB6200制動單元,
每台使用BR1K5W027 14PCS, 每2PCS串聯後再並聯接線

690V 750HP



VF4500_63_使用3台VFDB6160制動單元,
每台使用BR1K5W012 12PCS, 每3PCS串聯後再並聯接線

690V 750HP



VF5600_63_使用3台VFDB6200制動單元,
每台使用BR1K5W011 12PCS, 每3PCS串聯後再並聯接線



VFDB 系列刹车模组说明书

1 一般注意事项

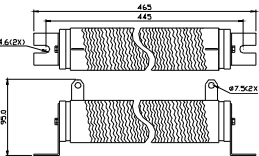
感谢您选用台达 VFDB 动力制动刹车模组。本产品主要应用于当三相感应电机由交流电机驱动器所驱动，在减速停止时用以吸收由电机侧所回生的能量。藉由 VFDB 制动单元将此能量以热能的方式消耗在刹车电阻上。...

2 规格

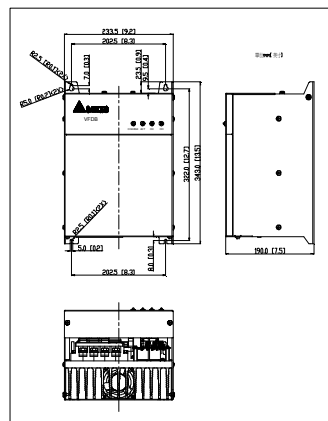
VFDB 制动单元规格					
使用电压等级	690V 级				
型号 VFDB□□□□	6055	6110	6160	6200	
最大适用马达容量 (KW)	55	110	160	200	
输出额定	最大放电电流 (A peak) 10%ED	46	92	136	
	连续放电电流 (A)	29	59	86	
	制动起始电压 (DC)	860/940/980/1020/1080/1120±9V			
电源	直流电压	600-1120VDC			
	每台等效最小电阻	24.5Ω	12.2Ω	8.2Ω	6.9Ω
保护	过电流 OC 保护准位(A)	70	140	210	250
	充电中显示	主回路(DC+~DC-)电压在 230VDC 以下熄灭			
	过热故障输出	RELAY 接点 3A 250Vac/28Vdc(RA,RC)			
使用环境	安装场所	屋内 (无腐蚀性气体、金属粉尘)			
	环境温度	-10℃~+50℃ (14°F to 122°F)			
	储存温度	-20℃~+60℃ (-4°F to 140°F)			
	湿度	90%RH 以下不结露			
振动	20Hz 以下	9.8m/S ² (1G)、20~50Hz 2m/S ² (0.2G)			
	机构构造	壁挂型 IP10			

BR 制动电阻规格	
型号	规格
BR1K2W033	1200W 33Ω
BR1K5W107	1500W 107Ω
BR1K0W011	1000W 11Ω
BR1K2W133	1200W 133Ω
BR1K5W012	1500W 12Ω
BR1K5W027	1500W 27Ω
BR1K5W011	1500W 11Ω

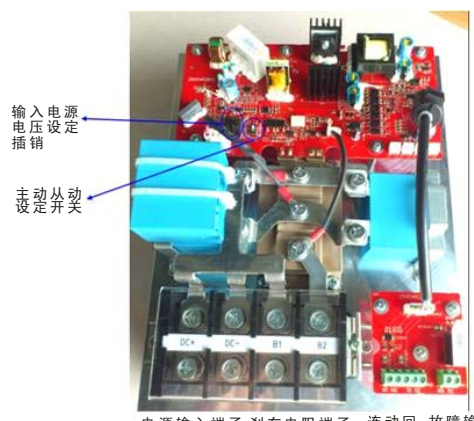
3 尺寸- 刹车电阻



3 尺寸- 制动单元



4 各部名称及功能说明



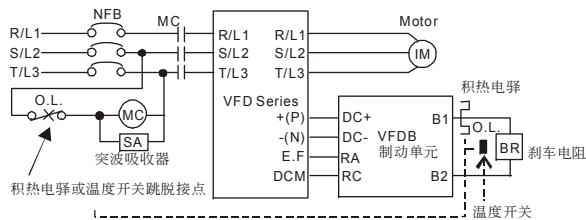
电源输入端子 DC+ DC- 刹车电阻端子 B1 B2 连动回路端子 M1 M2 故障输出端子 RA RC

各端子使用线径

回路名称	端子记号	导线线径 AWG (mm ²)	螺丝规格	扭力
电源输入回路	DC+,DC-	3~4AWG (26.67~21.15mm ²) (For VFDB6055&VFDB6110) 2~3AWG (33.62~26.67mm ²) (For VFDB6160&VFDB6200)	M8	50kgf-cm (43 in-lbf)
刹车电阻回路	B1,B2	3~4AWG (26.67~21.15mm ²) (For VFDB6055&VFDB6110) 2~3AWG (33.62~26.67mm ²) (For VFDB6160&VFDB6200)	M8	50 kgf-cm (43 in-lbf)
连动回路	输出 M1,M2	18~20AWG (0.8~0.5mm ²) (需用屏蔽线)	M2	4 kgf-cm (3 in-lbf)
	输入 S1,S2			
故障回路	RA,RC	18~20AWG (0.8~0.5mm ²)	M2	4 kgf-cm (3 in-lbf)
接地点		8~10AWG(8.37~5.26mm ²)	M5	25kgf-cm(21.5in-lbf)

5 基本配线图

动作说明: 1. 在安装制动单元的应用中为了安全的考虑，在制动单元与刹车电阻之间加装一积热电驿 (O.L.); 并与交流马达驱动器前端的电磁接触器 (MC) 作一连锁的异常保护。...

