

# Power<sup>IT</sup> Compact Secondary Substations, CSS

Technical catalogue for sheet steel substations



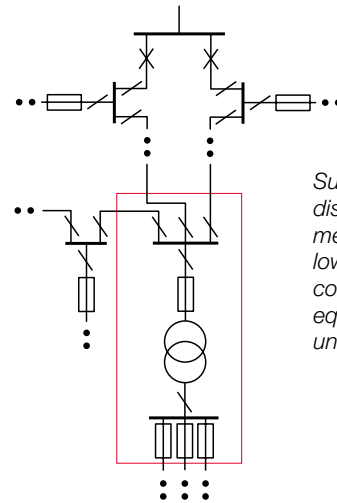
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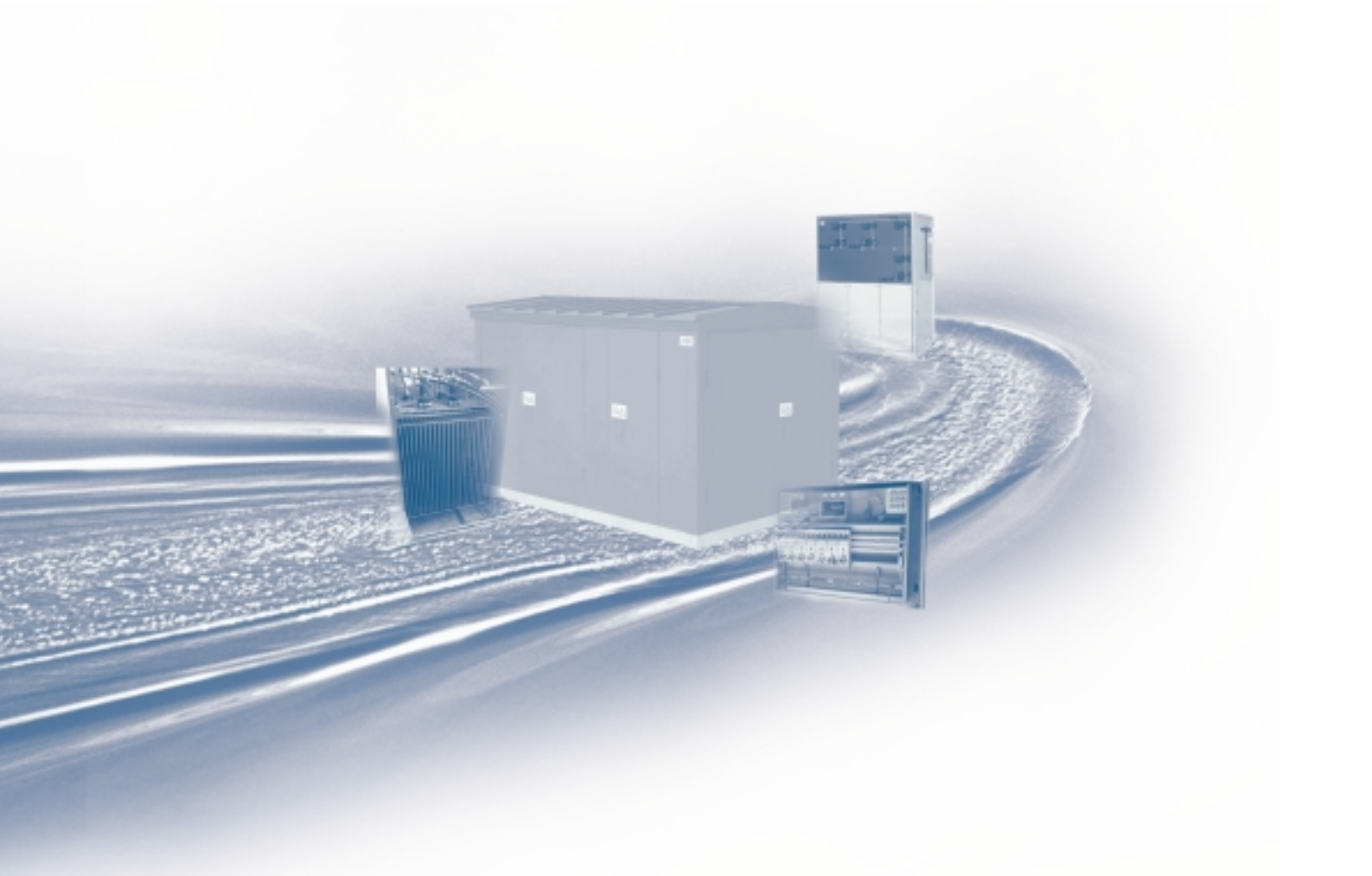


## The New Standard for Individual Solutions

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.



