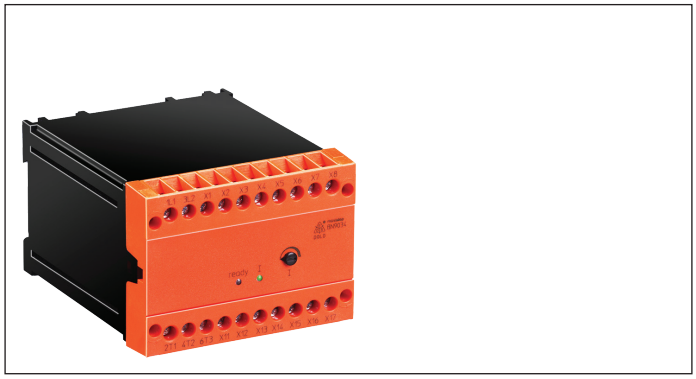
MINISTOP
Motor Brake Relay
BN 9034

Translation of the original instructions

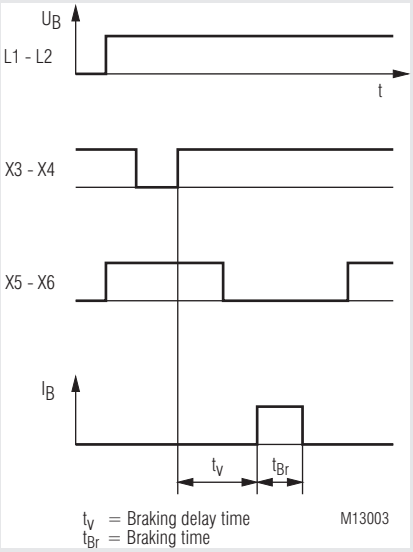
0245258



Product Description

The electronic motor brake relay BN 9034 from the MINISTOP series enable wear-free braking of three-phase and alternating current asynchronous motors. The braking devices are used for drives that must be reliably braked for safety and functional reasons.
Depending on the device version and the user's specification, the braking current switches off after a set braking time or via the integrated standstill detection after the motor has come to a standstill. With standstill-dependent braking, a potential-free signal contact signals if the motor has not come to a standstill within the maximum braking time.

Function Diagram



Your advantages
- Higher safety and economic efficiency due to shorter run-out times
- Easy to fit also into existing control circuits
- Wear and maintenance free
- Can be used on all asynchronous motors
- Adjustable braking current
- With automatic standstill monitoring

Features
- According to IEC/EN 60947-4-2
- DC brake with one way rectifier up to 25 A
- Integrated braking contactor
- Mounting on 35 mm DIN-rail
- As option with indicator relay for standstill monitoring
- As option with star-delta start function
- As option with thermistor motor protection
- As option with wide voltage input 200 ... 575 V

Approvals and Markings

CE UKCA

Applications

- Saws
- Centrifuges
- Woodworking machines
- Textile machines
- Transportation conveyors

Function

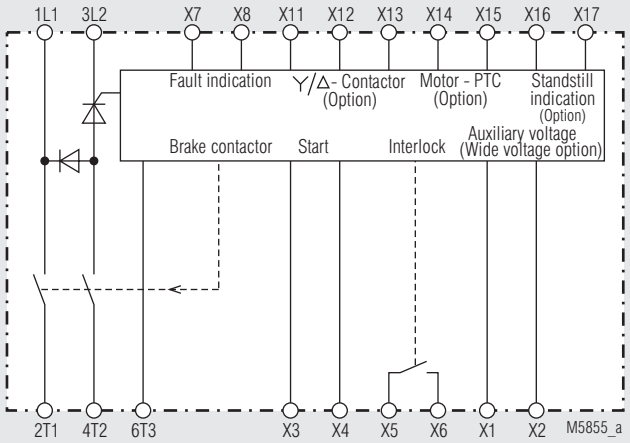
The supply voltage is connected to terminals L1-L2. The interlock contact for the motor contactor closes. The LED „ready“ indicates that the supply voltage is connected. The motor can be started with the start button. The DC voltage for the motor windings is supplied from T1-T2.
The timing of the different functions during braking is as follows:
The motor contactor is switched off and disconnects the motor. After elapse of the safety time, the brake contactor is energized and shortly after that the brake current is switched on for the adjusted braking time.