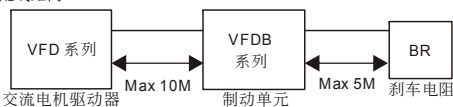


- 当交流电机驱动器有加装直流电抗器(DC Reator)时，其刹车模块的电源输入回路DC+端的配线方法，可参考交流电机驱动器手册。
- 请勿将电源输入回路DC-端，接至电力系统的中性点。

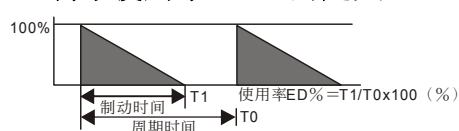
6 配线注意事项



- 进行配线施工时务必确认相关回路电源均为关闭状态；配线的线径及距离亦务必按照规定选用及施工。
- 交流电机驱动器 (VFD) 连接至制动单元 (VFDB) 的 DC+、DC-端子有极性之分，千万要确认再确认，否则电源一开启制动单元立即炸毁，请务必注意。
- 制动单元在执行刹车时，DC+、DC-、B1、B2 因有大电流通过所连接的导线瞬间将产生能量很大的电磁场；故在初期配线施工规划时，应与其它低电压的控制线路分离配线，以免造成不必要的干扰或误动作。
- 所有的主回路端子请使用 O 型端子配线，并确保端子已锁紧方可送电。
- 刹车电阻安装的场所不能有任何易燃性的物体、气体、液体，最好安装在独立的金属箱内并加以风扇散热。
- 制动单元的接地工程 230V 级请依第三种接地施工，460V 级请依特别第三种接地施工，690V 请依特别第三种接地施工。
- 在减速刹车频繁的场所 (超过 10%ED) 刹车电阻请加装风扇强制风冷或其它冷却设备。
- 在通电中严禁修改任何配线及制动单元内部设定，更严禁在通电中碰触相关配线的端子及 PCB 板中的任一组件，以免因通电中遭电压危险的直流高压感电造成人员伤害。



7 刹车使用率 ED%的定义



说明: 制定刹车使用率 ED%，主要是为了能让制动单元及刹车电阻有充分的时间来散除因制动而产生的热量；当刹车电阻发热时，电阻值将会随温度的上升而变高，制动转矩亦随之减少。

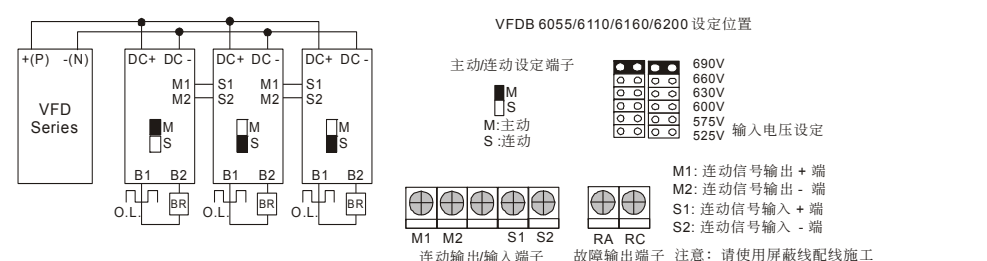
8 设定与调整

- 电源电压的调整: 制动单元的电力来源是接受接交流电机驱动器+ (P)、- (N)两端供应的直流电源。因此，在配线完成准备运转时，依交流电机驱动器的输入电源来设定制动单元的电源电压是非常重要的步骤；此设定将会影响制动单元动作电压的准位，下表为各个电压动作准位。
- 使用本公司 VFD 系列交流电机驱动器，请将参数的过电压失速防止功能设定为关闭状态，使失速防止功能失效，如此可得稳定的减速特性。

690V 级 AC 电源电压	制动开始电压 DC+、DC- 电压	VFDB 6055/6110/6160/6200 设定位置
525Vac	860Vdc	CHARGE 灯
575Vac	940Vdc	ACT 灯
600Vac	980Vdc	OC 灯
630Vac	1020Vdc	OH 灯
660Vac	1080Vdc	
690Vac	1120Vdc	

注: 容许输入电源有±10%的变动

- 主动(M)/连动(S)的设定: 制动单元在出厂时均设定在“MASTER”主动刹车的位置。“SLAVE”连动位置的功能主要是应用于两台以上制动单元并联的应用，可使每一台制动单元同时动作同时截止，如此每一台的消耗功率均为相等充分发挥每台的制动功能。



