

## EM Series Electrically Released Brakes

### For Dynamic Stopping and Cycling Applications

Warner Electric's modular design brakes and clutch/brake units offer material handling system users a high performance alternative to spring-set brakes. These modular units provide long life, maintenance free operation, and consistent performance with minimal downtime.

These brakes are offered in power-off types for double shaft motors and for installation between C-face motor and reducer or other drive device. Powerful permanent magnets generate braking torque. The brakes release when voltage is applied to the coil, countering the force of the permanent magnets. No power is required to stop or hold a load. An optional integral conduit box provides simple wiring direct from the motor power leads.

- Designed for dynamic stopping operations
- Brake automatically engages when power is turned off
- High cycle rate capability
- Never needs adjustment – automatically compensates for wear
- Powerful permanent magnets provide braking force
- Choice of open or enclosed brakes
- Prepackaged, preburnished UM version

### Three C-face Compatible Designs

The UM Series (UniModule Clutch/Brakes) are preassembled clutch/electrically released brake modules.

- The UM-1020-FBC brake/motor clutch combination is used for clutch/power-off brake applications. It mounts directly to C-face compatible components.
- The UM-2030-FBC brake/input clutch combination is used for clutch/power-off brake applications. It has shafts on both the input and output sides for base mounting.

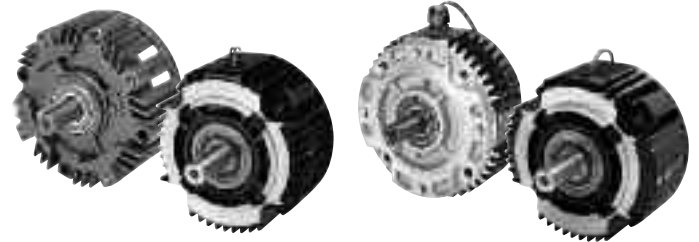
The EUM Series (Enclosed Motor Brakes) are totally enclosed non-vented units that keep wear particles in and contaminants out.

- The EUM-FBB brake unit can be mounted between two C-face compatible components.
- The EUM-MBFB motor brake is mounted directly to the rear of a double-shafted motor.

The EM Series (Electro Module Brakes and Clutch/Brakes) are comprised of individual units that may bolt together to form various combinations:

- The EM-FBB brake module mounts between a C-face motor and a gear box or reducer.
- The EM-MBFB motor brake module is mounted to the rear of a double-shafted motor.
- The EM-FBC brake module is used in combination with a motor clutch or input clutch unit to make a clutch/electrically released brake or can be used alone as a brake only.

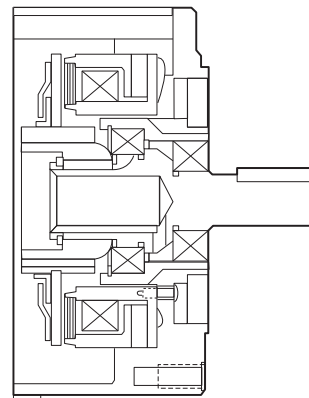
**Brake Modules (FBB)** – For mounting between a C-face motor and a gearbox or reducer



**EM Series**  
Shaft mounted,  
vented housing

**EUM Series**  
Shaft mounted,  
totally enclosed  
non-vented housing

Use for brake alone applications.



### Features

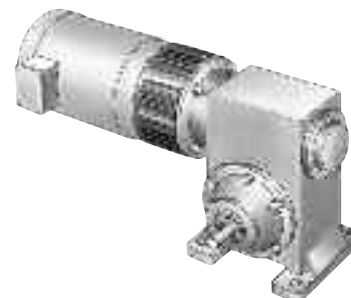
- Single armature for brake alone applications
- Output shaft
- Permanent magnets
- UL listed