Connection Terminals

Terminal designation	Signal description
1L1, 3L2	Operating voltage
2T1, 4T2, 6T3	Motor terminals
X1, X2	Auxiliary voltage (option) required for wide voltage
X3, X4	Start contact (NC contact of the motor contactor)
X14, X15	Motor PTC (option)
X5, X6	Interlock for monitor contactor
X7, X8	Alarm
X11, X12	Control of Y-contactor (option)
X12, X13	Control of Δ-contactor (option)
X16, X17	Standstill indication (option)

All technical data in this list relate to the state at the moment of edition. We reserve the right for technical improvements and changes at any time.

Circuit Diagrams



Installation notes

Danger to life due to electric shock!
The following conditions must be met for proper operation:

1. The device must be under category III overvoltage conditions.
2. Ensure that a pollution degree of 2 or better in accordance with IEC664 is maintained.
3. The (device) must be installed in an enclosure (protection class at least IP54).
4. The (device) must be operated free from exposure to water, oil, carbon, dust, etc.

Make sure that a minimum distance to adjoining devices is kept. Above and underneath the housing a minimum distance of 50 mm is to be kept.

Prior to using the standstill signaling contact for safety-directed purposes, it is necessary to subject the application to a risk assessment according to EN 1050 (ISO 14121).

Indicators

LED „ready“:	On, when supply voltage connected flashing, when braking current is adjusted too high
LED „I“:	On, when braking current is flowing

Usage to the intended purpose

The devices are electrical equipment that is used in industrial electrical power installations. They are designed for the application in machines, in order to slow down rotating masses on drives with three-phase induction motors.

Safety notes

Danger to life due to electric shock!

- Even when the motor is at a standstill, it is not galvanically isolated from the mains.
- The control terminals X3 and X4 of the BN 9034 have mains potential. If a switch or contactor contact is connected to these terminals, it must have a test voltage of 2.5 kV.
- The connection terminals X14, X15 of the BN 9034 have mains potential. When laying the connecting cables, ensure that they are safe from contact.

Warnings!

- The devices described are equipment used in industrial power installations. Unauthorized removal of covers during operation can cause serious damage to health, as there are live parts with high voltages in these devices.
- Adjustment work may only be carried out by trained personnel in accordance with the safety regulations. Installation work may only be carried out when the appliance is de-energized.
- Ensure that all drive components are properly eathed.
- The user must also ensure that the devices and the associated components are installed and connected in accordance with public, legal and technical regulations. For Germany, the VDE regulations VDE 0100, VDE 0110 (EN 60664), VDE 0160 (EN 50178), VDE 0113 (EN 60204, EN 61310), VDE 0660 (EN 50274) and the corresponding regulations of TÜV and trade associations apply.
- The user must ensure that the drive is brought to a safe operating state in the event of a device failure, operating error, control unit failure, etc.
- To protect the motor and the brake electronics, the braking current must be checked with a true RMS value measuring device during commissioning. Simple multimeters and current clamps often measure incorrectly, as they are only suitable for pure sine wave forms and not for phase angle control.

Technical Data

Nominal voltage:	AC 400 V ± 10 % AC 200 ... 575 V ± 10 % (Wide voltage option)
Nom. frequency:	50 / 60 Hz
Auxiliary voltage (with wide voltage option)**:**	AC 230 V or AC 24 V
Motor power at 400 V**:**	5.5 kW
Max. adjustable braking current:	25 A
ED at max. braking current:	8 %
I^2t value of the power semiconductors:	1250 A^2s
Backup value (assignment type 1):	20 A

Coordination type!
Coordination type 1 according to IEC 60947-4-1: The engine control unit is defective following a short circuit and must be replaced.