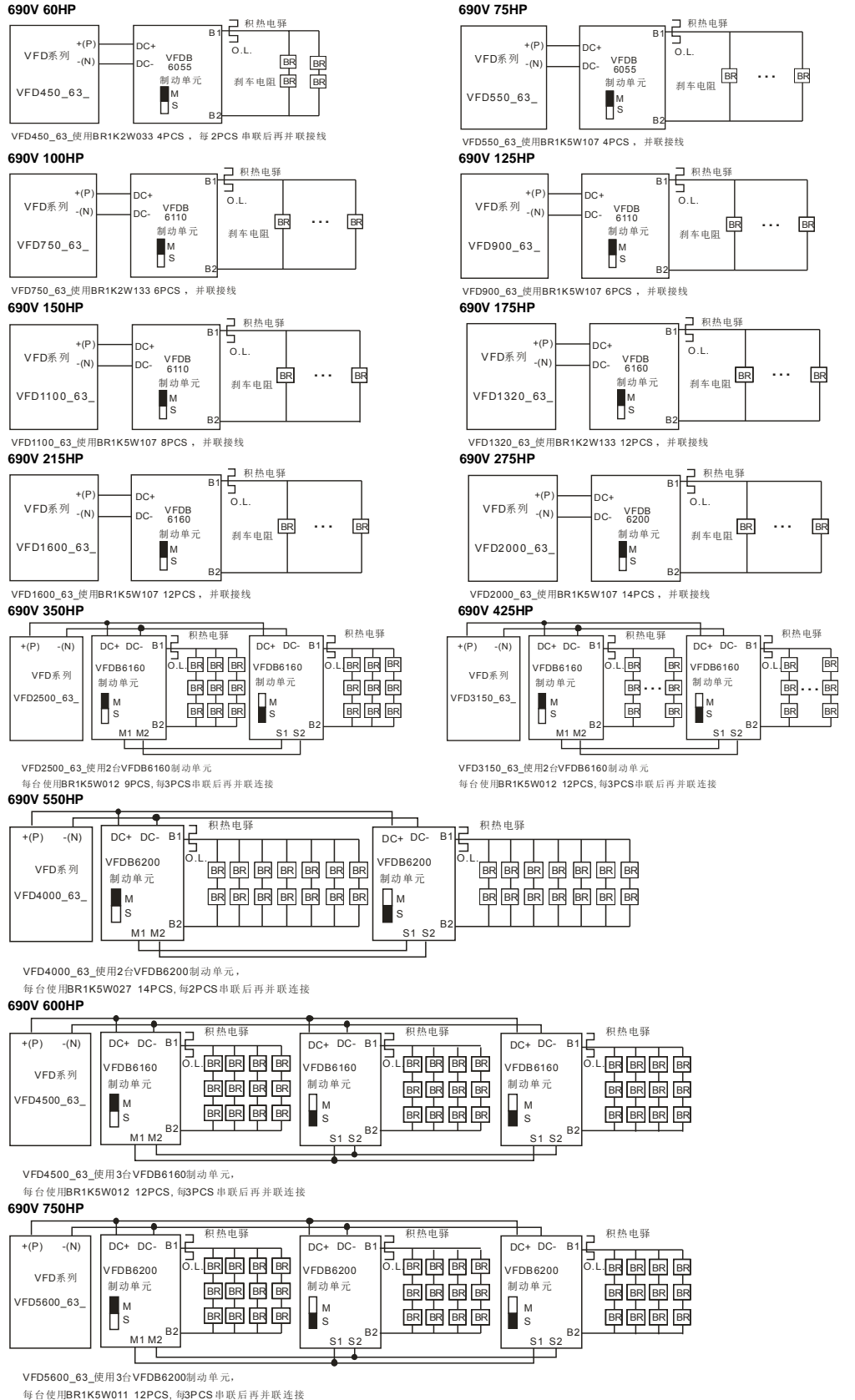
9 制动单元与放电电阻适用一览表

电压	适用电机		125%制动能力/ 10%ED				最大制动转矩限制						
	HP	KW	制动转矩 (kg-m)	VFDB 型号	用量	每台变频器等效刹车电阻规格	每个制动单元对应之制动电阻	刹车电流 (A)	最小电阻限制(Ω)	最高刹车电流限制(A)	最大峰值功率 (kW)		
690V	60	45	25.1	6055	1	4800W 33Ω	BR1K2W033	4	2 并联 2 串联	34	30.2	37	41.6
	75	55	30.5	6055	1	6000W 26.7Ω	BR1K5W107	4	4 并联	42	24.5	46	51.2
	100	75	37.2	6110	1	7200W 22.1Ω	BR1K2W133	6	6 并联	50	20.2	55	62.0
	125	90	50.8	6110	1	9000W 17.8Ω	BR1K5W107	6	6 并联	62	16.5	68	76.2
	150	110	60.9	6110	1	12000W 13.3Ω	BR1K5W107	8	8 并联	84	12.2	92	103.2
	175	132	74.5	6160	1	14400W 11.1Ω	BR1K2W133	12	12 并联	101	10.1	111	124.0
	215	160	89.4	6160	1	18000W 8.9Ω	BR1K5W107	12	12 并联	125	8.2	136	152.7
	275	200	108.3	6200	1	21000W 7.6Ω	BR1K5W107	14	14 并联	148	6.9	162	181.8

电压	适用电机		125%制动能力/ 10%ED						最大制动转矩限制				
	HP	KW	制动转矩 (kg-m)	VFDB 型号	用量	每台变频器等效刹车电阻规格	每个制动单元对应之制动电阻	刹车电流 (A)	最小电阻限制(Ω)	最高刹车电流限制(A)	最大峰值功率 (kW)		
690V	350	250	135.4	6160	2	27000W 6Ω	BR1K5W012	9	3 并 3 串联	184	5.5	202	226.7
	425	315	169.3	6160	2	36000W 4.5Ω	BR1K5W012	12	4 并 3 串联	250	4.1	270	302.4
	550	400	213.3	6200	2	42000W 3.85Ω	BR1K5W027	14	7 并 2 串联	280	3.6	308	345.0
	600	450	240.3	6160	3	54000W 3Ω	BR1K5W012	12	4 并 3 串联	370	2.8	403	451.7
	750	560	304.7	6200	3	54000W 2.75Ω	BR1K5W011	12	4 并 3 串联	396	2.6	436	488.3

10 制动电阻配线图例

在配线前，注意：每台刹车模组的等效刹车电阻不能低于每台制动单元最小等效电阻值 (参阅制动单元与放电电阻适用一览表)。





VFDB Series Braking Modules Instruction Sheet

1 Preface

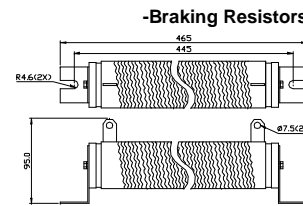
Thank you for choosing DELTA's braking module. VFDB braking units are applied to absorb the motor regeneration energy when the three-phase induction motor stops by deceleration. With VFDB braking unit, the regeneration energy will be dissipated in dedicated braking resistors. To prevent mechanical or human injury, please refer to this instruction sheet before wiring. VFDB braking units are suitable for DELTA AC Motor Drives VFD Series 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.delta.com.tw/industrialautomation>.

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	
	Continuous Discharge Current(A)	29	59	86	
	Braking Start-up Voltage (DC)	860/940/980/1020/1080/1120±9V			
Input Rating	DC Voltage 600-1120VDC				
Min. Equivalent Resistor for Each Braking Unit	24.5Ω	12.2Ω	8.2Ω	6.9Ω	
Protection	Over-current level (A)	70	140	210	
	Power Charge Display	Blackout until bus(DC+~DC-)voltage is below 230VDC			
	Overheat Alarm Output	RELAY contact 3A 250Vac/28Vdc(RA,RC)			
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	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				

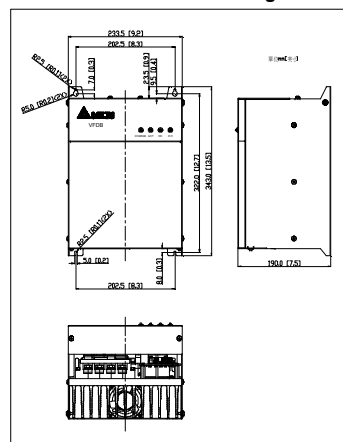
Braking resistor	
Model no.	Specification
BR1K2W033	1200W 33Ω
BR1K5W107	1500W 107Ω
BR1K0W011	1000W 11Ω
BR1K2W133	1200W 133Ω
BR1K5W012	1500W 12Ω
BR1K5W027	1500W 27Ω
BR1K5W011	1500W 11Ω

