

Power^{IT} Compact Secondary Substations, CSS

Technical catalogue for concrete substations



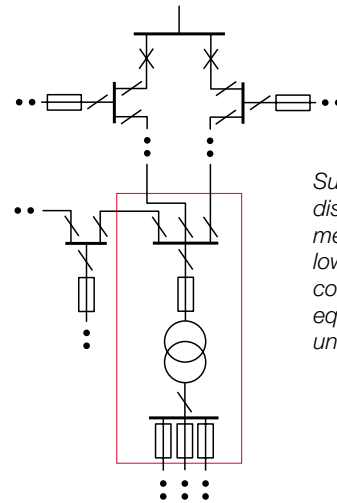
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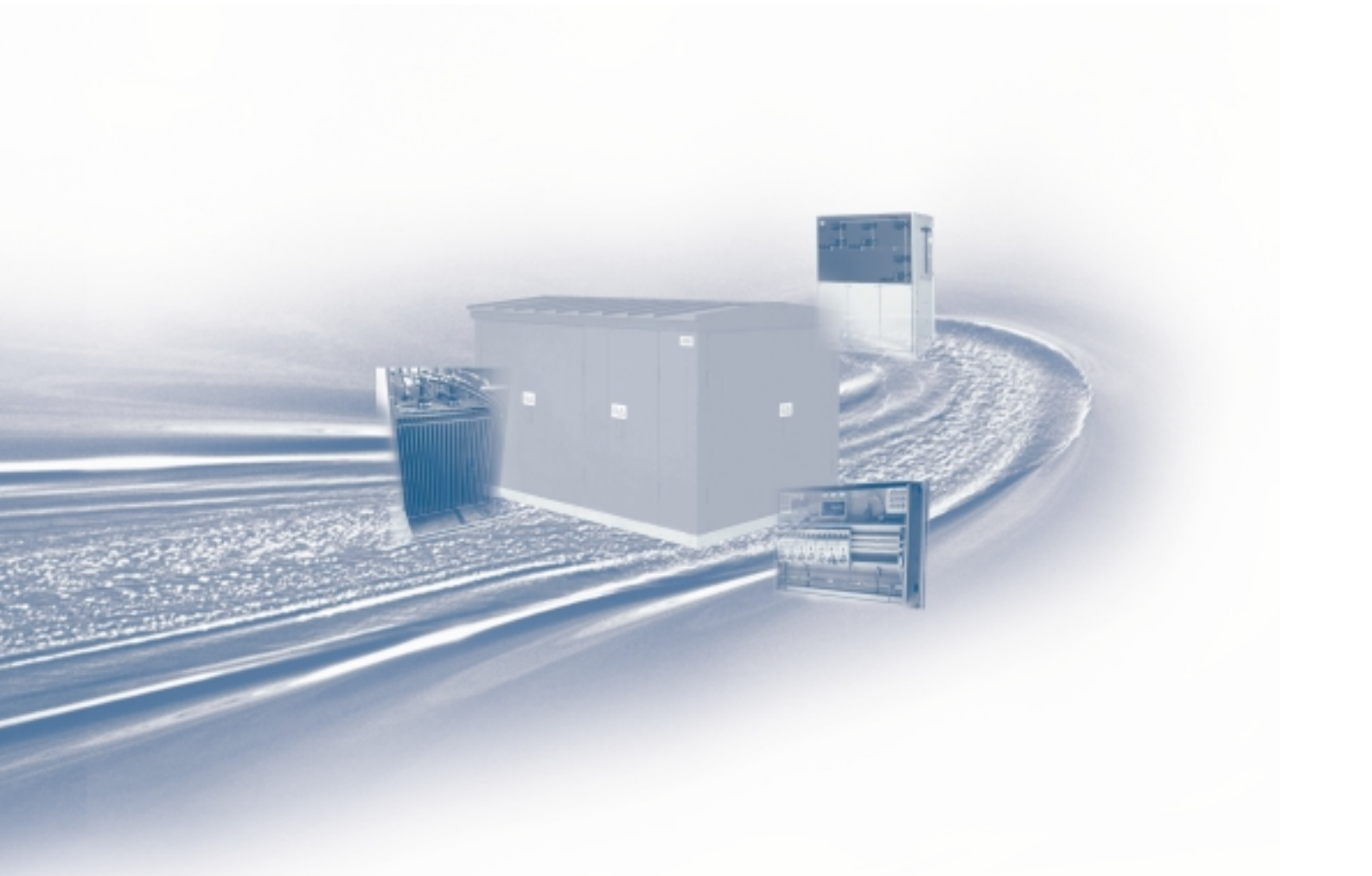


