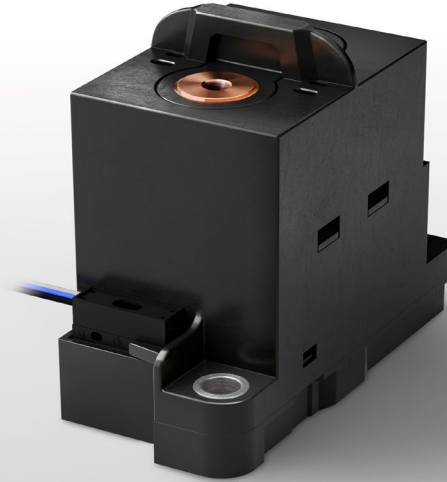


eddicy

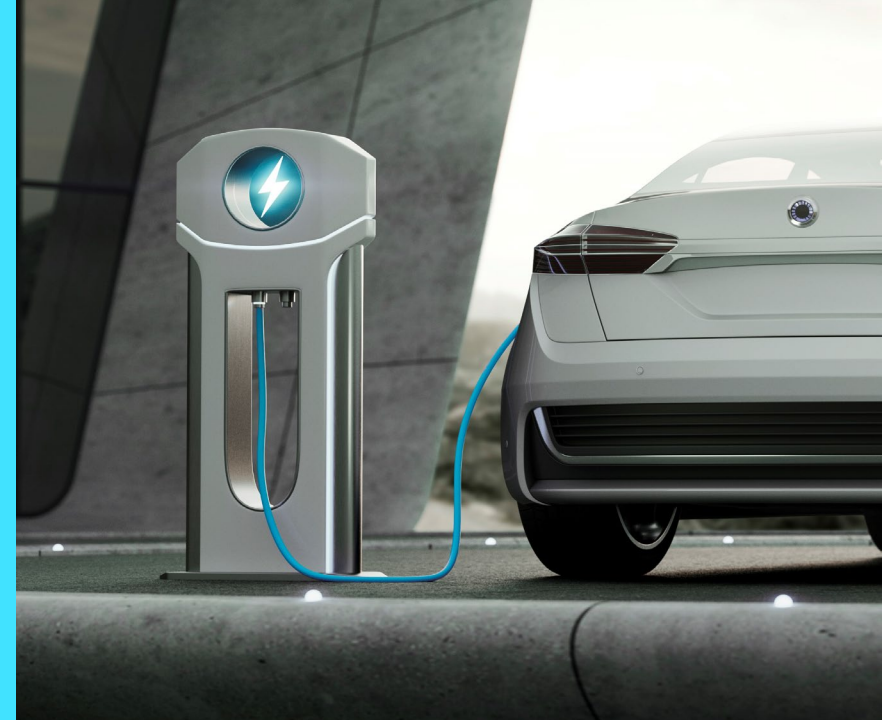
A Schaltbau Brand

Eddicy

Introduction, Portfolio &
Application



DC



Schaltbau is a global industry leader specializing in DC power and providing products and solutions that enable electrification