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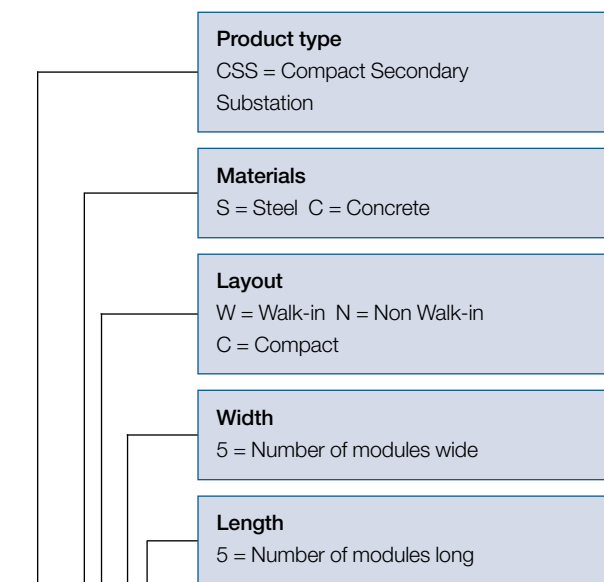
The text and illustrations are intended as guidelines. Reservation for changes.

## 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-SC.5.5

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

## Product overview

### CSS-SW

Walk-in station. Operated from the inside and surface-mounted.



### CSS-SN

Non Walk-in station. Operated from the outside and surface-mounted.



### CSS-SC

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

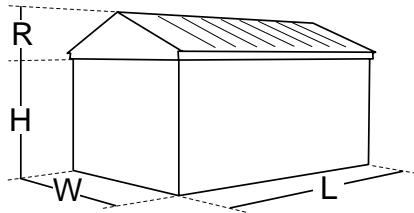


## Modular structure

The buildings in the CSS range consist of 300-mm wide modules (M) plus corner sections measuring 115 x 115 mm. We supply the walls in four different heights and the roof with two angles of pitch, 6° and 18°. The doors are 2, 3 or 4 M wide, and can be fitted as either single or double doors. The ventilation doors are 2 or 3 M wide.

### Standard building sizes

Other sizes may be supplied on request.



W = Widths, mm	4 M	5 M	6 M	7 M
External width, steel	1430	1730	2030	2330
External width, wooden cladding	1490	1790	2090	2390
L = Lengths, mm	5 M	6 M	7 M	8 M
External length, steel	1730	2030	2330	2630
External length, wooden cladding	1790	2090	2390	2690
L = Lengths, mm	9 M	10 M	11 M	12 M
External length, steel	2930	3230	3530	3830
External length, wooden cladding	2990	3290	3590	3890
H = Wall heights, mm	1266	1664	1914	2114
R = Roof heights, mm	Width of building			
	4 M	5 M	6 M	7 M
6° roof pitch	203	219	235	251
18° roof pitch	365	414	463	512

## 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.

Option	Type	CSS-SW	CSS-SN	CSS-SC
<b>Functionality</b>				
Snow panel below doors			X	X
Condensation cover over low-voltage room		X	X	X
Separate room e.g. for communication		X	X	X
Internal emergency handle		X		
Separate oil collection pit		X	X	
Concrete slab as base		X	X	
Lift incl. transformer (depending on the solutions available)			X	X
IP54 in doors		X	X	X
Temperature class K 10		X	X	
Earthing system to 20 kA		X	X	X
Partitioned roof (longer than 3 m)		X	X	X
Cylinder lock in doors		X	X	X
Aluminium foundation plates				X
<b>Styling</b>				
Wooden panels on wall		X	X	X
Alternative colours and surface structure		X	X	X
Increased roof pitch 18 degrees		X	X	X
Alternative roof cladding		X	X	X

# Design



## The building

The building will typically be divided into three rooms for the medium-voltage switchgear, low-voltage switchboard and distribution transformer. All standard modules of walls, doors and ceilings are produced using roller formed sections. The roof has a choice of pitches, 6° or 18°, and is secured to the corner sections by bolts. The whole roof is detachable, and is supported by a beam with ventilation openings.