### EM-FBB

Available in 5 sizes

### EUM-FBB

Available in 5 sizes

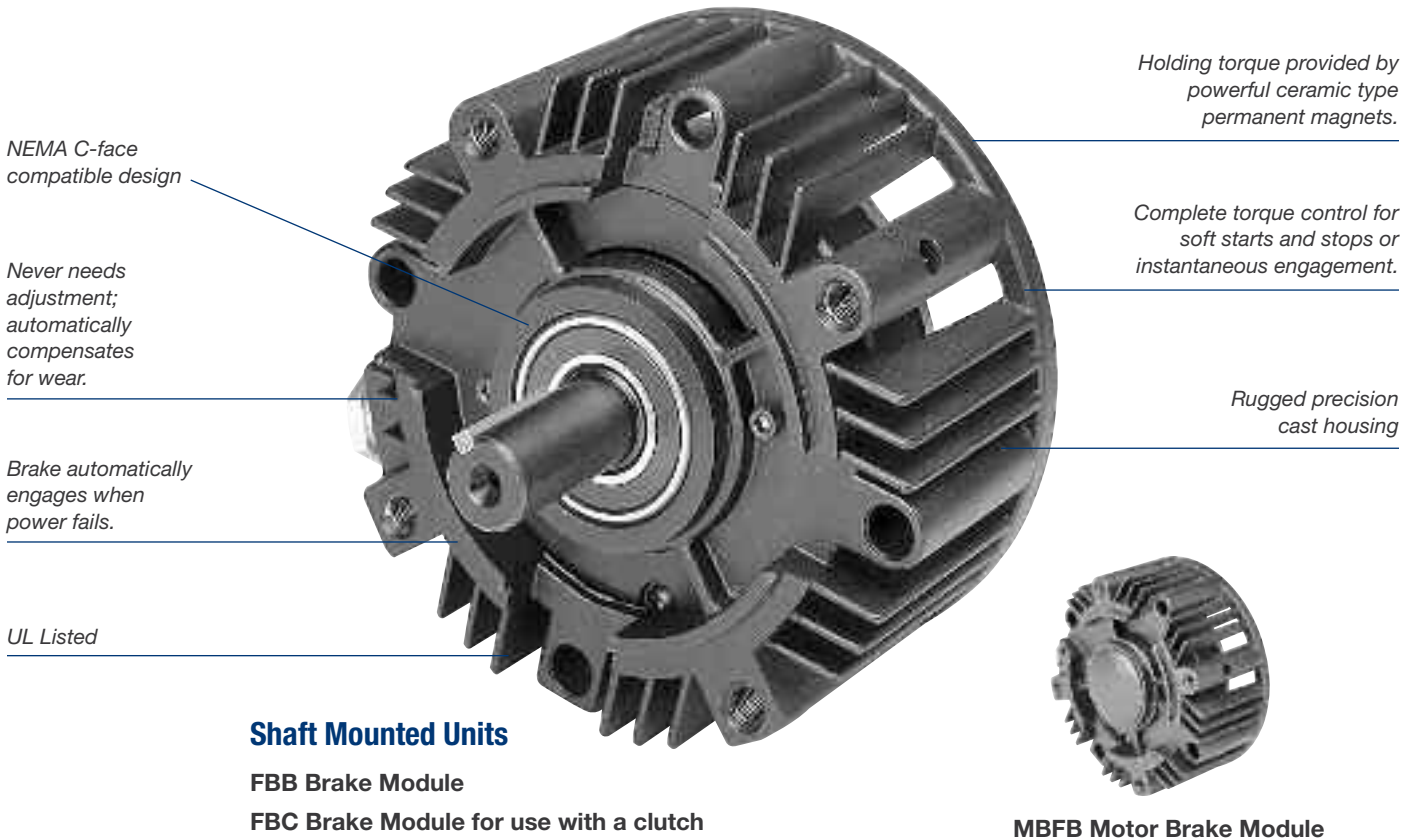


EM-FBB Electro Module  
brake unit between a  
motor and a reducer.

## EM Series Electrically Released Brakes

### Electro Module, Electrically Released Brakes and Clutch/Brake Units for Dynamic Stopping and Cycling Applications

#### 210 and 215 sizes



Warner Electric's unique design employs powerful permanent magnets for maximum torque when power is removed from the brake coil. A small amount of electrical power applied to the brake coil nullifies the permanent magnets' force and the brake releases. No springs to limit cycle rates. Never need adjustment. No lubrication. These brakes are recommended for dynamic cycling operations only.

#### Available in Three Design Styles

##### EM-FBB Brake Module

Use for brake alone applications. Mounts between a C-face motor and a gear box or reducer. Available in five sizes.