Braking voltage:	DC 0 ... 230 V
Max. braking time:	15 s
Back-EMF braking time delay:	Selfoptimizing (100 ... 2500 ms)
Cross section:	Max. 2 x 2.5 mm^2 per terminal
Tightening torque:	Max. 0.8 Nm
Power consumption for electronic:	6 VA
Contacts:	6 A / 250 V AC; 6 A / 30 V DC
Temperature range:	0 ... + 45 °C
Storage temperature:	- 25 ... + 75 °C
Degree of protection:	IP 20
Mounting:	DIN-rail mounting
Weight:	0.8 kg
Overvoltage category:	III
Pollution degree:	2

Technische Daten

Rated insulation voltage:	600 V
Rated impuls voltage:	6 kV
Electrostatic discharge (ESD):	4 kV (contact) 8 kV (air)
Interference emission:	Wire guided 150 kHz - 30 MHz, device class A
Fast transients:	Wires for power supply: 2 kV I/O interfaces, data and control lines: 1 kV
Surge voltage:	
Between wires for power supply:	1 kV
Between wire and ground:	2 kV
Voltage dips:	According to DIN EN 61000-4-11

Note:
When designing braking devices, please take into account the higher braking currents when using IE3 motors.

Dimensions

Width x height x depth: 100 x 73 x 120 mm

Standard Type

BN 9034 25 A AC 400 V 50/60 Hz 15 s
Article number: 0057148

- Integrated braking contactor
- Mounting on 35 mm DIN-rail
- Width: 100 mm

Variant

BN 9034 / _ _ _ _

- 1: Thermistor-motor protection input
- 1: Star-delta control
- 1: Output relay for standstill indication
- 1: Wide voltage input (U_N = 200 ... 575 V)

Note:
The 4 options are available individually or in combination. In the „wide voltage range“ variant, an auxiliary voltage of AC 230 V or AC 24 V is required.
The options are not available for standard devices, even if the terminals are present. The required options must be specified when ordering.

BN 9034 /_ _ _ _ 25 A AC 400 V 50 / 60 Hz 15 s

- Braking time
- Nominal frequency
- Nominal voltage
- Max. braking current
- Variant
- Type

Inputs

X3, X4:	Opening the contact on terminal X3 and X4 makes the device ready for braking. When the contact is closed the braking current starts to flow.
X14, X15:	Motor temperatur (option)

Outputs

X5, X6:	Interlock for monitor contactor
X7, X8:	Fault indicating output
X11, X12:	Control of Y-contactor (option)
X12, X13:	Control of Δ-contactor (option)
X16, X17:	Standstill indication (option)

Setting facilities

„I“	Setting the braking current

Motor PTC monitoring, variant _ _ _1

This option enables a simple monitoring of the motor temperatur. It is possible to evaluate up to 6 PTC-thermistors or thermostats (normally closed contact) connected in series. The contact X7, X8 (alarm) opens when the cut-out temperature value is reached. The contact remains open until the temperature falls below this value again, at least, however, for a period of 240 s. This monitoring function is able to detect overtemperatures and open circuits, but no short circuits of the PTC thermistors or thermostats.

WARNING **Danger to life due to electric shock!**
The terminals X14 and X15 carry mains potential. When laying the connecting leads make sure to protect them against inadvertent contact.

Star-delta starting, variant _ _ 1_

If star-delta starting is requested, it is possible with this option to control the power contactors (see connection diagram with Y-Δ-set up).

In this case, a normally closed contact of the mains contactor is connected to X3, X4.

The closing of the mains contactor starts the following sequence:
1. The potential-free contact X11, X12 will be closed (control of the star contactor).
2. After a period of 6 s X11, X12 will be opened.
3. After a delay of 60 ms the potential-free contact X12, X13 will be closed (control of the delta contactor).

The opening of the mains contactor starts the following sequence:
1. The contact X12, X13 will be opened (delta contactor will be switched off).
2. After the drop of the remanent voltage, X11, X12 will be closed (control of the star contactor).
3. When the contact bounce time is over, the braking current will flow for approx. 1.5 s after the motor standstill.

In the case of star-delta starting, even if not implemented via the BN 9034, the star contactor should be controlled via the contact on the terminals 11 and 12 (variant /_ _1_) to initiate braking. Thus, the motor windings are interconnnected in time before the actual braking operation.