1929

Founded



1,000

Employees
worldwide



3

Core Markets



25

Sales partners



12

Production and
sales sites

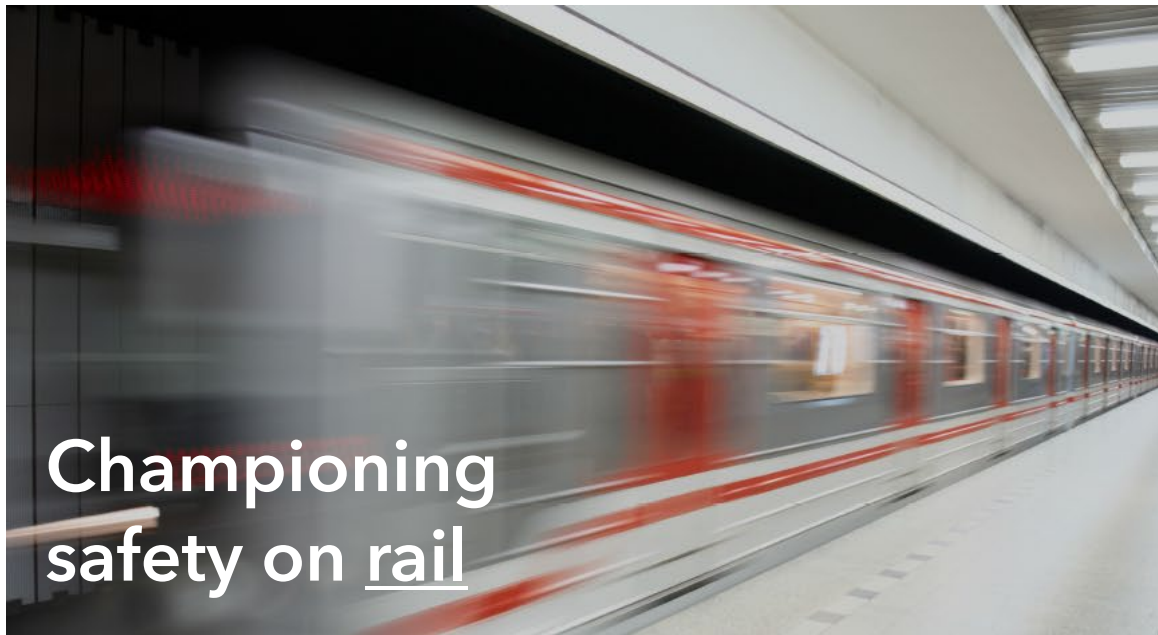


€ 176m

Sales in FY2023



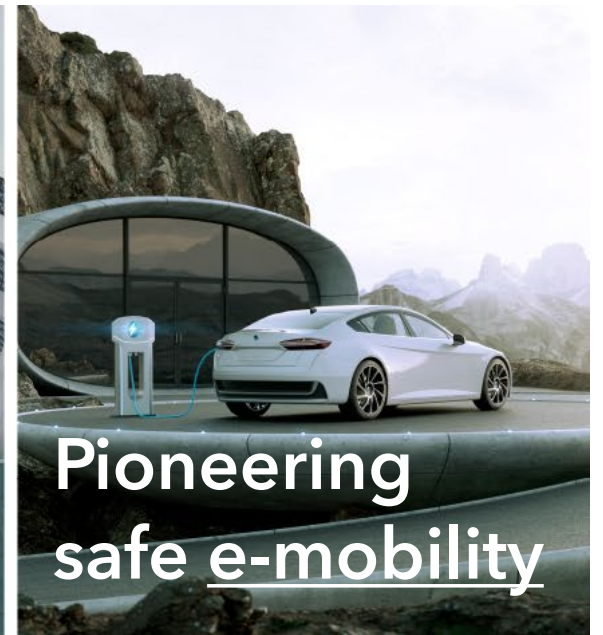
As pioneers of electrification, Schaltbau help partners and customers solve today's challenges in rail, energy, and e-mobility



Championing
safety on rail



Unlocking
the green
energy
potential



Pioneering
safe e-mobility



eddicy A Schaltbau Brand

Our broad portfolio of contactors, connectors, switches, and other electrics sets the benchmark for safety and efficiency in our markets

Contactors

Our contactors play a crucial role in rail, energy, and e-mobility as they seamlessly control power distribution, enable smooth acceleration, deceleration, and support an efficient energy utilization.



Connectors

Our connectors are designed to ensure reliable transmission of energy and signals – coping with high voltages, harsh environments, and the rough conditions of rail, energy, and e-mobility applications.



Snap action switches

Snap action switches quickly change from one state to another. This distinctive characteristic makes them ideal for safety applications in rail, energy, and e-mobility.



Electrics for rolling stock

From footrests and displays to fully equipped driver desks: we also have a broad portfolio of electric devices ensuring both ergonomics and safety in rail.



In the energy sector, we serve applications that enable a green and sustainable future.