##### EM-MBFB Motor Brake Module

Mounts to the back of a double shafted motor. Available in four sizes.

##### EM-FBC Brake Module for use with a Clutch

Combine with a motor or input clutch for clutch/brake applications. Three sizes are available.

#### Specifications

Size	Voltage DC	Static Torque (lb.ft.)		Max. Speed (RPM)	Total Weight (lbs.)	Component Inertia -WR <sup>2</sup> (lb.ft. <sup>2</sup> )				NEMA Frame Size
		Brake	Clutch			Armature		Hub	Shaft	
						FBB/MBFB	FBC			
EM-50	24 90	10.5	16	3600	8.6	.0071	.014	.003	.001	56C/48Y
EM-100	90	21	—	3600	10.5	.018	—	.004	.002	56C/48Y
EM-180	24 90	21	30	3600	10.5	.018	.036	.004	.002	182C/143TC 184C/145TC
EM-210	24 90	56	95	3600	27	.081	.162	.027	.017	213C/182TC 215C/184TC

# EM Series Electrically Released Brakes

## C-face Compatible Brakes and Clutch/Brakes

### Motor Brake Modules (MBFB)

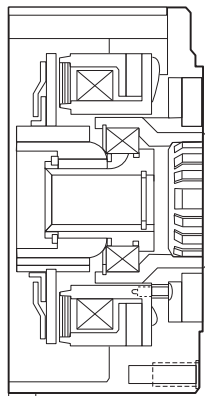
For mounting directly to the rear of a double-shafted motor



**EM Series**  
vented housing

**EUM Series**  
totally enclosed  
non-vented  
housing

Use as a motor brake on C-face type motors.



#### Features

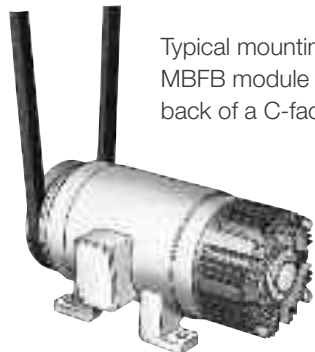
- Single armature design
- Complete torque control
- Precision cast housing
- Ceramic type permanent magnets

#### EM-MBFB

Available in 5 sizes

#### EUM-MBFB

Available in 5 sizes



Typical mounting of an MBFB module on the back of a C-face motor

### Clutch/Brake Modules (FBC)

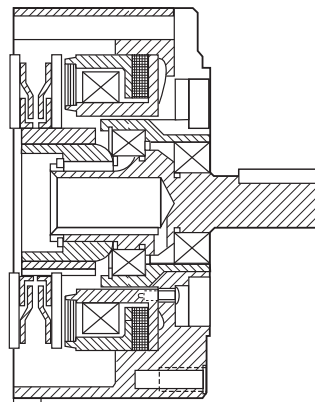
Clutch/Fail-safe brake for mounting between a C-face motor and a gearbox or reducer



**EM Series**  
Modular unit with  
C/B capability

**UM Series**  
Fully assembled  
C/B combination  
package

Combine with a motor or input clutch for clutch/brake applications or use alone as a brake only.



#### Features

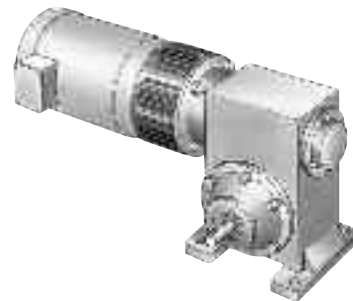
- Dual armature for clutch/brake combination
- Output shaft
- Can be base mounted for use as a separate drive unit.

