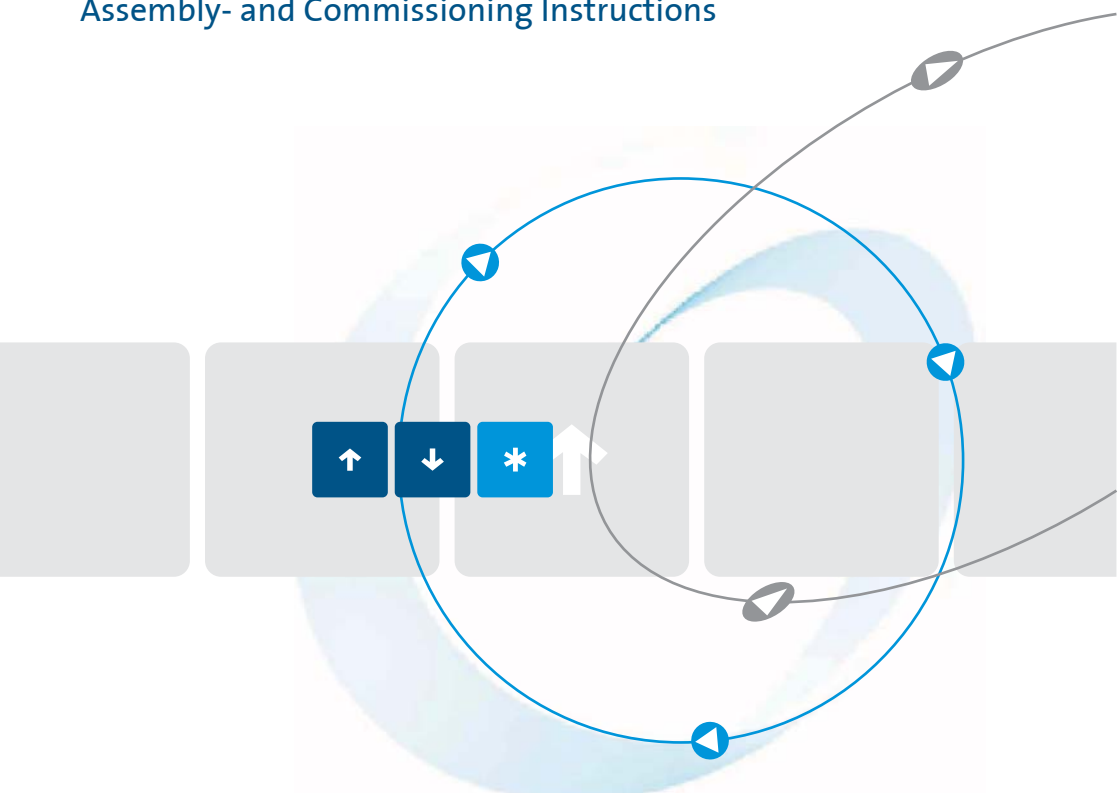


Braking Devices
BR 230/400 - 10...400
Assembly- and Commissioning Instructions



as per 09/13 11600.10001

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These commissioning instructions were prepared with great care. Nevertheless, PETER electronic GmbH & Co. KG does not assume liability for damage resulting from mistakes possibly contained in this manual. Technical changes that serve to improve the product are subject to change without notice.

Notes and symbols used in these instructions

Note: Notes explain the advantages of certain adjustments or settings and help you to make use of the device in the best possible way.



Warning notices: Read them carefully and follow them strictly!

Warning notices are indicated in order to protect you against danger or to help you to prevent the device from being damaged.



Caution: Danger to life through electric shock!

When you see this sign, always make sure that the device is de-energized and secured against unintentional energizing.

1. Safety notes



The described devices are electrical equipment for use in industrial electrical power installations. An impermissible removal of the covers during operation can cause serious damage to your health, since these devices contain live parts with high voltages.

Adjustment work may only be performed by trained staff observing the safety regulations. Assembly and mounting work may only be carried out with the equipment deenergized.

Make sure that all drive components are properly earthed.

Please read these commissioning instructions carefully before putting the device into operation.

