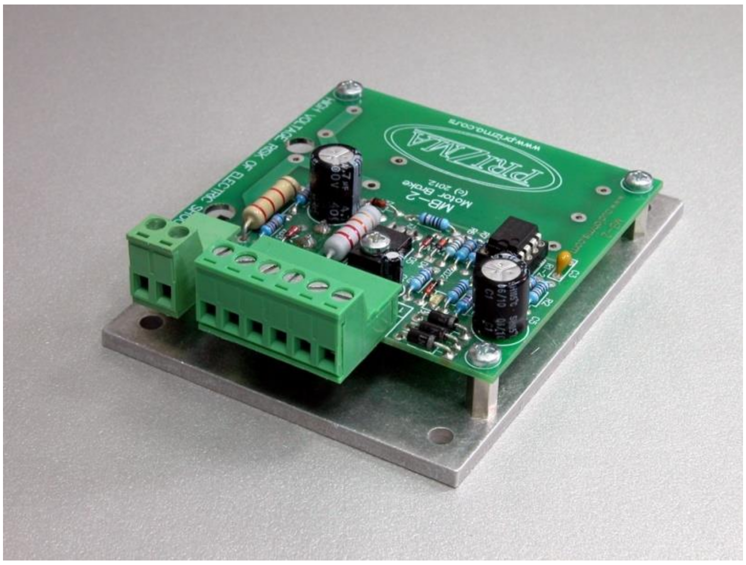
MB-2
MOTOR BRAKE CIRCIUT

1. DESCRTIPTION



When motor slows down moving machine mass, the motor will act as a generator. Regenerative currents are rectified by motor drive and the energy returns to the main DC rail. As the capacitors on the DC rail charge, the voltage rises. The motor brake circuit allows excess power to be dissipated if the DC power rail exceeds a specified limit.

In cases of large moving mass and rapid deceleration, increasing the voltage of motor drive power supply can lead to permanent damage of motor drive.

Motor break circuit MB-2 follows amplitude of input AC voltage and output DC voltage of rectifier for motor drive power supply. If voltage generated by motor increases more than 5V compared to amplitude of input AC voltage, brake circuit will activate. In that way, it prevents uncontrolled increasing of power supply voltage. LED indicator built in motor brake circuit MB-2 shows when the brake circuit is active.

Motor brake circuit also quickly discharge electrolytic capacitors in the power adapter after powering off.

Motor brake has built-in circuit for power supply of control electronics of the motor brake circuit MB-2.

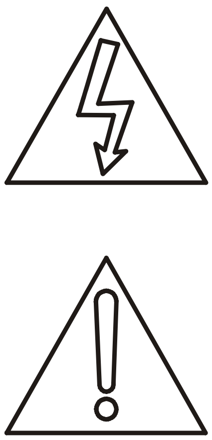
The braking resistor is externally connected to the motor brake circuit MB-2 via terminals. There is also the option of installing braking resistors to the motor brake circuit MB-2.

2. SPECIFICATIONS

Description	Motor brake circuit with floating voltage brake activation
Power supply	U_m = 50 ÷ 150 V DC
Maximum brake current	15 A
Brake voltage activation	U_m + 5 V DC
Braking mode	Via additional braking resistor (external or optionally on motor break circuit MB-2)
Dimensions (W x L x H)	102 mm x 77 mm x 30 mm
Weight	~150 g

NOTE: Specifications are subject to change without notice

3. SAFETY PRECAUTION



Installation of Motor brake circuit MB-2 can perform only person who has appropriate knowledge.

Supply voltages over 50 V DC can be danger of death. If supply voltage is over 50 V DC, aluminium heat sink has to be properly grounded.

Use only galvanic isolated power supply for motor brake circuit MB-2.

Temperature of motor break should not exceed 70ºC. It is recommended for motor break to be placed in enclosures and to ensure additional cooling if it is needed.

Motor break circuit should not be used in places where, in case of failure, people safety is in danger, financial losses are big, or there exist other losses.

During operation should be used all required precautious.

Does not exclude the possibility that this document contains errors. In addition the manufacturer assumes no responsibility for any damage caused by the use of this motor break circuit, which has occurred as a result of compliance or non-compliance with this instruction manual.

4. THE CONNECTION OF MOTOR BRAKE CIRCUIT

Place of motor brake circuit MB-2 in the power supply system is shown in Figure 3.1.