#### EM-FBC

Available in 4 sizes

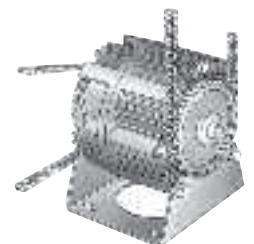
#### UM-FBC

Available in 5 size combinations



EM-FBC Electro Module brake unit combined with a motor clutch module

UM-FBC UniModule  
clutch/brake mounted  
on a base



# EM Series Electrically Released Brakes

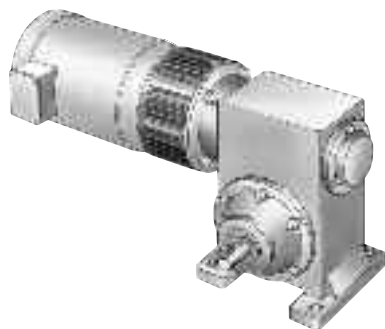
## EM-FBB, EM-FBC, EM-MBFB Selection

Warner Electric Electrically Released Electro Modules are available in three styles. The EM-FBB Brake Module is used in brake only applications and mounts between a C-face motor and a gear box or reducer. The EM-MBFB Motor Brake Module mounts to the back of a double shafted motor. The EM-FBC Brake Module is combined with a motor clutch (EM-10) or an input clutch (EM-30) for clutch/electrically released brake applications.

Note: Care must be exercised when selecting a brake to ensure it is sized properly for your application.

### 1. Select Configuration

#### a. For FBB and MBFB Modules NEMA C-face Mounting



Verify that the brake will be cycled frequently.

Determine the NEMA C-face frame size of your motor and/or reducer, and choose the corresponding size Electro Module from the Frame Size Selection chart.

Size EM-100 modules utilize a 5/8" diameter shaft to fit 56C/48Y motor frames with components of EM-180 units for higher torque and heat dissipation capacity than the EM-50.

Select Brake Configuration: use an EM-FBB for mounting between a motor and a reducer; or an EM-MBFB for mounting on the rear of a double shafted motor.

NOTE: When selecting an MBFB, ensure the shaft dimensions on the rear of the motor are compatible with the EM-MBFB unit selected.

#### b. For FBC Modular Units, NEMA C-face Mounting

Verify that brake will be cycled frequently, and will be used with a motor mounted clutch (EM-10) for C-face mounting.

Determine the NEMA C-face frame size of your motor and/or reducer, and choose the corresponding size Electro Module from the Frame Size Selection chart.

### FBC Frame Size Selection

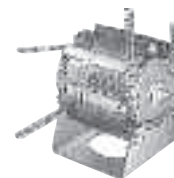
NEMA Frame Size	EM Size
56C/48Y	EM-50* EM-100**
182C/143TC 184C/145TC	EM-180
213C/182TC 215C/184TC	EM-210

For torque ratings, refer to the "Specifications" chart. Note that separate torque ratings are listed for the clutch and brake segments of the module.

\* For 56C/48Y C-frame motors 3/4 HP and smaller, the EM-100 size may be used where extended life is desirable.

\*\* The EM-100 size is recommended for motors 1 HP and larger.

#### c. For FBC Modular Units, Base Mounting



Verify that brake will be cycled frequently, and will be used with an input clutch (EM-30) for base mounting.

Select the correct size module from the Horsepower vs. Shaft Speed chart (at the bottom of this page) by determining the motor horsepower and RPM at the module location. The correct size EM is shown at the intersection of the HP and operating speed. For additional sizing information, refer to the technical sizing procedure (step 2).

### FBB AND MBFB Frame Size Selection

NEMA Frame Size	EM Size
56C/48Y	EM-50* EM-100**
182C/143TC 184C/145TC	EM-180
213C/182TC 215C/184TC	EM-210
213TC/215TC	EM-215

\*For 56C/48Y C-frame motors 3/4 HP and smaller, the EM-100 size may be used where extended life is desirable.

\*\*The EM-100 size is recommended for motors 1 HP and larger.

### Horsepower vs. Shaft Speed

HP	SHAFT SPEED AT CLUTCH (IN RPM)																		
	100	200	300	400	500	600	700	800	900	1000	1100	1200	1500	1800	2000	2400	3000	3600	
1/4																			
1/2														EM-50					
3/4																			
1																			
1-1/2														EM-100 or EM-180					
2																			
3																			
5																			
7-1/2																			

# EM Series Electrically Released Brakes

## 2. Determine Technical Requirements

Technical considerations for sizing and selection are torque and heat dissipation. Each merits careful consideration, especially heat dissipation as over time, use in excessive temperature environments will have an adverse effect on bearing life and coil wire insulation integrity.

