

DYNAMIC BRAKE

**Instruction Manual
and Operation Guide**



DBMC22 Ver.1

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Section 1

WARNINGS AND PRECAUTIONS

WARNING: THIS EQUIPMENT SHOULD BE INSTALLED, ADJUSTED AND SERVICED BY QUALIFIED ELECTRICAL MAINTENANCE PERSONEL, FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF THE EQUIPMENT AND THE HAZARDS INVOLVED. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SERIOUS OR FATAL INJURY.

WARNING: THIS EQUIPMENT IS POWERED FROM TWO SEPARATE POWER SOURCES. DISCONNECT BOTH POWER SOURCES AND TEST FOR RESIDUAL VOLTAGE PRESENT AT THE DC BUS, BEFORE DISCONNECTING ANY WIRING. DANGEROUS VOLTAGE EXISTS UNTIL THE CHARGE LIGHT IS OFF.

WARNING: TO PREVENT DYNAMIC BRAKING RESISTOR OVERHEATING, FROM CAUSING DBM MALFUNCTION, INSTALL AN INTERLOCKING FAULT CIRCUIT WITH THE VFD INPUT POWER SUPPLY. SEE FIG. 5-2, 5-3 AND 5-4.

WARNING: THE DYNAMIC BRAKING RESISTORS MAY GET VERY HOT. TO PREVENT FROM FIRE HAZARD, INSTALL THE DYNAMIC BRAKE RESISTORS ON A NON-COMBUSTABLE SURFACE, IN A CLEAN, DRY, WELL VENTILLATED AREA. IF INSTALLING IN A PANEL, PROVIDE ADEQUATE VENTILLATION AND DISTANCE FROM OTHER COMPONENTS. HIGH VOLTAGE, HIGH TEMPERATURE LEADS SHOULD BE USED TO CONNECT THE DYNAMIC BRAKING MODULE TO THE DYNAMIC BRAKING RESISTORS.

WARNING: THE DYNAMIC BRAKING MODULE AND DYNAMIC BRAKING RESISTORS ARE AT A HIGH POTENTIAL WHILE THE VARIABLE FREQUENCY DRIVE IS UNDER POWER, EVEN IF THE VARIABLE FREQUENCY DRIVE IS NOT RUNING.

CAUTION: ENSURE THAT THE DC BUS CONNECTION IS WIRED CORRECTLY. IF THE POLARITY IS REVERSED THE DYNAMIC BRAKING MODULE AND THE VARIABLE FREQUENCY DRIVE MAY BE DAMAGED.

Section 2

INTRODUCTION

The Dynamic Braking Module (DBM), in conjunction with Dynamic Braking Resistors (DBR), provides protection for voltage-source, variable frequency drives (VFD's) from over-voltage faults caused by dynamically regenerated power.

Typical applications where regenerative conditions may occur are:

- High inertia loads such as saws, fans and centrifuges.
- High cycle loads such as machine tools, stackers and pick and place systems.
- Reciprocal loads such as punch presses, tumblers, pump jacks and stamping operations.

The DBMC2 series, DBM operates with any 200-240 VAC, 380-480 VAC or 575-600 VAC, voltage source, VFD system that employs a fixed DC Bus. Dynamic braking of the VFD dramatically shortens the amount of time required for the motor to decelerate or stop.

When power is applied to the DBM, the built in micro-controller monitors the voltage level of the VFD DC bus and loads the predetermined set points. There are no jumpers and no calibration is required for different voltage class VFD's.

The DBM requires a separate 120VAC supply for control power. The DBM monitors the DC bus voltage level and if the set point is reached the DBM, connects the DC bus across the DBR dissipating the regenerated energy as heat.

Section 3

RECEIVING AND STORAGE

3.1 Receiving

All DBM's go through rigorous factory testing before shipment. After unpacking however, check the following:

- 1) Nameplate data matches your requirements.
- 2) Any damage sustained while in transit.
- 3) Fastening screws are tight.

3.2 Storage

- 1) Ambient temperature -10-40 °C
- 2) Humidity 20-90% non-condensing.
- 3) Protection from physical damage, vibration and dust.