Note: To ensure that, in the case of external star-delta control, the starting operation is not in fluenced by the BN 9034, a break contact of the motor contactor K1 has to be connected in series before the terminals 11 and 12.

Variant /_1_ _ – Standstill signaling relay

This option makes the motor standstill signal available on a potential-free contact on terminals X16, X17.

Possible states on X16, X17:

No voltage applied	Contact X16, X17 opened
Voltage applied	Contact X16, X17 closed
Motor contactor K1 pulled in (X3, X4 opened), motor runs	Contact X16, X17 opened
Motor contactor K1 dropped out (X3, X4 closed), motor brakes	Contact X16, X17 opened
Motor contactor K1 dropped out (X3, X4 closed), motor stands still	Contact X16, X17 closed

Indicator outputs

The following states on the fault signaling contact (terminal X7, X8) are possible:

No voltage applied	Contact X7, X8 opened
Voltage applied, no error	Contact X7, X8 closed
Overtemperature (optional)	Contact X7, X8 opened
No standstill is reached during monitoring time	* Contact X7, X8 opened

* Closes at motor restart.

Set-up procedure

The braking device is to be installed according to the attached connection diagram.

To ensure a reliable function it is necessary to comply with the interlocking conditions:

1. To initiate braking, a potential-free normally closed contact of the main contactor is necessary, i.e., when the motor contactor is dropped out, the terminals X3, X4 (start) of the braking device are connected.
2. The interlocking contact of the braking device (terminals X5, X6 (lock)) has to be looped into the control circuit of the motor contactor, so that the motor contactor cannot pull in during braking.

Sequence of commissioning:

1. Disconnect the plant from the supply mains.
2. Connect the current measuring instrument between the braking device, terminal „2T1“, and the motor terminal.
3. Turn the potentiometer „I“ to a position in the first third of the adjustment range (factory setting).
4. Switch on the plant.
5. Initiate braking by switching the motor contactor ON and OFF.

Note: The adjustment of the braking current requires a moving-iron instrument. Clamp-on probes or digital multimeters may only be used if they can measure the true r.m.s.

Adjusting the braking current:
The braking current is to be adjusted to a value as small as possible, in order to avoid unnecessary heating of the power semiconductors and the motor. This is especially important in the case of frequent operation. We recommend to limit the maximum braking current to 2.5 times the rated motor current. The requested braking torque is to be adjusted with the potentiometer „I“. It is important that the braking current does not exceed the rated device current which is indicated on the nameplate of the device. A braking current higher than the rated device current causes a flashing „ready“-LED. In this case, the potentiometer „I“ has to be turned back to a position where the flashing goes over into a steady light. Zur Kontrolle kann der Bremsstrom mit einem Zangenamperemeter (True RMS) oder einem entsprechenden Dreheisen-Amperemeter an der Ausgangsklemme „4T2“ des Bremsgerätes gemessen werden.

WARNING

Attention!

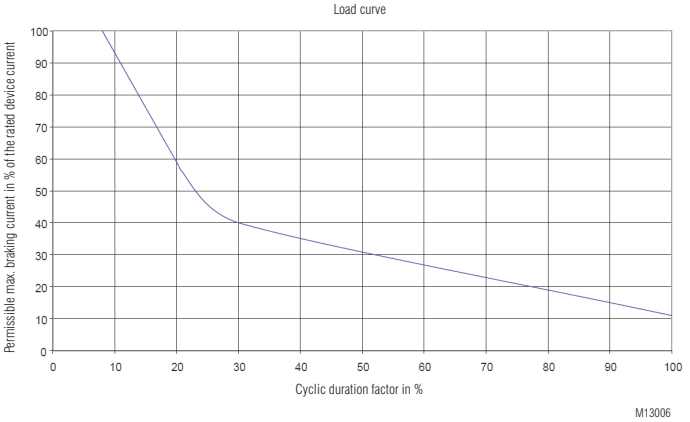
- When the „ready“-LED is flashing, the current flowing in the device is approx. 1.3 times as high as the rated device current. Operating the device with the LED flashing and utilizing the permissible braking frequency will cause that the braking device is overloaded and consequently destroyed.
- The motor can overheat if the brakes are applied several times in succession.