Compare the calculated torque requirement with the average dynamic torque ratings. Select a unit with adequate torque. If the unit selected on torque is different than the unit selected based on heat, select the larger size unit.

### a. Heat Dissipation Sizing

Friction surfaces slip during the initial period of engagement and, as a result, heat is generated. The clutch/brake selected must have a heat dissipation rating greater than the heat generated by the application. Therefore, in high inertia or high cycle rate applications, it is necessary to check the heat dissipation carefully. Inertia, speed and cycle rate are the required parameters.

Heat dissipation requirement is calculated as follows:

$$E = 1.7 \times WR^2 \times (N/100)^2 \times F$$

where:

$$E = \text{Heat (lb. ft./min.)}$$

$WR^2$  = Total reflected inertia at the clutch/brake shaft. Include the clutch/brake output inertia. (lb.ft.<sup>2</sup>)

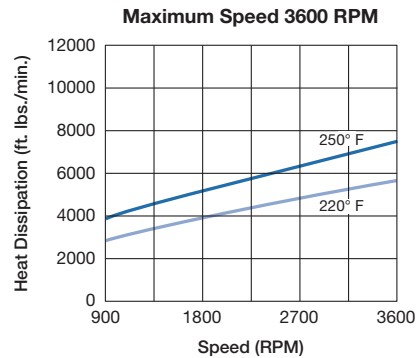
N = Speed in revolutions per minute. (RPM)

F = Cycle rate in cycles per minute (CPM)

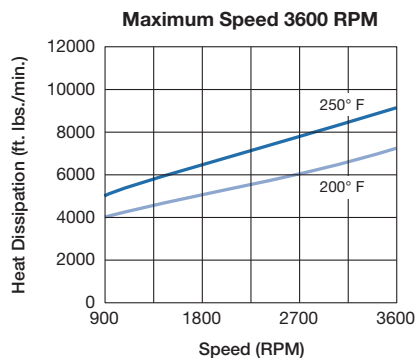
Compare the calculated heat generated in the application to the unit ratings using the heat dissipation curves. Select the appropriate unit that has adequate heat dissipation ability.

## Heat Dissipation Curves

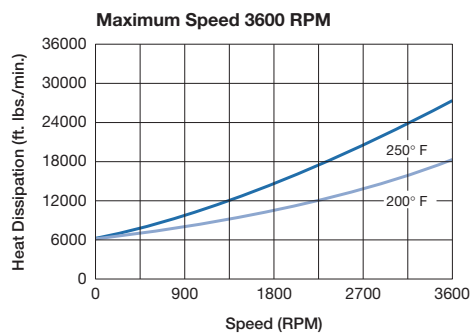
### Size 50



### Size 100/180



### Size 210/215



### b. Torque Sizing

For most applications, the correct size clutch/brake can be selected from the Horsepower vs. Shaft Speed chart on page 162. Determine the motor horsepower and the RPM at the clutch/brake. The correct size unit is shown at the intersection of horsepower and shaft speed.

If the static torque requirements are known, refer to the technical ratings chart to select a unit.

For some applications, the torque requirement is determined by the time allowed to accelerate and decelerate the load. (This time is generally specified in milliseconds.) For these applications, it is necessary to determine the torque requirement based on load inertia and the time allowed for engagement.

The torque requirements are calculated as follows:

$$T = (WR^2 \times N) / (308 \times t)$$

where:

$$T = \text{Average Dynamic Torque (lb. ft.)}$$

$WR^2$  = Total reflected inertia at the clutch/brake shaft. Include the clutch/brake output inertia. (lb. ft.<sup>2</sup>)

N = Speed in revolutions per minute (RPM)

t = Time allowed for the engagement (sec)

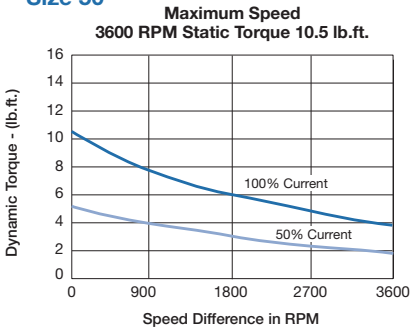


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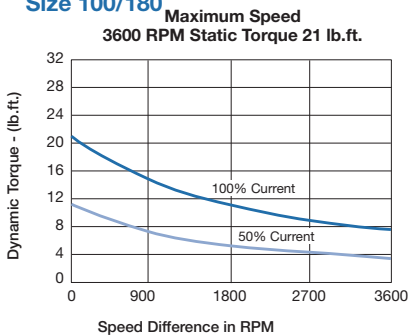
## Ordering Information