3 Dimensions

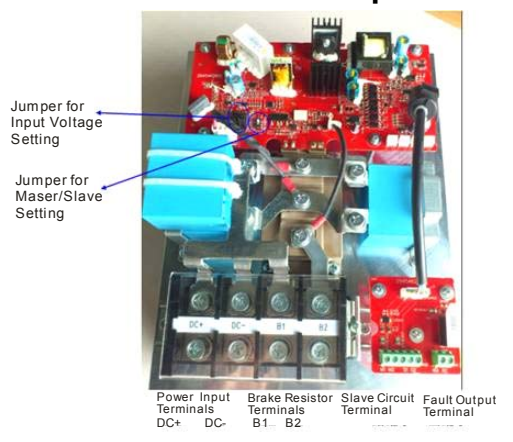


3 Dimensions

- VFDB Braking Units



4 Individual Parts and Function Explanation

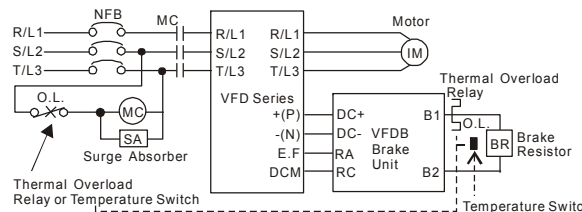


Terminal Wire Gauge

Circuit	Terminal Mark	Wire Gauge AWG (mm ²)	Screw	Torque
Power Input Circuit	DC+, DC-	3~4AWG (26.67~21.15mm ²) (For VFDB6055&VFDB6110) 2~3AWG (33.62~26.67mm ²) (For VFDB6160&VFDB6200)	M8	50kgf-cm (43 in-lbf)
Braking Resistor	B1, B2	3~4AWG (26.67~21.15mm ²) (For VFDB6055&VFDB6110) 2~3AWG (33.62~26.67mm ²) (For VFDB6160&VFDB6200)	M8	50 kgf-cm (43 in-lbf)
SLAVE Circuit	Output Input M1, M2 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)
Earth Connection		8~10AWG(8.37~5.26mm ²)	M5	25kgf-cm(21.5in-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 (RA, RC) of the braking unit will be activated when the temperature of the heat sink exceeds 80°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 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.



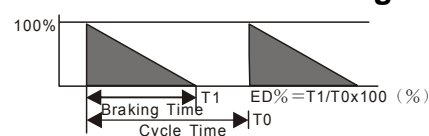
- When the AC motor drive is used with DC reactor, please refer to the wiring diagram in the AC motor drive for user manual for wiring terminal DC+ of brake unit.
- DO NOT wire terminal DC- to the neutral point of power system.

6 Wiring Notice



- 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 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.

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.

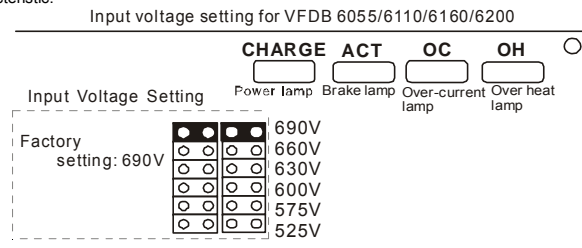


- Before regulating the power voltage, make sure the power has been turned off. Please set power voltage as the possible highest voltage for unstable power system. Take 575Vac power system for example. If the voltage may be up to 620Vac, 630Vac should be regulated.
- For DELTA's AC motor drive VFD Series,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

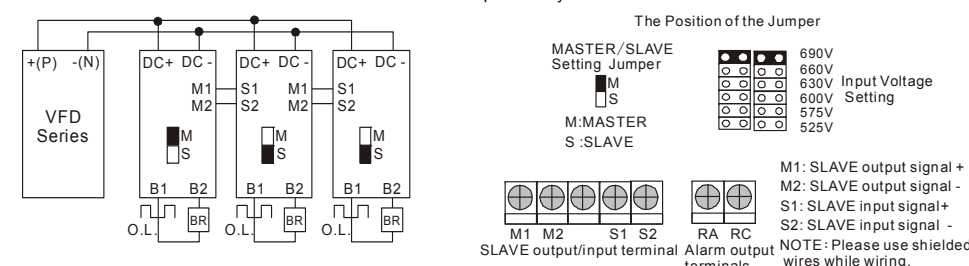
The Selection of Power Voltage and Operation Potential of PN DC Voltage

690V Model AC Power Voltage	Braking Start-up voltage DC Bus(DC+, DC-) Voltage
525Vac	860Vdc
575Vac	940Vdc
600Vac	980Vdc
630Vac	1020Vdc
660Vac	1080Vdc
690Vac	1120Vdc

NOTE: Input Power With Tolerance ±10%



- 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

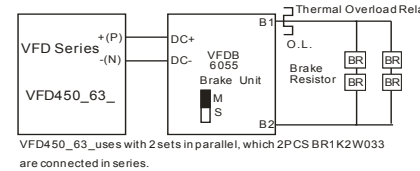
Voltage	Applicable Motor		125% Braking Torque/ 10%ED				Max. Braking Torque						
	HP	KW	Braking Torque (kg-m)	Braking Unit VFD Model	Qty.	Equivalent Brake Resistor Spec. for Each AC Motor Drive	Part No.	Qty.	Connection	Braking Current (A)	Min. Resistor Value (Ω)	Max. Braking Current (A)	Max. Peak Power (kW)
690V	60	45	25.1	6055	1	4800W 33Ω	BR1K2W033	4	2 in parallel	34	30.2	37	41.6
	75	55	30.5	6055	1	6000W 26.7Ω	BR1K5W107	4	4 in parallel	42	24.5	46	51.2
	100	75	37.2	6110	1	7200W 22.1Ω	BR1K2W133	6	6 in parallel	50	20.2	55	62.0
	125	90	50.8	6110	1	9000W 17.8Ω	BR1K5W107	6	6 in parallel	62	16.5	68	76.2
	150	110	60.9	6110	1	12000W 13.3Ω	BR1K5W107	8	8 in parallel	84	12.2	92	103.2