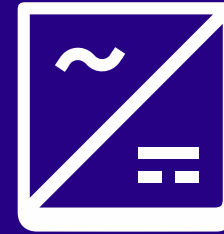
EV Charging



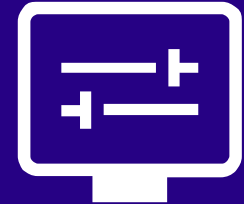
Energy Storage



Power Conversion



Test Benches

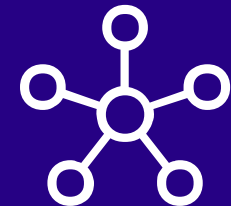


Data Center



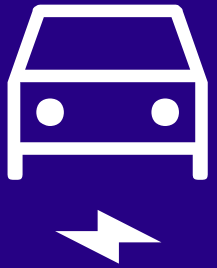
eddicity A Schaltbau Brand

DC Microgrids



In the field of E-mobility, we enable the electric transport of people, goods, and freight.

Automotive



Commercial Vehicles



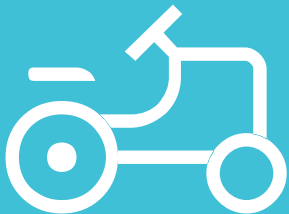
Intralogistics



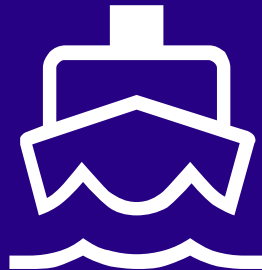
Heavy Duty



Agriculture



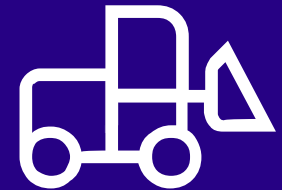
Marine



Aviation



Speciality Vehicles



Bidirectional DC Contactors

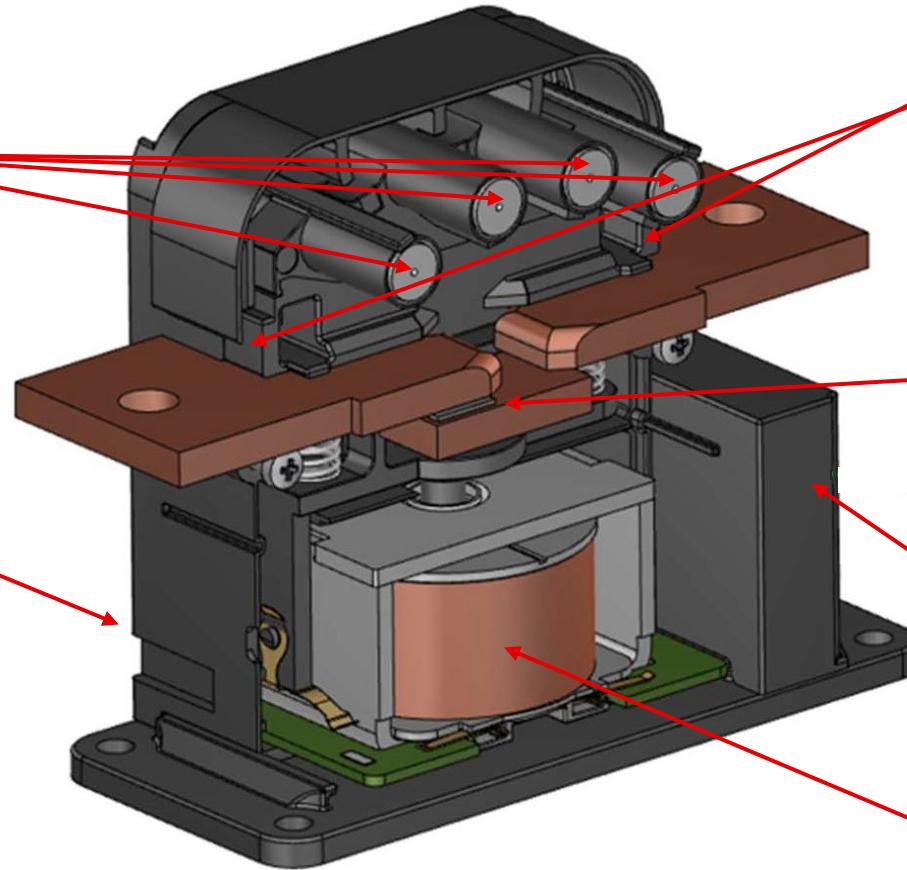
Open-Air technology

Permanent Magnets

Stretch and cool the arc within the arc chamber towards the partitioning blades, without minimum current considerations.