### C-face Electrically Released Brakes Dynamic Torque Curves

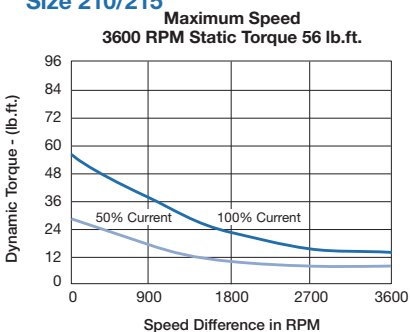
#### Size 50



#### Size 100/180



#### Size 210/215



## 3. Select Accessories

Warner Electric Electro Modules can be fitted with several accessories to extend their capacity and ease of mounting.

## 4. Select Control

All electrically released modules require a control with a potentiometer that will vary brake channel output. For FBB and MBFB brake modules, the CBC-160, CBC-200, CBC-300, or CBC-500/550 is recommended. The FBC units require either a CBC-300 or a CBC 500/550 control.

## How to Order

1. Specify model number and voltage or the corresponding part number.
2. Specify conduit box, if desired.
3. Specify required control. See the Controls Section (page 201).

## Ordering Example

EM-50-20FBB, 90V or 5370-169-234;  
5370-101-042 conduit box;  
CBC-160-2 control.

## Part Numbers (Blue shaded areas indicate GEN 2 design)

Model No.	Voltage DC	GEN 2 Part No.	Original Part No.
<b>FBB Brake Module for use as brake only</b>			
EM-50-20FBB	24	5370-169-278	5370-169-066
EM-50-20FBB	90	5370-169-279	5370-169-058
EM-100-20FBB	24	5370-169-283	5370-169-020
EM-100-20FBB	90	5370-169-284	5370-169-084
EM-180-20FBB	24	5370-169-288	5370-169-068
EM-180-20FBB	90	5370-169-289	5370-169-059
EM-210-20FBB	24		5371-169-032
EM-210-20FBB	90		5371-169-029
EM-215-20FBB	24		5371-169-100
EM-215-20FBB	90		5371-169-054
<b>FBC Brake Module for use with EM clutch</b>			
EM-50-20FBC	24	5370-169-233	5370-169-065
EM-50-20FBC	90	5370-169-234	5370-169-056
EM-100-20FBC	24	5370-169-238	5370-169-109
EM-100-20FBC	90	5370-169-239	5370-169-108
EM-180-20FBC	24	5370-169-243	5370-169-067
EM-180-20FBC	90	5370-169-244	5370-169-057
EM-210-20FBC	24		5371-169-031
EM-210-20FBC	90		5371-169-028
<b>MBFB Motor Brake Module</b>			
EM-50-20MBFB	24	5370-169-248	5370-169-063
EM-50-20MBFB	90	5370-169-249	5370-169-060
EM-100-20MBFB	24	5370-169-253	5370-169-007
EM-100-20MBFB	90	5370-169-254	5370-169-085
EM-180-20MBFB	24	5370-169-258	5370-169-069
EM-180-20MBFB	90	5370-169-259	5370-169-061
EM-210-7/8-20MBFB	24		5371-169-101
EM-210-7/8-20MBFB	90		5371-169-072
EM-210-20MBFB	24		5371-169-033
EM-210-20MBFB	90		5371-169-030

## Accessories

Description	EM Size	Part No.
Conduit Box	EM series All sizes	5370-101-042
Base Mount Kit for 2030 FBC	50/100	5370-101-004
	180	5370-101-002
	210/215	5371-101-019
Motor Mount Kit for 20 FBB, 1020 FBC	50/100	5370-101-078
	180	5370-101-079
	210/215	5371-101-012
Cover Kit	50/100/180	5370-101-076
	50/180 (FBB or MBFB)	5370-101-082