Besides, the user must ensure that the devices and associated components are fitted and connected in accordance with the applicable local, legal and technical regulations. The VDE-regulations VDE 0100, VDE 0110 (EN 60664), VDE 0160 (EN 50178) , VDE 0113 (EN 60204, EN 61310), VDE 0660 (EN 50274) plus the appropriate regulations of the TÜV (Technical Control Association) and the trade associations apply in Germany.

The user must ensure that the drive turns into a safe operating state following a device failure, in the event of maloperation, or if the control unit has failed etc..

Caution: Even if the motor is at rest, it is **not** physically separated from the mains.

2. Declaration of conformity

In industrial linguistic usage the electronic brakes of the type BR... are called "devices", however, in the sense of the "device-safety-law", the "EMC-law" or the "EC-guideline for machinery" they are not devices or machines ready for use or connection but they are components. It is only possible to define their final function, when these components are integrated into the design and construction of the user.

To be able to use the devices to their intended purpose, it requires power supply networks according to DIN EN 50160 (IEC38).

The user takes the responsibility that the user's design and construction comply with the applicable legal provision.

The commissioning is strictly forbidden as long as the conformity of the final product with the guidelines 2006/42/EC (Machinery directive) and 2006/95/EC (Low voltage directive) is not proved.

3. General description

The electronic braking devices of the BR...-type enable a non-wearing braking of three-phase asynchronous motors and A.C. motors. The braking devices are used for drives that due to safety or functional reasons have to be reliably slowed down.

Special features

- non-wearing and maintenance-free
- retrofitting in existing systems possible
- also available for special voltages
- for all asynchronous motors

4. Usage to the intended purpose

The devices of the BR-series 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 motors. With due regard to the installation guidelines they meet the following requirements:

Typical applications

- sawing machines
 - centrifuges
 - wood working machines
 - textile machinery
 - conveying machines
-

5. EC Declaration of conformity

EC Declaration of Conformity 

The manufacturer / company placing the product on the market
(authorized representatives of the manufacturer / companies placing the product on the market
that are established within the Community)

Name / Address: Peter Electronic GmbH & Co.KG
Bruckäcker 9
92348 Berg

hereby declares that the following product (device, component, unit) in the version as supplied

Product designation: **Braking device**
Series / type designation: BR ... - 10...600
Article number: 216...
Year of manufacture: 1997

complies with the provisions of the following EC-directives:

- | | |
|--------------------|---|
| 2004/108/EC | Electromagnetic compatibility |
| 2006/95/EC | Electrical equipment designed for use within certain voltage limits |
| 2011/65/EC | The restriction of the use of certain hazardous substances in electrical and electronic equipment |

The following harmonized standards have been applied:

- | | |
|--------------------------------|--|
| EN 60947-1:2007+A1:2012 | Low-voltage switchgear and controlgear General rules |
| EN 60947-4-2:2012 | Low-voltage switchgear and controlgear Contactors and motor-starters - AC semiconductor motor controllers and starters |

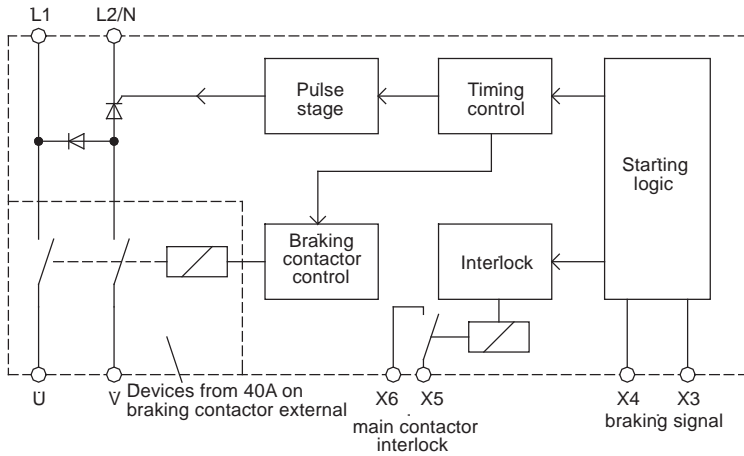
This EC Declaration of Conformity is no longer valid, if the product is modified or changed
without our agreement.