Voltage	Applicable Motor		125% Braking Torque/ 10%ED				Max. Braking Torque						
	HP	KW	Braking Torque (kg-m)	Braking Unit VFD Model	Qty.	Equivalent Brake Resistor Spec. for Each AC Motor Drive	Part No.	Qty.	Connection	Braking Current (A)	Min. Resistor Value (Ω)	Max. Braking Current (A)	Max. Peak Power (kW)
690V	175	132	74.5	6160	1	14400W 11.1Ω	BR1K2W133	12	12 in parallel	101	10.1	111	124.0
	215	160	89.4	6160	1	18000W 8.9Ω	BR1K5W107	12	12 in parallel	125	8.2	136	152.7
	275	200	108.3	6200	1	21000W 7.6Ω	BR1K5W107	14	14 in parallel	148	6.9	162	181.8
	350	250	135.4	6160	2	27000W 6Ω	BR1K5W012	9	3 in parallel	184	5.5	202	226.7
	425	315	169.3	6160	2	36000W 4.5Ω	BR1K5W012	12	4 in parallel	250	4.1	270	302.4
	550	400	213.3	6200	2	42000W 3.85Ω	BR1K5W027	14	7 in parallel	280	3.6	308	345.0
	600	450	240.3	6160	3	54000W 3Ω	BR1K5W012	12	4 in parallel	370	2.8	403	451.7
	750	560	304.7	6200	3	54000W 2.75Ω	BR1K5W011	12	4 in parallel	396	2.6	436	488.3

10 Wiring Examples of Braking Resistors

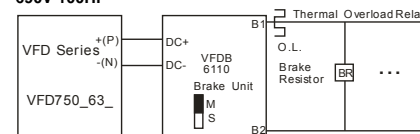
NOTE: Before wiring, please notice equivalent resistors value shown in the column "Braking Resistors & Braking Units Use in the AC Drives" in the above table to prevent damage.

690V 60HP



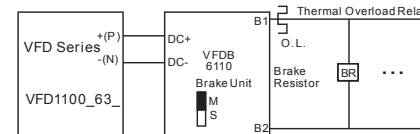
VFD450_63_ uses with 2 sets in parallel, which 2PCS BR1K2W033 are connected in series.

690V 100HP



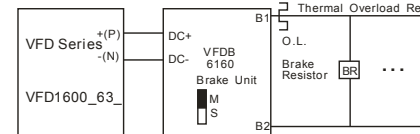
VFD750_63_ uses with 6PCS BR1K2W133 in parallel.

690V 150HP



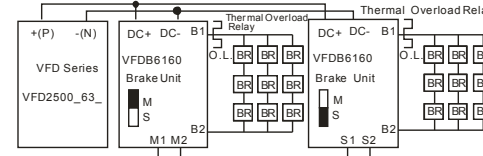
VFD1100_63_ uses with 8PCS BR1K5W107 in parallel.

690V 215HP



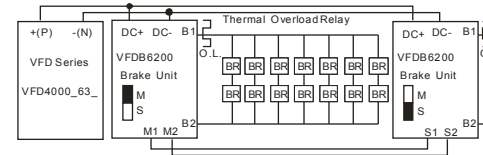
VFD1600_63_ uses with 12PCS BR1K5W107 in parallel.

690V 350HP



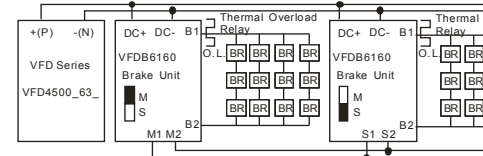
VFD2500_63_ uses with 2 VFDB6160 Brake Units. Each Brake Unit uses with 7 BR sets in parallel, which 2PCS BR1K5W012 are connected in series.

690V 550HP



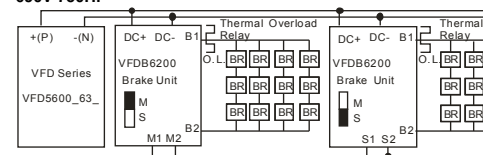
VFD4000_63_ uses with 3 VFDB6160 Brake Units. Each Brake Unit uses with 4 BR sets in parallel, which 3PCS BR1K5W012 are connected in series.

690V 600HP



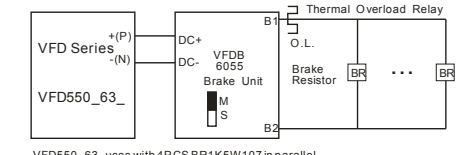
VFD4500_63_ uses with 3 VFDB6160 Brake Units. Each Brake Unit uses with 4 BR sets in parallel, which 3PCS BR1K5W012 are connected in series.

690V 750HP



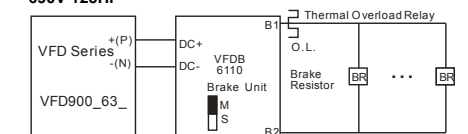
VFD5600_63_ uses with 3 VFDB6200 Brake Units. Each Brake Unit uses with 4 sets in parallel, which 3 PCS BR1K5W011 are connected in series.

690V 75HP



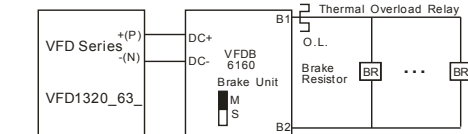
VFD550_63_ uses with 4PCS BR1K5W107 in parallel.

690V 125HP



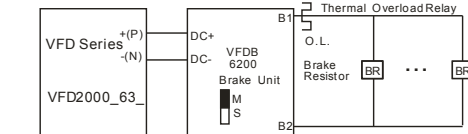
VFD900_63_ uses with 6PCS BR1K5W107 in parallel.

690V 175HP



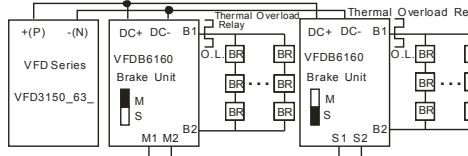
VFD1320_63_ uses with 12PCS BR1K2W133 in parallel.

690V 275HP



VFD2000_63_ uses with 14PCS BR1K5W107 in parallel.

