MINISTOP
Motor Brake Relay
BI 9023

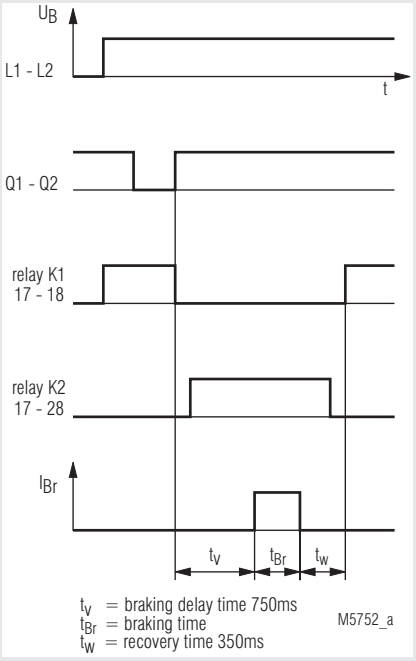
Translation of the original instructions

DOLD

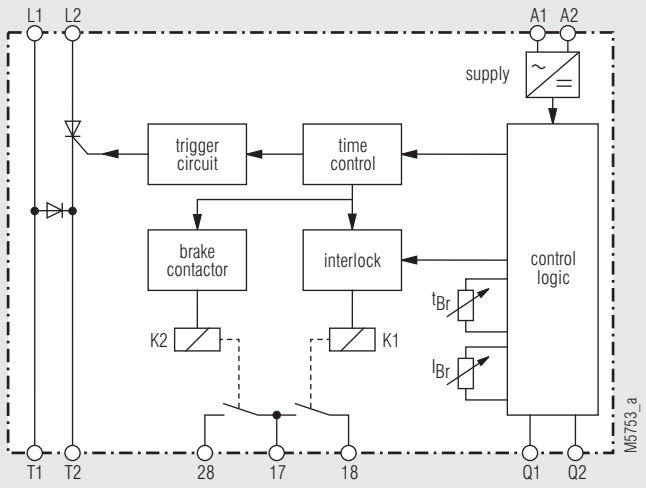
0248604

- According to IEC/EN 60947-4-2
- DC brake with one way rectified brake voltage
- Suitable foe 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



Block Diagram



Approvals and Markings

CE

Application

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

Function

The auxilliary 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.

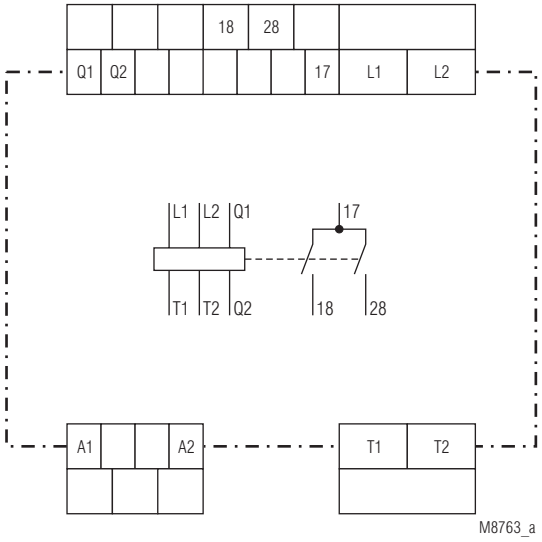
The DC braking voltage is supplied form the terminals T1 - T2 to the motor.

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 induce high voltage.