This declaration is issued under the sole responsibility of the signatory.

Berg, 18.07.2013 Dr. Thomas Stiller, Managing director
(place, date) (signatory and function of the signatory)


(signature)

6. Block diagram



7. Functional description (see connection diagram)

After switching on the operating voltage on L1 and L2 the main contactor interlock (terminal X5,X6) closes. The motor can be started.

A starting logic makes sure that braking is not yet initiated when the plant is switched on with the master switch while the motor is still switched off.

The fully automatic run of the braking interval starts with the switch-off of the motor contactor which at the same time closes the contact (terminal X3,X4). During braking the main contactor is interlocked via the contact (terminal X5,X6). After a delay time in which the remanent voltage of the motor decays to a value that is harmless for the power semiconductors (0.25sec. for small-size braking devices, up to 1.5sec. for the 400A-version), the braking contactor pulls in. Afterwards an adjustable d.c. voltage is applied to the motor winding. The resulting magnetic field has a braking effect on the still rotating rotor. The d.c. voltage is generated by a thyristor generalized phase control. Special circuits protect the power semiconductors against overvoltage. With the potentiometer "I" the braking torque can be adjusted in wide ranges. Experience shows that a braking current amounting to double rated motor current has a good braking effect. When commissioning the device, the braking current, for safety reasons, has to be checked with a moving-iron instrument. Multimeters and clamp-on probes give wrong measurements and must not be used for this purpose. Value-adjustments higher than the rated device current are not allowed. If, due to heavy rotating masses to be slowed down, the braking time at rated device current is still too long, the next larger braking device has to be used.

With the potentiometer "t" the braking time can be adjusted from 2 to 14sec.. At the end of the adjusted braking time the braking voltage is switched off and the braking contactor drops out with delay. Thereupon the contact (terminal X5,X6) recloses, so that the motor can be started anew.



Warning note :

When putting the device into operation for the first time, the braking current should be checked with a true r.m.s. measuring instrument. Clamp-on probes or digital multimeters may only be used if they can measure the true r.m.s..

Note: If the braking time at rated device current is too short, due to the fact that the centrifugal masses to be slowed down are too large, a device featuring a higher rated current has to be used.

7.1 LED indicators

| | |
|-------------|---|
| LED – green | mains voltage is applied, braking device is ready |
| LED – red | braking current flows |

8. Control inputs and outputs

8.1 Control inputs

| Control terminals | Designation | Description |
|-------------------|------------------|--|
| X3, X4 | Starting contact | Connection of a break contact of the motor contactor |



Caution: Danger to life through electric shock!

The terminals X3, X4 carry mains potential. If a switch or contactor contact is connected to these terminals, it must have a test voltage of 2.5kV.

8.2 Control outputs

| Control terminals | Designation | Description |
|----------------------|-------------------------------|---|
| X1, X2 ¹⁾ | Contact for braking contactor | The contact closes during braking. Loop the normally opened contact into the branch of the braking contactor. |
| X5, X6 | Interlock | The interlock prevents the motor from being switched on during braking. Loop the normally closed contact into the branch of the motor contactor. |

¹⁾ devices from 40A up, braking contactor external

9. Potentiometers

With the potentiometers on the front panel of the BR-devices the following parameters can be adjusted.

„I“ **Adjusting the braking current**

Adjust the braking current 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 double rated motor current.

The required braking torque is to be adjusted with the potentiometer „I“. It is important that the braking current does not exceed the rated device current that is indicated on the nameplate of the device.

„t“ **Adjusting the braking time**

The time, in which the braking current flows, is to be adjusted with the potentiometer „t“. It should be so long that, as soon as the motor has come to rest, the braking current is switched off.

When the motor has reached operating temperature, check the settings and, if necessary, readjust them.



Warning note :

The devices BR 230-10 to BR 400-200 feature overcurrent cut-off. If the rated device current is exceeded, the braking current will be switched off.

