Energy efficient EV charging station
Prefabricated Substation of distribution solution
Who we are - ABB in brief

ABB is a global leader in power and automation technologies. Based in Zurich, Switzerland, the company employs about 140,000 people and operates in approximately 100 countries. The firm’s shares are traded on the stock exchanges of Zurich, Stockholm and New York.

ABB’s business is comprised of five divisions that are in turn organized in relation to the customers and industries they serve. The group is particularly proud of its record for innovation - widely recognized through countless awards and scientific accolades. Many of the technologies we take for granted today, from ultra efficient high-voltage direct current power transmission to a revolutionary approach to ship propulsion, were developed or commercialized by ABB.

Today ABB is the largest supplier of industrial motors and drives, the largest provider of generators to the wind industry and the largest supplier of power grids in the world.
### General Information

**ABB intelligent compact secondary substation**

### CSS Concept

- **Compact Secondary Substation**
  - CSS is a type tested assembly comprising an enclosure containing Medium Voltage switchgear, Distribution transformers, Low Voltage switchboards, connections and auxiliary equipment to supply low voltage energy from medium voltage systems.
  - CSS is for energy transformation in secondary distribution network from MV to LV or LV to MV.
  - Improve power quality (reactive compensation, voltage regulation…), control and protection.
  - These substations are typically installed in locations accessible to the public and should ensure protection for all people according to specified service conditions.
  - All CSS components shall be type and routine tested per their relevant product standards.
General Information
ABB intelligent compact secondary substation

Typical Application

- Transformer
- Main substation
- Secondary substation
- Distribution substation

Transmission substation

- 400 kV
- 130 kV
- 40-70 kV
- 11/22 kV
- 400 V
General Information
ABB intelligent compact secondary substation

Typical Application (Wind)
General Information
ABB intelligent compact secondary substation

Typical Application (Solar)
ABB intelligent Compact Secondary Substation CSS Portfolio

- Unipack
- Magnum
- Ingenious
- CSS-Underground
ABB intelligent compact secondary substation

How beautiful CSS like house people lived

Picture was taken from Europe where is CSS technology transfer from.
ABB intelligent compact secondary substation
How beautiful CSS like house people lived

Run in Harbin China skiing field where held 24th Winter Universidad (the World University Games) Feb. 2009
ABB intelligent compact secondary substation

Typical Achievements

- **Grid**

- **Real estate**
  - 350 pcs. 12KV CSS in Jiangsu province 2010-2013 for residential distribution

- **Rail**
  - 80 pcs. 12KV CSS in Hada high speed railway for signal Power supply.

- **Infrastructure**
  - 22 pcs. 12kV full underground CSS in Beijing Olympic Center Park 2007-2008 for landscape and road lighting.

- **Export**
  - 51 pcs. 12KV CSS in Sultan 2005 for oil field power supply.
ABB intelligent compact secondary substation

Typical Achievements

- Utility power distribution network, thousands of ABB CSS delivered to Local China province as Jiangsu, Zhejiang, Beijing, Chongqing, Liaoning, Qinghai, Tibet, Shandong... and oversea countries, valuable experience accumulated.

- Industrial and mining, ABB had hundreds supply experience in related field

- Wind Power, domestic and oversea wind farm with hundreds supply experience, Jiangsu, Heilongjiang, Pakistan...

- Expressway, hundreds of delivery experience in related field as Hunan express way, Sanfu express way channel CSS, etc.,

- High speed railway signal CSS running in operation with more than hundreds of CSS in Hada, Jianghu line.