Section 4

INSTALLATION

4.1 Caution:

The installation location should be free of high heat exposure, excessive moisture, dust, corrosive gas and vibration.

4.2 Distance

The DBMC2 series DBM is NEMA1 rated. Knockouts for conduit connection are provided on the bottom and on the side of the enclosure. For cooling purposes the DBM must be installed vertically and be separated from other components and walls as per fig .4-1. If mounted inside a panel, ensure the DBM ambient temperature specification of -10 to 40 degrees C.

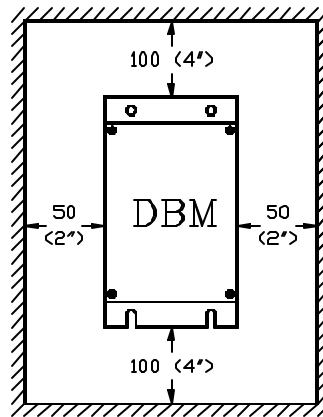


Fig. 4.1 Mounting space required by DBM.

Section 5

WIRING

5.1 Caution

- Ensure that the DC Bus connection is wired correctly. If the polarity is reversed, the DBM and the VFD may be damaged.
- Voltage rating of the wire should be no less than 600VAC and the temperature rating for the DBR wire no less than 125 °C

5.2 Wiring distance

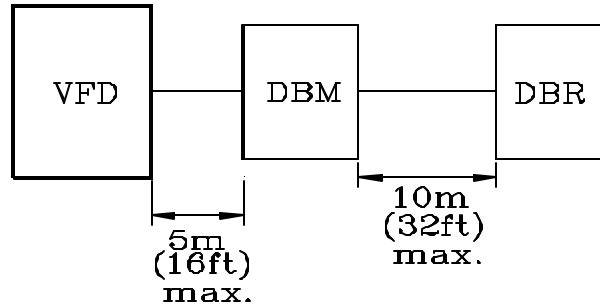


Fig. 5.1 Maximum cable length between VFD, DBM and DBR components

5.3 Caution:

To prevent the DBR from overheating in the event of a DBM fault, provide an interlocking control circuit to switch off the VFD power supply. See fig. 5-2, 5-3, 5-4

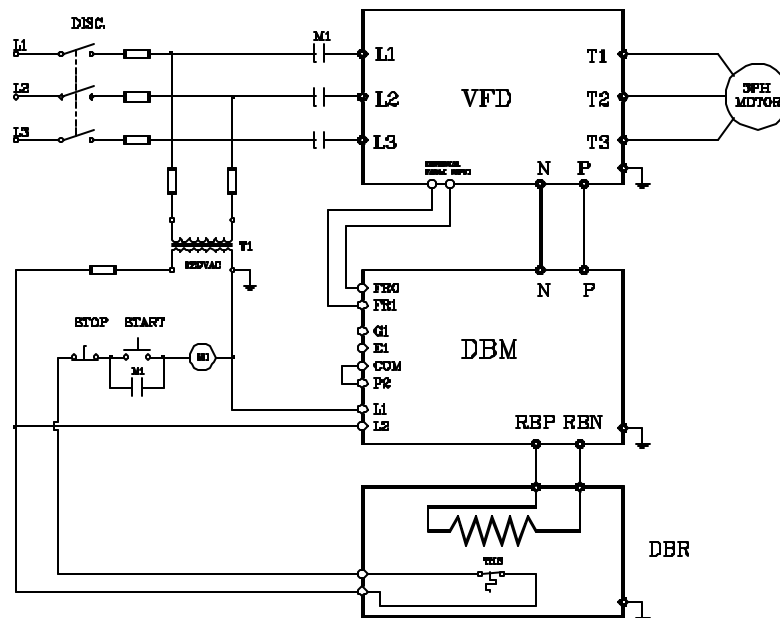


Fig 5-2

Connection diagram with a contactor on the input side of the VFD and the DBM fault contact connected to the external trip input of the VFD.