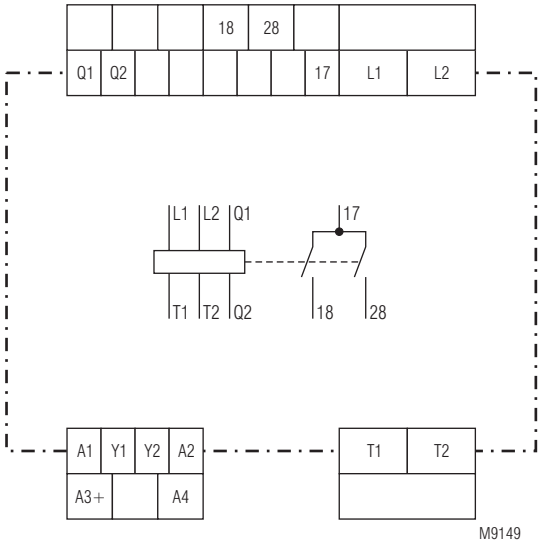
A braking cycles has the following sequence. The motor contactor is switched off. After a fixed safety time the contact 17 - 28 closes and switches on the braking contactor K2. For the adjusted time now the braking current flows through the motor windings.

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

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 freqency
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: 2 AC 200 V -10 % ... 480 V +10 %
2 AC 30 V -10% ... 100V +10%

Auxiliary voltage U_H
Device with AC 400 V
(Standardtype): A1/A2, AC 400 V, +10 %, -15 %,
Device with AC 115/230 V
DC 24 V: A1/A2, AC 115 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

Nominal frequency: 50/60 Hz

Motor power
at 400 V: 15 kW

Max. adjustable braking current: 60 A at 60 cycles / h and 20 s braking time, 80 A at 20 cycles / h and 20 s braking time 80 A at 3 s braking time and 9 s off time

Fuse, superfast: ≤ 6600 A^2s

Braking voltage: DC 0 ... 190 V at 2 AC 400 V
DC 0 ... 18 V bei 2 AC 48 V

Braking time: Adjustable 1 ... 20 s

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_{th}: 4 A
Switching capacity
to AC 15
NO contact: 3 A / 230 V IEC/EN 60947-5-1
Electrical life:
to AC 15 at 3 A, AC 230 V: 1 x 10^5 switch. cycl. IEC/EN 60947-5-1
Short circuit strength
max. fuse rating: 4 A gG /gL IEC/EN 60947-5-1
Mechanical life: 1 x 10^8 switching cycles

Technical Data

General Data

Temperature range

Operation:	0 ... + 45 °C	
Storage:	- 25 ... + 75 °C	
Altitude:	< 2000 m	
Clearance and creepage distances		
rated impulse voltage / pollution degree		
Controlvoltage to auxiliary-voltage, motor voltage:	4 kV / 2	IEC 60664-1
motor voltage / heat sink:	6 kV / 2	IEC 60664-1
EMC		
Electrostatic discharge:	8 kV (air)	IEC/EN 61000-4-2
HF-irridation:	10 V/m	IEC/EN 61000-4-3
Fast transients:	2 kV	IEC/EN 61000-4-4
Surge voltages between wires for power supply:	1 kV	IEC/EN 61000-4-5
between wire and ground:	2 kV	IEC/EN 61000-4-5
Degree of protection		
Housing:	IP 40	IEC/EN 60529
Terminals:	IP 20	IEC/EN 60529
Vibration resistance:	Amplitude 0.35 mm Frequency 10 ... 55 Hz,	IEC/EN 60068-2-6
Climate resistance:	0 / 045 / 04	IEC/EN 60068-1

Wire connection

Load terminals:	1 x 10 mm² solid 1 x 6 mm² stranded ferruled A current of 60 A or 80 A is permitted at a.m. duty cycles for 6 mm² wiring
Control terminals:	1 x 4 mm² solid or 1 x 2.5 stranded ferruled (isolated) or 2 x 1.5 mm² stranded ferruled (isolated) DIN 46228-1/-2/-3/-4 or 2 x 2.5 mm² stranded ferruled DIN 46228-1/-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 2 AC 200 ... 480 V

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 2 AC 200 ... 480 V

- 2 AC 200 ... 480 V — Nominal voltage
- 1 ... 20 s — Braking time
- 50 / 60 Hz — Nominal frequency
- AC 400 V — Auxiliary voltage
- 60 A — Max. braking current
- /_ _ _ — Variant, if required
- BI 9023 — 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

