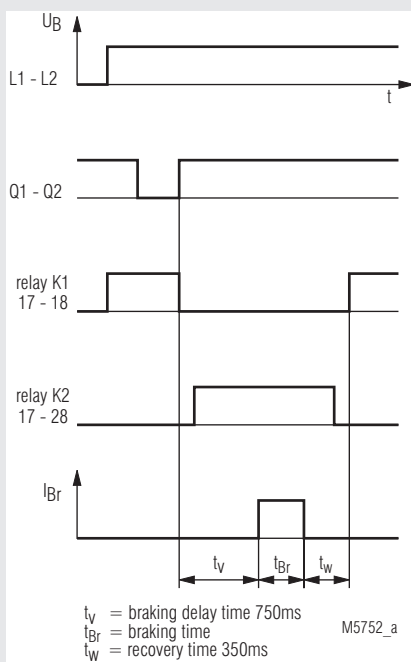


MINISTOP Motor Brake Relay BI 9023



- According to IEC/EN 60 947-4-2
- DC brake with one way rectified brake voltage
- Suitable for all squirrel cage motors
- Easy to fit also in existing circuits
- Wear- and maintenance free
- To mount on 35 mm DIN rail
- Adjustable brake current to 80 A
- Adjustable braking time 1 ... 20 s
- 90 mm width

Function Diagram



Approvals and Markings



Application

- Saws
- Centrifuges
- Woodworking machines
- Textile machines
- Conveyor systems

Function

The auxiliary supply is connected to terminals A1 - A2. The braking voltage is connected to terminals L1 - L2. A green LED indicates that supply voltage is connected. The interlocking contact of the motor contactor is connected to Q1 - Q2. The motor can be started.

If the braking voltage is missing the unit goes into failure state 4 and the motor cannot be started.

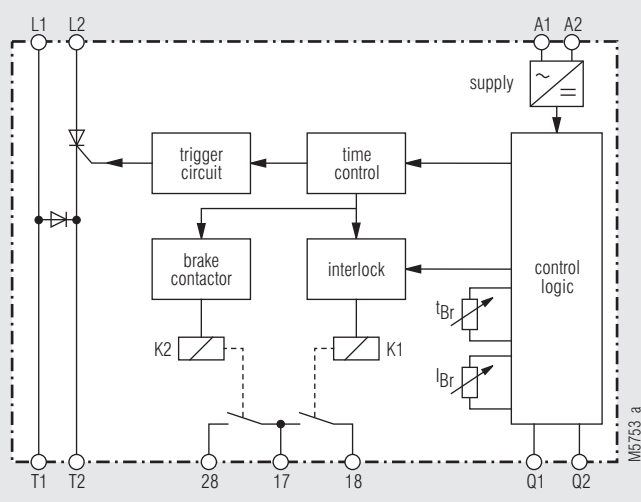
The DC braking voltage is supplied from the terminals T1 - T2 to the motor.

When the contact on terminals Q1 - Q2 is opened the brake unit goes into braking mode. When closing the contact again the output 17 - 18 opens and 17 - 28 closes. The motor contactor K1 is disabled. By a special time control it is guaranteed, that the motor contactor K1 is open before the braking contactor K2 comes and the braking current is switched on. As a result the back EMF voltage is already low so the power semiconductor cannot be destroyed by induced high voltage.

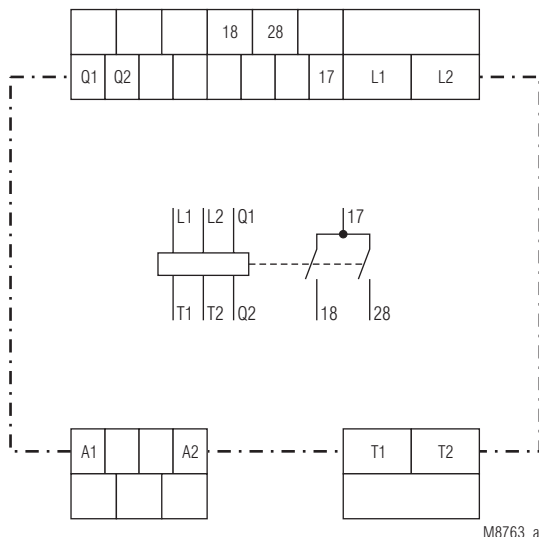
A braking cycle has the following sequence. The motor contactor is switched off. After a fixed safety time the contact 17 - 28 closes and switches on the braking contactor K2. For the adjusted time now the braking current flows through the motor windings.