Adjusting the braking time:
An adjustment is not necessary, since 1.5 s after the motor has come to a standstill the braking current will be automatically switched off. If during the maximum braking time (15 s in the case of standard devices) no standstill is detected, the braking current will be switched off after this time. This case will be indicated by an opening of the potential-free contact (X7, X8).

Permissible braking frequency

The braking frequency depends on the adjusted braking current. Please find below some typical values for braking devices:

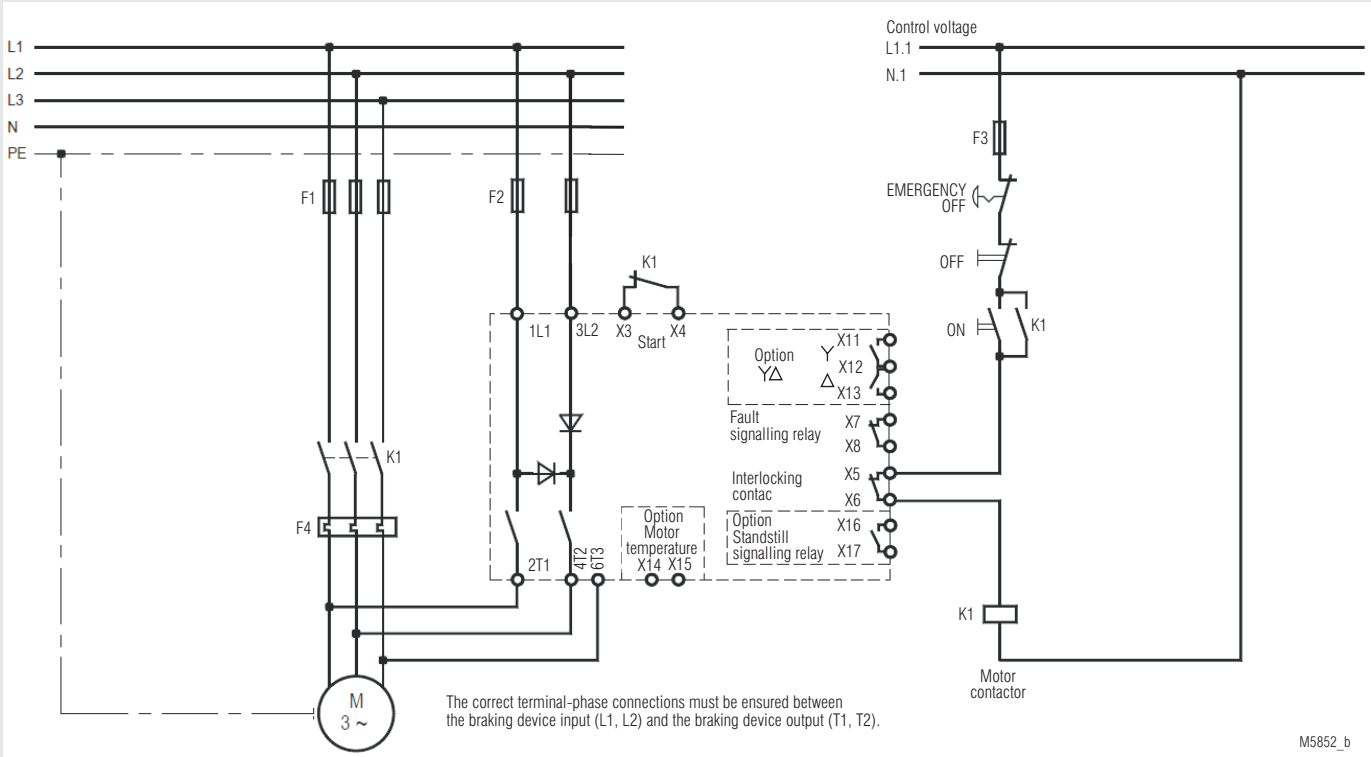
Braking current	Braking time	Braking frequency
25 A	5 s 15 s	1 braking per 60 s 1 braking per 180 s
20 A	5 s 15 s	1 braking per 40 s 1 braking per 120 s
15 A	5 s 15 s	1 braking per 25 s 1 braking per 40 s
10 A	5 s 15 s	1 braking per 17 s 1 braking per 50 s
7.5 A	5 s 15 s	1 Bbraking per 10 s 1 braking per 28 s