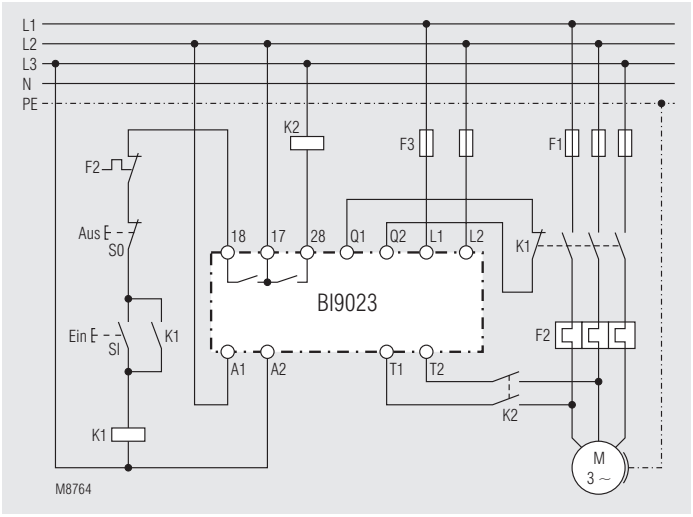
Set-up Procedure

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.

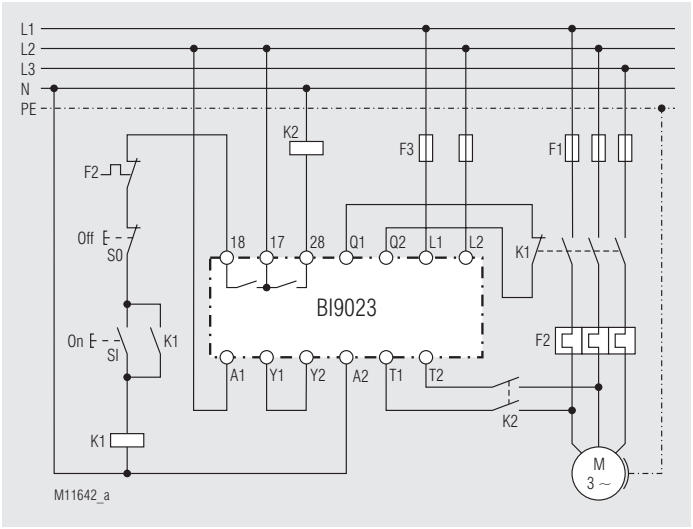
To avoid damage of the unit the braking current should be verified with a moving coil or true RMS current meter.

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

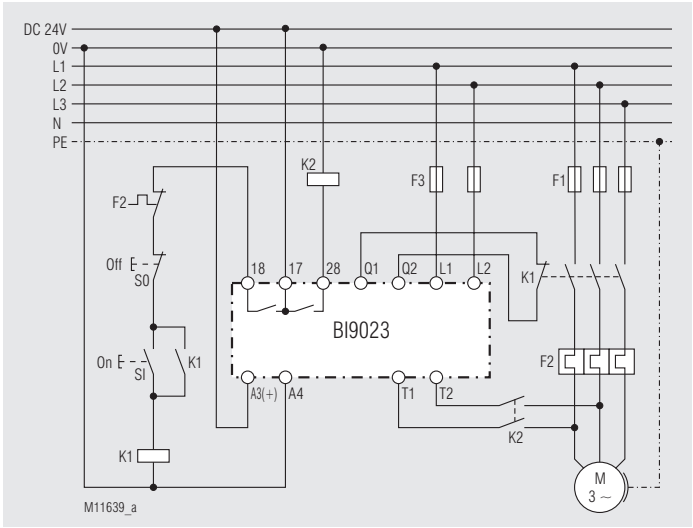
Connection Examples



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