The doors are fitted as standard with handles for padlocks. The doors are closed by means of a two-point device, which secures the door to the top frame and the base frame. The doors are fitted as standard with stainless steel hinges and are equipped with door stoppers. The wall and roof modules are assembled by means of a self-locking design. Clinching technology is used to assemble walls, roof, doors and foundation. Lifting fittings, corner sections, bearing sections, base plates and cable covers are assembled using bolts. The low-voltage switchboard and the medium-voltage switchgear are bolted to the building.

Walls, roof and doors are made from 1.5 mm AlZn-coated sheet steel with ALC protection. As well as providing protection, ALC also forms an ideal base for the painting process. Once all AlZn parts have been degreased, the whole building is painted with a coat of two-component polyurethane wet paint. Corrosion tests show that the surface treatment of painted materials corresponds to corrosion category C4 H according to ISO 12944. Corrosion protection in the form of hot galvanised foundations and base frames guarantees a long mechanical service life.

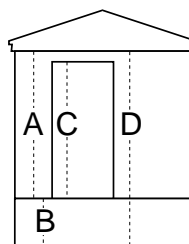
## Foundation or base frame

We supply a model CSS-SC for installation partly below ground level, with a foundation at three different heights: 528, 778 or 978 mm, depending on the size of the transformer. Stations designed for installation at ground level have a 130 mm high base frame.



*Foundation with an integrated oil collection pit.*

Height measurements, mm					
Wall height A	Door opening height C	Internal free height D			
		Type			
		CSS-SW	CSS-SN	CSS-SC	
1266	1140			1790	2040
1664	1538		1790	2188	2438
1914	1788	2040	2040	2438	
2114	1988	2240	2240		
Base height B	Type				
	CSS-SW	130			
	CSS-SN		130		
	CSS-SC			528	
					778
					978

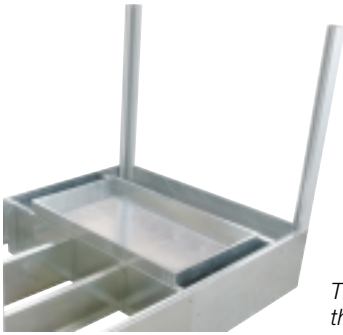


The foundation and base frame are produced using 2 mm hot-rolled steel, and are hot dipped galvanised prior to assembly. An aluminium foundation is also available for Compact stations. All foundations and base frames have detachable panels in front of the medium-voltage and low-voltage

rooms to allow the easy insertion of cables. A CSS for installation at ground level can be supplied with a concrete slab, which reduces installation work on site. The foundation slab matches the size of the substation, and has recesses for cables to the medium-voltage and low-voltage rooms.

### Oil collection pit

CSS solutions that are installed partly below ground are fitted as standard with an integrated oil collection pit made from 1.5 mm galvanised steel. We can supply a separate oil collection pit for stations installed at ground level. The distribution transformer is fitted in the oil collection pit, which has a volume of at least 20% of the transformer's oil volume. The oil collection pit provides protection against oil pollution in case of a leak in the transformer.



*The oil collection pit protects the environment.*

### Ventilation

Natural ventilation is provided by means of ventilation openings for air intake in the lower part of the doors. The air is extracted at the top of the roof. Natural air circulation ensures sufficient cooling of the distribution transformer. The ventilation openings to the transformer room are of the labyrinth type. As standard CSS is classified and type-tested in accordance with temperature class K20. Temperature class K10 can be achieved for all ground-level substations by means of extra ventilation. Extra ventilation is achieved by increasing the ventilation area for the transformer room.



*The ventilation openings in the doors are of the labyrinth type.*

### Protection against internal condensation

To avoid any condensation dripping on to the low-voltage switchboard, an additional cover can be installed over the low-voltage room.

