

ABB industrial drives

Hardware manual

ACS880-604 1-phase brake chopper units as modules



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List of related manuals

General drive manuals	Code (English)
<i>Cabinet design and construction instructions for ACS880 multidrive modules</i>	3AUA0000107668
<i>Electrical planning instructions for ACS880 multidrive cabinets and modules</i>	3AUA0000102324
<i>Safety instructions for ACS880 multidrive cabinets and modules</i>	3AUA0000102301
Supply module manuals	
<i>ACS880-204 IGBT supply units as modules hardware manual</i>	3AUA0000131525
<i>ACS880 IGBT supply control program firmware manual</i>	3AUA0000131562
<i>ACS880-304 diode supply modules (+A003) hardware manual</i>	3AUA0000102452
<i>ACS880 diode supply control program firmware manual</i>	3AUA0000103295
Inverter module manuals and guides	
<i>ACS880-104 inverter modules hardware manual</i>	3AUA0000104271
<i>ACS880 primary control program firmware manual</i>	3AUA0000085967
<i>ACS880 primary control program quick start-up guide</i>	3AUA0000098062
Brake module manuals	
<i>ACS880-604 1-phase brake chopper units as modules hardware manual</i>	3AUA0000106244
Option manuals and guides	
<i>ACS-AP-x Assistant control panels user's manual</i>	3AUA0000085685
<i>Drive composer start-up and maintenance PC tool user's manual</i>	3AUA0000094606
<i>Manuals and quick guides for I/O extension modules, fieldbus adapters, etc.</i>	

You can find manuals and other product documents in PDF format on the Internet. See section [Document library on the Internet](#) on the inside of the back cover. For manuals not available in the Document library, contact your local ABB representative.

Hardware manual

ACS880-604 1-phase brake chopper units as
modules

Table of contents



3. Mechanical installation



5. Electrical installation



7. Start-up



Table of contents

1. Introduction to the manual

Contents of this chapter	9
Safety instructions	9
Target audience	9
Contents of the manual	10
Related documents	10
Terms and abbreviations	10

2. Operation principle and hardware description

Contents of this chapter	13
Product overview	13
Operation principle	13
Single-line diagram of the drive system	14
Layout drawing	15
Overview of power and control connections	16
Type designation label	17

3. Mechanical installation

Contents of this chapter	19
Checking the installation site	19
Required tools	19
Installing the brake chopper module	20
Examples: Installing the brake chopper module and a cooling fan	21
Example 1: Installation into generic closure	21
Example 2: Installation into Rittal TS8 enclosure	22
Examples: Installing brake resistors and a cooling fan	23
Example 1: Installation into generic enclosure	23
Example 2: Installation into Rittal TS8 enclosure	24

4. Planning the electrical installation

Contents of this chapter	25
Limitation of liability	25
Generic guidelines	25
Equipping the drive with a main contactor and manual control switch(es)	26
Selecting the brake circuit components	28
Calculating the maximum braking power	29
Example 1	29
Example 2	29
Example 3	30
Selecting and routing the brake resistor cables	30
Minimizing electromagnetic interference	30
Maximum cable length	30
EMC compliance of the complete installation	30
Placing the brake resistors	31
Selecting the chopper enable input cable	31



Protecting the system against thermal overload	31
Operation principle	31
Protecting the resistor cable against short-circuits	31
Controlling the brake chopper from an external control location	32

5. Electrical installation

Contents of this chapter	33
Safety	33
Checking the insulation of the resistor circuit	34
Selecting the voltage	34
Synchronizing multiple brake choppers	35
Connecting the DC and resistor cables	36
Connection diagram	36
Connection procedure	37
Connecting the thermal switch	38

6. Installation checklist

Contents of this chapter	39
Checklist	39

7. Start-up

Contents of this chapter	41
Start-up procedure	41
Preliminary actions	41
Power switch-on	42
Operational checks	42

8. Fault tracing and maintenance

Contents of this chapter	43
Maintenance	43
Fault indications	44
NRED voltage reducer selection for NBRA-669	45

9. Ordering information

Contents of this chapter	47
Brake chopper modules	48
Brake chopper cooling fans	49
Fuses	50
Fuse bases	51
Brake resistors	52
Brake resistor cooling fans	53
Attenuator	54



10. Technical data

Contents of this chapter	55
Ratings	56
Only chopper	56
Chopper with standard resistors	57
Definitions	58
DC fuses	59
Dimensions, weights and free space requirements	60
Losses, cooling data and noise	61
Only chopper	61
Chopper with standard resistors	62
Brake circuit cable sizes	63
Brake chopper terminal data	64
Brake resistor terminal data	65
Degree of protection	65
Auxiliary circuit current consumption	65
CE marking	66
Compliance with the European Low Voltage Directive	66
Compliance with the European EMC Directive	66
UL marking	66
More information on standards and markings	66

11. Dimension drawings

Contents of this chapter	67
Brake chopper modules NBRA-658, NBRA-659, NBRA-669	68
Brake chopper cooling fan G2E140-PI51-09	68
Brake resistors SAFUR180F460, SAFUR125F500, SAFUR200F500, SAFUR210F575	69
Brake resistor cooling fan D4E225-CC01-39	69

12. Example circuit diagrams

Contents of this chapter	71
ACS880-604-0640-3 brake unit, master	73
ACS880-604-0640-3 brake unit, follower	74

Further information

Product and service inquiries	75
Product training	75
Providing feedback on ABB Drives manuals	75
Document library on the Internet	75







1

Introduction to the manual

Contents of this chapter

This chapter introduces this manual.

Safety instructions

Obey all safety instructions delivered with the drive.

Read the **complete safety instructions** before you install, start up, or use the drive. The complete safety instructions are given in *Safety instructions for ACS880 multidrive cabinets and modules* (3AUA0000102301 [English]).

Read the **task-specific safety instructions** before starting the task. See the subsection describing the task.

Target audience

The manual is intended for people who plan the installation of, install, start up and use the brake chopper units. Read the manual before working on the units. You are expected to know the fundamentals of electricity, wiring, electrical components, and electrical schematic symbols.

Contents of the manual

This manual consists of the following chapters:

- *Introduction to the manual* introduces this manual.
- *Operation principle and hardware description* describes the operation principle and construction of the brake chopper.
- *Mechanical installation* contains installation instructions and examples.
- *Planning the electrical installation* contains instructions on selecting, placing and protecting the brake circuit components and cables.
- *Electrical installation* contains instructions on wiring the brake chopper unit.
- *Installation checklist* contains a list for checking the mechanical and electrical installation of the brake chopper.
- *Start-up* contains the start-up procedure of a brake unit.
- *Fault tracing and maintenance* describes the fault tracing possibilities and maintenance of a brake unit.
- *Ordering information* lists the components and accessories for the brake chopper unit.
- *Technical data* contains the technical specifications of the brake chopper module, eg, the ratings, sizes and technical requirements, provisions for fulfilling the requirements for CE and other markings.
- *Dimension drawings* contains the dimension drawings of the brake chopper module, as well as the standard brake resistors and cooling fans.
- *Example circuit diagrams* contains example circuit diagrams of a brake unit.

Related documents

The user documentation of a multidrive module delivery includes a USB memory stick with all manuals of the product series.

You can find instructions on equipment kits on the Internet. Go to <https://www151.abb.com/spaces/lvacdrivesengineeringsupport/content>. For other manuals, see the inside of the front cover. If needed, contact your local ABB representative.

Terms and abbreviations

Term/Abbreviation	Explanation
Control board	Circuit board in which the control program runs
Brake chopper	Conducts the surplus energy from the intermediate circuit of the drive to the brake resistors when necessary. The chopper operates when the DC link voltage exceeds a certain maximum limit. The voltage rise is typically caused by deceleration (braking) of a high inertia motor.
Brake chopper module	Brake chopper enclosed inside a metal frame or enclosure. Intended for cabinet installation. See <i>Brake chopper</i> .
Brake chopper unit	Brake chopper modules under control of one control board and related accessories. The control board is considered part of the unit.
Brake resistor	Dissipates the drive surplus braking energy conducted by the brake chopper to heat. Essential part of the brake circuit. See <i>Brake chopper</i> .

Term/Abbreviation	Explanation
Brake unit	Brake chopper and resistors
Cubicle	One section of a cabinet-installed drive. A cubicle is typically behind a door of its own.
DC link	DC circuit between rectifier and inverter
Drive	Frequency converter for controlling AC motors
EMC	Electromagnetic compatibility
IGBT	Insulated gate bipolar transistor; a voltage-controlled semiconductor type widely used in various converters because of their easy controllability and high switching frequency.
Intermediate circuit	See DC link .
Inverter	Converts direct current and voltage to alternating current and voltage.
Multidrive	Drive for controlling several motors which are typically coupled to the same machinery. Includes one supply unit, and one or several inverter units.
NBRC	Chopper control board. See Control board .
Parameter	User-adjustable operation instruction to the drive, or signal measured or calculated by the drive
Rectifier	Converts alternating current and voltage to direct current and voltage.
SAFUR	Series of optional brake resistors

2

Operation principle and hardware description

Contents of this chapter

This chapter describes the operation principle and construction of the brake chopper.

Product overview

ACS880-604 is an air-cooled brake chopper unit. It includes an NBRA brake chopper module or two parallel-connected NBRA brake chopper modules.

Operation principle

The brake chopper handles the energy generated by a decelerating motor. The chopper connects the brake resistor to the intermediate DC circuit whenever the voltage in the circuit exceeds the limit defined by the control program. Energy consumption by the resistor losses lowers the voltage until the resistor can be disconnected.

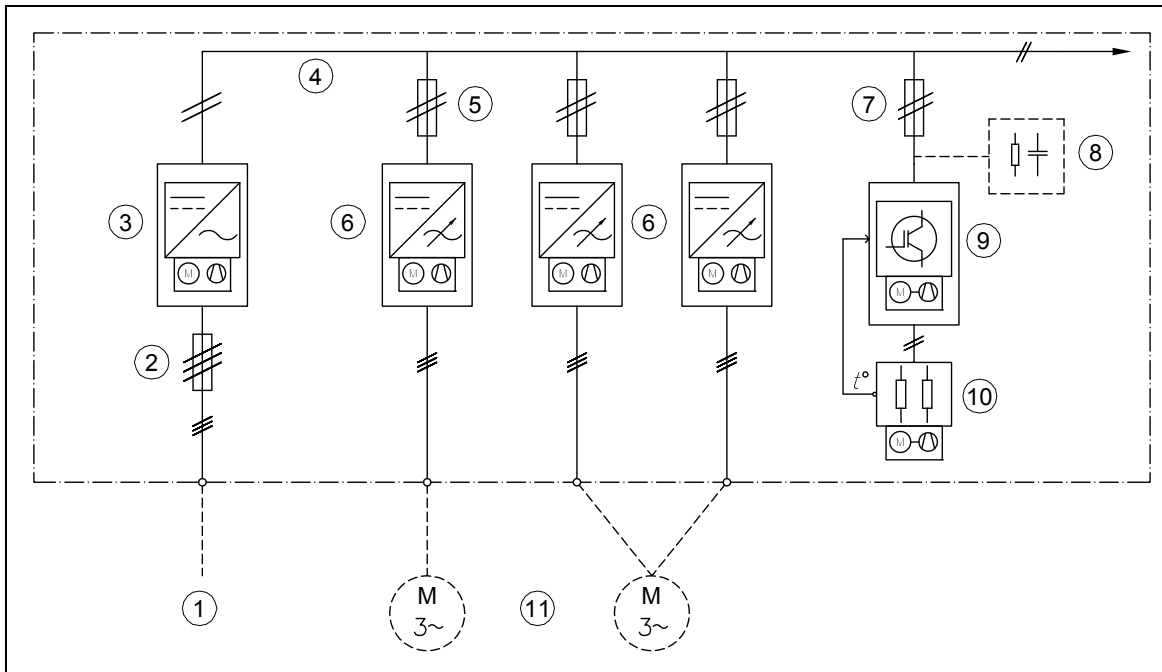
Typically, a drive system is equipped with a brake chopper(s) if:

- high capacity braking is needed and the drive cannot be equipped with a regenerative supply unit
- a backup for the regenerative supply unit is needed.

Standard resistors are available from ABB for each brake chopper module.

Single-line diagram of the drive system

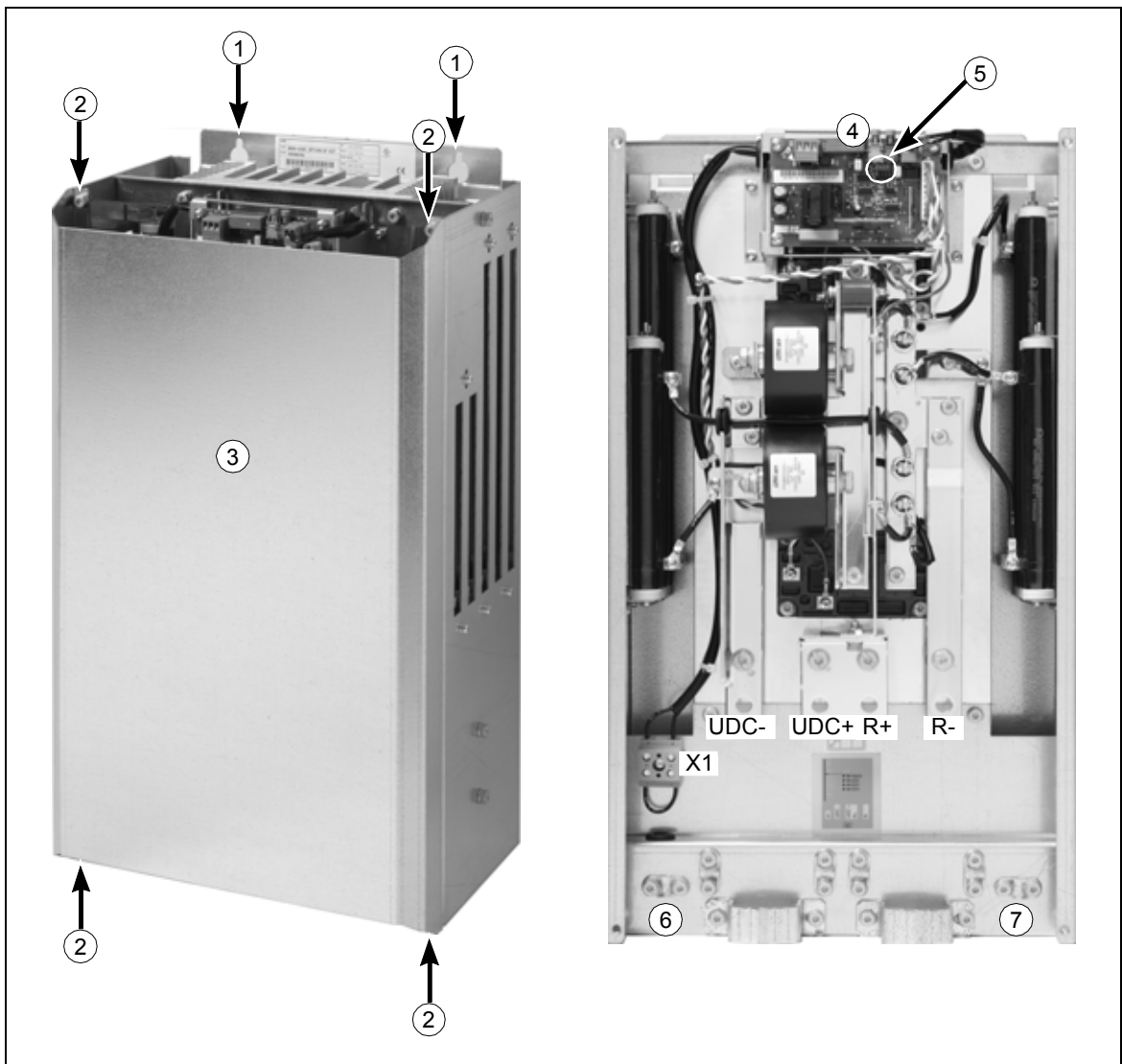
The diagram below shows a typical common DC link drive system.