After the time is elapsed, the braking current is switched off, K2 is de-energized and contact 17 - 18 closes to enable a new start with K1.

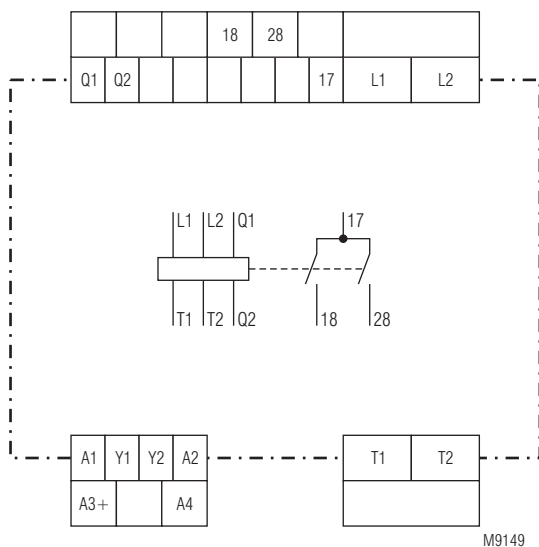
Block Diagram



Circuit Diagrams



BI 9023 Device with $U_H = AC 400 V$



BI 9023 Device with $U_H = AC 230 V, 115 V, DC 24 V$

Connection Terminals

Terminal designation	Signal description
L1	Phase voltage L1
L2	Phase voltage L2
T1	Motor connection T1
T2	Motor connection T2
Q1	Feed back motor contactor
Q2	(+) Feed back motor contactor
17, 18	Monitoring relay 1, motor contactor
17, 28	Monitoring relay 2, braking contactor
A1, A2	Auxiliary voltage AC 230 V, 400 V
Y1, Y2	Switching 115 V / 230 V
A3+, A4	Auxiliary voltage DC 24 V

Indicators

Green LED: ON, when auxiliary supply connected
„ON“: Flashing, when braking

Relais K1

Yellow LED: ON, when contact 17 - 18 closed

Relais K2

Yellow LED: ON, when contact 17 - 28 closed
„ERROR“: Flashing, when contact 17-28 open
1*): Overtemperature on thyristor (internal)
6*): Wrong frequency
4*): Voltage L1 - L2 missing

1 - 6*) = Number of pulses in flashing sequence

Notes

The braking current is generated by phase control. The value is depending on the voltage connected to L1 - L2, the current setting and resistance of the motor windings. It is therefore possible, that the current with full scale setting is much higher then the permitted max current.

To achieve the optimum braking effect, the braking current I_b should be max 1.8 to 2 times the motor nominal current. This is the saturation current of the magnetic field necessary to brake. A higher current leads only to overheating of the motor. A better braking effect is achieved, when using 2 or more motor windings to brake. The permitted duty cycle is depending on braking current and ambient temperature.

Technical Data

Nominal voltage U_N : 3 AC 200 V -10 % ... 480 V +10 %

Auxiliary voltage U_H :

Device with AC 400 V

(Standardtype):

Device with AC 115/230 V

DC 24 V:

A1/A2, AC 400 V, +10 %, -15 %, bridge A1-Y1, bridge A1-Y2

A1/A2, AC 230 V, +10 %, -15 %, bridge Y1-Y2

A3/A4, DC 24 V, +10 %, -15 %, no bridge

50/60 Hz

Nominal frequency:

Motor power

at 400 V:

Max. adjustable

braking current:

15 kW

60 A at 60 cycles / h
and 20 s braking time,
80 A at 20 cycles / h
and 20 s braking time

≤ 6600 A²s

DC 0 ... 90 V

adjustable 1 ... 20 s

Fuse, superfast:

Braking voltage:

Braking time:

Back-EMF braking

time delay:

750 ms

Power consumption

for control:

2 VA

Relay Output

Contacts: 2 NO contacts AC 400 V

Thermal continuous current I_m : 4 A

Switching capacity

to AC 15

NO contact:

3 A / 230 V

IEC/EN 60 947-5-1

Electrical life:

to AC 15 at 3 A, AC 230 V:

1 x 10⁵ switching cycles

Short circuit strength

max. fuse rating:

4 A gG / gL

IEC/EN 60 947-5-1

Mechanical life:

1 x 10⁸ switching cycles

Technical Data	
General Data	
Temperature range:	0 ... + 45 °C
Storage temperature:	- 25 ... + 75 °C
Clearance and creepage distances	
rated impulse voltage / pollution degree	
Controlvoltage to auxiliary-voltage, motor voltage:	4 kV / 2 IEC 60 664-1
motor voltage / heat sink:	6 kV / 2 IEC 60 664-1
EMC	
Electrostatic discharge:	8 kV (air) IEC/EN 61 000-4-2
HF-irradiation:	10 V/m IEC/EN 61 000-4-3
Fast transients:	2 kV IEC/EN 61 000-4-4
Surge voltages between	
wires for power supply:	1 kV IEC/EN 61 000-4-5
between wire and ground:	2 kV IEC/EN 61 000-4-5
Degree of protection	
Housing:	IP 40 IEC/EN 60 529
Terminals:	IP 20 IEC/EN 60 529
Vibration resistance:	Amplitude 0.35 mm
	Frequency 10 ... 55 Hz, IEC/EN 60 068-2-6
Climate resistance:	0 / 055 / 04 IEC/EN 60 068-1
Wire connection	
Load terminals:	1 x 10 mm ² solid 1 x 6 mm ² stranded ferruled A current of 60 A or 80 A is permitted at a.m. duty cycles for 6 mm ² wiring
Control terminals:	1 x 4 mm ² solid or 1 x 2.5 stranded ferruled (isolated) or 2 x 1.5 mm ² stranded ferruled (isolated) DIN 46 228-1/-2/-3/-4 or 2 x 2.5 mm ² stranded ferruled DIN 46 228-1/-2/-3
Wire fixing	
Load terminals:	Plus-minus terminal screws M 4 box terminals with self-lifting clamping piece
Control terminals:	Plus-minus terminal screws M 3.5 box terminals with self-lifting clamping piece
Fixing torque	
Load terminals:	1.2 Nm
Control terminals:	0.8 Nm
Mounting:	To mount on 35 mm DIN rail
Weight:	780 g
Dimensions	
Width x height x depth:	90 x 85 x 120 mm

Standard Type	
BI 9023	60 A AC 400 V 50/60 Hz 1 ... 20 s
Article number:	0057302
Width:	90 mm

Variants	
BI 9023/100:	Braking time 1 ... 30 s
BI 9023/200:	Braking time 1 ... 30 s Braking voltage 0 ... 40 V _{eff} .

Ordering Example for Variants

BI 9023	/	-	-	60 A	AC 400 V	50 / 60 Hz	1 ... 20 s
							Braking time
							Nominal frequency
							Nominal voltage
							max. braking current
							Variant, if required
							Type

Control Input	
Opening the contact on terminals Q1 - Q2 enables the braking cycle, closing the contact will start the braking	

Relay Outputs	
17, 18:	Control of motor contactor
17, 28:	Control of braking contactor