The New Standard for Individual Solutions

The new CSS substations represent a unique concept, which is introducing new standards with its broader, modular product range, a new product configurator, type-tested solutions and shorter delivery times. All products are based on the latest technology and form part of ABB's Industrial IT Platform. The result is a safe energy supply and a reduction in operating costs for the grid.



Substations comprise the distribution transformer, medium-voltage switchgear, low-voltage switchboard, connections and associated equipment in an enclosed unit.





Substations from ABB

Definitions

In accordance with the EN 61330 standard, Prefabricated Secondary Substations are defined as substations with type-tested equipment comprising distribution transformer, medium-voltage switchgear, low-voltage switchboard, connections and associated equipment in an enclosed unit. Substations are located in places to which the general public has access, and hence must provide a high level of personal safety.

Solutions

In substations for outdoor use all components are housed in a building, which protects the equipment against climate effects and unauthorised access. The building will typically be divided into three rooms for the medium-voltage switchgear, low-voltage switchboard and distribution transformer. A substation may be operated from the inside (Walk-in) or from the outside (Non Walk-in). The electrical equipment is cooled by natural ventilation through openings in the substation.



Contents

Application	4
Product overview	4
Type designations	
Concrete substations	5
Building dimensions	
Additional options available	5
Design	6
Building	
Roof	
Base and foundation	
Cable cellar	
Oil collection pit	
Ventilation	
Doors	
Internal emergency handle	
Degree of protection	
Solutions available	8
Model CSS-CW Walk-in	
Model CSS-CN Non Walk-in and CSS-CC Compact	
Separate room for other purposes	
Exterior styling	9
Standard surface structure	
Alternative surface structures	
Standard wall colour	
Alternative wall colours	
Standard colour of doors and ventilation grilles	
Alternative colours for doors and ventilation grilles	
Roof	
Roof with high pitch	
Electrical equipment in the substation	10
Medium-voltage switchgear	
Low-voltage switchboard	
Distribution transformer	
Cables and cable accessories	
Type test	11
Quality	11
Personal safety	
Protection against climate effect	
Environment	

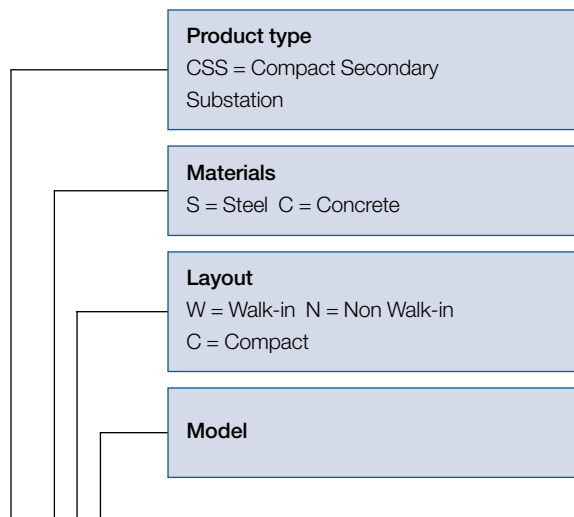
The text and illustrations are intended as guidelines. Reservation for changes.

Application

Substations are used in a large number of different areas.

Secondary Substation	Application
Distribution	Transformation and public distribution
Operation	Operation at medium-voltage level
Supply	Supply to satellite stations
Customer supply	Supply to major electricity customers
Feeding	Connection of decentralised power plant to the public network
Satellite	Substations for the end of radial connections
Pylon feeder station	Smaller stations connected to overhead lines

Type designations



CSS-CW.1

The CSS range comprises three main models, which we supply with a number of different layouts, designs and materials.