1	AC supply
2	Input (AC) fuses
3	Supply unit. In this example, the supply unit consists of one supply module.
4	DC link
5	Inverter DC fuses
6	Inverter units. In this example, one of the units consists of two inverter modules connected in parallel.
7	Brake chopper DC fuses
8	Attenuator
9	Brake chopper
10	Brake resistors
11	Motors

Layout drawing

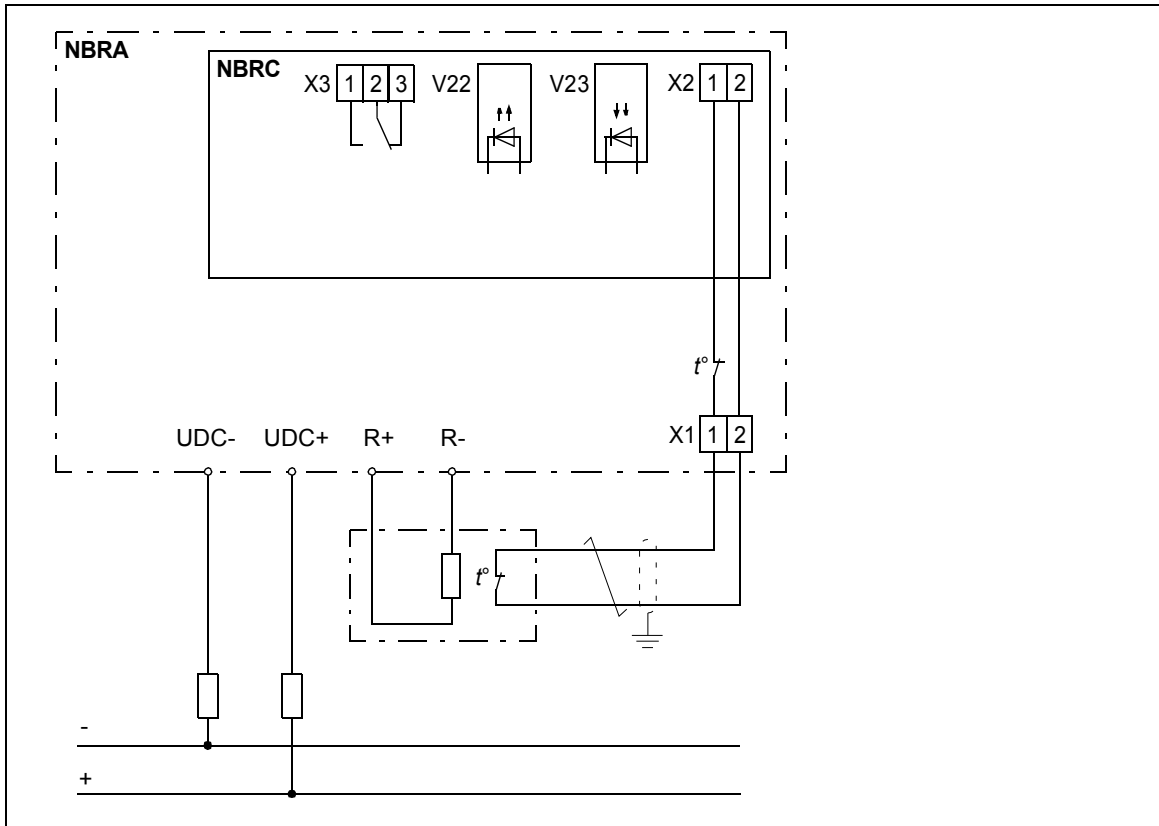
The components of the brake chopper module are shown below.



1	Four fastening points at the back of the unit
2	Four front panel fastening screws
3	Front panel
4	Chopper control board (NBRC) with control terminals (see page 16)
5	Voltage selection jumper (see page 34)
6	PE (protective earth) clamp
7	Grounding clamp
X1	Enable input terminal block (see page 16)
UDC-	Power connection terminals
UDC+	
R+	
R-	

Overview of power and control connections

The diagram below shows the power and control connections of the brake chopper module.



Item	Description	Additional information
X1	Chopper enable input	<i>Protecting the system against thermal overload</i> (page 31)
X3	Fault indication relay output	
V22	Fiber optic cable connection: Chopper control signal to another chopper (Transmitter)	<i>Controlling the brake chopper from an external control location</i> (page 31)
V23	Fiber optic cable connection: Chopper control signal from another chopper (Receiver)	

Type designation label

Each brake chopper module is equipped with a type designation label. An example label is shown below.

<div style="display: flex; justify-content: space-between; width: 100%;"> (4) (5) </div>	
No.	Description
1	Type designation
2	Brake chopper module order code
3	Serial number <ul style="list-style-type: none"> • The first digit of the serial number refers to the manufacturing plant. • The next four digits refer to the unit's manufacturing year and week, respectively. • The remaining digits complete the serial number so that there are no two units or modules with the same number.
4	Ratings
5	Valid markings

3

Mechanical installation



Contents of this chapter

This chapter contains installation instructions and examples.

Checking the installation site

The brake chopper module must be installed in an upright position. The degree of protection of the module is IP00. Take this into account when selecting the installation site. Installation in a cabinet is highly recommended.

Obey the general ACS880 multidrive module cabinet installation instructions given in *Cabinet design and construction instructions for ACS880 multidrive modules* (3AUA0000107668 [English]). In addition, observe these restrictions:

- The brake unit can be grounded to the frame through the mounting screws if the galvanic connection to PE (protective earth) is good enough.
- Leave 150 mm (5.91 in.) free space below and above the brake chopper module.
- Leave enough space for the fuses and the cooling fan.
- To prevent the module from overheating, do not install it directly above the brake resistors.

The maximum lengths of the chopper and resistor cables are 5 m and 10 m, respectively.

Required tools

Make sure that you have these tools available:

- drill with suitable bits
 - screwdriver and/or wrench with a set of suitable bits
 - mounting screws (M6).
-

Installing the brake chopper module

1. Mark the locations of the four mounting holes onto the installation surface.
For the module dimensions, see chapter [Dimension drawings](#).
2. Drill the mounting holes. Make sure that dust and burr from drilling does not enter the module or other equipment at the installation site.
3. Put screws into the holes. Tighten the screws far enough to make sure that they can carry the weight of the module.
4. Lift the module onto the mounting screws.
5. Tighten the screws.



Examples: Installing the brake chopper module and a cooling fan

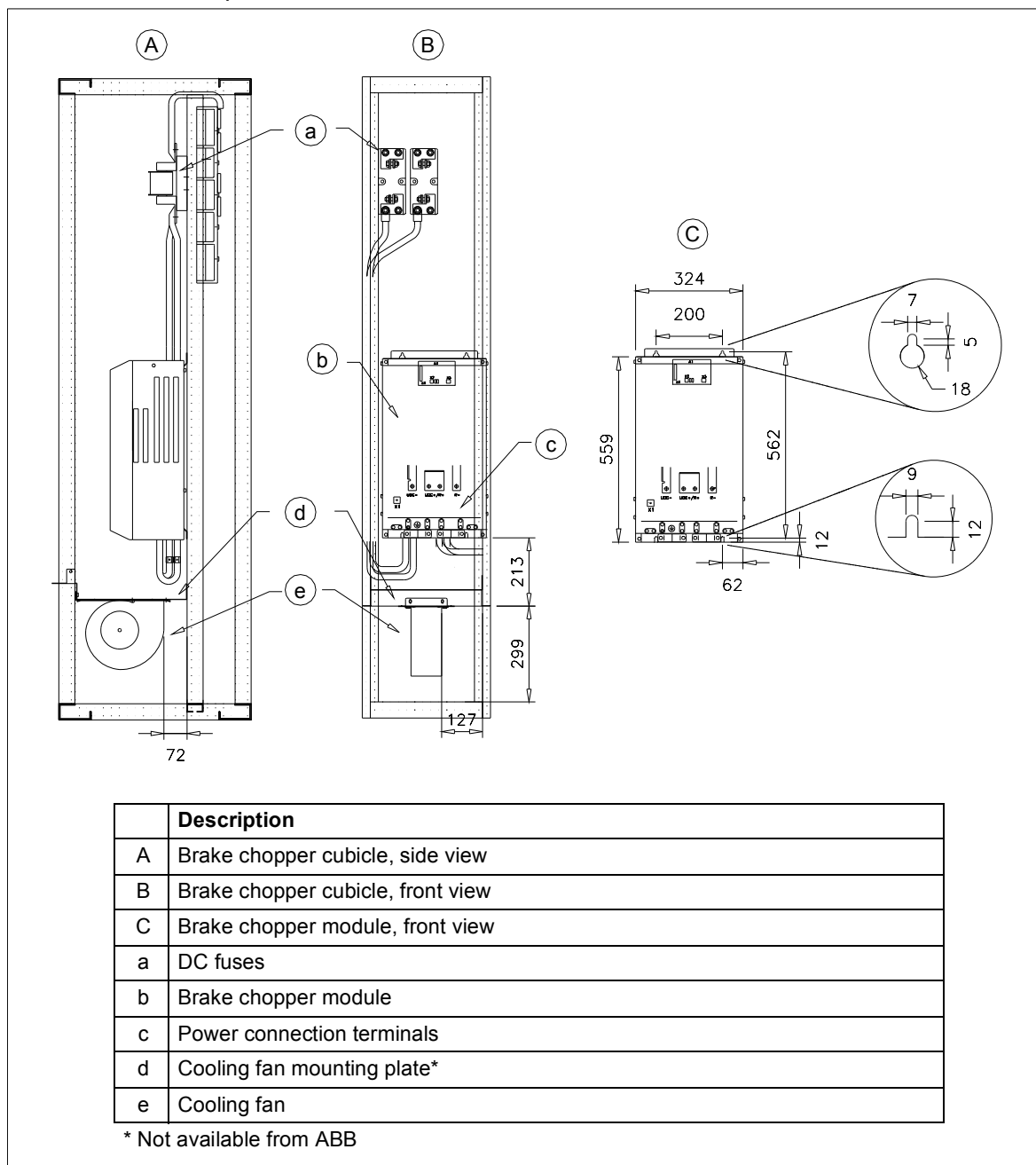
■ Example 1: Installation into generic closure

Note: To ensure proper cooling, the brake chopper module and the cooling fan must be positioned exactly as illustrated in relation to each other.

1. Attach the brake chopper module (b) to the installation surface of the enclosure. See [Installing the brake chopper module](#) on page 20.

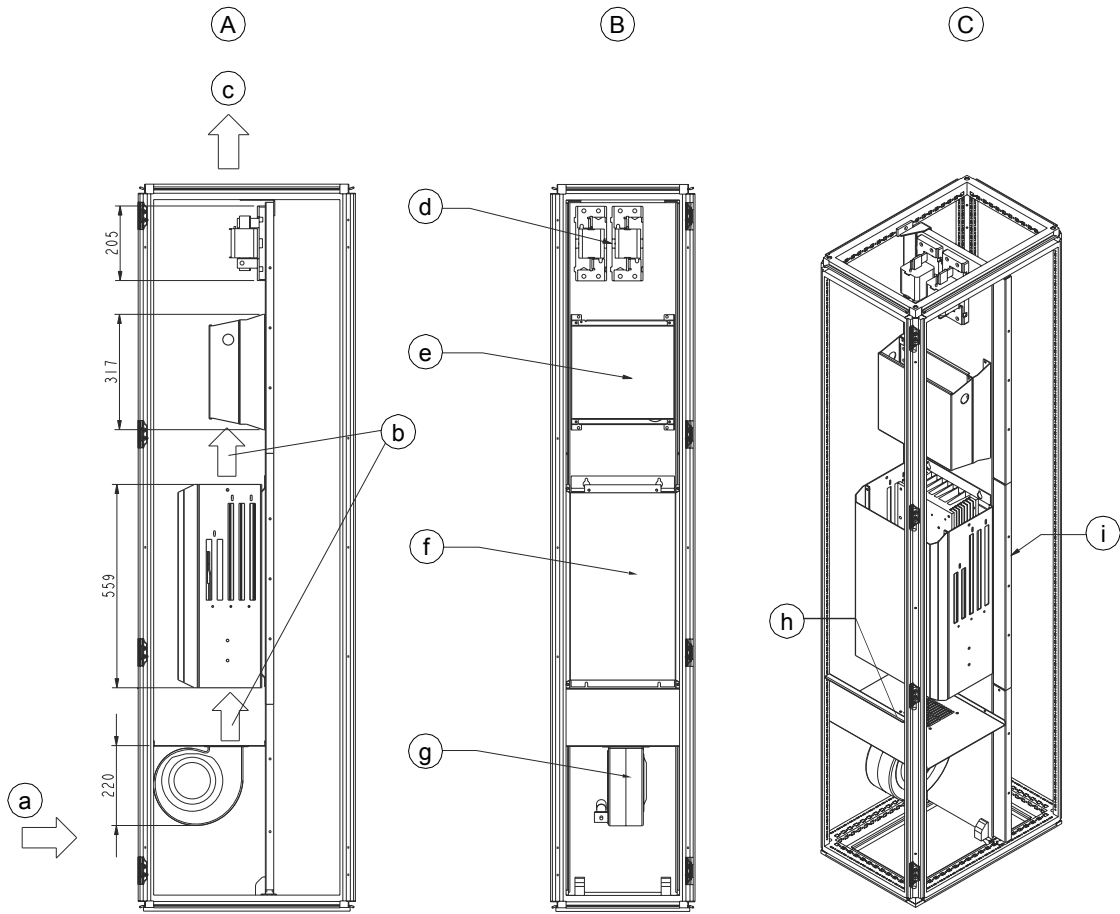
2. Install the cooling fan (e) using a separate mounting plate (d).

The mounting plate is also used to prevent cooling air recirculation in the cabinet. Therefore, the plate has to cover the whole cross-sectional area of the cabinet.



For more information on the dimensions, see chapter [Dimension drawings](#).

■ Example 2: Installation into Rittal TS8 enclosure



	Description
A	Brake chopper cubicle, side view
B	Brake chopper cubicle, front view
C	Brake chopper module, side view
a	Air flow in. Use door inlet.
b	Air flow into components
c	Air flow out. Use open roof.
d	DC fuses
e	Attenuator (optional)
f	Brake chopper module
g	Cooling fan
h	Cooling fan mounting plate*
i	Plastic bars on both sides to block airflow**

* Not available from ABB. For an illustration, see 3AXD5000007886.