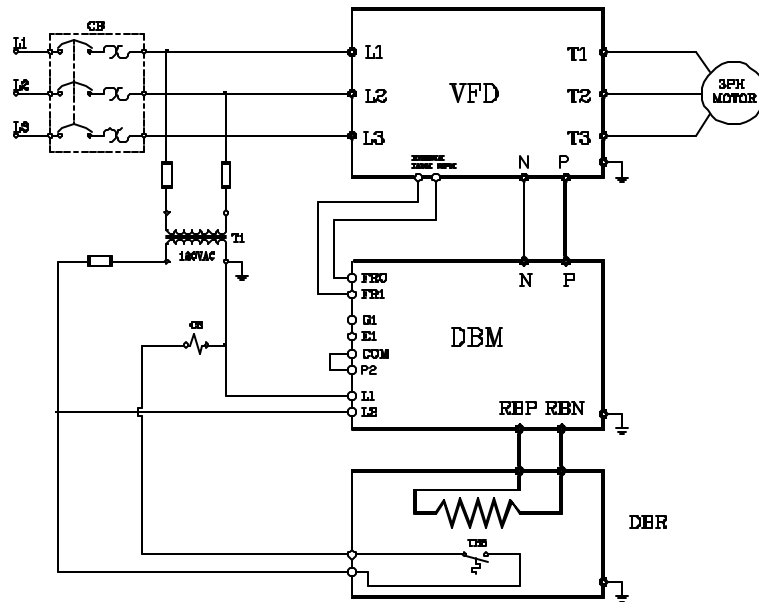


Fig 5-3 Connection diagram showing a circuit breaker with a shunt coil on the input side of the VFD.

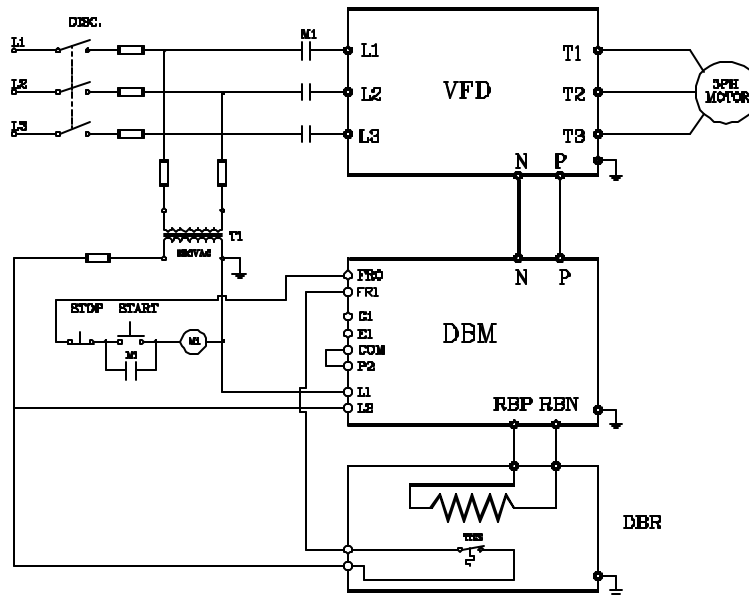


Fig. 5-4 Connection diagram showing the DBM fault contact interlocked with the control circuit of the VFD input contactor.