- EV Charging, more than hundreds of CSS in Beijing, Jiangsu, etc.,

- Photovoltaic power generation with more than 10 years related experience globally
ABB EV-Charging CSS
Function introduction

- According to the characteristics of electric vehicles to improve the distribution system design
- Adjust the power factor compensation capacity
- Equipped split charging cabinet (cabinet and charging gun settled respectively), charging pile located near the CSS
- Integrated charging cabinet into CSS not only saves the footprint of overall system design, it also simplify the connection and reduce the line loss from CSS to charging equipment, due to only dc transmission without ac reactive loss, which realized the goal of energy efficiency and saving
ABB EV-Charging CSS

Charger characteristics

- Power module adopts three-phase three-wire system 380V ac input, no center line, adopting digital decoupling control, with APFC function, high power factor, low harmonic current, good electromagnetic compatibility

- Three level for the full bridge DC/DC topology with galvanic isolation, digital control, digital synchronous flow technology, high efficiency, low ripple, large range of voltage regulation

- With the intelligent power module and the N+X redundancy distributed control system, the current unbalance degree is less than 3% and a single module failure does not affect the system operation

- New intelligent management concept including scheduling allows to leverage the load current automatically and start the needed number of modules. This leads to a long lifetime, reduce the system looses improving the overall operational efficiency and reducing the energy consumption.
ABB EV-Charging CSS
Typical Layout with 2*150KW Battery Charger
ABB EV-Charging CSS
Typical Layout without Battery Charger
1. Latest Unipack series product with excellent arc protection design, passed the strict harsh test procedure validation of internal arc resistance level, ensure ABB CSS has higher personal safety to protect the operator and general public, internal arc test level IAC-AB-20KA/1S

2. Excellent combination of experience in design and engineering application of natural ventilation, make ABB CSS has good control measures and effect of transformer temperature rise

3. Modular design (exclude Ceres product) with assembling configuration which could realized the best assembly precision and quality, as well as the best anti-corrosion effect
ABB EV-Charging CSS
Priority for Safety

Original/common arc protection design

ABB CSS IAC-ABB test performance
ABB intelligent compact secondary substation

Enclosure Type

- Metal
- GRC
- GRP

Paint of CSS enclosure can be powder painting

Many colours are available, RAL-7032 as default.
ABB EV-Charging CSS Enclosure Features

- Base frame and detachable cover plates are made of 5 mm galvanised sheet steel with at least 40 µm zinc layer to avoid corrosion due to direct contact with foundation & ground
  - Higher mechanical stability needed in base frame due to support all CSS components including transformer
  - Thicker zinc layer is needed for corrosion protection at ground level
- Cover plates in bottom of MV and LV compartments are included for increasing of IP degree and anti-condensation
- Walls, roof, doors and other components are made of sheet steel coated by alloy of aluminum and zinc.
  - Additional protective powder painting system to apply to enhance resistance of atmospheric corrosion.
  - The modular system ensures sufficient mechanical stability & robustness for handling, installation and service
  - Various thicknesses sheet available on request
ABB EV-Charging CSS
Metal Enclosure _ Assembly structure with no welding

- More flexible for various schemes combination.
- Better assembly quality by prefabricated part by program controlling Punch, Bend, Cut machine.
- No welding, can enhance performance of resistance of corrosion.
ABB EV-Charging CSS
Metal Enclosure _ Removable Roof

- Roof has one detachable piece for easy handling during transformer installation
- Standard roof slope of 6 degrees for water runoff
  - Special slope of 18 degrees for unusual weather conditions
- Internal locking available as an option to prevent unauthorized access through roof
- Magnum can be entire lifted and transported by using fixture
ABB EV-Charging CSS Components

- **ABB SafeRing, SafePlus, SafeRing/Plus Air (HV parts)**
  - MV secondary switchgear including incoming feeder, outgoing feeder and transformer feeder as well as metering panel

- **Transformer**
  - 1 or 2 distribution transformers can be installed
  - Oil immersed hermetically sealed or Dry type transformers can be installed
  - Transformer bushings can be located on top or side of transformer as per customer needs
  - Wide range of transformer capacities up to 3300kVA
  - Typical KVA’s: 200, 250, 315, 400, 500, 630, 1000, 1600
  - ABB CSS is designed to allow simple and easy transformer installation on site or integrated into the CSS in the factory