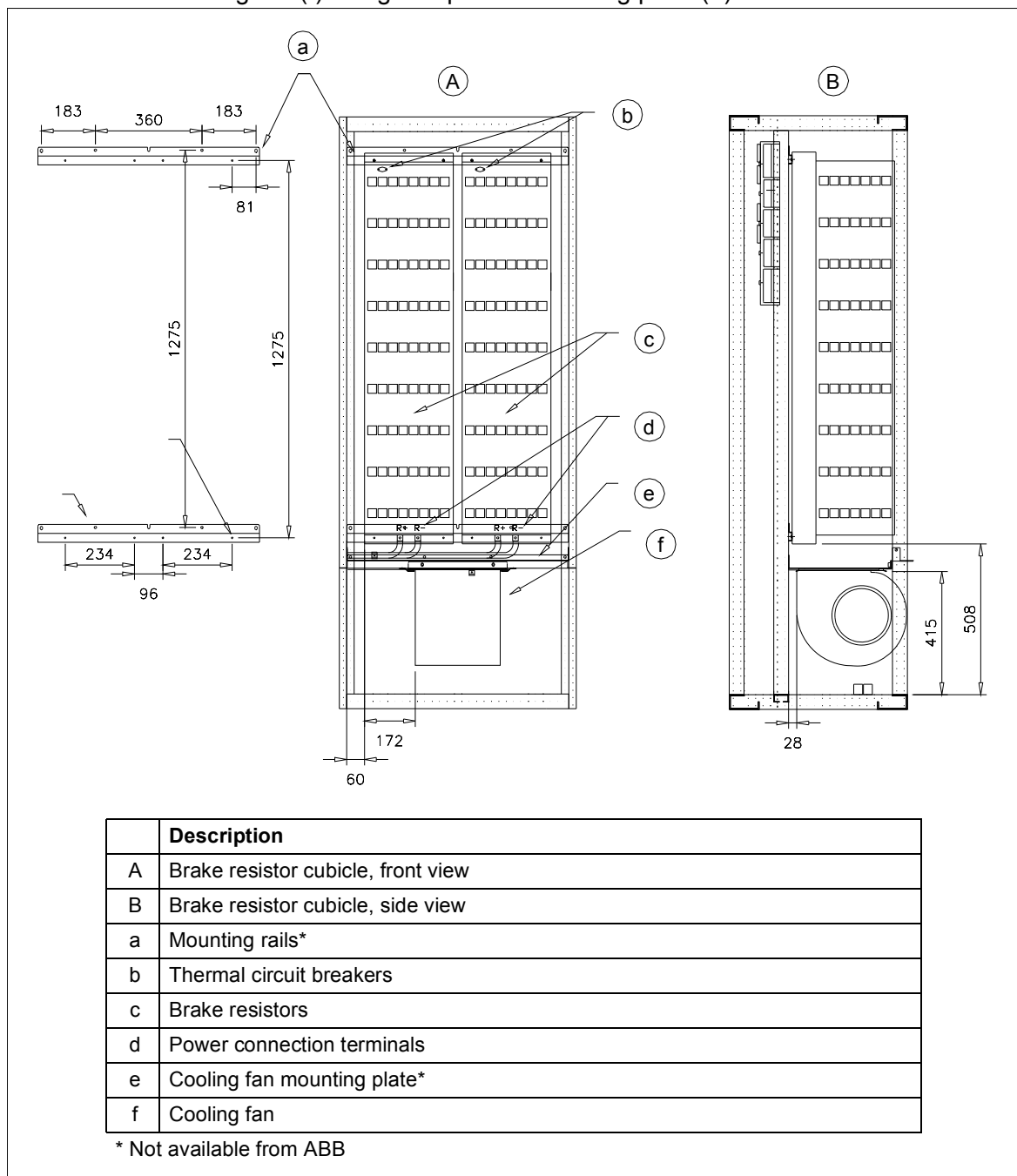
** Not available from ABB. For an illustration, see 3AXD5000008190 and 3AXD5000008209.

Examples: Installing brake resistors and a cooling fan

■ Example 1: Installation into generic enclosure

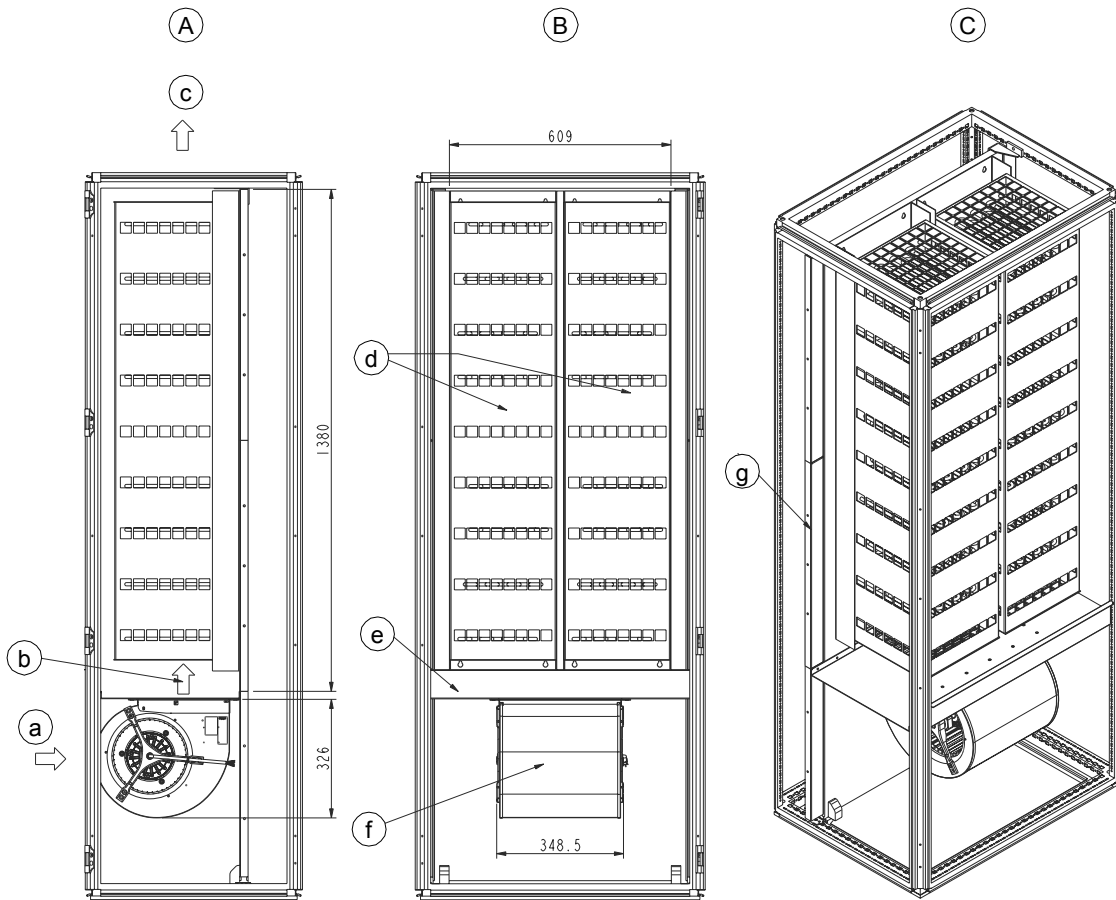
Note: To ensure proper cooling, the brake resistors and the cooling fan must be positioned exactly as illustrated in relation to each other. Make sure that the cooling air does not circumvent the resistors.

1. Attach two mounting rails (upper and lower) (a) to the installation surface of the enclosure using four M6 screws per rail.
2. Attach each brake resistor (c) to the rails using four M6 screws.
3. Install the cooling fan (f) using a separate mounting plate (e).



For more information on the dimensions, see chapter [Dimension drawings](#).

Example 2: Installation into Rittal TS8 enclosure



	Description
A	Brake resistor cubicle, side view
B	Brake resistor cubicle, front view
C	Brake resistor cubicle, side view
a	Air flow in. Use door inlet.
b	Air flow into components
c	Air flow out. Use open roof.
d	Brake resistors
e	Cooling fan mounting plate*
f	Cooling fan
g	Plastic bars on both sides to block airflow**

* Not available from ABB. For an illustration, see 3AXD50000008316.

** Not available from ABB. For an illustration, see 3AXD50000008190 and 3AXD50000008209.

4

Planning the electrical installation

Contents of this chapter

This chapter contains instructions on selecting, placing and protecting the brake circuit components and cables.

Limitation of liability

The installation must always be designed and made according to applicable local laws and regulations. ABB does not assume any liability whatsoever for any installation which breaches the local laws and/or other regulations. Furthermore, if the recommendations given by ABB are not followed, the drive may experience problems that the warranty does not cover.

Generic guidelines

See *Electrical planning instructions for ACS880 multidrive cabinets and modules* (3AUA0000102324 [English]) for the generic guidelines for planning the electrical installation (selecting cables, routing cables, etc.) of the air-cooled multidrive modules.

Equipping the drive with a main contactor and manual control switch(es)

It is highly recommended to equip the drive with a main contactor and wire it to fault indication relay output X3 on the chopper control board. This configuration also requires a manual start/stop switch(es) for system start-up.

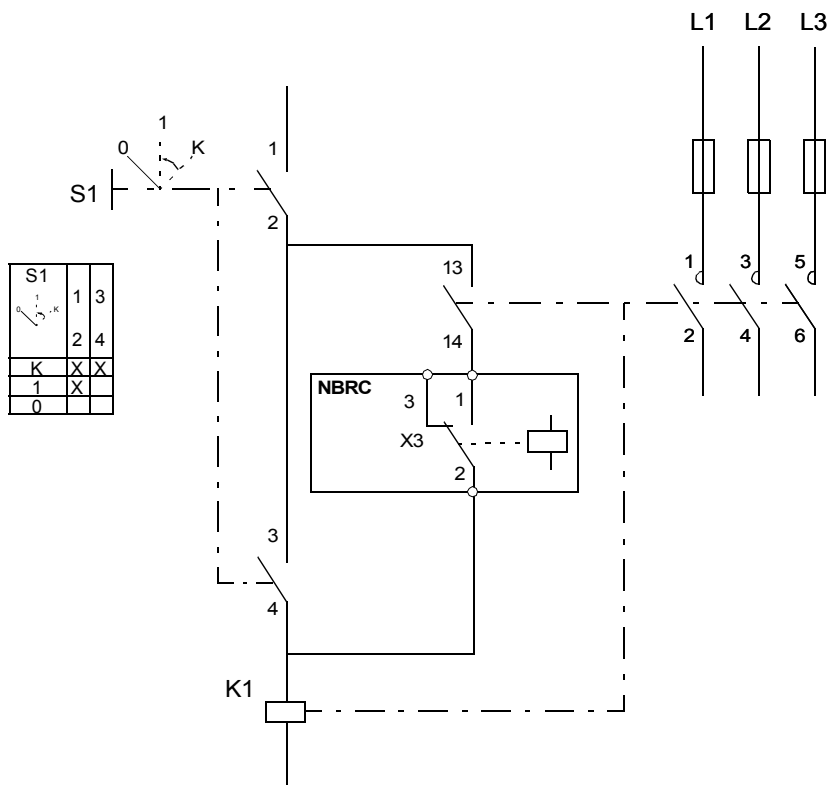
The relay output indicates chopper faults, for example, in a thermal overload situation (see page 31). The changeover switch opens when a failure is detected or the chopper is unpowered.



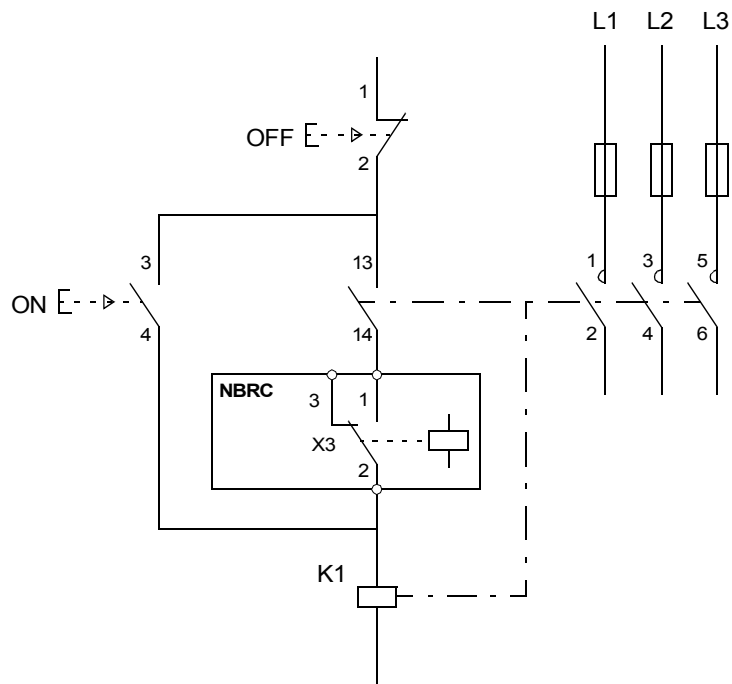
WARNING! In a chopper failure, always switch off the power supply to the drive. This is the only way to guarantee safe operation in case of a chopper failure since the chopper is unable to disconnect the resistor from the intermediate circuit.

For connection examples, see the diagrams below.

Example 1



Example 2



Selecting the brake circuit components

1. Calculate the maximum power generated by the motor during braking (P_{\max}).
2. Select a suitable brake chopper and brake resistor combination for the application from the rating table on page 57. This condition must be met:

$$P_{\text{brmax}} > P_{\max}$$

The P_{brmax} values in the rating table are specified for the reference braking cycle (10 s of braking, 50 s of rest). If the actual duty cycle does not correspond to the reference cycle, the maximum allowed braking power P_{br} must be used instead. See section [Calculating the maximum braking power](#) on page 29.

3. Check the resistor selection. The energy generated by the motor during a 400-second period must not exceed the resistor heat dissipation capacity E_R .

Note: If the E_R value is not sufficient, it is possible to use a four-resistor assembly in which two standard resistors are connected in parallel, two in series. The E_R value of the four-resistor assembly is four times the value specified for the standard resistor.

Notes:

- The resistor assembly must be equipped with a thermal switch (all SAFUR resistors include a thermal switch). Make sure that the switch is properly isolated (over 2.5 kV) and shrouded against contact.
- A custom resistor can be selected within the limits imposed by the brake chopper. That is, the resistance value of the custom resistor is at least equal to the resistance value of the resistor given in the rating table on page 57. You can calculate the braking power capacity of the resistor using this equation:

$$P_{\max} < \frac{U_{\text{DC}}^2}{R}$$

where:

P_{\max} Maximum power generated by the motor during braking

U_{DC} Voltage over the resistor during braking:

1.35 · 1.2 · 415 V DC when supply voltage is 380...415 V AC

1.35 · 1.2 · 500 V DC when supply voltage is 440...500 V AC

R Resistor resistance value (ohm)



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

■ Calculating the maximum braking power

The P_{brmax} value for each standard brake chopper and brake resistor combination is given in the rating table on page 57. The rated value is specified for a reference braking cycle (10 s of braking, 50 s of rest). If the actual braking cycle does not correspond to the reference cycle, you have to calculate the maximum allowed braking power as shown below.

1. Braking energy transferred during any ten minute period must be less than or equal to the energy transferred during the reference braking cycle:

$$n \cdot P_{br} \cdot t_{br} \leq P_{brmax} \cdot 100 \text{ s}$$

where:

n	Number of braking pulses during a ten minute period
P_{br}	Maximum allowed braking power (kW)
t_{br}	Braking time (s)
P_{brmax}	Maximum braking power for a reference cycle (kW)

2. The braking power must not exceed the rated maximum value P_{brmax} :

$$P_{br} \leq P_{brmax}$$

Example 1

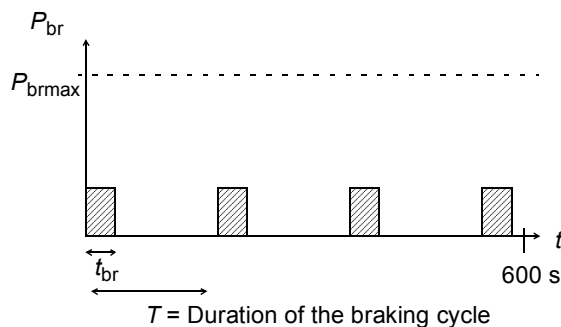
The duration of a braking cycle is 30 minutes. The braking time is 15 minutes.

Result: If the braking time exceeds ten minutes, the braking is considered continuous. The allowed continuous braking power is ten percent of the maximum braking power (P_{brmax}).

Example 2

The duration of a braking cycle is three minutes. The braking time is 40 seconds.

1.
$$P_{br} \leq \frac{P_{brmax} \cdot 100 \text{ s}}{4 \cdot 40 \text{ s}} = 0.625 \cdot P_{brmax}$$



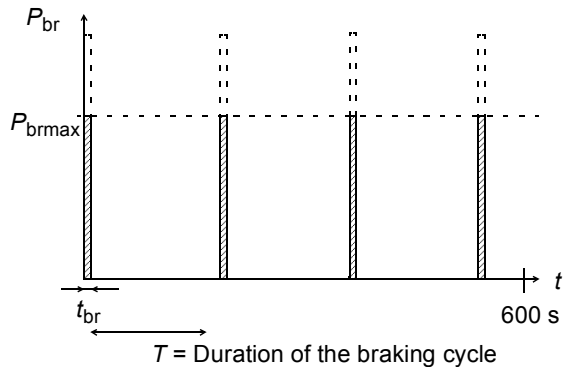
2. $P_{br} < P_{brmax}$ O.K.

