

Farnell Codes : 4375634 - 4375660

Powerbrake

PBC Range DC Injection Critical Brakes

Powerbrake PBC is a range of self-contained D.C. Injection Critical Brakes for 400V three-phase motors from 3.0 to 75 kW.

Powerbrake PBC is designed to be used in conjunction with a conventional direct-on-line or star-delta motor starter for normal starting and stopping functions. In the event that a pair of trip contacts is opened, **Powerbrake PBC** will provide rapid braking while minimising the maintenance associated with mechanical brakes.

Powerbrake PBC incorporates a line contactor to control the three-phase power to the motor starter. An electronic control unit and semiconductor switching devices provide an adjustable D.C. injection braking current to the motor via the internal braking contactor, whenever the trip contacts open. During braking the line contactor automatically removes the normal three-phase supply from the starter. A reset button must be operated before the motor can be re-started.

Note that injection braking cannot operate in the event of supply failure. A risk assessment should therefore be undertaken to determine whether the application requires additional backup. D.C. injection brakes do not lock the motor in the rest position after the selected braking time has elapsed.

Order references

PBC3-XXX	3kW	(4hp)	400V	7A FLC maximum
PBC5-XXX	5.5kW	(7.5hp)	400V	12A FLC maximum
PBC7-XXX	7.5kW	(10hp)	400V	16A FLC maximum
PBC11-XXX	11kW	(15hp)	400V	23A FLC maximum
PBC15-XXX	15kW	(20hp)	400V	32A FLC maximum
PBC22-XXX	22kW	(30hp)	400V	45A FLC maximum
PBC30-XXX	30kW	(40hp)	400V	63A FLC maximum
PBC37-XXX	37kW	(50hp)	400V	75A FLC maximum
PBC45-XXX	45kW	(60hp)	400V	86A FLC maximum
PBC55-XXX	55kW	(75hp)	400V	105A FLC maximum
PBC75-XXX	75kW	(100hp)	400V	136A FLC maximum

N.B. Replace XXX with 110 for 110V control supply
 230 for 230V “ “
 400 for 400V “ “

Technical specification

Supply voltage: 380...415V } +10% - 15%
 50-60Hz }

Current rating: As shown under “Order References” above.

All units: Braking current 2x motor rated FLC max.

Internal adjustments:

Braking time 0.1-15s
 Braking torque (current) 10-100% rated max

Internal indicators: Green - Power On
 Amber - Braking
 Red - Fault*

*Refer to diagram on top of DCB5A/DCBUA braking module

Fault Protection:

- Motor temperature high / P1-P2 link missing¹
- Heatsink above rated temperature²
- Thyristor fuse/supply failure
- Thyristor failure
- Disconnected brake time potentiometer³

¹ Applies only to motors fitted with PTC thermistors to BS4999

² Excessive braking current or frequency of braking

³ Link T1 – T2 missing

Panel hardware: Fault indicator lamp (amber)
 RESET button

Enclosure rating: IP55

Humidity: Maximum 95%, non-condensing

Ambient temperature: -10°C to+40°C

Terminal cable capacity:

3kW - 11kW	4mm ²
15kW - 22kW	10mm ²
37kW - 45kW	35mm ²
55kW - 75kW	Bolted lug

Weight:

3kW & 5.5kW	5.3kG
7.5kW, 11kW & 15kW	7.0kG
22kW & 30kW	11.0kG
37kW & 45kW	
55kW & 75kW	

Terminal functions

- 1 } 3-phase supply voltage
- 3 }
- 5 }
- 2 } 3-phase out to motor starter
- 4 }
- 6 }
- U } D.C. braking current output to motor
- V }
- E1 } Normally Closed trip contact
- E2 }
- P1 } PTC motor thermistors to BS 4999⁴ (or link)
- P2 }

⁴ Must trip at T_R = 2000 – 4000 ohms (hot)
 Must reset at T_R = less than 750 ohms (cold)

Applications information

The operating sequence is shown on the graph overleaf. The d.c. braking current is injected into two motor terminals after the three-phase supply has been disconnected. The magnitude of the braking current – and braking torque – is dependent on:

- a. The stator winding resistance of the motor *and*
- b. The setting of the torque control (adjustable 10 – 100%)

In practice the braking current should be adjusted to be no more than twice the motor rated current, i.e. I_B ≤ 2I_N. Higher currents can cause saturation of the stator windings and lead to overheating, with no corresponding increase in braking torque.