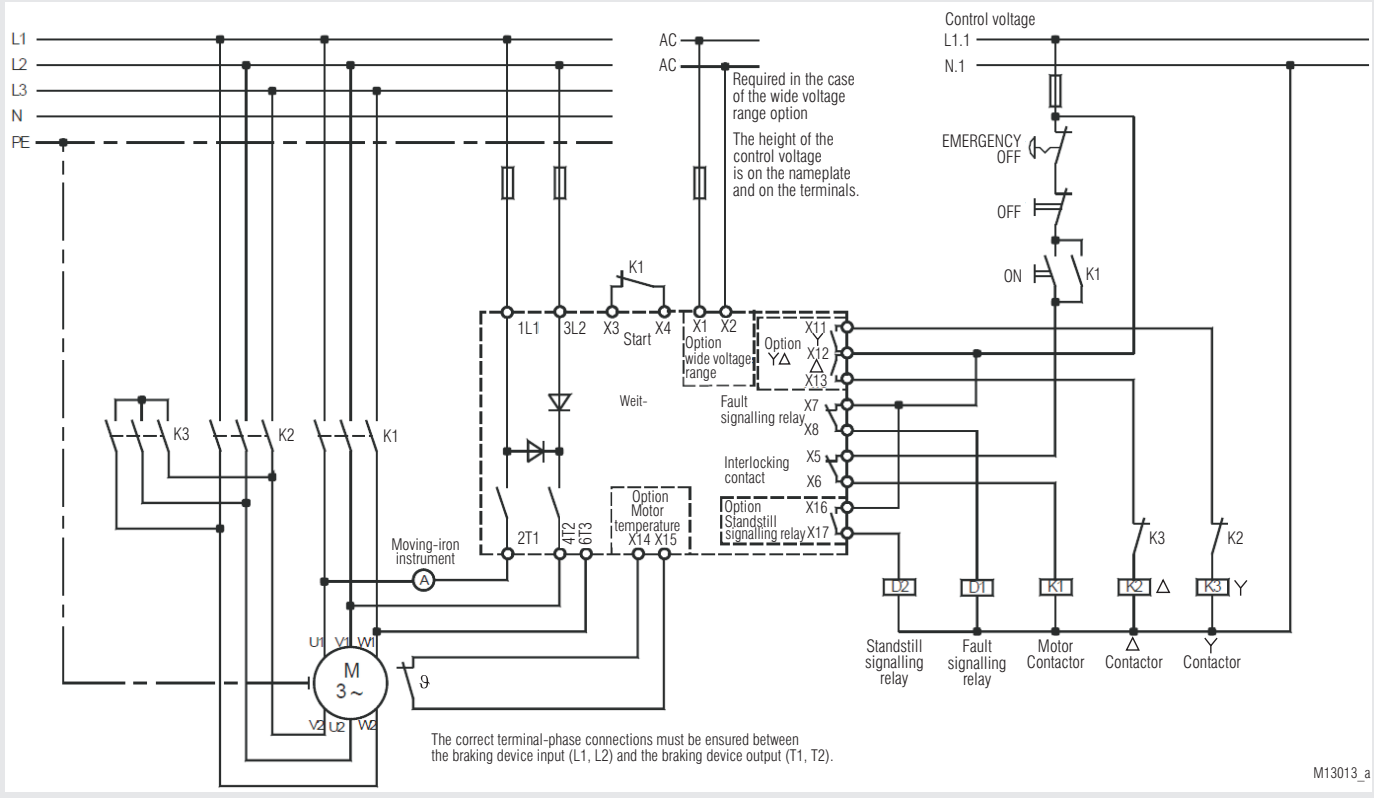


WARNING

Warning!
When setting up the machine or during commissioning it is possible to carry out 10 braking operations in succession with the rated device current at a braking time of 15 s. After these operating conditions, however, the device needs a recovery time of 20 minutes.

Connection Examples





With all options