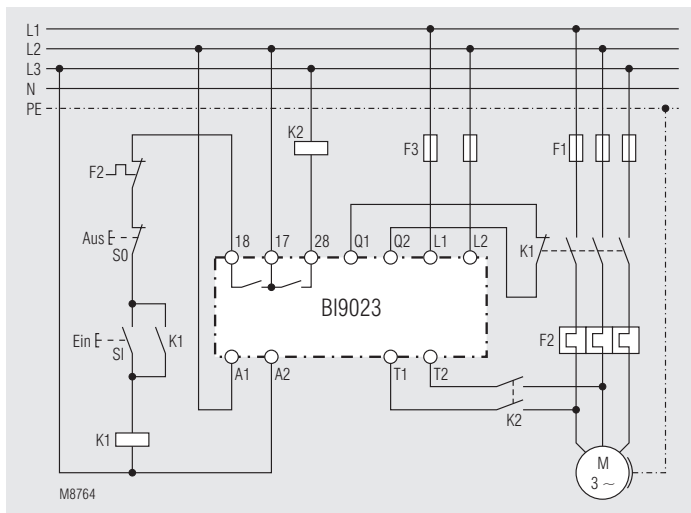
Adjustment Facilities		
Potentiometer	Description	Initial setting
I _{Br}	braking current	left end of scale
t _{Br}	braking time	middle of scale

Set-up Procedure	
The braking time t _{Br} is adjusted on the unit together with the braking current I _{Br} (max 1.8 ... 2 I _N). If the motor has stopped and is still humming, the braking current is too high or the braking time too long. Current and time has then to be adjusted accordingly.	

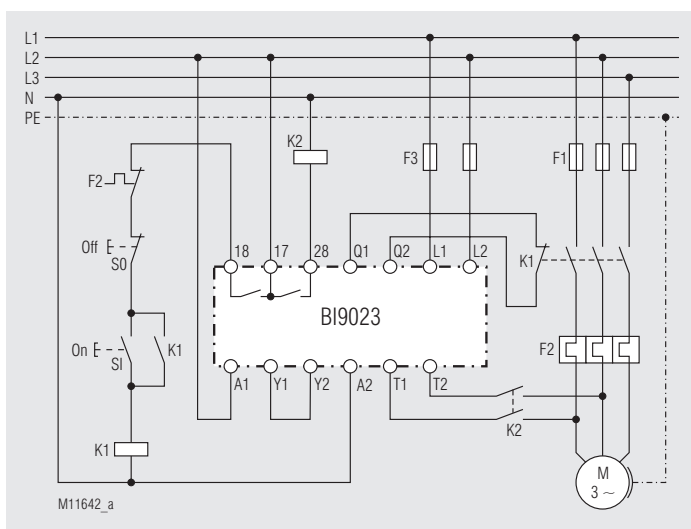
To avoid damage of the unit the braking current should be verified with a moving coil or true RMS current meter.

Extended contactors must be equipped with protection devices (diodes, varistors, etc.).

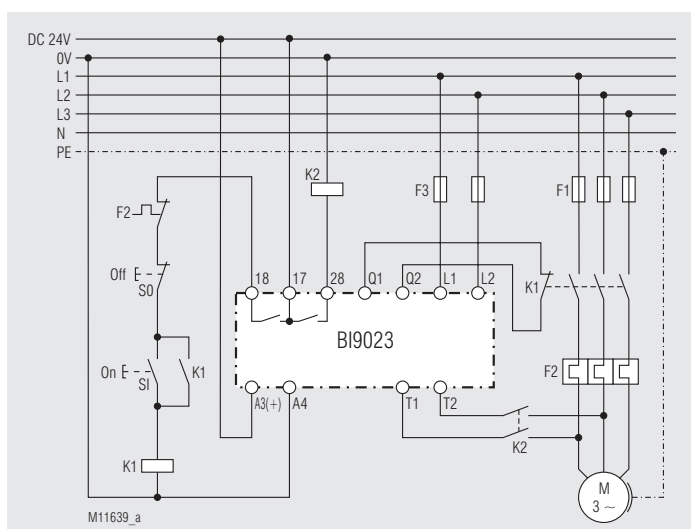
Connection Examples



Basic circuit for standardtype
BI 9023 with $U_H = AC 400 V$



BI 9023 with $U_H = AC 230 V$



BI 9023 with $U_H = DC 24 V$