Product overview

CSS-CW

Walk-in station. Operated from the inside and installed at ground level.



CSS-CN

Non Walk-in station. Operated from the outside and installed at ground level.



CSS-CC

Compact station. Operated from the outside and installed partly below ground level.



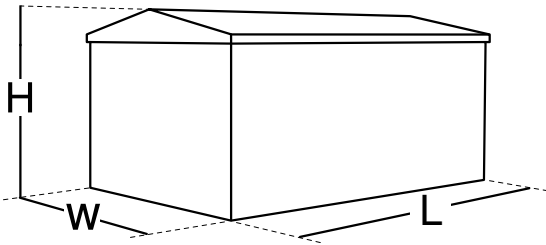
Concrete substations

Concrete substations in the CSS range are available in sizes that are suitable for:

- Transformers to max. 400 kVA
- Transformers to max. 1000 kVA
- Transformers to max. 1250 kVA
- 2 transformers, each up to 1250 kVA

For certain sizes of substations there are several solutions available, with doors located in different positions.

Building dimensions



Type designation	Max. transformer	L All measurements in mm	W	H (above ground)
Walk-in				
CSS-CW.1	1 x 1250 kVA	3900	2500	2640
CSS-CW.2	1 x 1250 kVA	3900	2500	2640
CSS-CW.3	1 x 1250 kVA	4680	2500	2640
CSS-CW.4	2 x 1250 kVA	5400	3260	2640
Non Walk-in				
CSS-CN.1	1 x 400 kVA	3000	1360	2030
CSS-CN.2	1 x 1000 kVA	3000	2360	2230
CSS-CN.3	2 x 1000 kVA	3900	3260	2230
Compact				
CSS-CC.1	1 x 400 kVA	3000	1360	1580
CSS-CC.2	1 x 1000 kVA	3000	2360	1780
CSS-CC.3	1 x 1000 kVA	3000	2360	1930
CSS-CC.4	2 x 1000 kVA	3900	3260	1930

Additional options available

The standard buildings can be fitted with a broad range of additional options, so that the individual substation can meet individual, functional and aesthetic requirements. These options include various modifications and accessories, which make the operation, installation and use of the substation easier. There are also several options to vary the substation's appearance.

Additional options	Type	CSS-CW	CSS-CN	CSS-CC
Functionality				
Cable cellar		X	X	X
Separate room e.g. for communication		X	X	X
Earthing of doors and ventilation grille		X	X	X
Lift incl. transformer		X	X	X
Internal emergency handle		X		
IP54 in doors		✓	X	X
Cylinder lock in doors		✓	X	X
Alternative door material		X		
Temperature class K 10		X	X	X
Filter in ventilation openings		X	X	X
Styling				
Alternative façade structure		X	X	X
Painted façade		X	X	X
Alternative colour for doors ventilation grille		X	X	X
Roof with high pitch		X	X	X
X additional options ✓ standard				

Design



Building

The building is manufactured from reinforced concrete sections with embedded steel fittings. The sections are assembled by welding of the steel fittings, and connections are jointed using an elastic joint filler. Wall sections for the long sides of the substation are designed with two horizontal rows of recesses or openings, where doors and ventilation openings may be placed. As standard the surface is not painted, and has a coarse structure. The concrete walls have a thickness of 80 mm.

The internal dividing walls are manufactured from 1.5 mm AlZn-coated sheet steel and bolted to the substation's concrete wall. All painted metal parts are powder coated, and the standard colour is concrete grey NCS5005-G50Y (corresponding to RAL 7023). The reinforcement in the concrete is connected to the substation's earth bar. All substations are fitted with holes for emergency current outputs, and in substations without doors to the transformer room it is possible to open one ventilation grille to inspect the transformer.

Roof

The roof is manufactured from reinforced concrete as a pitched roof, with a height of 120 mm in the middle and 80 mm along the edge. The roof is secured by bolts inside the building. When the bolts are removed the roof can be lifted by means of lifting devices located at the top of the roof.