Result: The maximum allowed braking power for the cycle is 62% of the rated value given for the reference cycle.

Example 3

The duration of a braking cycle is three minutes. The braking time is 10 seconds.

$$1. \quad P_{br} \leq \frac{P_{brmax} \cdot 100 \text{ s}}{4 \cdot 10 \text{ s}} = 2.5 \cdot P_{brmax}$$



$$2. \quad P_{br} > P_{brmax} \quad \text{Not allowed.}$$

Result: The maximum allowed braking power for the cycle is equal to the maximum braking power (P_{brmax}).

Selecting and routing the brake resistor cables

For the recommended copper cable for connecting a brake resistor to the brake chopper, see [Brake circuit cable sizes](#) on page 63.

■ Minimizing electromagnetic interference

Obey these rules in order to minimize electromagnetic interference caused by the rapid current changes in the resistor cables:

- Shield the braking power line completely, either by using shielded cable or a metallic enclosure. Unshielded single-core cable can only be used if it is routed inside a cabinet that efficiently suppresses radiated emissions.
- Install the cables away from other cable routes.
- Avoid long parallel runs with other cables. The minimum parallel cabling separation distance should be 0.3 meters.
- Cross the other cables at right angles.
- Keep the cable as short as possible in order to minimize the radiated emissions and stress on chopper IGBTs. The longer the cable, the higher the radiated emissions, inductive load and voltage peaks over the IGBT semiconductors of the brake chopper.

■ Maximum cable length

The maximum cable length of the resistor cable(s) is 10 m (33 ft).

■ EMC compliance of the complete installation

Note: ABB has not verified that the EMC requirements are fulfilled with external user-defined brake resistors and cabling. The EMC compliance of the complete installation must be considered by the customer.

Placing the brake resistors

Install the resistors in a place where they will cool.

Arrange the cooling of the resistor in a way that:

- no danger of overheating is caused to the resistor or nearby materials
- the temperature of the room the resistor is located in does not exceed the allowed maximum.

Supply the resistor with cooling air/water according to the resistor manufacturer's instructions.



WARNING! The materials near the brake resistor must be non-flammable. The surface temperature of the resistor is high. Air flowing from the resistor is of hundreds of degrees Celsius. If the exhaust vents are connected to a ventilation system, ensure that the material withstands high temperatures. Protect the resistor against contact.

Selecting the chopper enable input cable

Make sure that the cable connecting the resistor thermal switch to chopper enable input X1 meets the following requirements:

- shielded cable
- rated operating voltage between a core and ground $> 750 (U_0)$
- insulation test voltage > 2.5 kV.

Protecting the system against thermal overload

The drive control program includes a resistor and resistor cable thermal protection function, which can be tuned by the user. The brake chopper protects itself and the resistor cables against thermal overload, provided that the following conditions are met:

- the resistor assembly is equipped with a thermal switch, which is connected to chopper enable input X1 (see page 38)
- fault indication relay output X3 is wired to the main contactor circuit of the drive (see page 26)
- the cables are dimensioned according to the nominal current of the drive.

■ Operation principle

If the resistor overheats, its thermal switch opens and interrupts the chopper enable input signal. The signal is internally wired to the chopper control board via a temperature sensitive switch. Upon a fault, the relay output either opens the drive main circuit breaker or gives a fault indication to the overriding control system, which takes care of the protection.

For more information on the thermal protection function, see the appropriate drive firmware manual.

Protecting the resistor cable against short-circuits

The brake chopper unit requires the use of brake circuit fuses. The fuses protect the brake chopper and the brake circuit cables in a cable short-circuit situation.

Controlling the brake chopper from an external control location

The brake chopper can be controlled from an external control location via a fiber optic link (terminals V22 and V23 on the chopper control board). Using the link, it is possible to synchronize several brake choppers. For instructions, see section [Synchronizing multiple brake choppers](#) on page 35.

5

Electrical installation

Contents of this chapter

This chapter contains instructions on wiring the brake chopper unit.

Safety

Obey the safety instructions for the drive. See *Safety instructions for ACS880 multidrive cabinets and modules* (3AUA0000102301 [English]).



WARNING! If you ignore these instructions, physical injury or death, or damage to the equipment can occur.

- If you are not a qualified electrician, do not do electrical installation work.
 - Make sure that the drive is disconnected from the power line. Wait for 5 minutes to let the drive DC capacitors discharge. Ensure by measuring with a multimeter (impedance at least 1 Mohm) that there is no voltage present.
 - **Note:** The DC link, resistor and enable input terminals (UDC+, UDC-, R+, R-, X1 and X2) carry a dangerous voltage.
-

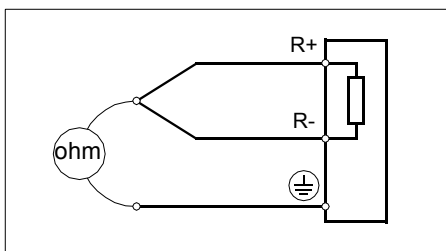


Checking the insulation of the resistor circuit

Do not make any voltage tolerance or insulation resistance tests on the brake chopper modules. Every brake chopper module has been tested for insulation between the main circuit and the chassis at the factory.

Check the insulation of the brake resistor assembly as follows:

1. Check that the resistor cable is connected to the resistor, and disconnected from the chopper output terminals R+ and R-.
2. At the brake unit end, connect the R+ and R- conductors of the resistor cable together. Measure the insulation resistance between the combined conductors and the PE conductor by using a measuring voltage of 1 kV DC. The insulation resistance must be higher than 1 Mohm.



Selecting the voltage

Before wiring the brake chopper unit, select the voltage level as follows:

1. Remove the chopper front panel by undoing the four screws at the top and bottom of the panel.
2. Set the voltage selection jumper on the chopper control board (see page 15) to the appropriate voltage as shown below.

Drive supply voltage 380...415 V	<table border="1"> <tbody> <tr> <td>>500 V</td> <td>400 V</td> <td>230 V</td> <td>FIBER</td> </tr> <tr> <td><input type="radio"/></td> <td><input checked="" type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> </tr> <tr> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> </tr> </tbody> </table>	>500 V	400 V	230 V	FIBER	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
>500 V	400 V	230 V	FIBER										
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>										
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>										
Drive supply voltage 440...500 V	<table border="1"> <tbody> <tr> <td>>500 V</td> <td>400 V</td> <td>230 V</td> <td>FIBER</td> </tr> <tr> <td><input checked="" type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> </tr> <tr> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> </tr> </tbody> </table>	>500 V	400 V	230 V	FIBER	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
>500 V	400 V	230 V	FIBER										
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>										
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>										
Drive supply voltage 525...690 V	<table border="1"> <tbody> <tr> <td>>500 V</td> <td>400 V</td> <td>230 V</td> <td>FIBER</td> </tr> <tr> <td><input checked="" type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> </tr> <tr> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> </tr> </tbody> </table>	>500 V	400 V	230 V	FIBER	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
>500 V	400 V	230 V	FIBER										
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>										
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>										

Note: In follower choppers, you must set the voltage to FIBER as shown in section [Synchronizing multiple brake choppers](#) on page 35.

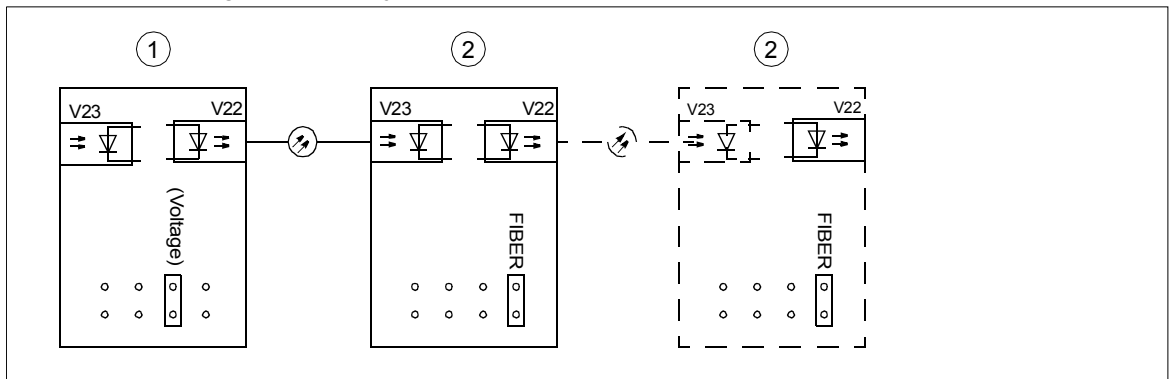


WARNING! An incorrect jumper setting or missing jumper may cause brake chopper malfunctioning or damage to the chopper or resistor.

Synchronizing multiple brake choppers

When several brake choppers are in use, the first chopper in the chain acts as the master for the other choppers. To synchronize the choppers:

1. Set the voltage selection jumper of the master to the appropriate voltage.
2. Set the voltage selection jumpers of the followers to FIBER.

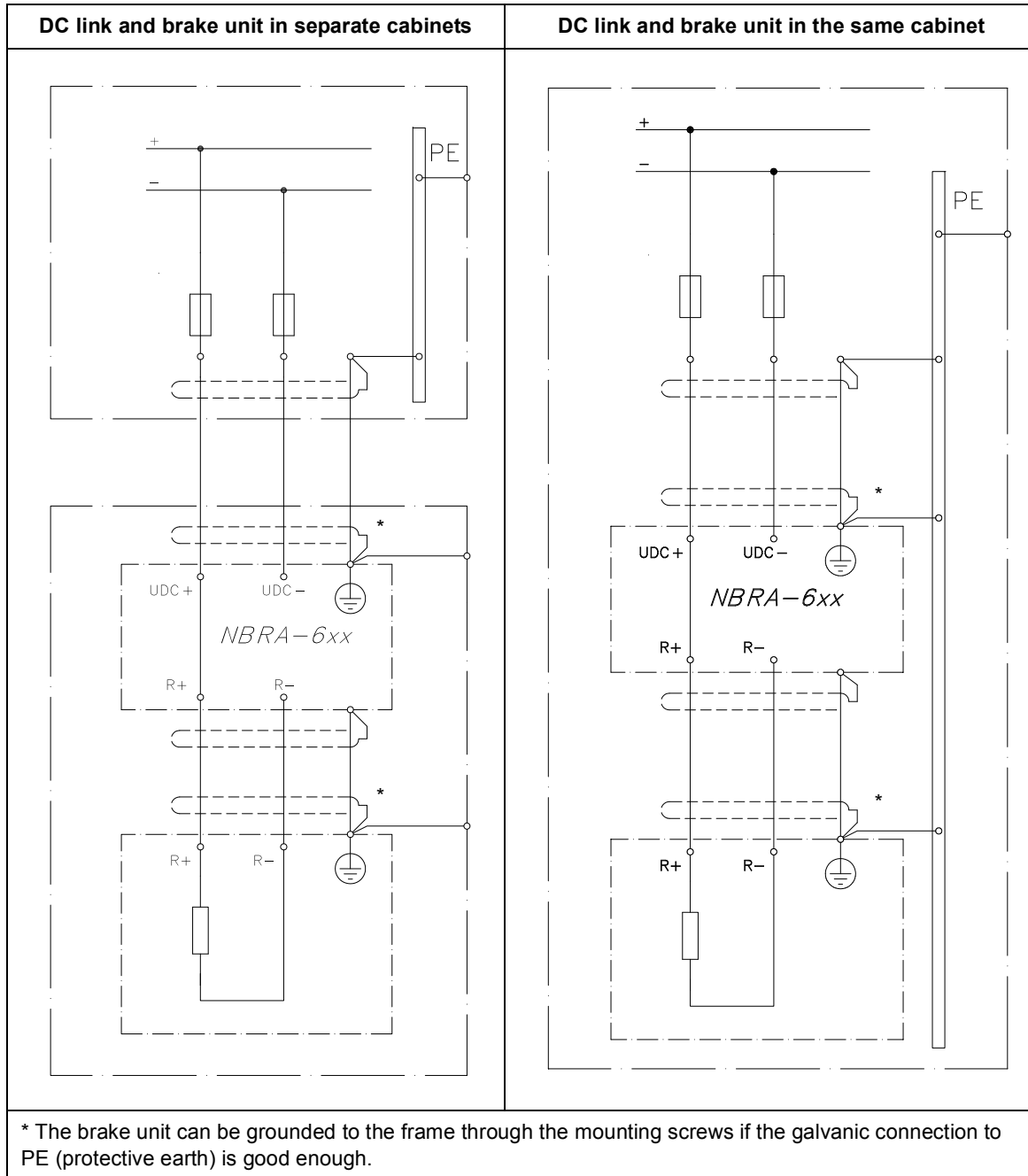


Connecting the DC and resistor cables



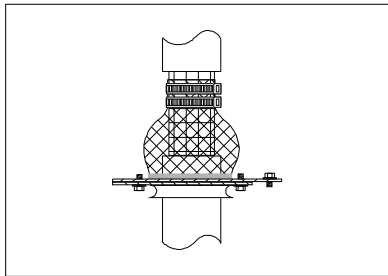
WARNING! Never connect the output terminals of the brake chopper together. It short-circuits the chopper and will damage it.

■ Connection diagram

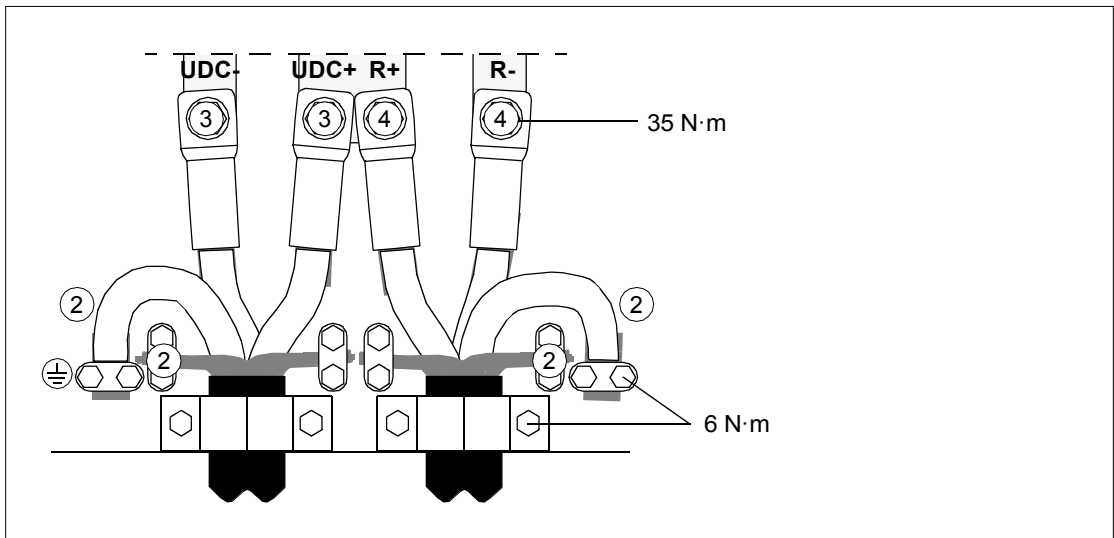


■ **Connection procedure**

1. If the DC link and the brake unit are located in separate cabinets, ground the DC cable 360 degrees at the cabinet lead-throughs.