Section 6

OPERATION

6.1 Control Board- features

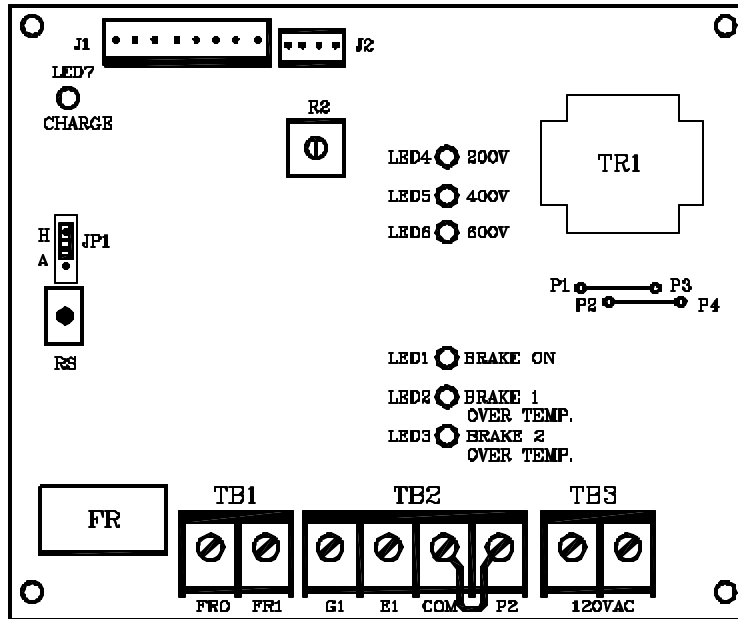


Table 6.1
Control Board Features

Designation	Description
LED1	Operation of the DBM (IGBT turned on)
LED2	Over temperature trip of the master DBM
LED3	Over temperature trip of the slave DBM (indicates open terminal COM/P2)
LED4	DBM initialized for 240 VAC Class
LED5	DBM initialized for 480 VAC Class
LED6	DBM initialized for 600 VAC Class
LED7	"Charge" DC bus voltage over 50 VDC
RS	Fault Reset Button
JP1	Selection of "Hand" or "Auto" reset
R2	Braking start voltage adjustment (factory-set)
P1,P2,P3,P4	120/240 VAC input power setting (factory-set 120 VAC)
TB1	Terminals for fault contact. FRO/FR1 contact is closed during normal operating condition, open when there is no control power or in a DBM fault condition.
TB2	G1/E1 gate control signal for slave DBM (not available-option for future development). The COM/P2 terminals must be shorted.
TB3	120 VAC/ min.10VA (240 VAC available on special order) input control power to DBM

6.2 Operation and settings

The DBMC2 series DBM is designed to operate with 200-240, 440-480 (380-415VAC settings available on request) and 575-600VAC class VFD's. Typically no jumpers or calibration are required for different voltage classes.

When the control power and DC voltage are applied to the DBM, the "charge" LED lights and the DBM initialization begins. The built in micro-controller monitors the DC bus voltage level and automatically sets the braking voltage levels. Once initialized the "green" LED indicating the voltage class of the installation is lit and the DBM is ready to operate. The initialization process takes about 1.5 seconds from the time the DC bus voltage is stabilized.

If the DBM overheats, a fault is detected, operation is stopped, the fault contact opens and LED2 lights. Reset can be by "Hand" or "Auto", settable by jumper JP1. The JP1 jumper is factory set to the "Hand" position. In the "Hand" mode the fault will be cleared by pressing the "RS" push button, in the "Auto" mode the fault will be cleared automatically when the temperature normalizes. The automatic mode should be used with caution and the cause of overheating should be investigated before clearing the fault.

Section 7

TROUBLESHOOTING

Table 7.1

No.	Fault Status	Cause	Corrective Action
1	DBM does not operate, “charge” LED is lit , voltage class indicator LED is not lit.	Missing 120VAC power supply to the control board.	Restore 120VAC power supply.
		Internal damage in the control board.	Replace control board
2	DBM trips, LED2 is Lit. Over temperature fault.	Excessive start/stop operation frequency.	Examine the duty cycle operation; check if the duty cycle of the DBM and DBR are suitable for the application. Replace with larger unit if necessary.
		Excessive load inertia.	
		Improper combination of DBM and DBR.	Confirm component ratings.
3	VFD trips on over voltage	Ambient temperature above 40deg.C (104deg.F).	Reduce ambient temperature.
		Insufficient braking resistor capacity.	Examine if the DBR, DBM and VFD have been sized correctly for the application. Extend decel time.
		DBM over temperature fault.	Check as per No. 2.
4	DBR thermal switch in trip mode.	DBM failure.	Replace the DBM.
		DBR wattage not sized correctly for the application.	Replace DBR with higher duty cycle rating.
5	DBR thermal switch sometimes trips.	DBM failure.	Replace the DBM.
		Insufficient DBR wattage.	Investigate braking condition and replace DBR with higher wattage if necessary.