Base and foundation

The base frame is 120 mm thick and fitted with recesses or openings for the insertion of cables. Lifting devices are fitted to the base frame. In substations operated from the outside, base plates are fitted under the doors to the medium-voltage and low-voltage rooms. These are manufactured in 2-mm, hot dipped galvanised steel, and can be detached to allow cables to be laid.



Opening for cable entry.

Base plates can be detached.



Cable cellar

All substations can be supplied with a cable cellar, which is installed inside the actual substation. The substation is then placed on top of the cable cellar.

Oil collection pit

As standard all concrete substations have an oil collection pit, which can take 100% of the transformer's oil volume. In substations operated from the outside, the oil collection pit is integrated into the substation's concrete base, while the oil collection pit in substations operated from the inside is created by the fitting of dividing walls around the transformers.



The oil collection pit protects the environment.

Ventilation

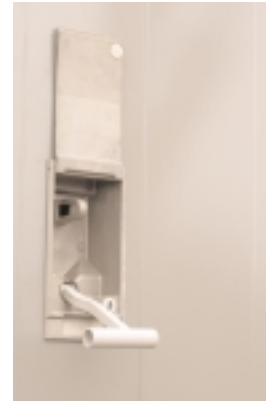
Natural ventilation is provided through ventilation for air intake at the bottom of the walls. The air is extracted through ventilation openings at the top of the walls, and natural air circulation ensures sufficient cooling of the distribution transformer. As standard CSS is classified and type-tested in accordance with temperature class K20. Temperature class K10 can be achieved by increasing the ventilation area for the transformer room. The ventilation grilles are manufactured in aluminium and can be fitted with filters.



Ventilation grilles ensure air flow.

Doors

In substations operated from the outside, doors and door frames are manufactured from 1.5 mm AlZn-coated sheet steel. The surface of the actual door is slightly profiled. The doors are fitted as standard with stainless steel hinges and are equipped with door stoppers. The doors are closed by means of a two-point device, which secures the door to the top frame and the base frame. Doors that are designed as standard with a locking device for a padlock can also be fitted with a cylinder lock.



Locking device for padlock.

In all substations operated from the inside, the doors and door frames are manufactured in aluminium. The doors are fitted with handles and cylinder locks.

Internal emergency handle

Substations operated from the inside can be supplied with an internal emergency handle, so that the door can be opened very quickly in an emergency.

Degree of protection

The standard seal for CSS is IP23D in accordance with EN 60529. To provide protection against dust being drawn into the medium-voltage and low-voltage rooms, the doors can be fitted with gaskets that increase the degree of protection to IP54.

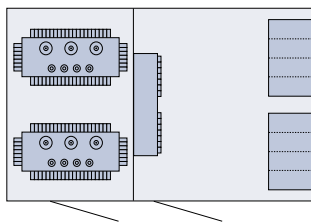
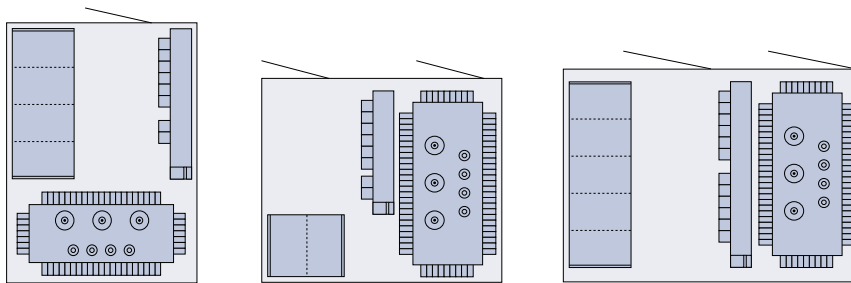
Solutions available

The CSS range has a number of possible solutions, covering:

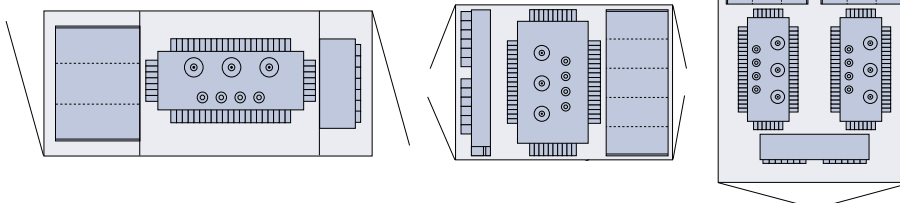
- Substations operated from the outside for one transformer in sizes up to and including 400 kVA
- Substations operated from the outside for one transformer in sizes from 400 kVA to 1000 kVA
- Substations operated from the inside for one transformer in sizes up to and including 1250 kVA

There are also solutions available for the installation of two transformers.

Model CSS-CW Walk-in

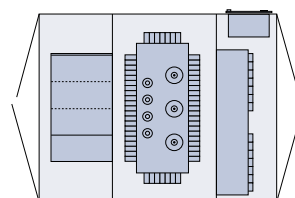


Type CSS-CN Non Walk-in and CSS-CC Compact

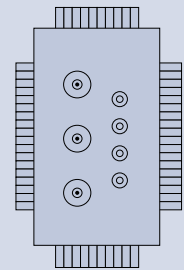


Separate room for other purposes

In addition to the three normal rooms, the substation can also include a separate room for other purposes, such as street-lighting equipment, telecommunications or cable TV. The room is separated totally from the other rooms by means of walls, and access is through a separate door with its own lock.



CSS can be fitted with a separate room for other purposes.



Distribution transformers can be supplied in the technology suited for the task.



Medium-voltage switchgears can be supplied pre-configured or fully configurable.



Low-voltage switchboards are supplied in accordance with local norms and regulations, and are adapted to the customer's requirements.

Exterior styling

Standard surface structure

Concrete substations in the CSS range are supplied as standard with a “stipple-rolled” facade.



Alternative surface structures

As well as the standard structure, CSS in concrete can be supplied with the following structures:



“Rough plaster”



“Granite”



“Brushed”



“Wood structure”

Standard wall colour

Concrete substations in the CSS range are supplied as standard with an unpainted concrete facade

Alternative wall colours

CSS in concrete can be supplied with a painted concrete facade in the following colours:

- Light yellow NCS1010-Y30R (corresponding to RAL 1015)
- Green NCS3040-G10Y (corresponding to RAL 6032)
- Light brown NCS3010-Y50R
- White NCS0500-N (corresponding to RAL 9001)

Standard colour of doors and ventilation grilles

Doors and ventilation grilles are painted as standard in a shade of grey NCS5005-G50Y (corresponding to RAL 7023).



NB: Substations operated from the inside are supplied as standard with an unpainted aluminium door.

Alternative colours for doors and ventilation grilles

Instead of the standard colour, you can choose the following colours, which are used to paint all doors and ventilation grilles in the substation:



- Light grey NCS2000-N (corresponding to RAL 7047)
- Dark brown NCS7010-Y30R (corresponding to 8028)

Roof

As standard the roof is unpainted concrete with no surface structure. In substations with an alternative colour the edges of the roof are painted in the same colour as the substation.



Roof with high pitch

In order to allow the substation to fit in with its surroundings, CSS can be supplied with a roof with a high pitch, fitted on top of the standard roof.

Electrical equipment in the substation

Medium-voltage switchgear

The CSS range has been designed and type-tested with ABB's medium-voltage switchgears. We can install the following models:

- SafeRing 12-24 kV
- SafePlus 12-24 kV
- SafeLink 12 kV
- UniSwitch 24 kV
- NAL switchgear 12-24 kV

The range of medium-voltage switchgears includes both pre-configured and fully configurable solutions. A high level of personal safety should be guaranteed by the use of type-tested equipment. ABB offers gas-insulated and air-insulated medium-voltage solutions.

The options for gas-insulated solutions comprise the SafeRing, SafePlus and SafeLink models. The options for air-insulated solutions comprise the UniSwitch model (which uses SF₆ gas as a breaking medium) and units with purely air-insulated devices with and without fuses.