If the braking current is adjusted to a too high value, the braking current will be cut off after approx. 0.5s.

In the event, adjust the braking current „I“ downwards so that the required braking time is reached again.

If, with the maximum braking time, the motor does not come to a rest, a braking device of the next higher performance category or a device with an extended braking time (special device) has to be used.

10. Technical data

| Type designation BR | 230-10 400-10 | 230-20 400-20 | 230-40 400-40 | 230-60 400-60 | 230-100 400-100 | 230-200 400-200 | 230-400 400-400 |
|---|--|--------------------|-------------------|---|--------------------|--------------------|--------------------|
| Nominal voltage according to DIN EN 50160 (IEC 38) | BR230 ... 220/240V ±10% 50/60Hz other voltages BR400 ... 380/415V ±10% 50/60Hz upon request | | | | | | |
| Power draw of the electronics | 6 VA | | | | | | |
| Recommended for rated motor currents up to | 5A | 10A | 20A | 30A | 50A | 100A | 200A |
| Rated device current | 10A | 20A | 40A | 60A | 100A | 200A | 400A |
| c.d.f. at max. braking current | 20% | 20% | 15% | 15% | 15% | 15% | 15% |
| I ² t-value of power semiconductors (A ² s) | 40 | 680 | 8000 | 8000 | 8000 | 80000 | 320000 |
| Braking voltage | 0 ... 130VDC at 220/240V 0 ... 220VDC at 380/415V | | | | | | |
| Braking time | 2 ... 14s (other times upon request) | | | | | | |
| Contact rating | relay contact for motor contactor = 6A/250VAC; 6A/30VDC | | | | | | |
| | - | | | contact for braking contactor = 6A/250VAC; 6A/30VDC | | | |
| Delay time for reduction of residual e.m.f. | 250ms | 250ms | 600ms | 600ms | 1500ms | 1500ms | 1500ms |
| max. Cross-sectional area / connect. cable | 2,5mm ² | 2,5mm ² | 16mm ² | 16mm ² | 35mm ² | 35mm ² | Screw M8 |
| Weight | 0,5kg | 0,55kg | 2,4kg | 2,4kg | 2,55kg | 3,55kg | 7,6kg |

10.1 Ambient conditions

| | |
|-----------------------|--|
| Storage temperature | -25 ... 75°C |
| Operating temperature | 0 ... 45°C |
| Protection class | IP 20 |
| Environment | Overvoltage category III, pollution degree 2 |

11. Commissioning

The device is to be put into operation in 3 steps::

1. Mounting
2. Connection and
3. Parameter setting

11.1 Mounting instructions



Caution: Danger to life through electric shock!

The following conditions are to be complied with in order to ensure a safe and reliable operation of the BR ...:

1. The device series BR ... is to be used under overvoltage conditions of the category III.
2. Make sure that pollution degree 2 or better, in accordance with IEC664, is complied with.
3. The device is to be installed into a housing (min. degree of protection: IP54).
4. The device must be operated without being exposed to contamination by water, oil, carbon deposits, dust, etc..



Warning:

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

11.2 Connection

The braking device has to be connected according to the attached connection diagram. For other connections refer to the factory.

Note: Further connection proposals for special circuit arrangements are available via our homepage at www.peter-electronic.com.

Note: Prior to putting the motor brake into operation, the wiring has to be checked.

To ensure a reliable operation it is important to keep to the interlocking conditions:

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

3. When using braking devices with separate braking contactors (devices with rated currents from 40A up), braking contactor and motor contactor have to be interlocked against each other. (Electrical interlock with break contact)

11.3 Commissioning

Sequence of commissioning:

1. Disconnect plant from supply mains.
2. Connect current measuring instrument to the supply line from the braking device to the motor. The adjustment of the braking current (r.m.s. value) requires a moving-iron instrument. Do not use clamp-on probes or moving-coil instruments. The true r.m.s. value is to be measured by using a current probe.
3. Turn potentiometer "t" to right stop (maximum).
4. Turn potentiometer "l" to left stop (minimum).
5. Switch on the plant.
6. Initiate braking by switching the motor contactor ON/OFF.