Section 8

SPECIFICATIONS

8.1 General specifications

Table 8.1

Voltage	200-240 VAC, 380-480 VAC, 575-600 VAC
Current	Up to 200 amps
Turn On Voltage	360 VDC – 200-240 VAC Class
	740 VDC – 440-480 VAC Class (380-415VAC consult factory)
	920 VDC – 575-600 VAC Class
Duty Cycle	See Table 8.3
Max On Time	60 seconds braking
Enclosure	NEMA 1
Adjustments	No field adjustments required
Fault Output	Contact opens on:
	Loss of power
	Over Temperature (85deg. C)
Fault Contact Ratings	5A/250 VAC
	5A/30 VDC
Ambient Temperature	-10 to 40 deg. C
Storage Temperature	-10 to 60 deg. C
Humidity	20% to 90% Non-condensing
Location	Max 1000 m above sea level
	Indoor, free of corrosive gas and dust

8.2 Dimensions

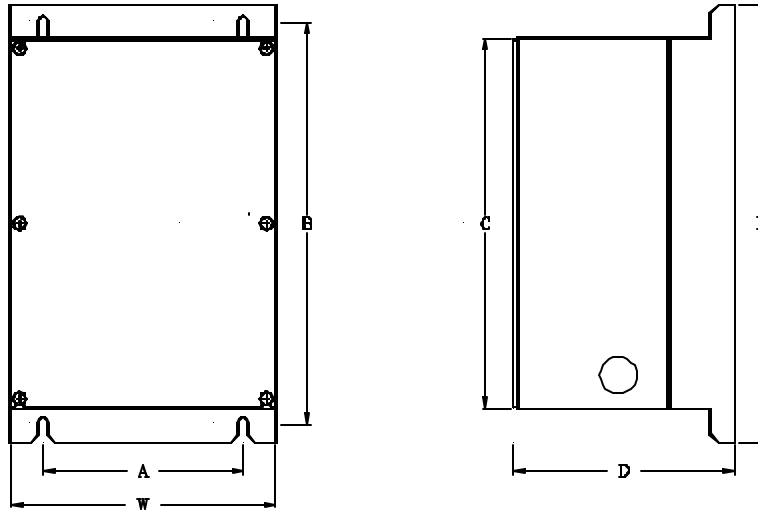


Table 8.2

DBM Dimensions							
Model No.	Enclosure Code	A	B	C	D	H	W
		Inches/mm	Inches/mm	Inches/mm	Inches/mm	Inches/mm	Inches/mm
DBMC2-035A	A	4.72/120	9.44/240	8.66/220	5.20/130	10.23/260	6.30/160
DBMC2-050A	A	4.72/120	9.44/240	8.66/220	5.20/130	10.23/260	6.30/160
DBMC2-065A	B	4.72/120	11.42/290	10.62/270	7.60/170	12.20/310	7.08/180
DBMC2-065A-FC	B	4.72/120	11.42/290	10.62/270	7.60/170	12.20/310	7.08/180
DBMC2-100A	B	4.72/120	11.42/290	10.62/270	7.60/170	12.20/310	7.08/180
DBMC2-100A-FC	B	4.72/120	11.42/290	10.62/270	7.60/170	12.20/310	7.08/180
DBMC2-135A	C	6.3/160	14.56/370	13.78/350	7.48/190	15.35/390	9.05/230
DBMC2-135A-FC	C	6.3/160	14.56/370	13.78/350	7.48/190	15.35/390	9.05/230
DBMC2-200A	C	6.3/160	14.56/370	13.78/350	7.48/190	15.35/390	9.05/230
DBMC2-200A-FC	C	6.3/160	14.56/370	13.78/350	7.48/190	15.35/390	9.05/230

8.3 DBM model number and DBR values by HP and duty cycle. Braking torque is rated for 100%.

Note: Wattage of the resistor in the Table 8.3 is base on the 100% duty cycle rating for that resistor