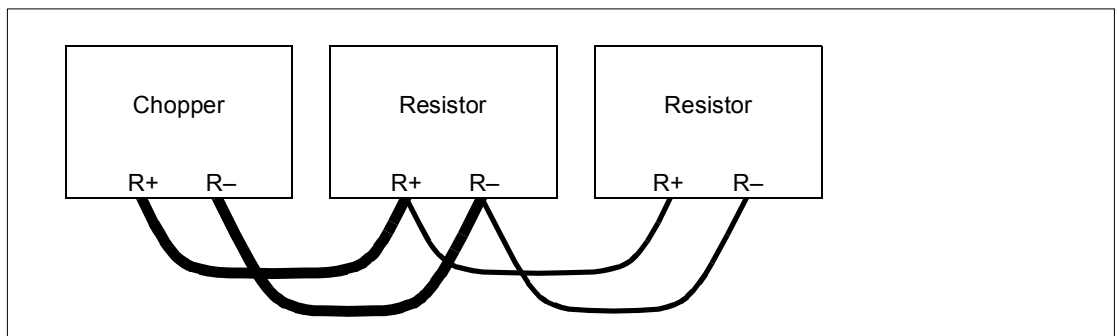


2. At the brake chopper end, connect the twisted shields (protective earth conductor) of the DC and resistor cables and the third conductors to the grounding terminals.
3. Connect the conductors to the UDC+ and UDC- terminals of the brake chopper as shown below.
4. Connect the conductors to the R+ and R- terminals of the brake chopper as shown below.



5. Connect the brake resistors in parallel as shown below. See the [Connection diagram](#) on page 36 for the cable shield grounding.

Note: The cable between the chopper and the first resistor must be able to carry the entire braking power. Provide adequate support for the cables below the chopper and resistor units.



Connecting the thermal switch

Connect the thermal switches of the resistors in series to chopper enable input X1 as shown in the power and control connections diagram on page [16](#).



6

Installation checklist

Contents of this chapter

This chapter contains a list for checking the mechanical and electrical installation of the brake chopper.

Checklist

Check the mechanical and electrical installation of the brake chopper before start-up. Go through the checklist together with another person.



WARNING! Only qualified electricians are allowed to carry out the work described below. Obey the complete safety instructions for the drive. If you ignore the safety instructions, physical injury or death can occur.

Open the main switch-disconnector of the drive and lock it to open position.

Ensure by measuring that the drive is not powered.

<input checked="" type="checkbox"/>	Check that ...
<input type="checkbox"/>	The brake chopper module has been attached properly on an even, vertical and non-flammable mounting plate.
<input type="checkbox"/>	There is an adequately sized protective earth (ground) conductor between the brake chopper and the cabinet PE busbar.
<input type="checkbox"/>	All protective earth (ground) conductors have been connected to the appropriate terminals and the terminals have been tightened (pull the conductors to check). The galvanic connection between the brake chopper module frame and the cabinet is proper. (Fastening points are unpainted.)
<input type="checkbox"/>	The supply voltage matches the nominal input voltage of the brake chopper module. Check the type designation label.

40 Installation checklist

<input checked="" type="checkbox"/>	Check that ...
<input type="checkbox"/>	The setting of the voltage selection jumper is correct. See section Selecting the voltage on page 34.
<input type="checkbox"/>	The DC cable has been connected to the appropriate terminals, and the terminals have been tightened. (Pull the conductors to check.)
<input type="checkbox"/>	Appropriate DC fuses have been installed.
<input type="checkbox"/>	The resistor cable has been connected to the appropriate terminals, and the terminals have been tightened. (Pull the conductors to check.)
<input type="checkbox"/>	The brake resistor cable has been routed away from other cables.
<input type="checkbox"/>	The control cables have been connected to the appropriate terminals, and the terminals have been tightened. (Pull the conductors to check.)
<input type="checkbox"/>	There are no tools, foreign objects or dust from drilling inside the brake unit cabinet.
<input type="checkbox"/>	All shrouds and the front panel of the brake chopper module are in place. Cabinet doors have been closed.

7

Start-up

Contents of this chapter

This chapter contains the start-up procedure of a brake unit.




WARNING! Only qualified electricians are allowed to perform the work described in this chapter. Obey all safety instructions in *Safety instructions for ACS880 multidrive cabinets and modules* (3AUA0000102301 [English]). If you ignore the safety instructions, physical injury or death, or damage to the equipment can occur.

Note: Some brake resistors are coated with oil film for protection. The protective oil will burn off when the brake resistor is used for the first time. Make sure that the airflow is sufficient.

Start-up procedure

Action	Additional information
Preliminary actions	
WARNING! Make sure that the disconnecter of the supply transformer is locked to open position, ie, no voltage is, or can be, connected to the drive inadvertently. Check also by measuring that there is no voltage connected.	
<input type="checkbox"/> Check that the mechanical and electrical installation of the brake chopper has been inspected and is OK.	See Installation checklist .
<input type="checkbox"/> Check that the insulation of the resistor circuit has been measured and is OK.	See section Checking the insulation of the resistor circuit on page 34.

Action		Additional information
<input type="checkbox"/>	Check that the drive is ready for the brake chopper start-up: <ul style="list-style-type: none"> • The supply and inverter units have been installed according to the instructions given in their hardware manuals. • The supply unit has been started up according to the instructions given in the appropriate supply unit manual. • The inverter units have been started up according to the instructions given in the hardware manual and appropriate firmware manual. 	See the supply and inverter module hardware manuals and other appropriate manuals on the inside of the front cover.
<input type="checkbox"/>	Close all cabinet doors.	
Power switch-on		
 <p>WARNING! Before the power switch-on, make sure that there are inverters connected to the intermediate circuit. A rule of thumb: the sum of the inverter powers must be at least 30% of the rated power of the brake unit (P_{brmax} value).</p> <p>Too few inverters connected results in a low intermediate circuit capacitance. Upon the power switch-on, the DC voltage will overshoot the controller voltage limit, causing an immediate switching to braking mode. High brake current will blow the inverter DC fuses.</p>		
<input type="checkbox"/>	Close the disconnecter of the supply transformer.	
<input type="checkbox"/>	Switch on power to the drive and start the supply unit.	
Operational checks		
<input type="checkbox"/>	Make sure that it is safe to start the drive. Start the drive and increase the rotation speed of the high-inertia motor that will generate power to the drive intermediate circuit when it is decelerated.	Use a low speed at first.
<input type="checkbox"/>	Deactivate the overvoltage controllers of all inverters (parameter 30.30 Overvoltage control in the Primary control program).	For the inverter parameter settings, see the appropriate firmware manual.
<input type="checkbox"/>	Make sure that the stop mode of the motor to be decelerated is ramp stop (parameter 21.03 Stop mode in the Primary control program) and set the deceleration time according to the drive control mode in parameter group 23, 26 or 28.	Use a relatively long deceleration time at first.
<input type="checkbox"/>	Check that the brake chopper evokes and operates during the deceleration of the high-inertia motor: Give a stop command to the inverter running the motor.	The DC voltage level during the braking indicates the brake chopper operation: <ul style="list-style-type: none"> • Successful braking: DC voltage level is: $1.2 \cdot 1.35 \cdot U_{1max}$ • Unsuccessful braking: DC voltage level exceeds $1.21 \cdot 1.35 \cdot U_{1max}$ and inverter trips on overvoltage. See chapter <i>Fault tracing and maintenance</i>. If the brake chopper does not function at all, see chapter <i>Fault tracing and maintenance</i> .
<input type="checkbox"/>	Repeat the stop sequence a few times with higher rotation speeds and shorter deceleration times.	





Fault tracing and maintenance

Contents of this chapter

This chapter describes the fault tracing possibilities and maintenance of a brake unit.

Maintenance

If installed into an appropriate environment, the brake chopper module does not require maintenance, except for regular cleaning.

Fault indications

A fault in the resistor brake circuit prevents fast motor deceleration and may cause the drive to trip on a fault.

If a fault is detected by the chopper control board, the brake chopper disconnects the brake resistor from the intermediate circuit, and the changeover switch of the fault indication relay output is released. The relay output indicates the following faults:

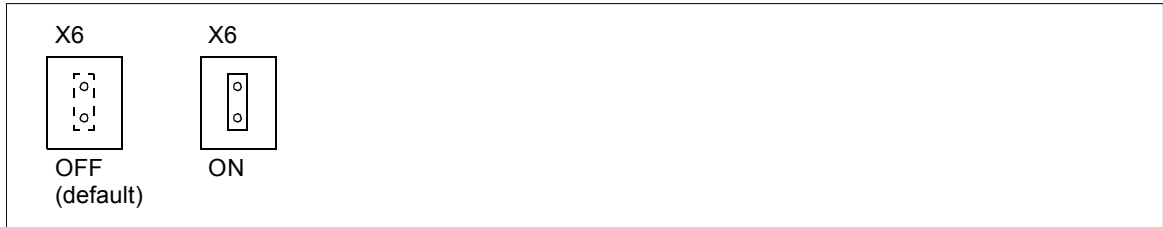
- brake resistor or resistor cable short circuit
- brake chopper – IGBT – short circuit
- chopper control board failure
- chopper enable input signal switched off.

Note: The chopper is not able to switch off a short-circuit current. If the fault indication relay output X3 is wired to the main contactor circuit of the drive, the main contactor will open upon a fault. For wiring examples, see section [Equipping the drive with a main contactor and manual control switch\(es\)](#) on page 26.

Fault indication/Fault	Cause	Remedy
Fault indication relay output switches off the main power or gives a fault indication to an overriding control system.	Chopper or resistor overheated.	Check connections. Let equipment cool.
	No enable input received by chopper control board.	Check that enable input is on.
	Short circuit in power cables or resistor.	Check power cables and resistor.
	Chopper control board failure. Chopper damaged; it is not able to disconnect resistor from intermediate circuit.	Contact local ABB representative.
Chopper does not function.	Chopper voltage setting too high. Inverter overvoltage control is on.	Check voltage setting. Check parameters of all inverters. Check that enable input is on.
Chopper starts to function at too low a DC voltage.	Chopper voltage setting too low.	Check voltage setting.
Inverter trips on fault 3210 DC link overvoltage.	Chopper voltage setting too high.	Check voltage setting. Check parameters of all inverters.
Brake resistor or chopper overheats.	The maximum brake cycle exceeded or resistor cooling insufficient.	Check duty cycle and resistor cooling.
	Chopper voltage setting incorrect or jumper missing.	Make sure that voltage setting is correct and jumper is properly in place.

NRED voltage reducer selection for NBRA-669

The NRED voltage reducer can be used to protect the NBRC-61 chopper control board from overvoltage peaks. Jumper X6 on the chopper control board defines if the NRED voltage reducer is used. By default, the NRED voltage reducer is used and the jumper is set to OFF (recommended).



Note: When the jumper is set to ON, the NRED voltage reducer is not used. You must use this setting if the chopper control board is replaced with a newer version and the brake chopper does not include the NRED voltage reducer board.



9

Ordering information

Contents of this chapter

This chapter lists the components and accessories for the brake chopper unit.

Brake chopper modules

ACS880-604-	Module type	Qty	Ordering code
$U_N = 400\text{ V}$ (Range 380...415 V)			
0210-3	NBRA-658	1	59006428
0320-3	NBRA-659	1	59006436
0640-3	2×NBRA-659	2	59006436
0960-3	3×NBRA-659	3	59006436
1280-3	4×NBRA-659	4	59006436
1600-3	5×NBRA-659	5	59006436
1920-3	6×NBRA-659	6	59006436
$U_N = 500\text{ V}$ (Range 380...500 V)			
0260-5	NBRA-658	1	59006428
0400-5	NBRA-659	1	59006436
0800-5	2×NBRA-659	2	59006436
1200-5	3×NBRA-659	3	59006436
1600-5	4×NBRA-659	4	59006436
2000-5	5×NBRA-659	5	59006436
2400-5	6×NBRA-659	6	59006436
$U_N = 690\text{ V}$ (Range 525...690 V)			
0400-7	NBRA-669	1	59012517
0800-7	2×NBRA-669	2	59012517
1200-7	3×NBRA-669	3	59012517
1600-7	4×NBRA-669	4	59012517
2000-7	5×NBRA-669	5	59012517
2400-7	6×NBRA-669	6	59012517

Brake chopper cooling fans

ACS880-604-	Module type	Qty	Ordering code	Additional information
$U_N = 400\text{ V}$ (Range 380...415 V)				
0210-3	NBRA-658	1	64114158	230 V fan kit (G2E140-PI51-09 + wire)
0320-3	NBRA-659	1	64114158	
0640-3	2×NBRA-659	2	64114158	
0960-3	3×NBRA-659	3	64114158	
1280-3	4×NBRA-659	4	64114158	
1600-3	5×NBRA-659	5	64114158	
1920-3	6×NBRA-659	6	64114158	
$U_N = 500\text{ V}$ (Range 380...500 V)				
0260-5	NBRA-658	1	64114158	230 V fan kit (G2E140-PI51-09 + wire)
0400-5	NBRA-659	1	64114158	
0800-5	2×NBRA-659	2	64114158	
1200-5	3×NBRA-659	3	64114158	
1600-5	4×NBRA-659	4	64114158	
2000-5	5×NBRA-659	5	64114158	
2400-5	6×NBRA-659	6	64114158	
$U_N = 690\text{ V}$ (Range 525...690 V)				
0400-7	NBRA-669	1	64114158	230 V fan kit (G2E140-PI51-09 + wire)
0800-7	2×NBRA-669	2	64114158	
1200-7	3×NBRA-669	3	64114158	
1600-7	4×NBRA-669	4	64114158	
2000-7	5×NBRA-669	5	64114158	
2400-7	6×NBRA-669	6	64114158	

Fuses

ACS880-604-	Module type	Qty	Ordering code	Fuse type	Ratings
$U_N = 400\text{ V}$ (Range 380...415 V)					
0210-3	NBRA-658	2	10028183	170M5142	400 A, 1250 V
0320-3	NBRA-659	2	10028191	170M5146	630 A, 1250 V
0640-3	2×NBRA-659	4	10028191	170M5146	630 A, 1250 V
0960-3	3×NBRA-659	6	10028191	170M5146	630 A, 1250 V
1280-3	4×NBRA-659	8	10028191	170M5146	630 A, 1250 V
1600-3	5×NBRA-659	10	10028191	170M5146	630 A, 1250 V
1920-3	6×NBRA-659	12	10028191	170M5146	630 A, 1250 V
$U_N = 500\text{ V}$ (Range 380...500 V)					
0260-5	NBRA-658	2	10028183	170M5142	400 A, 1250 V
0400-5	NBRA-659	2	10028191	170M5146	630 A, 1250 V
0800-5	2×NBRA-659	4	10028191	170M5146	630 A, 1250 V
1200-5	3×NBRA-659	6	10028191	170M5146	630 A, 1250 V
1600-5	4×NBRA-659	8	10028191	170M5146	630 A, 1250 V
2000-5	5×NBRA-659	10	10028191	170M5146	630 A, 1250 V
2400-5	6×NBRA-659	12	10028191	170M5146	630 A, 1250 V
$U_N = 690\text{ V}$ (Range 525...690 V)					
0400-7	NBRA-669	2	10028191	170M5146	630 A, 1250 V
0800-7	2×NBRA-669	4	10028191	170M5146	630 A, 1250 V
1200-7	3×NBRA-669	6	10028191	170M5146	630 A, 1250 V
1600-7	4×NBRA-669	8	10028191	170M5146	630 A, 1250 V
2000-7	5×NBRA-669	10	10028191	170M5146	630 A, 1250 V
2400-7	6×NBRA-669	12	10028191	170M5146	630 A, 1250 V

Fuse bases

ACS880-604-	Module type	Qty	Ordering code	Base type
$U_N = 400\text{ V}$ (Range 380...415 V)				
0210-3	NBRA-658	2	10028205	170H3005
0320-3	NBRA-659	2	10028205	170H3005
0640-3	2×NBRA-659	4	10028205	170H3005
0960-3	3×NBRA-659	6	10028205	170H3005
1280-3	4×NBRA-659	8	10028205	170H3005
1600-3	5×NBRA-659	10	10028205	170H3005
1920-3	6×NBRA-659	12	10028205	170H3005
$U_N = 500\text{ V}$ (Range 380...500 V)				
0260-5	NBRA-658	2	10028205	170H3005
0400-5	NBRA-659	2	10028205	170H3005
0800-5	2×NBRA-659	4	10028205	170H3005
1200-5	3×NBRA-659	6	10028205	170H3005
1600-5	4×NBRA-659	8	10028205	170H3005
2000-5	5×NBRA-659	10	10028205	170H3005
2400-5	6×NBRA-659	12	10028205	170H3005
$U_N = 690\text{ V}$ (Range 525...690 V)				
0400-7	NBRA-669	2	10028205	170H3005
0800-7	2×NBRA-669	4	10028205	170H3005
1200-7	3×NBRA-669	6	10028205	170H3005
1600-7	4×NBRA-669	8	10028205	170H3005
2000-7	5×NBRA-669	10	10028205	170H3005
2400-7	6×NBRA-669	12	10028205	170H3005