690V 425HP



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



TÜRKİYE
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VFDB Serisi Frenleme Modülü Bilgi Dokümanı

1 Önsöz

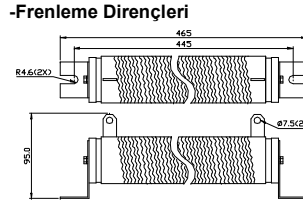
DELTA'nın fren modülünü seçtiğiniz için teşekkürler. VFDB fren üniteleri üç-faz indüksiyon motorun yavaşlayarak durması aşamasında ortaya çıkan motor rejenerasyon enerjisini söndürmede kullanılır. VFDB ünitesi belirlenen fren direnci ile rejenerasyon enerjisini söndürür. Mekanik ve kişisel zararları önlemek için, bağlantı yapmadan önce lütfen bu bilgi dokümanını okuyunuz. Belirlen VFDB fren üniteleri 690V VFD serisi DELTA AC Motor sürücülerini ile uyumludur. En iyi frenleme karakteristiğini sağlamak için VFDB fren üniteleri BR serisi fren dirençleri ile birlikte kullanılmalıdır. Bu bilgi dokümanının içeriği hiç bir bildirim gerek kalmadan değiştirilebilir. En son güncellenmiş halini elde etmek için teknik servisimize başvurabilir veya http://www.delta.com.tw/industrialautomation adresinden indirebilirsiniz.

2 Özellikler

VFDB Frenleme Üniteleri					
Özellik		690V Serisi			
Model VFDB		6055	6110	6160	6200
Max. Motor Kapasitesi (KW)		55	110	160	200
Çıkış Aralığı	Max. Deşarj Akımı (Amper pik) 10%ED	46	92	136	162
	Sürekli Deşarj Akımı (Amper)	29	59	86	107
	Frenleme Başlangıç Voltajı (DC)	860/940/980/1020/1080/1120±9V			
Giriş Aralığı	DC Voltaj	600-1120VDC			
Her Fren Ünitesi için Minimum Eşdeğer Direnç		24.5Ω	12.2Ω	8.2Ω	6.9Ω
Koruma	Aşırı akım seviyesi (A)	70	140	210	250
	Power Şarj Göstergesi	Bus voltajı (DC+~DC-) 230VDC altında kadar karartma			
	Aşırı Isı Alarm Çıkışı	RÖLE kontak 3A 250Vac/28Vdc(RA,RC)			
Çalışma Ortamı	Kurulum Ortamı	İç mekan (aşındırıcı gaz, metalik toz olmayan)			
	Çalışma Sıcaklığı	-10°C ~ +50°C (14°F ~ 122°F)			
	Saklama Sıcaklığı	-20°C ~ +60°C (-4°F ~ 140°F)			
	Rutubet	90%RH altında yoğunlaşmaz			
	Titreşim	20Hz altında 9.8m/S ² (1G) · 20~50Hz'de 2m/S ² (0.2G)			
Mekanik Konfigürasyon		Duvar montaj kapalı tip IP10			

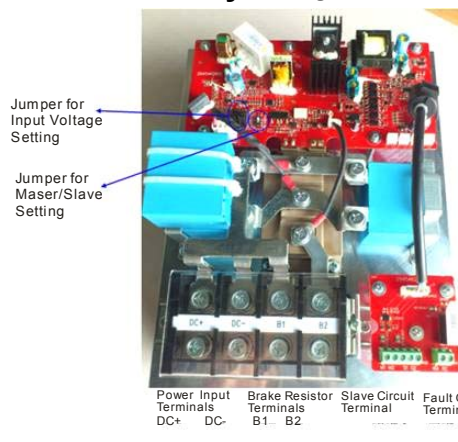
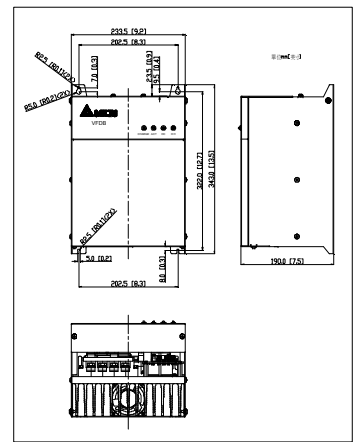
Frenleme Direnci	
Model no.	Özellik
BR1K2W033	1200W 33Ω
BR1K5W107	1500W 107Ω
BR1K0W011	1000W 11Ω
BR1K2W133	1200W 133Ω
BR1K5W012	1500W 12Ω
BR1K5W027	1500W 27Ω
BR1K5W011	1500W 11Ω

3 Ölçüler



3 Ölçüler

- VFDB Frenleme Üniteleri

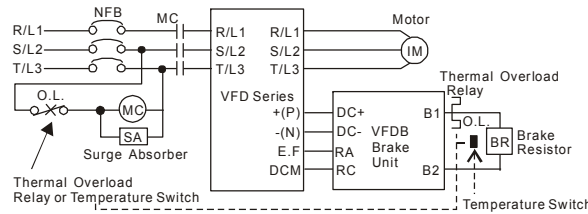


Terminal Kablo Ölçüsü

Devre	Terminal İşareti	Kablo Ölçüsü AWG (mm ²)	Vida	Tork
Power Giriş Devresi	DC+, DC-	3~4AWG (26.67~21.15mm ²) (VFDB6055&VFDB6110 için) 2~3AWG (33.62~26.67mm ²) (VFDB6160&VFDB6200 için)	M8	50kgf-cm (43 in-lbf)
Fren Direnci	B1, B2	3~4AWG (26.67~21.15mm ²) (VFDB6055&VFDB6110 için) 2~3AWG (33.62~26.67mm ²) (VFDB6160&VFDB6200 için)	M8	50 kgf-cm (43 in-lbf)
SLAVE Devresi	Çıkış Giriş M1, M2 S1, S2	18~20AWG (0.8~0.5mm ²) (ekranlı kablolar ile)	M2	4 kgf-cm (3 in-lbf)
Hata Devresi	RA, RC	18~20AWG (0.8~0.5mm ²)	M2	4 kgf-cm (3 in-lbf)
Topraklama Bağlantısı		8~10AWG(8.37~5.26mm ²)	M5	25kgf-cm(21.5in-lbf)

5 Temel Bağlantı Şeması

Çalışma Açıklaması: 1. Güvenlik emniyeti için, fren ünitesi ile fren direnci arasında aşırı yük rölesi koyunuz. Sürücünün önüne bağlanan manyetik kontaktör (MC) ile çalışmada, anormal durumlar için tam koruma sağlar.
2. Aşırı yük termik rölesinin kullanımı amaçlı çalışma sırasında çok sık meydana gelen frenlemeden ve beklenmeyen yüksek voltajların sonucunda fren ünitesinin çalışmasından fren direncinin zarar görmesini önlemek için enerji kesilmelidir.
3. Lütfen aşırı yük termik rölesi özelliklerine bakınız.
4. Fren ünitesi alarm çıkış terminalleri (RA, RC) soğutucunun sıcaklığı 80°C'yi aştığı zaman aktif olur. Bu durum ürünün kurulum ortamının sıcaklığının 50°C'yi aştığı veya, fren %ED değeri 10%ED'yi aştığı anlamına gelir. Bu tür alarm durumunda, lütfen soğutma için FAN yerleştiriniz veya çalışma ortamı sıcaklığını düşürünüz. Eğer bu durum sıcaklıktan dolayı meydana gelmiyorsa, sıcaklık sensörü kontrol devreleri zarar görmüş olabilir. Bu durumda lütfen teknik servisimize bağlantıya geçiniz.