Table 8.3

Motor HP	Duty Cycle %	230VAC			460VAC			575VAC		
		DBU Model	Resistor		DBU Model	Resistor		DBU Model	Resistor	
			Ohms	Watts		Ohms	Watts		Ohms	Watts
10	10	DBMC2-035A	17.2	750	DBMC2-035A	72	750	DBMC2-035A	110	750
	20	DBMC2-035A		1500	DBMC2-035A		1500	DBMC2-035A		1500
	50	DBMC2-035A		3750	DBMC2-035A		3750	DBMC2-035A		3750
15	10	DBMC2-035A	11.8	1100	DBMC2-035A	50	1100	DBMC2-035A	76	1100
	20	DBMC2-035A		2200	DBMC2-035A		2200	DBMC2-035A		2200
	50	DBMC2-050A		5500	DBMC2-035A		5500	DBMC2-035A		5500
20	10	DBMC2-050A	8.6	1500	DBMC2-035A	36	1500	DBMC2-035A	55	1500
	20	DBMC2-050A		3000	DBMC2-035A		3000	DBMC2-035A		3000
	50	DBMC2-065A		7500	DBMC2-035A		7500	DBMC2-035A		7500
25	10	DBMC2-050A	7.2	1850	DBMC2-035A	30	1850	DBMC2-035A	45	1850
	20	DBMC2-050A		3700	DBMC2-035A		3700	DBMC2-035A		3700
	50	DBMC2-100A		9250	DBMC2-050A		9250	DBMC2-035A		9250
30	10	DBMC2-065A	5.9	2200	DBMC2-035A	25	2200	DBMC2-035A	38	2200
	20	DBMC2-065A		4400	DBMC2-035A		4400	DBMC2-035A		4400
	50	DBMC2-100A		11000	DBMC2-050A		11000	DBMC2-050A		11000
40	10	DBMC2-100A	4.4	3000	DBMC2-050A	18	3000	DBMC2-035A	27.5	3000
	20	DBMC2-100A		6000	DBMC2-050A		6000	DBMC2-035A		6000
	50	DBMC2-135A		15000	DBMC2-065A		15000	DBMC2-065A		15000
50	10	DBMC2-100A	3.6	3700	DBMC2-065A	14.8	3700	DBMC2-050A	22.5	3700
	20	DBMC2-100A		7400	DBMC2-065A		7400	DBMC2-050A		7400
	50	DBMC2-200A		18500	DBMC2-100A		18500	DBMC2-065A		18500
60	10	DBMC2-135A	2.9	4500	DBMC2-100A	12	4500	DBMC2-050A	19.2	4500
	20	DBMC2-135A		9000	DBMC2-100A		9000	DBMC2-050A		9000
	50	DBMC2-200A-FC		22500	DBMC2-100A		22500	DBMC2-100A		22500
75	10	DBMC2-200A	2.3	5500	DBMC2-100A	10	5500	DBMC2-065A	15.2	5500
	20	DBMC2-200A		11000	DBMC2-100A		11000	DBMC2-065A		11000
	50	DBMC2-200A-FC		27500	DBMC2-135A		27500	DBMC2-100A		27500
100	10	DBMC2-200A-FC	1.8	7500	DBMC2-135A	7.4	7500	DBMC2-100A	11.2	7500
	20	DBMC2-200A-FC		15000	DBMC2-135A		15000	DBMC2-100A		15000
	50				DBMC2-135A-FC		37500	DBMC2-135A		37500

Table 8.3

Motor HP	Duty Cycle %	230VAC			460VAC			575VAC		
		DBU Model	Resistor		DBU Model	Resistor		DBU Model	Resistor	
			Ohms	Watts		Ohms	Watts		Ohms	Watts
125	10				DBMC2-135A	6	9000	DBMC2-100A	9.6	9000
	20				DBMC2-135A		18000	DBMC2-100A		18000
	50				DBMC2-135A-FC		45000	DBMC2-135A-FC		45000
150	10				DBMC2-200A	5	11000	DBMC2-135A	7.6	11000
	20				DBMC2-200A		22000	DBMC2-135A		22000
	50				DBMC2-200A-FC		55000	DBMC2-135A-FC		55000
200	10				DBMC2-200A	3.7	15000	DBMC2-200A	5.6	15000
	20				DBMC2-200A-FC		30000	DBMC2-200A		30000
	50							DBMC2-200A-FC		75000
250	10							DBMC2-200A	4.8	18000
	20							DBMC2-200A-FC		36000
	50									