Chapter 2 – Overview

Resistor Braking

The deceleration time of an AC drive can be decreased by using resistor braking. For this, the frequency converter has to be equipped with a braking chopper and a braking resistor.

The standard braking choppers and braking resistors available for the ACS 600 units are given in Table 2-1.

The choppers and the resistors are rated so that the power equal to the short-term overload capacity of the ACS 600 can be handled during braking. The short-term overload capacity for a Normal Use rated ACS 600 is 110 % of the rated output power (current), and, for a Heavy-duty Use rated ACS 600, 150 % of the rated output power (current).

Braking Chopper NBRA-6xx

The NBRA-6xx Braking Choppers are optional devices for ACS 600 Family frequency converters.

The chopper connects the braking resistor to the intermediate circuit of the frequency converter whenever the voltage in the intermediate circuit exceeds the maximum limit.

The maximum limit is equal to $1.21 \cdot 1.35 \cdot U_{1max}$. U_{1max} is dependent on the chopper voltage selection (see *Chapter 3 – Voltage Selection and Mechanical Installation)*. With the selection **400V**, U_{1max} is 415 V; with the selection **500V**, U_{1max} is 500 V; with the selection **>500V** (NBRA-66x), U_{1max} is 690V. Energy consumption by resistor losses lowers the voltage until the resistor can be disconnected. This limit is equal to $1.19 \cdot 1.35 \cdot U_{1max}$. The energy generated by the motor during a fast deceleration of the drive typically causes the voltage to rise in the intermediate circuit.

Note: Drive Parameter 20.5 (20.7 for ACP 600) OVERVOLTAGE CTRL must be set to OFF to enable chopper operation.

The chopper control board supervises system status and detects failures such as:

- braking resistor and resistor cable short circuits
- chopper (IGBT) short circuit
- chopper control board failure.

There is an enable input and a relay output on the chopper control board. The input can be connected to a temperature sensitive switch mounted in the resistor assembly to protect the resistor against overtemperature (see *Chapter 4 – Electrical Installation* for more information). The relay output indicates chopper faults.

The chopper can be controlled from an external control location via a fibre optic link. Using the link it is possible to synchronise several braking choppers. In standard applications the fibre optic link is not used.

Accessories It is highly recommended to equip the ACS 600 with a main contactor controlled by the chopper relay output. This configuration also requires a manual start/stop switch for system start-up. For more information, see *Chapter 4 – Electrical Installation*.

Delivery Check The package contains:

- Braking chopper type NBRA-6xx
  (check the correct type with Table 2-1)
- *Installation and Start-up Guide* for *NBRA-6xx* (this document).

Warranty See the *Installation and Start-up Manual* delivered with the frequency converter for warranty information.

Braking Resistors

Standard resistors are available for each ACS 600 / NBRA-6xx combination. These resistors are specified in Table 2-1, and their dimensions given in *Appendix A.* (Some combinations require the use of two parallel-connected resistors.) Other resistors with a resistance not below the minimum allowed resistance value *(R)* may also be used.

WARNING! Never use a braking resistor with a resistance value below the minimum allowed resistance value specified for that particular ACS 600 / braking chopper combination. The chopper and the frequency converter are not able to handle the overcurrent caused by the low resistance.

If the heat dissipation capacity *(E_R)* of the standard braking resistor is not sufficient for the application, it is possible to use a four resistor assembly in which two standard resistors are connected in parallel and two in series. This implementation does not change the total resistance of the resistor assembly.

Fuses

The NBRA-658, NBRA-659 and NBRA-669 require the use of braking circuit fuses. Other units do not require the fuses if all of the following provisions are fulfilled:

- the ACS 600 mains cable is protected with fuses
- the cable and the fuses are of the type specified for that particular converter model in its *Installation and Start-up Manual*
- the braking chopper circuit cables are as specified in this Guide.

The fuses in the braking circuit protect the chopper and the braking circuit cables in a cable short-circuit situation. The fuses do not protect the cables, the chopper or the resistor against overload. Overload protection can be implemented by wiring the temperature sensor of the resistor to the Enable Input of the chopper and simultaneously connecting the Relay Output of the chopper to the main contactor control circuit of the ACS 600.

The fuses must be installed as near as possible to the ACS 600 intermediate circuit terminals (UDC+ and UDC–). Unprotected cable length must not exceed 0.5 metres.

Rating Tables

The standard braking choppers, braking resistors, cables and fuses are specified in Tables 2-1 and 2-2. (See also *Chapter 4 – Electrical Installation.)*

The Maximum Braking Power of the ACS 600 / NBRA-6xx combination is given for a reference braking cycle (the drive brakes for one minute every ten minutes). If the actual cycle does not correspond to the reference cycle, the maximum allowed braking power must be calculated. See *Appendix B – Maximum Braking Power* for instructions.