The braking time is dependent on motor and load characteristics, as well as braking current, in accordance with the following approximate formula:

$$t_B = \frac{0.1 \times I_{LR}^2 \times J \times n}{I_B^2 \times T_{LR}} \text{ seconds}$$

where t_B is the braking time
 I_{LR} is locked rotor current in A
 I_B is braking current in A
 T_{LR} is locked rotor torque (Nm)
 J is the total moment of inertia of motor and load in kgm²
 N is the motor speed in rpm

Operation

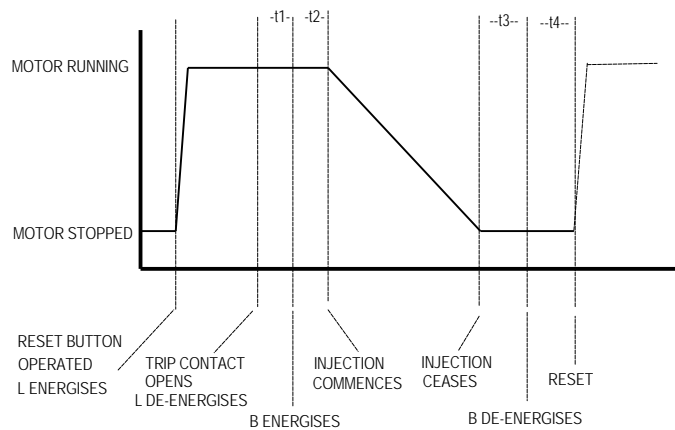
(See Typical Wiring Diagrams, opposite).
Check wiring carefully. Before switching on, check that the TORQUE and TIME setting potentiometers on the DCB5A or DCBUA control module within the PBC unit are set to minimum (counter-clockwise). If possible, a moving iron ammeter or true-RMS clamp meter should be available to measure the d.c. injection current in the cable leading from terminal U on the PBC unit to the motor.

Turn on the supply to the PBC unit. Press the START button on the motor starter. The motor should *not* start. Press the RESET button on the PBC unit. The motor should start and stop normally. With the motor running, open the trip contacts. The line contactor in the PBC should de-energise, stopping the motor and disabling the starter. There will be very little braking effect at this stage. It should not be possible to restart the motor until the RESET button is pressed. The TORQUE and TIME controls should be advanced about 1/4 turn clockwise. Restart the motor. When the trip contacts are next opened the BRAKE LED on the DCB5A/DCBUA module will illuminate for about 3s and the motor should stop more quickly than before.

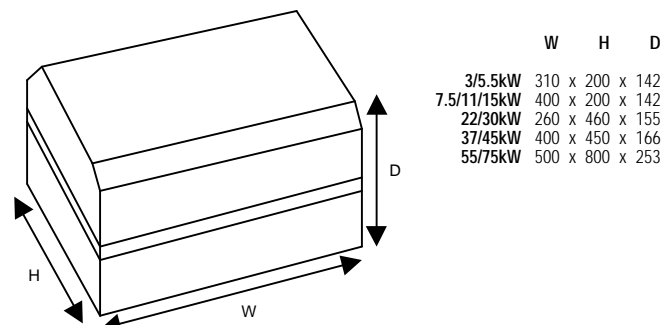
If the amber FAULT light illuminates it is possible that the motor is too hot (if thermistors are fitted) or that terminals P1 & P2 have been left unconnected. On units of 7.5kW or greater, the heatsink in the PBC may be too hot as a result of excessive braking. Thyristor fault or fuse failure will also be indicated. The red fault LED on the DCB5A/DCBUA shows continuously or flashes at differing rates depending on the type of fault. A key to fault LED indications is printed on the DCB5A/DCBUA top data panel.