### Partitioned roof

The standard roof of up to 3.8 m in length can be detached in one piece. A partitioned roof can be supplied for stations over 3 m.

### Doors

The standard doors are designed for padlocks. The doors can also be fitted with a cylinder lock.

### Snow panel below door

Snow panels make it easier to open the doors after heavy snowfall. The snow panel replaces the lower third of the door, and is secured to the wall. The snow panel can be removed once the door is open.



### Internal emergency handle

Substations operated from the inside can be supplied with an internal emergency handle, so that the door can be opened even if it has been locked from the outside.

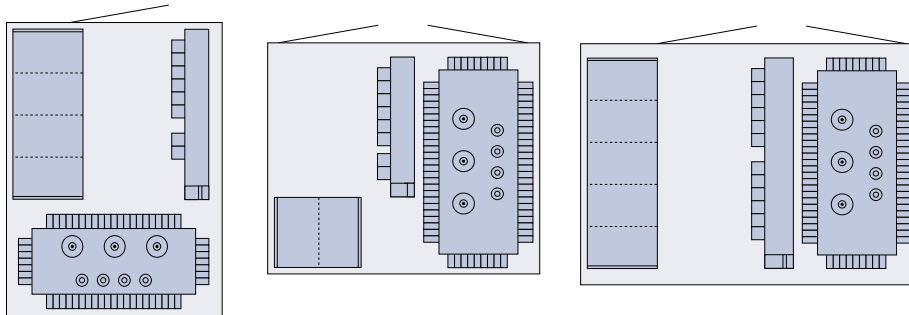
### IP54 degree of protection

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.

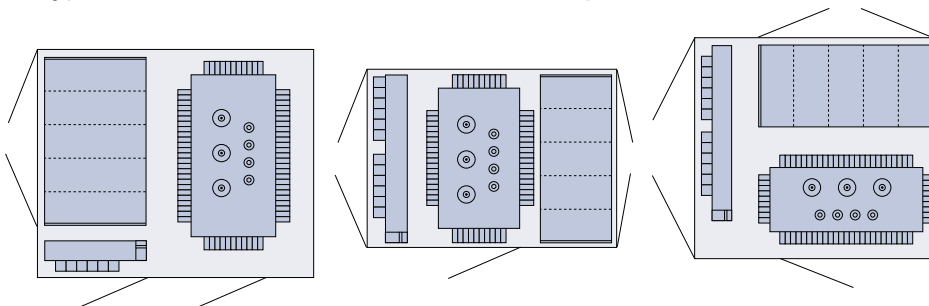
## Solutions available

The modular structure makes it possible to select a design for a substation that guarantees both ideal content and the best access facilities. The solutions shown here are examples of the many options that we can supply.

### Model CSS-SW Walk-in

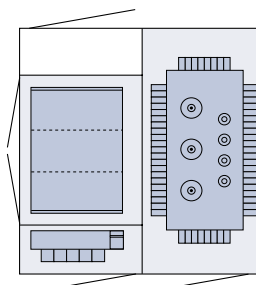


### Type CSS-SN Non Walk-in and CSS-SC Compact

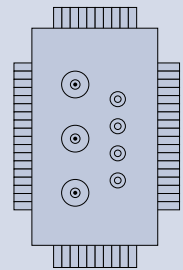


### Separate room for other purposes

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 totally separated 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.*

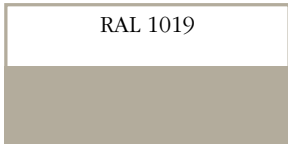
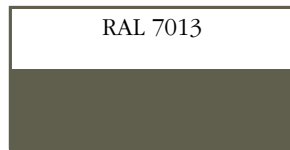
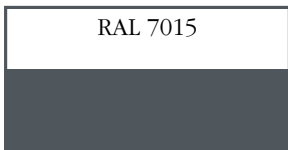


# Exterior styling

## Walls

### Standard wall colours

CSS can be painted in the following standard colours:



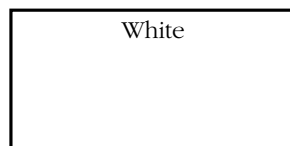
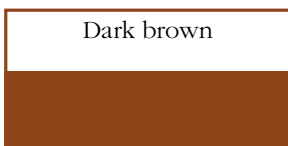
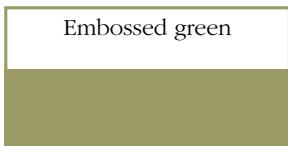
### Alternative exterior styling

In addition to the standard finish, the substation can be painted with a special textured paint containing fine sand. This provides extra texture to the painted surface.