Note: When putting the device into operation for the first time, the braking current should be checked with a true r.m.s. measuring instrument. Clamp-on probes or digital multimeters may only be used if they can measure the true r.m.s..

Adjusting the braking current

Adjust the braking current 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 double rated motor current.

The required braking torque is to be adjusted with the potentiometer "l". It is important that the braking current does not exceed the rated device current that is indicated on the nameplate of the device.

If the braking current is adjusted to a too high value, the braking devices will be switched off immediately.



Warning note:

The devices do **not** have a current control or overcurrent cut-off function.

If the potentiometer "l" is turned up to an accordingly high level, the braking current may be higher than the rated device current and can thus destroy the braking device.

If, due to non-compliance with the above adjustment instructions, the current has been set to a too high value, it may happen that in the case of devices up to 20A the braking current will be switched off after approx. 0.5s.

In the event, adjust the braking current "l" downwards so that the required braking time is reached again.

Adjusting the braking time

The time, in which the braking current flows, is to be adjusted with the potentiometer "t". It should be so long that, as soon as the motor has come to rest, the braking current is switched off.

When the motor has reached operating temperature, check the settings and, if necessary, readjust them.

12. Dimensioning rules

Note! All data sheets and commissioning instructions are available on our homepage at www.peter-electronic.com.

12.1 Dimensioning of braking contactors

The braking contactor is switched on or off via a control contact of the braking device (no-load switching).

When selecting the braking contactor, it must be ensured that the contacts are able to carry the maximally occurring braking current (nominal/rated device current). Therefore, the value „conventional thermal current“ (I_{th}) is decisive when selecting the braking contactor.

If this value is not indicated, the rated operational current for AC1-operation may be used instead.

Tip: By connecting contacts in parallel it is often possible to use a lower-priced contactor of a smaller design.

12.2 Dimensioning of pre-fuses

Basically, two types of fuse protection are available for the user:

1. Fusing according to allocation type „1“, DIN EN 60947-4-2.
After a short circuit, the braking device is allowed to be inoperative.
2. Fusing according to allocation type „2“, DIN EN 60947-4-2.
After a short circuit, the braking device must be suitable for further use. However, there is the danger that the contacts of the braking relay (braking contactor) weld. Therefore, if possible, these contacts are to be checked prior to reconnecting the device to the supply. If this check cannot be carried out by the user, the device has to be returned to the producer in order to have it checked.

The following dimensioning information refers to the below operating conditions:

- Use of standard asynchronous motors
 - Braking time not exceeding 20s, for braking devices up to 36A.
 - Braking time not exceeding 40s, for braking devices from 40A up.
 - Braking current not exceeding $2.5 \times I_{NOM}$ of the motor.
 - Cyclic duration factor (c.d.f.) not exceeding the value indicated in the data sheet.
-

Fusing according to allocation type „1“:

As pre-fuses, we recommend to use line protection fuses (utilization category gL) or automatic circuit-breakers with tripping characteristic B, C, D or K.

Taking into account the maximum braking currents that occur (normally the nominal/rated device current), we recommend fuses according to table 2, column 3.

Note: Wiring cross-sectional area according to DIN VDE 0100-430, DIN EN 57100-430.

Fusing according to allocation type „2“:

The power semiconductors are to be protected by fuses of the utilization category gR (semiconductor fuses, high-speed fuses). However, since these fuses do not ensure line protection, it is necessary to use additionally line protection fuses (utilization category gL).

As for the dimensioning of the line protection fuse (gL), please refer to table 2, column 3.

To protect the semiconductors it is necessary to select gR-fuses featuring cutoff- I^2t -values of the ranges indicated in table 2, column 4. In this connection, the current value of the selected fuse should not be smaller than the braking current to be expected (nominal/rated device current).

Note 1: On the basis of the recommended I^2t -value, braking current, and possibly the c.d.f., the fuse supplier is able to select a suitable type. Due to the great variety of producers, sizes and types, PETER electronic does not recommend any particular fuses.