- **LV Switchgear**
  - Incoming options can be direct connected, circuit breakers, fused disconnectors or Load Break Switches
  - The LV busbar rating depends on the transformer rating
  - Various number and ratings of outgoing feeders depending on transformer size and customer needs
  - Equipment for metering, measuring and control available
ABB EV-Charging CSS
Non Dangerous touchable parts

- All busbars are covered for protection against unintentional contact
- A 1.5 mm galvanized steel cable cover is provided for surface mounted CSS to protect the LV cables and grounding system from any damage and to restrict access for personnel safety
- Extra ventilation design to keep busbar ratings within limits available for high temperature environments
- There are no live touchable parts either in MV or LV compartments (safe access for operator)
- LV incoming breaker connections are covered for safety
- Touch components are available that guarantee high level of safety
ABB EV-Charging CSS
Self Cooling

- Air intake in bottom of doors for natural chimney effect and smooth air flow
- Air circulation secures sufficient self cooling of transformer
- Labyrinth type ventilation openings into transformer compartment to prevent foreign materials from entering
- Superior housing design which can maintain inside temperature within limits without forced cooling
- Unipack Series CSS, Temperature rise tested housing with class10. This will increase transformer efficiency within the housing
ABB EV-Charging CSS
Customer Value _ Reliability

- Complete test procedure
  - Strictly routine testing for CSS
    - HV Switchgear GB 3906
    - LV Panel GB 7251
    - Transformer GB 1094
    - Complete CSS GB 17467
• Production and Process
  • Ensure identity by mechanization and automation
  • Intelligence engineering system ensure the accuracy of design and manufacture
ABB EV-Charging CSS

Customer Value – Fulfil Harsh Environment

- Special customized ABB CSS can be applied to special conditions
  - Suitable for the filthy environment
    - HV part completely sealed, cut off from the outside environment of the influence of HV dangerous
    - Internal components without any oxidation, light aging factors, not influenced by damp filthy, foreign body, such as insulation to reduce factors, ensure safe and reliable operation
  - Suitable for the occasion of anti-corrosion
  - Ensure the treatment for exposed external structure
    - Coated aluminum zinc steel plate applied for ensure strong corrosion resistant ability
    - Using electrostatic spraying at the same time, have stronger ability of anti-corrosion performance;
  - Updated product for excellent anti-corrosion (GRP – Glass Fiber Reinforced Polyester)
    - No likelihood of corrosion, long lifecycle, more suitable for harsh environment
    - In light weight
    - Double layer design — Higher mechanical strength, strong impact resistance, low thermal conductivity (thermal insulation/heat preservation), maintain the temperature in the cabinet when environment temperature change drastically (avoids condensation)
ABB EV-Charging CSS
Customer Value _ Lower Maintenance Cost

- Effective control of transformer temperature rise and energy saving
- Highly reliable components operating efficiently reduce maintenance costs
- Few maintenance workload for the sealing chamber structure
- Natural ventilation, maintenance free design can reduce the operational cost
ABB EV-Charging CSS
Customer Value _ Smaller footprint

- Unipack Saturn structure design to achieve maximum space savings
  - Footprint only 6.2 square meter for 800 kVA CSS (HV/3Units, LV/8Feeders, 180 KVA Capacitor compensation cabinet /without charger cubicle)
  - Enclosure temperature rise class 10K
ABB EV-Charging CSS
Customer Value _ Easy installation and expansion

- Integral transportation and lifting including the transformer, Minimize on site working load
- Without any gas operation during installation, time and cost saved
- Modular design for enclosure and RMU, Suitable for extension and expansion needs of customers
ABB EV-Charging CSS
Customer Value _ Smart solution for optional

- Intelligent CSS have “four remote” function, the operation of all equipment of substation in real-time monitoring, control, measurement, and protection, improve the efficiency of power supply and quality
- With the method of distributed monitoring module layout, simplify wiring connection, improve the reliability
- Utilize temperature and humidity monitoring module, upload real-time temperature and humidity data to control center with function of start-stop heater, make CSS in a good running temperature and humidity, improve the safety stability of the substation operation, provide customer with high quality power
- Entrance guard alarm module can prevent unauthorized people getting into CSS
- additional fire smoke alarm upload the smoke signal monitoring center to take measure preventing electrical fires in advance
Minimize the influence for the external environment