### Alternative wall cladding

CSS can be clad using wooden panels that consist of impregnated boards mounted in metal rails, which are secured to the walls. The rails are fitted with locking pins, which prevent the boards from vibrating. The wooden panels cover all walls and doors. The wooden panels can be painted in various colours.



## Roof

### Standard roof colour

The standard roof colour is the same as the wall colour.

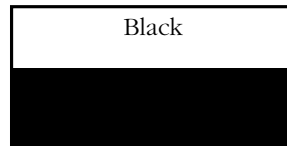
### Alternative exterior styling

The roof is available with a textured finish in the same colours as the walls. We can also supply the roof with a black textured finish.

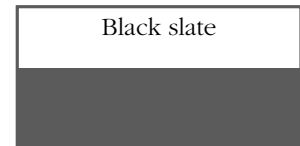
### Alternative roof cladding

The roof can be clad using "tiles" made of sheet steel or using shingles made of roofing felt. The roof can also be fitted with wooden panels. The alternative roof cladding requires a roof pitch of 18°.

#### Tile



#### Shingles



*The painted, profiled surface provides an attractive finish.*

## 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
- SafeRing 12-24 kV
- SafeLink 12 kV
- UniSwitch 24 kV
- NAL unit 12-24 kV
- Fuse-switch disconnectors

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 SF<sub>6</sub> gas as a breaking medium), units with purely air-insulated devices with and without fuses, and a fuse-switch disconnecter.

### Low-voltage switchboard

CSS is designed to house various low voltage 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 1600 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 transformer. The possibility of lifting the substation with transformer depends on the type of station, the solution in question and the transformer size.

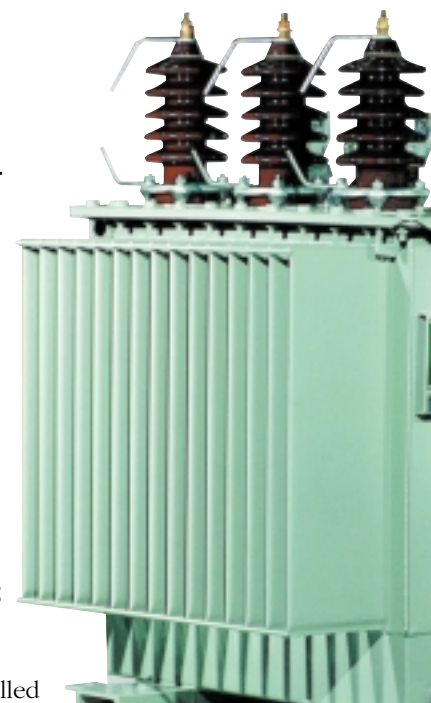
### Cables and cable accessories

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.

SF<sub>6</sub> 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](http://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
- Noise test
- EMC 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. Clinched or screwed connections form electrical connections with all of the station's metal parts. The galvanised steel foundation is bolted to the building. The result is a fully earthed enclosure, providing a high level of personal safety.

### Degree of protection

The standard degree of protection for CSS is IP23D in accordance with EN 60529. If required, CSS can be delivered with doors that comply with IP54, by including gaskets and omitting the ventilation openings in the doors.

### 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 equipment used can withstand harsh climate service conditions.

### 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.

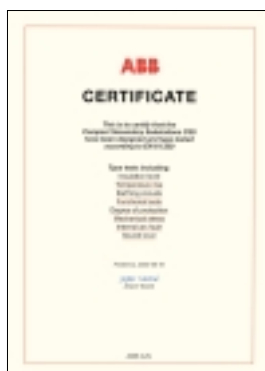


ABB Limited operates a process of continuous product development. We therefore reserve the right to change designs, dimensions and data without prior notice.

The logo for ABB Limited, consisting of the letters 'ABB' in a bold, red, sans-serif font. The letters are slightly shadowed to give a 3D effect.

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