The process of adjustment may be repeated until the required stopping performance is achieved. This may be a smooth stop over several seconds or a short sharp braking action. Avoid violent braking which could damage the machine or the PBC unit. The d.c. braking current is only measurable while the BRAKE LED is on and must not exceed 2 x rated FLC for the motor. If a suitable ammeter is unavailable, do not advance the TORQUE control beyond its midpoint setting. The TIME control should be set so that the BRAKE LED goes out just as the motor comes to rest. Excessive braking time and/or current will simply cause overheating of both motor and the PBC unit. Do not exceed 12 stops per hour, evenly spaced. Data is available for higher stopping rates but these should not generally be necessary in applications for which the PBC unit is intended.

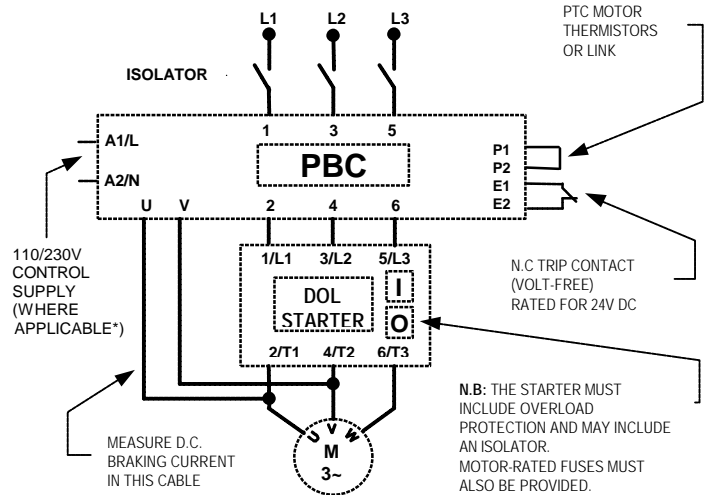
Operating sequence



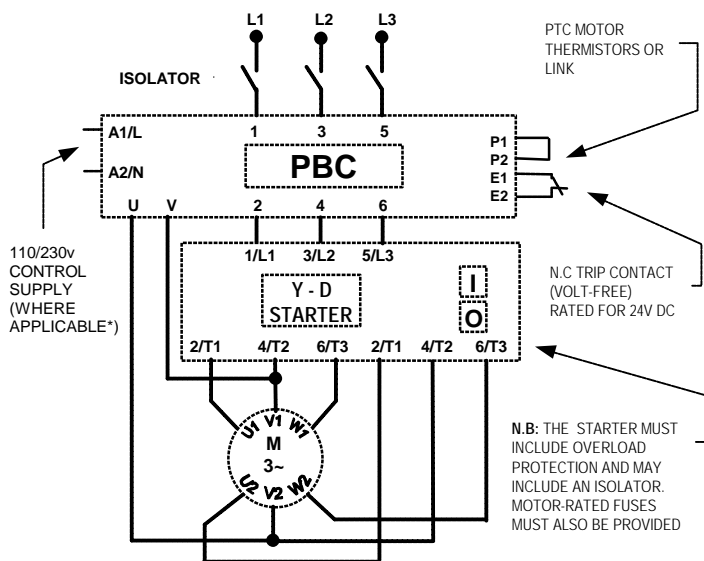
Dimensions (mm)



Typical wiring diagram (DOL motor)



Typical wiring diagram (Star-delta motor)



*N.B. These terminals are not present on units having 400V control voltage because the control supply is internally wired.

Installation

The supply must have an isolator as shown. Motor rated fuses and overloads should be used in the normal way. A Bussmann high speed semiconductor fuse is fitted inside the PBC unit to protect the braking thyristor, as follows:

3kW & 5.5kW	type 63FE
7.5kW, 11kW & 15kW	type 90FE
22kW	type 100FE
30kW	type 140FE
37kW & 45kW	type 180FM
55kW & 75kW	type 225FM

N.B: Two control circuit fuses are also fitted internally. These are 32x6.3mm, Belling type L693, rated at 5A. Under normal circumstances these should not require replacement.

WARNING:

Semiconductor devices transmit leakage current. Before installing or attempting adjustments or maintenance on PBC unit, starter or motor, the supply must be disconnected.

Council of European Communities Directives:

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