Environmental protection and recyclable materials

Thermal insulation performance, function of noise reduction

Extremely low rate of SF6 leakage

Lesser energy loss
ABB EV-Charging CSS
We do have

**ABB Global Resource**
- World’s leading technology and management
- Global integration research and development
- Global supply chain management
- Worldwide marketing and service network

**Customer Orientation**
- Test, design and manufacturing according to Chinese standard
- Comply with local culture, industry regulation and traditional habits

**Localization Production**
- Develop local supporting industrial chain, reduce the production cost
- Rapid market response

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ABB EV-Charging CSS Summary

- Type tested per latest IEC standard 62271-202
- High level of safety for personnel & equipment
- Reliable and friendly to environment
- Wide range of ratings & capacities in steel or concrete housing
- Complete ABB components portfolio
- Global leader with huge installed base, global service coverage and high level of engineering capabilities
ABB CSS factories at 12 sites in 12 countries

BR, Sao Paulo  
ZA, Johannesburg  
NZ, Auckland  
NO, Skien  
EE, Tallinn  
CH, Zuzwil  
EG, Cairo  
SA, Riyadh  
IN, Nashik  
VN, Hanoi  
CN, Beijing  
AU, Sydney

Contact Your local FES representative
UniGear 500R, Arc-proof, air insulated switchgear

Another step completing UniGear platform

- UniGear 500R: Compound with ABB other unigear product family such as ZS1, UG550
  - Compact footprint
  - Maintenance free

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UniGear 500R, Arc-proof, air insulated switchgear
Section view

- Inspection window
- 3 position DS
- CB mech.
- LVC
- 3 position DS
- CB
- Current transformer
- Cable cubicle
- BB cubicle
UniGear 500R, Arc-proof, air insulated switchgear

Product features

- Panel width **Only 500 mm**
- Close to wall installation
- Small passage width requirement for operation and maintenance

- Complete fix connection, maintenance free
- Visible status for 3 position DS
- DE imported VI
- Mech. mimic indicator

- Intelligent control and protection
  - IEC61850 compliant
  - GOOSE communication

- No SFT
- RoHS guidelines
UniGear 500R, Arc-proof, air insulated switchgear
Small footprint

- Highly space efficient solution
- Great reduced maintenance, don’t need service trolley
- Leave plenty of room for expansion

### Comparisons

- **UniGear 500R**
  - Footprint: 6.7m²
  - Save: 44%

- **KYN28**
  - Footprint: 12m²
  - Save: 57%

- **XGN**
  - Footprint: 15.4m²
  - Save: 57%
UniGear 500R,Arc-proof, air insulated switchgear

Digital solution

- **Safe and reliable**: Increases equipment reliability; Increases safety level in your substation; Extended communication supervision functionality is available
- **Simple and efficient**: Minimizes lifetime costs during switchgear operation; Saves space in your switchgear room by reducing switchgear footprint; Offers 30% quicker delivery time from order to switchgear operation *
- **Intelligent and ready for the future**: Provides flexibility towards varying load flows; Provides flexibility during switchgear operation; Offers possibility of late customizations and changes
- **Lower environmental impact**: Lowers energy consumption up to 250 MWh ** which represents saving of 13 000 EUR; Saves up 150 tons of CO2 **, that is equal to emissions produced by mid-size European car driven for 1 250 000 km

1 Busbar side voltage sensor
2 Current sensor
3 Cable side voltage sensor
UniGear 500R, Arc-proof, air insulated switchgear
Case study _ EV charging bus station

- EV charging bus station
- 4000kVA PS
- 10kV SWG truck
- 35kV SWG truck
ABB CNTHB
We will provide you with…

- RMU and CSS products with high quality
- Smart Design and Solution
- Production localization and fast delivery
- Customer orientated and 7 day *24 Hours after-sale service
Power and productivity for a better world™