Low-voltage switchboard

CSS is designed to house various terminal solutions in accordance with national norms and regulations, as well as individual requirements. The product range includes various types of fuse-switch disconnectors, including DIN solutions and moulded case circuit breakers. Equipment for street-lighting, measuring and metering can be supplied as required by the customer.



Distribution transformer

The CSS stations are designed to house distribution transformers with various technologies up to 1250 kVA/24 kV:

- Oil-insulated model, hermetically sealed
- Oil-insulated with oil conservator
- Dry-insulated, vacuum-cast windings
- Dry-insulated RESIBLOC

In many cases we can supply CSS with a readily installed integrated transformer. The possibility of lifting the substation with integrated transformer depends on the type of station, the solution in question and the transformer size.

Cables and cable accessories

CSS is supplied with cables and cable terminations:

- Medium-voltage cables from medium-voltage switchgears to distribution transformers
- Low-voltage cables from low-voltage switchboards to distribution transformers.

SF₆ gas-insulated medium-voltage switchgears are connected using elbow connections. The cable termination to the transformer is provided by means of regular cable adapters or, if required, elbow connections. The low-voltage cable between the distribution transformer and the low-voltage switchboard is fitted with the necessary cable lugs.

For further information about electrical equipment, order the relevant brochures or visit us at www.abb.com.



Type test

The CSS range is designed and type-tested in accordance with EN 61330, which covers the following test programs:

- Control of insulation level
- Control of temperature rise in the main components in the substation
- Control of earthing system
- Control of internal protection class
- Control of the building's resistance to mechanical effects
- Function tests on mechanical parts

Additional type tests in accordance with EN 61330

- Rated short-time current test

The main components are type-tested in accordance with their individual standards

Medium-voltage switchgear

- EN 60265: High-voltage switches
- EN 60298: Metal-enclosed high-voltage switchgear
- EN 60694: High-voltage switchgear

Low-voltage switchboard

- EN 60439: Low-voltage switchgear and control gear

Distribution transformer

- EN 60076: Power transformers

Quality

The CSS range is produced in accordance with ABB's stringent quality and environmental procedures. ISO 9001 and ISO 14001 certification guarantees quality and environmental considerations.

Personal safety

All live parts in the CSS range are protected against unintentional contact by means of lockable doors. The ventilation openings to the transformer room are of the labyrinth type. Cable connections and fuses in the medium-voltage room are also protected against unintentional contact. Anti-contact protection is tested in accordance with EN 61330.

The reinforcement in the concrete sections of the building is electrically connected via the welds, and is also connected to the substation's earth bar. Galvanised steel foundations are bolted to the walls' metal fittings and thus connected to earth.

CSS can be supplied with all doors and ventilation grilles earthed. This is achieved by drawing cables to the substation's earth bar. The result is a fully earthed enclosure, providing a high level of personal safety.

Protection against climate effect

The climate in substations can be extreme, due to moisture, condensation and dirt. In coastal locations sea salt on the surface of open, insulated surfaces can cause leaking current, which can result in flashover. It is strongly recommended that climate-proof connection equipment is used if the substation is installed in an extreme climate.

Environment

ABB works to develop and supply products and solutions that do not have any unnecessary impact on the environment, are safe to use and can be recycled, reused or disposed of safely. In our research and development we aim to produce sustainable technologies, systems and products.

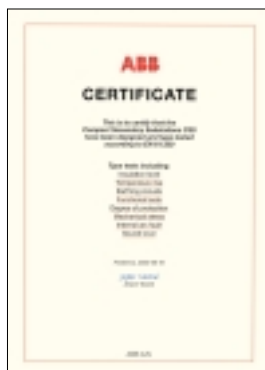




ABB A/S

Head Office

Meterbuen 33
DK-2740 Skovlunde
Phone: +45 4450 4450
Fax : +45 4450 4460

Branch Office

Håndværkervej 23
DK-7000 Fredericia
Phone: +45 7924 7924
Fax : +45 7594 4321

www.abb.dk
E-mail: abb.dk@dk.abb.com