Brake resistors

ACS880-604-	Module type	Qty	Ordering code	Resistor type	Ratings
$U_N = 400\text{ V}$ (Range 380...415 V)					
0210-3	NBRA-658	2	68759391	SAFUR210F575	575 V, 210 kW, $R = 3.4\text{ ohm}$
0320-3	NBRA-659	2	68759315	SAFUR180F460	460 V, 180 kW, $R = 2.4\text{ ohm}$
0640-3	2×NBRA-659	4	68759315	SAFUR180F460	460 V, 180 kW, $R = 2.4\text{ ohm}$
0960-3	3×NBRA-659	6	68759315	SAFUR180F460	460 V, 180 kW, $R = 2.4\text{ ohm}$
1280-3	4×NBRA-659	8	68759315	SAFUR180F460	460 V, 180 kW, $R = 2.4\text{ ohm}$
1600-3	5×NBRA-659	10	68759315	SAFUR180F460	460 V, 180 kW, $R = 2.4\text{ ohm}$
1920-3	6×NBRA-659	12	68759315	SAFUR180F460	460 V, 180 kW, $R = 2.4\text{ ohm}$
$U_N = 500\text{ V}$ (Range 380...500 V)					
0260-5	NBRA-658	2	68759285	SAFUR125F500	500 V, 125 kW, $R = 4.0\text{ ohm}$
0400-5	NBRA-659	2	68759340	SAFUR200F500	500 V, 200 kW, $R = 2.7\text{ ohm}$
0800-5	2×NBRA-659	4	68759340	SAFUR200F500	500 V, 200 kW, $R = 2.7\text{ ohm}$
1200-5	3×NBRA-659	6	68759340	SAFUR200F500	500 V, 200 kW, $R = 2.7\text{ ohm}$
1600-5	4×NBRA-659	8	68759340	SAFUR200F500	500 V, 200 kW, $R = 2.7\text{ ohm}$
2000-5	5×NBRA-659	10	68759340	SAFUR200F500	500 V, 200 kW, $R = 2.7\text{ ohm}$
2400-5	6×NBRA-659	12	68759340	SAFUR200F500	500 V, 200 kW, $R = 2.7\text{ ohm}$
$U_N = 690\text{ V}$ (Range 525...690 V)					
0400-7	NBRA-669	2	68759340	SAFUR200F500	500 V, 200 kW, $R = 2.7\text{ ohm}$
0800-7	2×NBRA-669	4	68759340	SAFUR200F500	500 V, 200 kW, $R = 2.7\text{ ohm}$
1200-7	3×NBRA-669	6	68759340	SAFUR200F500	500 V, 200 kW, $R = 2.7\text{ ohm}$
1600-7	4×NBRA-669	8	68759340	SAFUR200F500	500 V, 200 kW, $R = 2.7\text{ ohm}$
2000-7	5×NBRA-669	10	68759340	SAFUR200F500	500 V, 200 kW, $R = 2.7\text{ ohm}$
2400-7	6×NBRA-669	12	68759340	SAFUR200F500	500 V, 200 kW, $R = 2.7\text{ ohm}$

Brake resistor cooling fans

One cooling fan is sufficient for two of the above resistors when the resistors are installed side by side.

ACS880-604-	Module type	Qty	Ordering code	Additional information
$U_N = 400\text{ V}$ (Range 380...415 V)				
0210-3	NBRA-658	1	64114336	230 V fan kit (D4E225-CC01-39 + wire)
0320-3	NBRA-659	1	64114336	
0640-3	2×NBRA-659	2	64114336	
0960-3	3×NBRA-659	3	64114336	
1280-3	4×NBRA-659	4	64114336	
1600-3	5×NBRA-659	5	64114336	
1920-3	6×NBRA-659	6	64114336	
$U_N = 500\text{ V}$ (Range 380...500 V)				
0260-5	NBRA-658	1	64114336	230 V fan kit (D4E225-CC01-39 + wire)
0400-5	NBRA-659	1	64114336	
0800-5	2×NBRA-659	2	64114336	
1200-5	3×NBRA-659	3	64114336	
1600-5	4×NBRA-659	4	64114336	
2000-5	5×NBRA-659	5	64114336	
2400-5	6×NBRA-659	6	64114336	
$U_N = 690\text{ V}$ (Range 525...690 V)				
0400-7	NBRA-669	1	64114336	230 V fan kit (D4E225-CC01-39 + wire)
0800-7	2×NBRA-669	2	64114336	
1200-7	3×NBRA-669	3	64114336	
1600-7	4×NBRA-669	4	64114336	
2000-7	5×NBRA-669	5	64114336	
2400-7	6×NBRA-669	6	64114336	

Attenuator

Attenuator (optional) for suppressing voltage spikes at the chopper input. Must be fitted if it is possible to disconnect all inverter units from the DC link with the supply unit on.

ACS880-604-	Module type	Qty	Ordering code	Type
$U_N = 400 \text{ V}$ (Range 380...415 V)				
0210-3	NBRA-658	1	64019236	NRCB-010006
0320-3	NBRA-659	1	64019236	NRCB-010006
0640-3	2×NBRA-659	2	64019236	NRCB-010006
0960-3	3×NBRA-659	3	64019236	NRCB-010006
1280-3	4×NBRA-659	4	64019236	NRCB-010006
1600-3	5×NBRA-659	5	64019236	NRCB-010006
1920-3	6×NBRA-659	6	64019236	NRCB-010006
$U_N = 500 \text{ V}$ (Range 380...500 V)				
0260-5	NBRA-658	1	64019236	NRCB-010006
0400-5	NBRA-659	1	64019236	NRCB-010006
0800-5	2×NBRA-659	2	64019236	NRCB-010006
1200-5	3×NBRA-659	3	64019236	NRCB-010006
1600-5	4×NBRA-659	4	64019236	NRCB-010006
2000-5	5×NBRA-659	5	64019236	NRCB-010006
2400-5	6×NBRA-659	6	64019236	NRCB-010006
$U_N = 690 \text{ V}$ (Range 525...690 V)				
0400-7	NBRA-669	1	64019236	NRCB-010006
0800-7	2×NBRA-669	2	64019236	NRCB-010006
1200-7	3×NBRA-669	3	64019236	NRCB-010006
1600-7	4×NBRA-669	4	64019236	NRCB-010006
2000-7	5×NBRA-669	5	64019236	NRCB-010006
2400-7	6×NBRA-669	6	64019236	NRCB-010006

10

Technical data

Contents of this chapter

This chapter contains the technical specifications of the brake chopper module, for example, the ratings, sizes and technical requirements, provisions for fulfilling the requirements for CE and other markings. Standard brake resistor and cooling fan specifications are also included where applicable.

Ratings

■ Only chopper

ACS880-604-	Module type	P_{brmax} kW	R_{tot} ohm	I_{max} A	I_{rms} A	$P_{cont.}$ kW	Duty cycle (1 min/5 min)		Duty cycle (10 s/60 s)		E_R kJ
							P_{br} kW	I_{rms} A	P_{br} kW	I_{rms} A	
$U_N = 400\text{ V}$ (Range 380...415 V)											
0210-3	NBRA-658	230	1.7	384	109	70	230	355	230	355	–
0320-3	NBRA-659	353	1.20	545	149	96	303	468	353	545	–
0640-3	2×NBRA-659	706	0.60	1090	298	192	606	936	706	1090	–
0960-3	3×NBRA-659	1058	0.40	1635	447	288	909	1404	1059	1635	–
1280-3	4×NBRA-659	1411	0.30	2180	596	384	1212	1872	1412	2180	–
1600-3	5×NBRA-659	1764	0.24	2725	745	480	1515	2340	1765	2725	–
1920-3	6×NBRA-659	2117	0.20	3270	894	576	1818	2808	2118	3270	–
$U_N = 500\text{ V}$ (Range 380...500 V)											
0260-5	NBRA-658	268	2.15	380	101	81	268	331	268	331	–
0400-5	NBRA-659	403	1.43	571	136	109	317	391	403	498	–
0800-5	2×NBRA-659	806	0.72	1142	272	218	634	782	806	996	–
1200-5	3×NBRA-659	1208	0.48	1713	408	327	951	1173	1209	1494	–
1600-5	4×NBRA-659	1611	0.36	2284	544	436	1268	1564	1612	1992	–
2000-5	5×NBRA-659	2014	0.29	2855	680	545	1585	1955	2015	2490	–
2400-5	6×NBRA-659	2417	0.24	3426	816	654	1902	2346	2418	2988	–
$U_N = 690\text{ V}$ (Range 525...690 V)											
0400-7	NBRA-669	404	2.72	414	107	119	298	267	404	361	–
0800-7	2×NBRA-669	807	1.36	828	214	238	596	534	808	722	–
1200-7	3×NBRA-669	1211	0.91	1242	321	357	894	801	1212	1083	–
1600-7	4×NBRA-669	1615	0.68	1656	428	476	1192	1068	1616	1444	–
2000-7	5×NBRA-669	2019	0.54	2070	535	595	1490	1335	2020	1805	–
2400-7	6×NBRA-669	2422	0.45	2484	642	714	1788	1602	2424	2166	–

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■ Chopper with standard resistors

ACS880-604-	Module type	Resistors		P_{brmax} kW	R_{tot} ohm	I_{max} A	I_{rms} A	$P_{cont.}$ kW	Duty cycle (1 min/5 min)		Duty cycle (10 s/60 s)		E_R kJ
		Type	Qty*						P_{br} kW	I_{rms} A	P_{br} kW	I_{rms} A	
$U_N = 400$ V (Range 380...415 V)													
0210-3	NBRA-658	2×SAFUR210F575	2×21	230	1.7	384	65	42	130	200	224	346	8400
0320-3	NBRA-659	2×SAFUR180F460	2×30	353	1.20	545	84	54	167	444	287	444	12000
0640-3	2× NBRA-659	2× (2×SAFUR180F460)	4×30	706	0.60	1090	168	108	333	514	575	888	24000
0960-3	3× NBRA-659	3× (2×SAFUR180F460)	6×30	1058	0.40	1635	252	162	500	771	862	1332	36000
1280-3	4× NBRA-659	4× (2×SAFUR180F460)	8×30	1411	0.30	2180	336	216	667	1028	1150	1776	48000
1600-3	5× NBRA-659	5× (2×SAFUR180F460)	10× 30	1764	0.24	2725	420	270	833	1285	1437	2220	60000
1920-3	6× NBRA-659	6× (2×SAFUR180F460)	12× 30	2117	0.20	3270	504	324	1000	1542	1724	2664	72000
$U_N = 500$ V (Range 380...500 V)													
0260-5	NBRA-658	2×SAFUR125F500	2×18	268	2.00	408	45	36	111	137	192	237	7200
0400-5	NBRA-659	2×SAFUR200F500	2×27	403	1.35	605	67	54	167	206	287	355	10800
0800-5	2× NBRA-659	2× (2×SAFUR200F500)	4×27	806	0.68	1210	134	108	333	412	575	710	21600
1200-5	3× NBRA-659	3× (2×SAFUR200F500)	6×27	1208	0.45	1815	201	162	500	618	862	1065	32400
1600-5	4× NBRA-659	4× (2×SAFUR200F500)	8×27	1611	0.34	2420	268	216	667	824	1150	1420	43200
2000-5	5× NBRA-659	5× (2×SAFUR200F500)	10× 27	2014	0.27	3025	335	270	833	1030	1437	1775	54000
2400-5	6× NBRA-659	6× (2×SAFUR200F500)	12× 27	2417	0.23	3630	402	324	1000	1236	1724	2130	64800
$U_N = 690$ V (Range 525...690 V)													
0400-7	NBRA-669	2×SAFUR200F500	2×27	404	1.35	835	97	54	167	149	287	257	10800
0800-7	2× NBRA-669	2× (2×SAFUR200F500)	4×27	807	0.68	1670	194	108	333	298	575	514	21600
1200-7	3× NBRA-669	3× (2×SAFUR200F500)	6×27	1211	0.45	2505	291	162	500	447	862	771	32400
1600-7	4× NBRA-669	4× (2×SAFUR200F500)	8×27	1615	0.34	3340	388	216	667	596	1150	1028	43200
2000-7	5× NBRA-669	5× (2×SAFUR200F500)	10× 27	2019	0.27	4175	485	270	833	745	1437	1285	54000
2400-7	6× NBRA-669	6× (2×SAFUR200F500)	12 ×27	2422	0.23	5010	582	324	1000	894	1724	1542	64800

* The number of resistor elements. The resistance of one element is 8 ohm.

Definitions

<p>Example: ACS880-604-0640-3</p> <p style="text-align: center;"> R_{tot} P_{brmax} P_{br} $P_{cont.}$ </p>	<p>Brake unit</p> <p>P_{brmax} Maximum braking power per brake unit allowed momentarily</p> <p>R Nominal resistance of the brake resistors connected to one brake chopper unit</p> <p>R_{tot} Total recommended brake resistor resistance of the listed resistor assembly</p> <p>I_{max} Peak brake current (DC) per chopper</p> <p>$P_{cont.}$ Continuous braking power per brake unit. The braking is considered continuous if the braking time exceeds 10 minutes</p> <p>E_R Energy pulse that the resistor assembly will withstand (400 s duty cycle). This energy will heat the resistor element from 40°C to the maximum allowable temperature.</p> <hr/> <p>Duty cycle (10 s / 60 s)</p> <p>I_{rms} Total rms DC current (per chopper) during a period of 10 seconds with braking power P_{br}</p> <p>P_{br} Short term braking power per brake unit allowed for 10 seconds every 60 seconds</p> <hr/> <p>Duty cycle (1 min / 5 min)</p> <p>I_{rms} Total rms DC current (per chopper) during a period of 1 minute with braking power P_{br}</p> <p>P_{br} Short term braking power per brake unit allowed for one minute every 5 minutes</p> <hr/> <p>Brake current wave form</p>
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DC fuses

ACS880-604-	Module type	Fuse type*	Qty	U_N V	I_N A
$U_N = 400\text{ V}$ (Range 380...415 V)					
0210-3	NBRA-658	170M5142	2	1250	400
0320-3	NBRA-659	170M5146	2	1250	630
0640-3	2×NBRA-659	170M5146	4	1250	630
0960-3	3×NBRA-659	170M5146	6	1250	630
1280-3	4×NBRA-659	170M5146	8	1250	630
1600-3	5×NBRA-659	170M5146	10	1250	630
1920-3	6×NBRA-659	170M5146	12	1250	630
$U_N = 500\text{ V}$ (Range 380...500 V)					
0260-5	NBRA-658	170M5142	2	1250	400
0400-5	NBRA-659	170M5146	2	1250	630
0800-5	2×NBRA-659	170M5146	4	1250	630
1200-5	3×NBRA-659	170M5146	6	1250	630
1600-5	4×NBRA-659	170M5146	8	1250	630
2000-5	5×NBRA-659	170M5146	10	1250	630
2400-5	6×NBRA-659	170M5146	12	1250	630
$U_N = 690\text{ V}$ (Range 525...690 V)					
0400-7	NBRA-669	170M5146	2	1250	630
0800-7	2×NBRA-669	170M5146	4	1250	630
1200-7	3×NBRA-669	170M5146	6	1250	630
1600-7	4×NBRA-669	170M5146	8	1250	630
2000-7	5×NBRA-669	170M5146	10	1250	630
2400-7	6×NBRA-669	170M5146	12	1250	630

* The base type for these fuses is 170H3005 (1400 V, 630 A, 110 mm).