Note 2: If the value of the fuse or cutoff- I^2t -value is selected too small, it may happen that the semiconductor fuse reacts during braking..

| Column 1 | Column 2 | Column 3 | Column 4 |
|---|-------------|--------------------------------|---|
| max. Braking current / Rated device current | Device type | Fuse value allocation type „1“ | Recommended range for cutoff- I^2t -value of semiconductor protection fuses allocation type „2“ |
| 10A | BR ...-10 | 10A | 30... 38 A ² s |
| 20A | BR ...-20 | 16A | 300... 650 A ² s |
| 40A | BR ...-40 | 32A / 35A | 1.400... 3.500 A ² s |
| 60A | BR ...-60 | 40A | 3.000 ... 4.650 A ² s |
| 100A | BR ...-100 | 63A | 6.000 ... 7.600 A ² s |
| 200A | BR ...-200 | 125A | 50.000 ...76.000 A ² s |
| 400A | BR ...-400 | 250A | 200.000 ... 305.000 A ² s |

Table 2

12.3 Permissible braking frequency of BR ...-10 and BR...-20

The braking frequency depends on the adjusted braking current.

The braking devices of the BR 230/400-10-20A type allow the following braking frequencies:

| Braking current | Braking time | Braking frequency |
|--------------------------|--------------|--|
| rated device current | 5s 14s | 1 braking per 25s 1 braking per 70s |
| 75% rated device current | 5s 14s | 1 braking per 20s 1 braking per 55s |
| 50% rated device current | 5s 14s | 1 braking per 13s 1 braking per 35s |



Warning!

When setting up a machine or during commissioning, it is possible to carry out 10 braking operations in succession, i.e., with rated device current and at a braking time of 14s. After such operating conditions, however, the device needs a recovery time of 20 minutes.

12.4 Permissible braking frequency of BR ...-40...400

The braking frequency depends on the adjusted braking current.

The braking devices of the BR 230/400-40...400A type are designed for a cyclic duration factor c.d.f.) of 15% and allow the following braking frequencies:

| Braking current | Braking time | Braking frequency |
|--------------------------|--------------|---|
| rated device current | 5s 14s | 1 braking per 33s 1 braking per 100s |
| 75% rated device current | 5s 14s | 1 braking per 27s 1 braking per 80s |
| 50% rated device current | 5s 14s | 1 braking per 17s 1 braking per 50s |

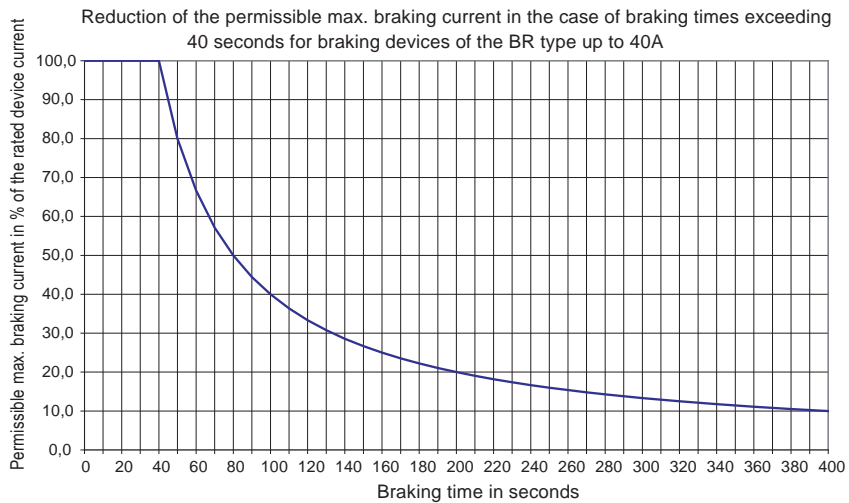


Attention!

If braking times exceeding 40s are required, it is absolutely necessary to reduce the permissible max. braking current according to the following table.

