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

Dimensioning of braking device:

For most applications, it is relatively easy to select a suitable braking device.
In most cases, an acceptable braking torque is achieved, if, during braking, the motor is connected in **Y** (star) and the braking current is 2.0 times as high as the rated motor current. If, during braking, the motor winding can only be connected in **Δ** (delta), the braking current has to be at least 2.5 times as high as the rated motor current in order to achieve a sufficiently high braking torque.

If special applications require more precise calculations, the following formula can be applied.

$$I_B = 1.3 \cdot f_B \cdot \sqrt{\frac{t_A}{t_B}} \cdot I_N$$

I_B = Braking current
1.3 = Form factor for 50/60Hz
f_B = Braking factor acc. to table 1
t_A = Acceleration time (with direct start) (time until nominal speed is reached) .
t_B = Braking time required
I_N = Rated/nominal motor current

Table 1

Connection of motor winding at nominal operation	during braking		
	 $f_B = 4.5$	 $f_B = 2.3$	 $f_B = 1.5$
	 $f_B = 2.0$	 $f_B = 1.3$	 $f_B = 0.9$

The braking current determined according to one of the above descriptions should be less than or equal to the rated current of the braking device.
If in these dimensional calculations, a braking current which equals 100% of the rated device current is used, please make sure that in the case of devices up to 36A and from 40A up the maximum braking time is 20s and 40s, respectively. In this connection, the c.d.f. (cyclic duration factor) indicated on the data sheet must not be exceeded.

Calculating the cyclic duration factor (c.d.f.):

$$c.d.f. = \frac{t_B}{Cycletime} \cdot 100$$

t_B = Braking time
Cycle time = Total cycle time (running-braking)

If braking times > 20s (devices up to 36A) or > 40s (devices from 40A up) are to be expected, it should be taken into account, when selecting a braking device, that the permissible maximum braking current is to be accordingly reduced.
For more detailed information please see device-specific commissioning instructions.

If the cyclic duration factor (c.d.f.) exceeds the permissible values indicated in the data sheet, in this case too, it has to be ensured that the permissible maximum braking current is to be reduced. For details in this connection, please see the device-specific commissioning instructions.
If the braking current cannot be reduced, a braking device of a higher performance category has to be used.
For example! If the required c.d.f. is twice as high as the value indicated on the data sheet, a braking device of twice the rated device current has to be used.

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 (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.

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 2.5x I_{NOM} of the motor
- Cyclic duration factor (c.d.f.) not exceeding the value indicated on 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 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 (utiliz. 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 (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 is selected too small, it may happen that the semiconductor fuse reacts during braking.

Table 2

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^2s
15A	BRMS	16A	300 … 650 A^2s
20A	BR …-20	16A	300 … 650 A^2s
25A	BR …-25L VB …-25L VB …-25	20A	500 … 900 A^2s
30A	BR …-30	25A	600 … 900 A^2s
36A	VB …-36	25A	700 … 1000 A^2s
40A	BR …-40 VB …-40	32A / 35A	1400… 3500 A^2s
60A	BR …-60 VB …-60	40A	3000 … 4650 A^2s
100A	BR …-100 VB …-100	63A	6000 … 7600 A^2s
200A	BR …-200 VB …-200	125A	50000 …76000 A^2s
400A	BR …-400 VB …-400	250A	200000 … 305000 A^2s
600A	BR …-600 VB …-600	400A	600000 …1050000 A^2s