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Fuses with the same ratings from other manufacturers can be used if they meet the ratings and the melting curve of the fuse does not exceed the melting curve of the fuse mentioned in the table.

Dimensions, weights and free space requirements

Device	Height		Width		Depth		Weight	
	mm	in.	mm	in.	mm	in.	kg	lb
Brake chopper module NBRA-658/659/669	538.5	21.20	334	13.15	240	9.45	26	57
Brake resistor SAFUR180F460	1320	51.97	300	11.81	345	13.58	32	71
Brake resistor SAFUR125F500	1320	51.97	300	11.81	345	13.58	25	55
Brake resistor SAFUR200F500	1320	51.97	300	11.81	345	13.58	30	66
Brake resistor SAFUR210F575	1320	51.97	300	11.81	345	13.58	27	60
Brake chopper cooling fan G2E140-PI51-09	218	8.58	130	5.12	258	10.16	3	7
Brake resistor cooling fan D4E225-CC01-39	328	12.91	341	13.43	397	15.6	14	31

For more information on the dimensions, see chapter [Dimension drawings](#).

150 mm (5.91 in.) free space is required below and above the brake chopper module.

Losses, cooling data and noise

The heat loss of a brake chopper is one percent of the braking power.

■ Only chopper

ACS880-604-	Module type	Air flow		Noise dB(A)
		m ³ /h	ft ³ /min	
U_N = 400 V (Range 380...415 V)				
0210-3	NBRA-658	660	389	64
0320-3	NBRA-659	660	389	64
0640-3	2×NBRA-659	1320	777	67
0960-3	3×NBRA-659	1980	1166	68
1280-3	4×NBRA-659	2640	1554	69
1600-3	5×NBRA-659	3300	1943	70
1920-3	6×NBRA-659	3960	2331	71
U_N = 500 V (Range 380...500 V)				
0260-5	NBRA-658	660	389	64
0400-5	NBRA-659	660	389	64
0800-5	2×NBRA-659	1320	777	67
1200-5	3×NBRA-659	1980	1166	68
1600-5	4×NBRA-659	2640	1554	69
2000-5	5×NBRA-659	3300	1943	70
2400-5	6×NBRA-659	3960	2331	71
U_N = 690 V (Range 525...690 V)				
0400-7	NBRA-669	660	389	64
0800-7	2×NBRA-669	1320	777	67
1200-7	3×NBRA-669	1980	1166	68
1600-7	4×NBRA-669	2640	1554	69
2000-7	5×NBRA-669	3300	1943	70
2400-7	6×NBRA-669	3960	2331	71

■ Chopper with standard resistors

ACS880-604-	Module type	Resistor type	Air flow		Noise dB(A)
			m ³ /h	ft ³ /min	
$U_N = 400\text{ V}$ (Range 380...415 V)					
0210-3	NBRA-658	2×SAFUR210F575	2500	1472	66
0320-3	NBRA-659	2×SAFUR180F460	2500	1472	66
0640-3	2×NBRA-659	2×(2×SAFUR180F460)	5000	2943	69
0960-3	3×NBRA-659	3×(2×SAFUR180F460)	7500	4415	70
1280-3	4×NBRA-659	4×(2×SAFUR180F460)	10000	5886	71
1600-3	5×NBRA-659	5×(2×SAFUR180F460)	12500	7358	72
1920-3	6×NBRA-659	6×(2×SAFUR180F460)	15000	8830	73
$U_N = 500\text{ V}$ (Range 380...500 V)					
0260-5	NBRA-658	2×SAFUR125F500	2500	1472	66
0400-5	NBRA-659	2×SAFUR200F500	2500	1472	66
0800-5	2×NBRA-659	2×(2×SAFUR200F500)	5000	2943	69
1200-5	3×NBRA-659	3×(2×SAFUR200F500)	7500	4415	70
1600-5	4×NBRA-659	4×(2×SAFUR200F500)	10000	5886	71
2000-5	5×NBRA-659	5×(2×SAFUR200F500)	12500	7358	72
2400-5	6×NBRA-659	6×(2×SAFUR200F500)	15000	8830	73
$U_N = 690\text{ V}$ (Range 525...690 V)					
0400-7	NBRA-669	2×SAFUR200F500	2500	1472	66
0800-7	2×NBRA-669	2×(2×SAFUR200F500)	5000	2943	69
1200-7	3×NBRA-669	3×(2×SAFUR200F500)	7500	4415	70
1600-7	4×NBRA-669	4×(2×SAFUR200F500)	10000	5886	71
2000-7	5×NBRA-669	5×(2×SAFUR200F500)	12500	7358	72
2400-7	6×NBRA-669	6×(2×SAFUR200F500)	15000	8830	73

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Brake circuit cable sizes


ACS880-604-	Module type	Chopper cable (Cu)*		Resistor cable (Cu)**	
		Single-core mm ²	Multicore mm ²	Single-core mm ²	Multicore mm ²
$U_N = 400\text{ V}$ (Range 380...415 V)					
0210-3	NBRA-658	70	3×95+50	50	3×50+25
0320-3	NBRA-659	120	3×185+95	70	3×95+50
0640-3	2×NBRA-659	2×120	2×(3×185+95)	2×70	2×(3×95+50)
0960-3	3×NBRA-659	3×120	3×(3×185+95)	3×120	3×(3×95+50)
1280-3	4×NBRA-659	4×120	4×(3×185+95)	4×120	4×(3×95+50)
1600-3	5×NBRA-659	5×120	5×(3×185+95)	5×120	5×(3×95+50)
1920-3	6×NBRA-659	6×120	6×(3×185+95)	6×120	6×(3×95+50)
$U_N = 500\text{ V}$ (Range 380...500 V)					
0260-5	NBRA-658	70	3×95+50	50	3×50+25
0400-5	NBRA-659	120	3×185+95	70	3×95+50
0800-5	2×NBRA-659	2×120	2×(3×185+95)	2×70	2×(3×95+50)
1200-5	3×NBRA-659	3×120	3×(3×185+95)	3×120	3×(3×95+50)
1600-5	4×NBRA-659	4×120	4×(3×185+95)	4×120	4×(3×95+50)
2000-5	5×NBRA-659	5×120	5×(3×185+95)	5×120	5×(3×95+50)
2400-5	6×NBRA-659	6×120	6×(3×185+95)	6×120	6×(3×95+50)
$U_N = 690\text{ V}$ (Range 525...690 V)					
0400-7	NBRA-669	120	3×185+95	70	3×95+50
0800-7	2×NBRA-669	2×120	2×(3×185+95)	2×70	2×(3×95+50)
1200-7	3×NBRA-669	3×120	3×(3×185+95)	3×120	3×(3×95+50)
1600-7	4×NBRA-669	4×120	4×(3×185+95)	4×120	4×(3×95+50)
2000-7	5×NBRA-669	5×120	5×(3×185+95)	5×120	5×(3×95+50)
2400-7	6×NBRA-669	6×120	6×(3×185+95)	6×120	6×(3×95+50)

* Size of the cable between the drive DC link and the brake chopper

** Size of the cable between the brake chopper and the first resistor which carries the entire braking power; see page 37.

Note: In order for the installation to comply with the EMC Directive, unshielded single-core cable can only be used if it is routed inside a cabinet that efficiently suppresses radiated emissions.

Brake chopper terminal data

ACS880-604-	Module type	UDC+, UDC-, R+, R-			Grounding clamps	
		Hole diameter mm	Screw	Tightening torque N·m	Max. wire size mm ²	Tightening torque N·m
						
$U_N = 400\text{ V}$ (Range 380...415 V)						
0210-3	NBRA-658	11	M10	35	70	6
0320-3	NBRA-659	11	M10	35	70	6
0640-3	2×NBRA-659	11	2×M10	35	2×70	6
0960-3	3×NBRA-659	11	3×M10	35	3×70	6
1280-3	4×NBRA-659	11	4×M10	35	4×70	6
1600-3	5×NBRA-659	11	5×M10	35	5×70	6
1920-3	6×NBRA-659	11	6×M10	35	6×70	6
$U_N = 500\text{ V}$ (Range 380...500 V)						
0260-5	NBRA-658	11	M10	35	70	6
0400-5	NBRA-659	11	M10	35	70	6
0800-5	2×NBRA-659	11	2×M10	35	2×70	6
1200-5	3×NBRA-659	11	3×M10	35	3×70	6
1600-5	4×NBRA-659	11	4×M10	35	4×70	6
2000-5	5×NBRA-659	11	5×M10	35	5×70	6
2400-5	6×NBRA-659	11	6×M10	35	6×70	6
$U_N = 690\text{ V}$ (Range 525...690 V)						
0400-7	NBRA-669	11	M10	35	70	6
0800-7	2×NBRA-669	11	2×M10	35	2×70	6
1200-7	3×NBRA-669	11	3×M10	35	3×70	6
1600-7	4×NBRA-669	11	4×M10	35	4×70	6
2000-7	5×NBRA-669	11	5×M10	35	5×70	6
2400-7	6×NBRA-669	11	6×M10	35	6×70	6

Brake resistor terminal data

ACS880-604-	Module type	Resistor type	R+, R- and grounding terminals		
			Hole diameter mm	Screw	Tightening torque N·m
$U_N = 400\text{ V}$ (Range 380...415 V)					
0210-3	NBRA-658	2×SAFUR210F575	7	M6	7
0320-3	NBRA-659	2×SAFUR180F460	7	M6	7
0640-3	2×NBRA-659	2×(2×SAFUR180F460)	7	2×M6	7
0960-3	3×NBRA-659	3×(2×SAFUR180F460)	7	3×M6	7
1280-3	4×NBRA-659	4×(2×SAFUR180F460)	7	4×M6	7
1600-3	5×NBRA-659	5×(2×SAFUR180F460)	7	5×M6	7
1920-3	6×NBRA-659	6×(2×SAFUR180F460)	7	6×M6	7
$U_N = 500\text{ V}$ (Range 380...500 V)					
0260-5	NBRA-658	2×SAFUR125F500	7	M6	7
0400-5	NBRA-659	2×SAFUR200F500	7	M6	7
0800-5	2×NBRA-659	2×(2×SAFUR200F500)	7	2×M6	7
1200-5	3×NBRA-659	3×(2×SAFUR200F500)	7	3×M6	7
1600-5	4×NBRA-659	4×(2×SAFUR200F500)	7	4×M6	7
2000-5	5×NBRA-659	5×(2×SAFUR200F500)	7	5×M6	7
2400-5	6×NBRA-659	6×(2×SAFUR200F500)	7	6×M6	7
$U_N = 690\text{ V}$ (Range 525...690 V)					
0400-7	NBRA-669	2×SAFUR200F500	7	M6	7
0800-7	2×NBRA-669	2×(2×SAFUR200F500)	7	2×M6	7
1200-7	3×NBRA-669	3×(2×SAFUR200F500)	7	3×M6	7
1600-7	4×NBRA-669	4×(2×SAFUR200F500)	7	4×M6	7
2000-7	5×NBRA-669	5×(2×SAFUR200F500)	7	5×M6	7
2400-7	6×NBRA-669	6×(2×SAFUR200F500)	7	6×M6	7

Degree of protection

The degree of protection of the brake chopper module and the SAFUR resistors is IP00 (UL type open).

Auxiliary circuit current consumption

Device	Type	U_N V AC	f Hz	I_N A	I_{start} A
Brake chopper cooling fan	G2E140-PI51-09	230	50	0.78	1.56
Brake chopper cooling fan	G2E140-PI51-09	230	60	0.97	1.94
Brake resistor cooling fan	D4E225-CC01-39	230	50/60	2.8	5.6

Definitions

I_N Nominal current consumption

I_{start} Starting current consumption

CE marking

A CE mark is attached to the brake chopper module to verify that the unit follows the provisions of the European Low Voltage and EMC Directives.

■ Compliance with the European Low Voltage Directive

The compliance with the European Low Voltage Directive has been verified according to standards EN 61800-5-1 and EN 60204-1.

■ Compliance with the European EMC Directive

ACS880 multidrive modules: The cabinet builder is in charge for the compliance of the drive with the European EMC Directive. For information on the items to consider, see:

- *Electrical planning instructions for ACS880 multidrive cabinets and modules* (3AUA0000102324 [English])
- *Cabinet design and construction instructions for ACS880 multidrive modules* (3AUA0000107668 [English])
- *Technical guide 3: EMC Compliant Installation and Configuration for a Power DriveSystem* (3AFE61348280 [English]).

UL marking

The brake chopper module is cULus Listed with the rated voltages.

The cooling fans are cURus Recognized or cULus Listed.

The fuses are cURus Recognized.

The SAFUR brake resistors do not have UL certification.

More information on standards and markings

See *Electrical planning instructions for ACS880 multidrive cabinets and modules* (3AUA0000102324 [English]).



11

Dimension drawings

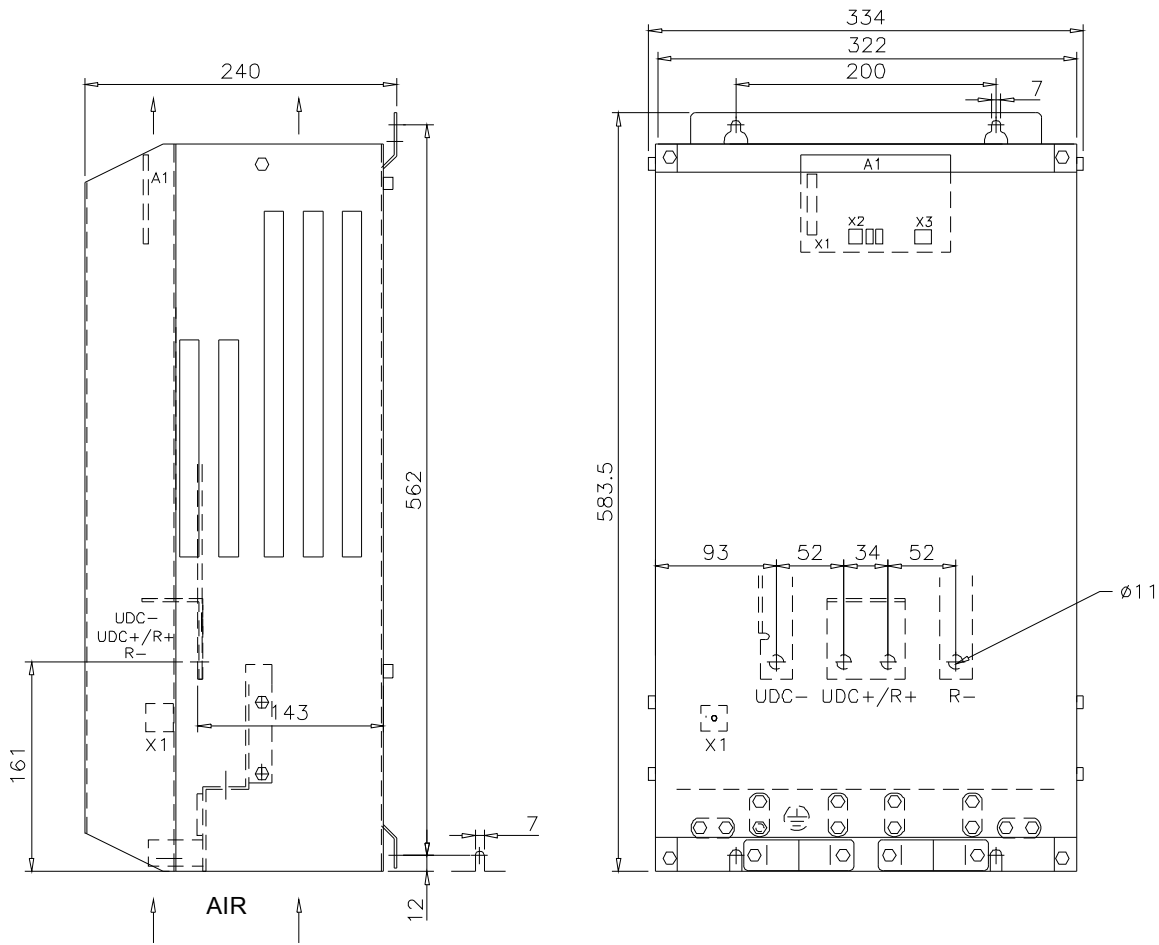
Contents of this chapter

This chapter contains the dimension drawings of the brake chopper module, as well as the standard brake resistors and cooling fans.