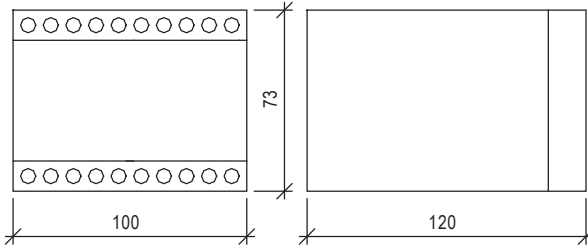
Non-observance can damage the braking device and motor!

table 3

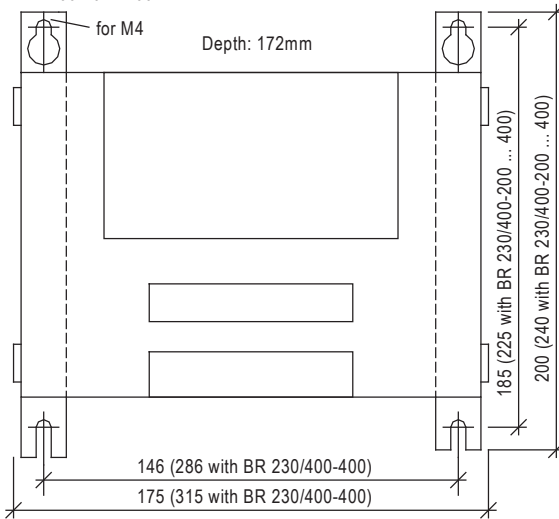


13. Dimensions

BR 230-10 ... 20
 BR 400-10 ... 20



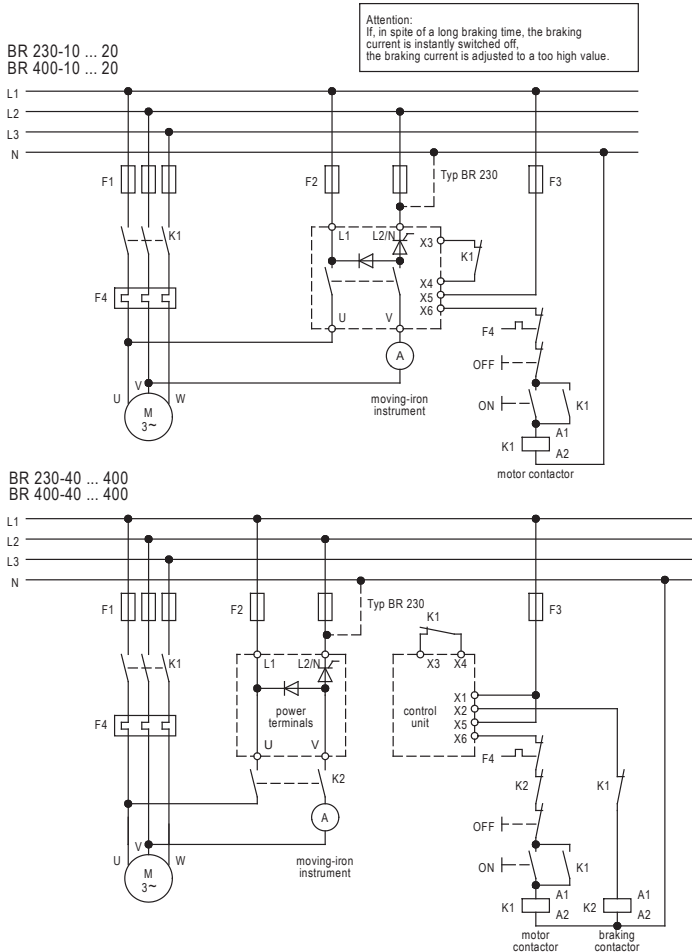
BR 230-40 ... 400
 BR 400-40 ... 400



All dimensions in mm!

14. Typical connections

14.1 Connection diagramm



EMC

The limit values for emitted interference according to the applicable device standards do not rule out the possibility that receivers and susceptible electronic devices within a radius of 10m are subjected to interference.

If such interference, that is definitely attributable to the operation of the braking devices "BR", occurs, the emitted interference can be reduced by taking appropriate measures.

Such measures are, e.g.:

to connect reactors (3mH) or a suitable mains filter in series before the soft starter, or to connect X-capacitors (0,15µ F) in parallel to the supply voltage terminals.





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