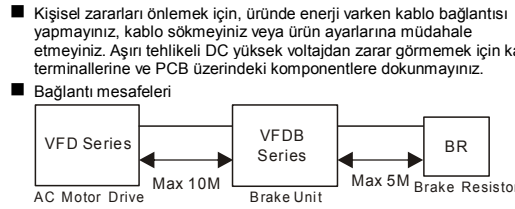


- When the AC motor drive is used with DC reactor, please refer to the wiring diagram in the AC motor drive for user manual for wiring terminal DC+ of brake unit.
- DO NOT wire terminal DC- to the neutral point of power system.

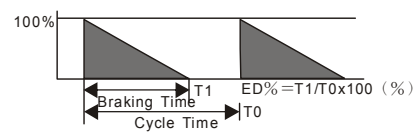
6 Bağlantı Uyarısı



- Ürüne power verildikten sonra bağlantılara müdahale etmeyiniz. Bağlantı kablo ölçüleri ve mesafeler elektrik kurallarına göre uygun olmalıdır.
- Fren ünitesine enerji verildiğinde zarar görmesini önlemek için AC motor sürücüsü (VFD Serisi) +(P), -(N) terminalleri fren ünitesi (VFDB) terminallerine doğru bağlanmalıdır.
- Parazit veya sürücünün çalışmama durumlarını önlemek için fren ünitesi fren yaptığı zaman yüksek akım geçecek DC+, DC-, B1 ve B2 terminaline bağlı kablolarla güçlü elektromanyetik alan meydana geleceğinden bu terminallere bağlı kablolar düşük voltaj kontrol devrelerinden olabildiğince uzak muhafaza edilmelidir



7 Fren Kullanım Oranı ED% Açılması



Açıklama: Fren kullanım oranı ED(%) fren ünitesi ve fren direnci için frenleme sırasında oluşan ısının dağıtılması için yeterli zamanı garanti altına alması olarak açıklanabilir. Fren direnci ısınır, sıcaklık ile birlikte fren direnç değeri artacak ve buna bağlı olarak fren torku düşecektir.

8 Voltaj Ayarları

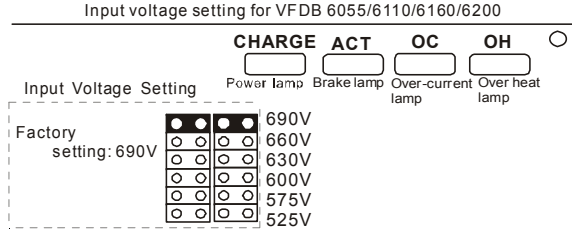
- Power voltajı ayarlaması: Fren ünitesinin besleme kaynağı AC motor sürücüsünün +(P), -(N) DC voltaj terminalleridir. Çalışmaya bağlanmadan önce fren ünitesinin power voltaj ayarını AC motor sürücüsünün giriş voltajına göre ayarlamak çok önemlidir. Bu ayar fren ünitesinin potansiyel çalışma voltajına çok büyük etki eder. Lütfen aşağıdaki tabloya bakınız.



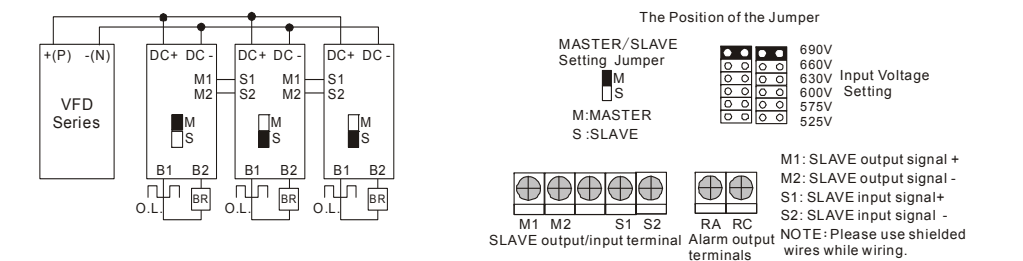
- Power voltajını ayarlamadan önce, enerjinin kesik olduğuna emin olunuz. Stabil olmayan güç sistemleri için power voltajını lütfen mümkün olan en yüksek voltaj ayarlayınız. 575Vac power sistem örneğinde, eğer voltaj 620Vac'ye kadar çıkıyorsa, power voltajı ayarı 630Vac ayarlanmalıdır.
- Sabit yavaşlama karakteristiği sağlamak için DELTA'nın VFD serisi AC motor sürücülerinde lütfen Aşırı Voltaj Durma Engeli parametresini pasif hale getiriniz.

690V Model AC Power Voltajı	Fren Başlangıç Voltajı DC Bus(DC+, DC-) Voltajı
525Vac	860Vdc
575Vac	940Vdc
600Vac	980Vdc
630Vac	1020Vdc
660Vac	1080Vdc
690Vac	1120Vdc

NOT: Giriş beslemesi ±10% tolerans ile



- MASTER/SLAVE ayarı: MASTER/SLAVE jumper ayarında fabrika ayarı "MASTER" dir. "SLAVE" ayarı iki veya daha fazla fren ünitesi paralel bağlanıldığında kullanılır ve senkron olarak fren ünitesini aktif/pasif eder. Daha sonra frenleme fonksiyonunu eksiksiz gerçekleştirebilmek için her bir ünitenin güç dağılımı eşdeğer olacaktır. Üç tane fren ünitesinin frenleme çalışması aşağıdaki şekilde gösterildiği gibidir. Bağlantılar yapıldıktan sonra, eksiksiz sistem kurulumu için birinci ünitenin jumper ayarı "MASTER" ve diğer ünitelerin ise "SLAVE" ayarlanmalıdır.