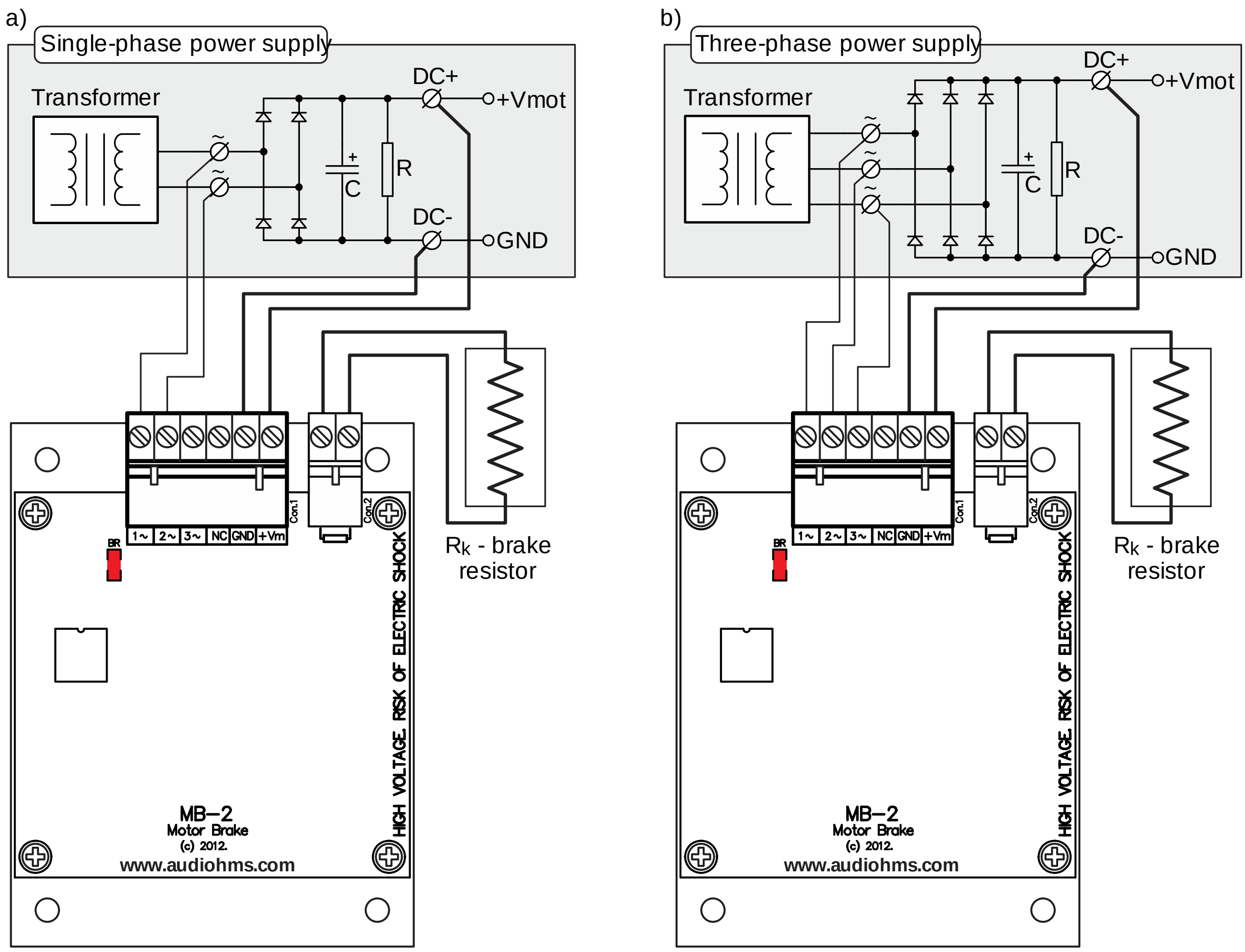


Figure 3.1 Motor brake circuit MB-2, a) as part of single-phase power supply and b) as part of three-phase power supply

When DC servo motor slows, acts like DC generator. Kinetic energy of the moving mass which DC servo motor slows, convert to current, which leads to increasing of voltage on +Vmot line. Motor brake circuit MB-2 follows amplitude of input AC voltage (via terminals 1~ and 2~ at single-phase power supply, i.e. terminals 1~, 2~ and 3~ at three-phase power supply) and output DC voltage of rectifier for motor power supply. If voltage on +Vmot line increase over 5V compared to amplitude of input AC voltage, brake circuit will activate and brake resistor R_k will connect between DC supply wires +Vmot and GND. Then, part of electric energy generated by braking, dissipates (converting to heat) on braking resistor R_k. Illumination of LED BR shows when the brake circuit is active.

5. CALCULATION OF BRAKING RESISTOR

Resistance of braking resistor R_k determine so that the current through the resistor (braking current I_k) do not exceed 15A. For example, if the voltage is V_{mot} = 90 V, choose value of braking resistor so it is:

$$R_k > 90\ V / 15\ A,$$

namely $R_k > 6\ \Omega$. For the chosen value $R_k = 10\ \Omega$ maximum current through braking resistor will be:

$$I_{max} = V_{mot} / R_k = 90 / 10 = 10\ A.$$

Power, in this case, transformed to heat on the resistor, will be:

$$P_d = V_{mot}^2 / I_{max} = 90^2 / 10 = 810\ W.$$

Brake resistor is, generally, very briefly active, so the rated power of this resistor can be from 3 to 5 times smaller than the power that the resistor dissipates. In this example rated power of brake resistor can be calculate by using the expression $P_k > P_d / 5 = 810 / 5$, i.e. $P_k > 162$ W.

Chosen rated power of brake resistor will be P_k = 200 W. It is important to note that brake resistor has to stand previously calculated maximal current of brake I_{max}.

NOTE: Energy converted to thermal energy in brake resistor depends of moving machine parts and of operating modes, so the calculation of brake resistor power is for guidance. If brake resistor heat up, its rated power should be increased or provide better heat dissipation.

Document revision:

- Ver. 1, February 2014, English version
- Ver. 1.1, November 2020, Minor revision