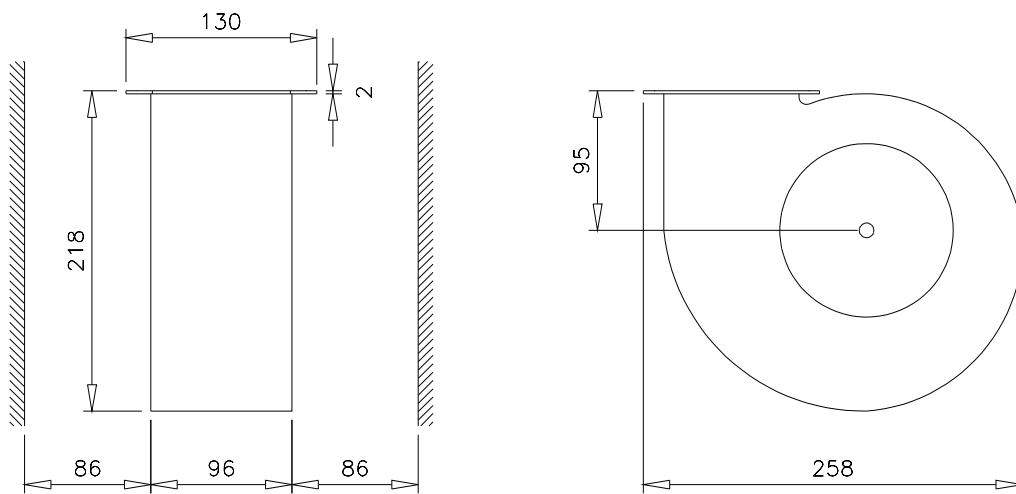
The dimensions are in millimeters. To convert to inches, use the formula:

25.4 mm = 1 in.

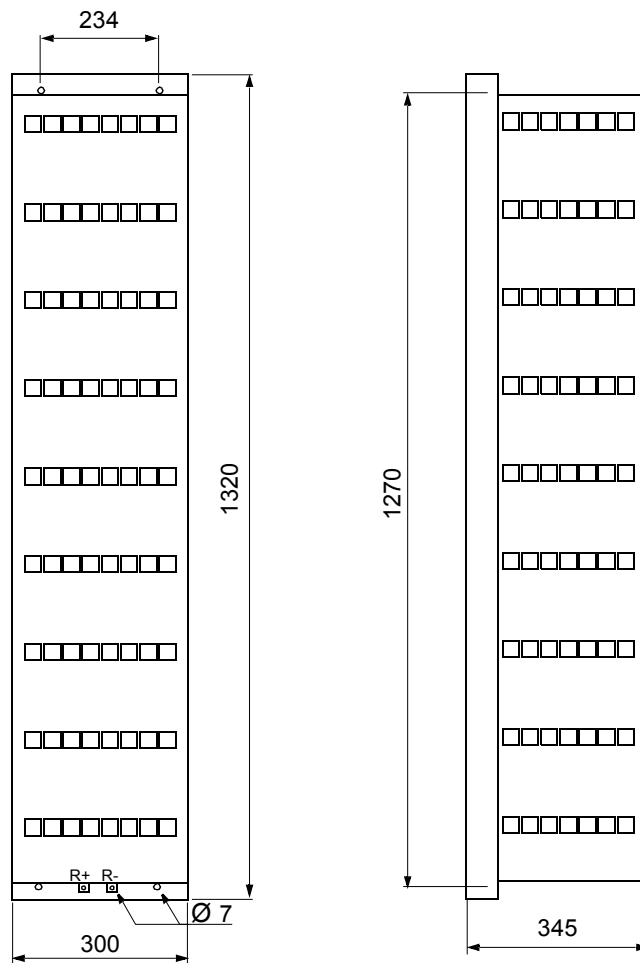
Brake chopper modules NBRA-658, NBRA-659, NBRA-669



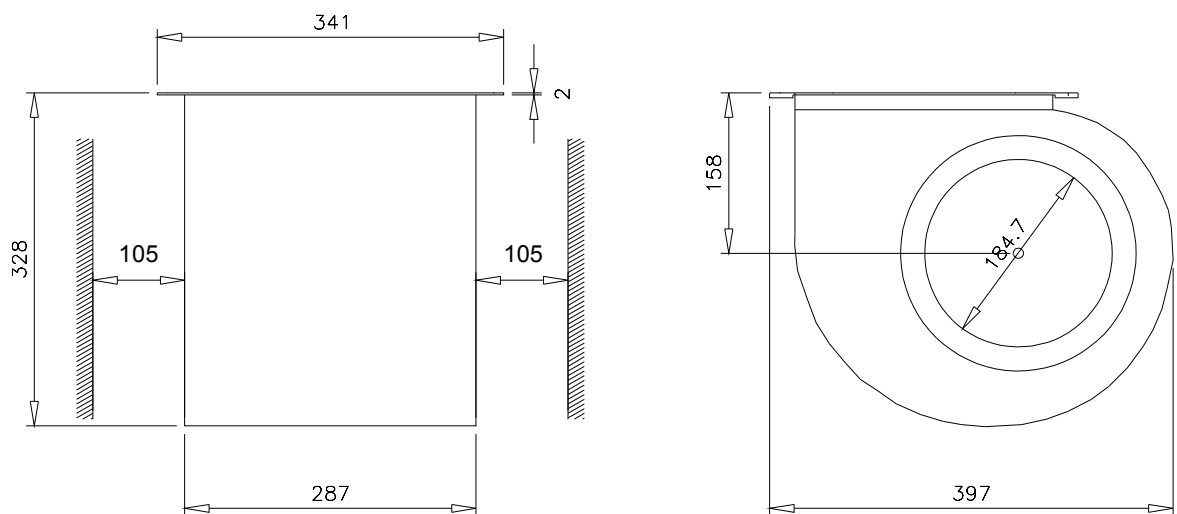
Brake chopper cooling fan G2E140-PI51-09



**Brake resistors SAFUR180F460, SAFUR125F500,
SAFUR200F500, SAFUR210F575**



Brake resistor cooling fan D4E225-CC01-39







12

Example circuit diagrams

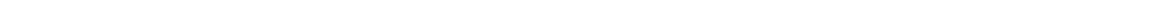
Contents of this chapter

This chapter contains example circuit diagrams of a brake unit.

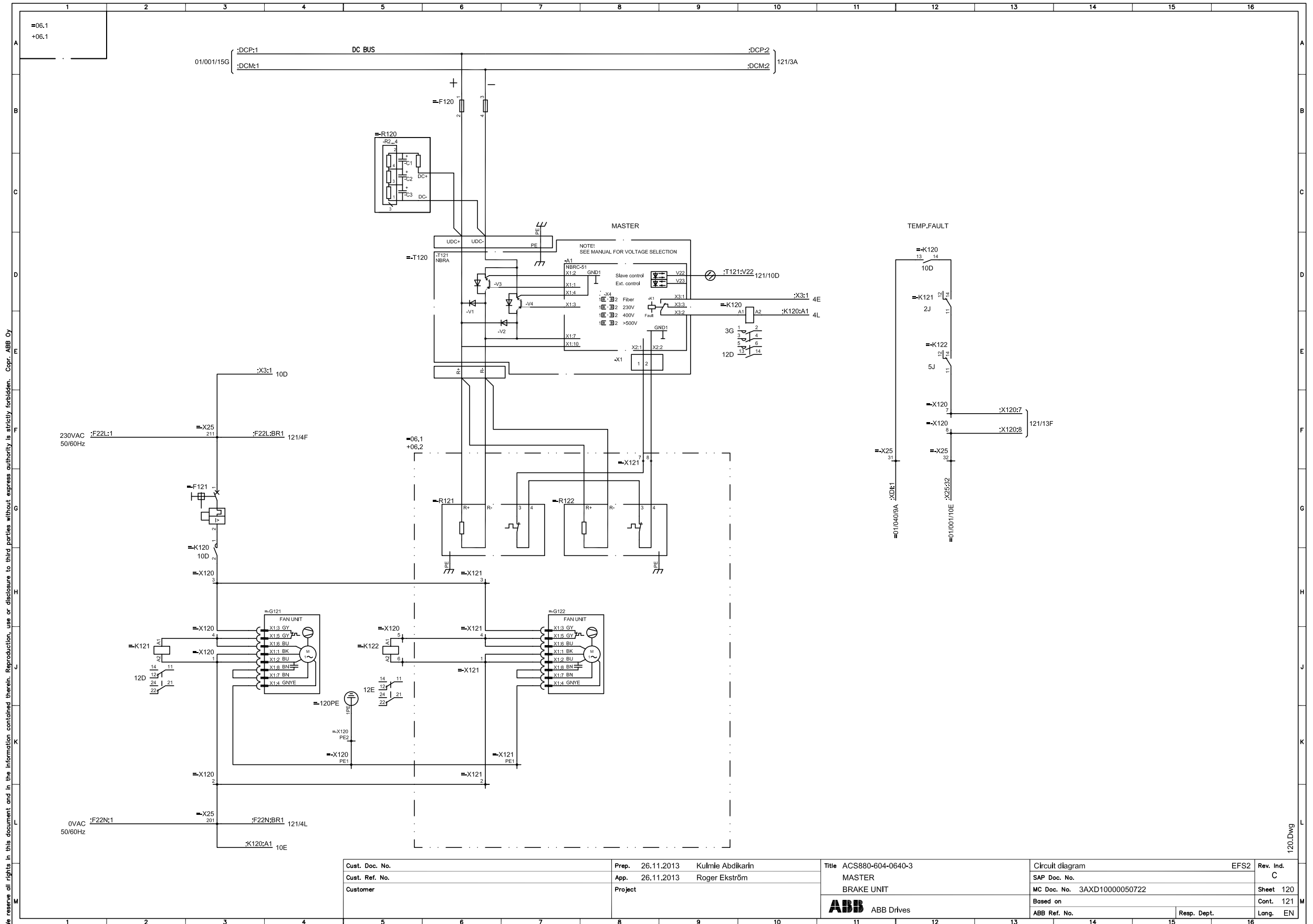
The installation consists of two parallel units both including a brake chopper and two brake resistors. One chopper – the first in the chain – acts as the master for the other. The switching of the follower chopper is controlled by the master via a fiber optic link.

The purpose of these diagrams is to help in:

- understanding the internal connections and operation of a brake unit, and
 - learning how to wire a brake unit.
-



ACS880-604-0640-3 brake unit, master

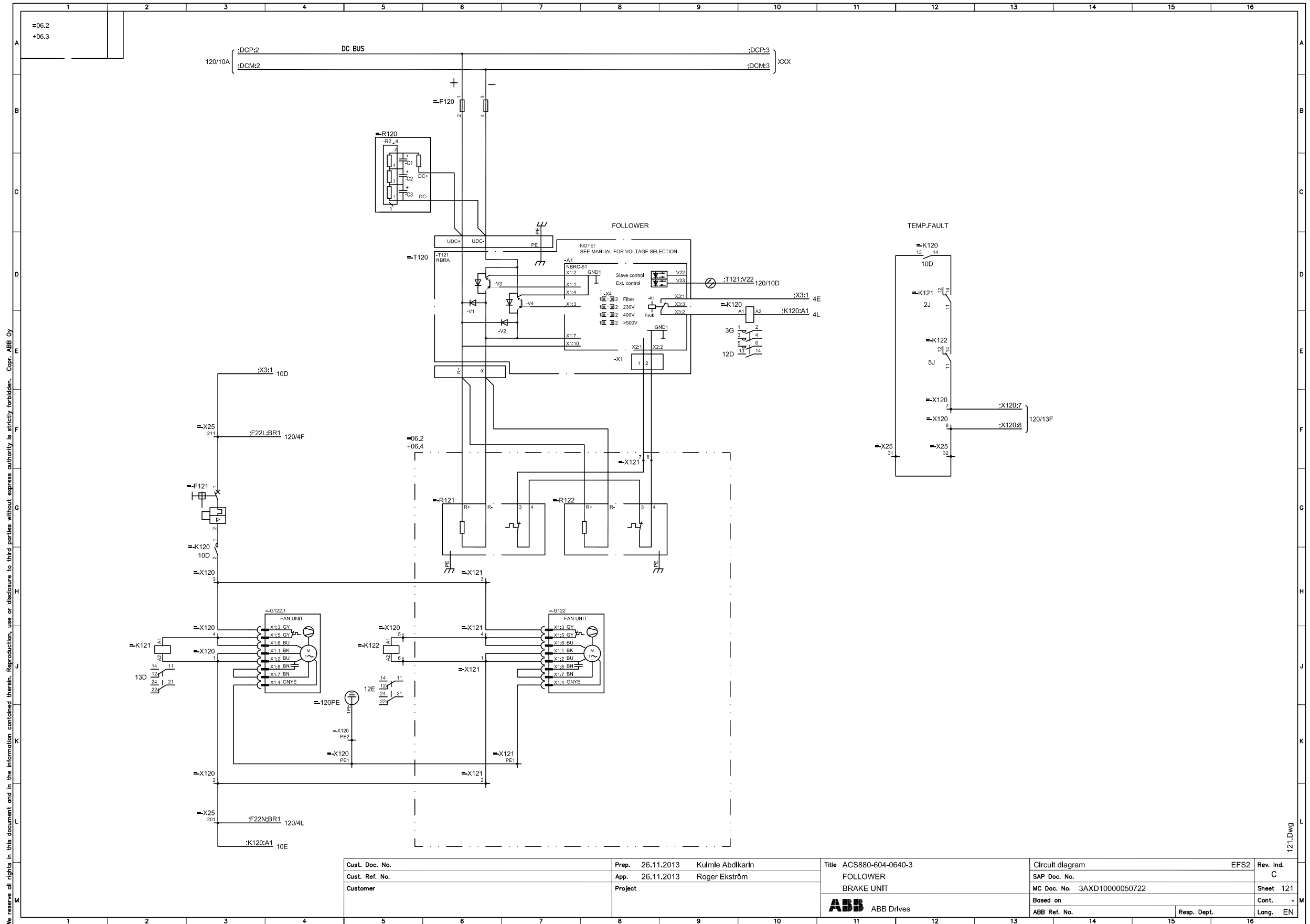


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Cust. Doc. No.	Prep. 26.11.2013 Kulmie Abdikarin	Title ACS880-604-0640-3	Circuit diagram	EFS2	Rev. Ind. C
Cust. Ref. No.	App. 26.11.2013 Roger Ekström	MASTER	SAP Doc. No.		Sheet 120
Customer	Project	BRAKE UNIT	MC Doc. No. 3AXD10000050722		Cont. 121
		ABB ABB Drives	Based on		Lang. EN
			ABB Ref. No.	Resp. Dept.	

120.Dwg

ACS880-604-0640-3 brake unit, follower



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Cust. Ref. No.	App. 26.11.2013 Roger Ekström	FOLLOWER	SAP Doc. No.		
Customer	Project	BRAKE UNIT	MC Doc. No. 3AXD1000050722		Sheet 121
		ABB ABB Drives	Based on		Cont. -
			ABB Ref. No.	Resp. Dept.	Lang. EN

121.Dwg

Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to www.abb.com/searchchannels.

Product training

For information on ABB product training, navigate to www.abb.com/drives and select *Training courses*.

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Your comments on our manuals are welcome. Go to www.abb.com/drives and select *Document Library – Manuals feedback form (LV AC drives)*.

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3AUA0000106244 Rev B (EN) 2013-12-05