9 AC Sürücülerde Kullanılan Frenleme Dirençleri & Frenleme Üniteleri

Voltaj	Uygulanan Motor		125% Frenleme Torku / 10%ED				Max. Frenleme Torku						
	HP	KW	Frenleme Torku (kg-m)	Frenleme Ünitesi VFD Model	Adet	Her Sürücü için Eşdeğer Direnç Değeri	Parça No.	Adet	Bağlantı	Frenleme Akımı (A)	Min. Direnç Değeri (Ω)	Max. Frenleme Akımı (A)	Max. PİK Güç (kW)
	690V	60	45	25.1	6055	1	4800W 33Ω	BR1K2W033	4	2 paralel 2 seri	34	30.2	37
	75	55	30.5	6055	1	6000W 26.7Ω	BR1K5W107	4	4 paralel	42	24.5	46	51.2
	100	75	37.2	6110	1	7200W 22.1Ω	BR1K2W133	6	6 paralel	50	20.2	55	62.0
	125	90	50.8	6110	1	9000W 17.8Ω	BR1K5W107	6	6 paralel	62	16.5	68	76.2
	150	110	60.9	6110	1	12000W 13.3Ω	BR1K5W107	8	8 paralel	84	12.2	92	103.2

5. AC motor sürücüsü ve fren ünitesi enerji verildiği zaman(NFB(sığortasız devre kesici) açıldığında) aynı anda enerjiler. Motorun çalışma ve durma durumu seçimi için lütfen ilgili VFD serisi AC motor sürücüsü manüeline bakınız. Fren ünitesi, AC motor sürücüsü yavaşlayarak durduğu zamanki dahili DC voltajı algılar. Fazla rejenerasyon hızlıca dağıtılarak direnç üzerinde ısınma yoluyla söndürülür. Bu sayede düzgün yavaşlama karakteristiği sağlanır.

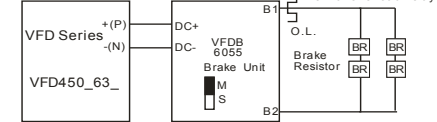
6. Fren direncini korumak için kullanılan aşırı yük termik rölesinin yanında koruma için fren direncinin yanına sıcaklık anahtarını konulabilir. Sıcaklık anahtarını fren direnci özelliklerine uygun olmalıdır. Daha fazla bilgi için teknik servisimize bağlantıya geçebilirsiniz.

Voltaj	Uygulanan Motor		125% Frenleme Torku / 10%ED				Max. Frenleme Torku						
	HP	KW	Frenleme Torku (kg-m)	Frenleme Ünitesi VFD Model	Adet	Her Sürücü için Eşdeğer Direnç Değeri	Parça No.	Adet	Bağlantı	Frenleme Akımı (A)	Min. Direnç Değeri (Ω)	Max. Frenleme Akımı (A)	Max. PİK Güç (kW)
	690V	175	132	74.5	6160	1	14400W 11.1Ω	BR1K2W133	12	12 paralel	101	10.1	111
	215	160	89.4	6160	1	18000W 8.9Ω	BR1K5W107	12	12 paralel	125	8.2	136	152.7
	275	200	108.3	6200	1	21000W 7.6Ω	BR1K5W107	14	14 paralel	148	6.9	162	181.8
	350	250	135.4	6160	2	27000W 6Ω	BR1K5W012	9	3 paralel 3 seri	184	5.5	202	226.7
	425	315	169.3	6160	2	36000W 4.5Ω	BR1K5W012	12	4 paralel 3 seri	250	4.1	270	302.4
	550	400	213.3	6200	2	42000W 3.85Ω	BR1K5W027	14	7 paralel 2 seri	280	3.6	308	345.0
	600	450	240.3	6160	3	54000W 3Ω	BR1K5W012	12	4 paralel 3 seri	370	2.8	403	451.7
	750	560	304.7	6200	3	54000W 2.75Ω	BR1K5W011	12	4 paralel 3 seri	396	2.6	436	488.3

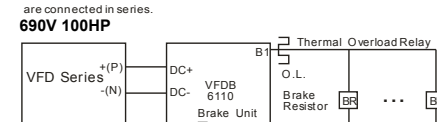
10 Frenleme Dirençleri Bağlantı Örnekleri

NOT: Bağlantı yapmadan önce, oluşabilecek zararları önlemek için yukarıdaki tabloda gösterilen "Her Sürücü için Eşdeğer Direnç Değeri" kısmında bulunan direnç değerini not ediniz.

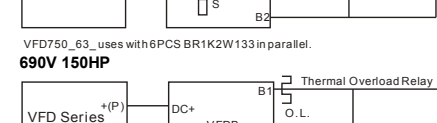
690V 60HP



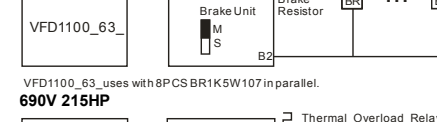
690V 100HP



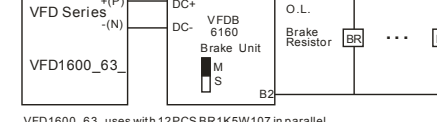
690V 150HP



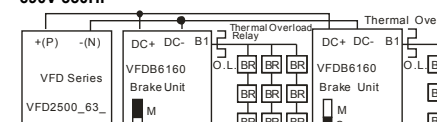
690V 215HP



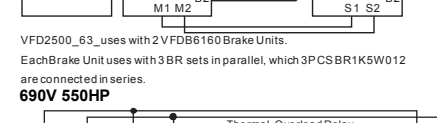
690V 250HP



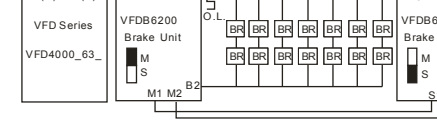
690V 350HP



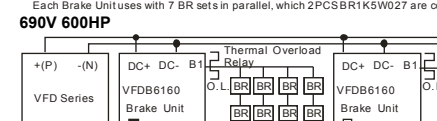
690V 550HP



690V 600HP



690V 750HP



690V 750HP