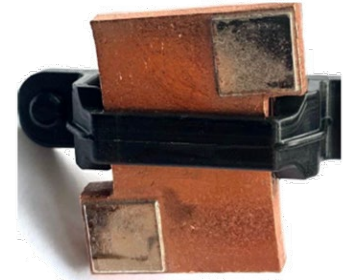
Auxiliary Contacts

Mirror contact function regarding to EN6047-4-1 Annex F (Aux is attached, not affecting the footprint)



Vents

Prevent overpressure and allow natural convection cooling within the arc chamber (no encapsulated gas).



"AgSnO2" Contact Tips

Silver Tin-Oxide provides the best arc erosion resilience and a very low contact resistance, leading to a lower power dissipation, better ability to carry high inrush currents, and a longer service life

Coil Economizer

Reducing the consumption at a few Watts only !

Controlling the coil temperature and adapting the current to avoid micro arcing effect.

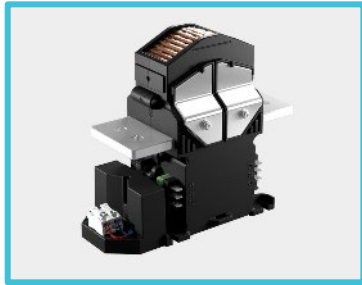
Coil

Different versions available, depending on the application needs.

Products Highlight :

Bidirectional DC-Contactors

NEW



CP

3000 V
1200 A -
2000 A

C320

1500 V
1000 A

C300

1000 V
500 A

C303

1000 V
350 A

C310

1000 V
150 A -
500 A

AFS

48 - 80 V
80 A -
150 A
250 A

Applications Highlight

Building a better tomorrow, today

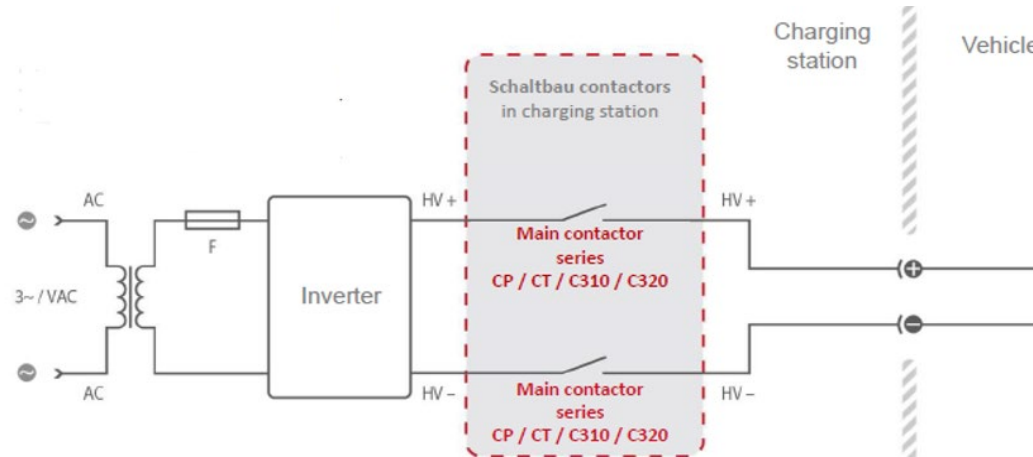
Advantages in DC applications :

- ❖ Robust design (no contact welding)
- ❖ AgSnO₂ contact tips (very low contact resistance)
- ❖ Fully Bi-directional (V2G and V2X ready)
- ❖ Reliable aux. contact (mirror contact function to IEC 60947-4-1, annex F)



EV Charging stations

For tomorrow's mobility solutions



C303



C300



C310



C320

SB Application for EV Charging

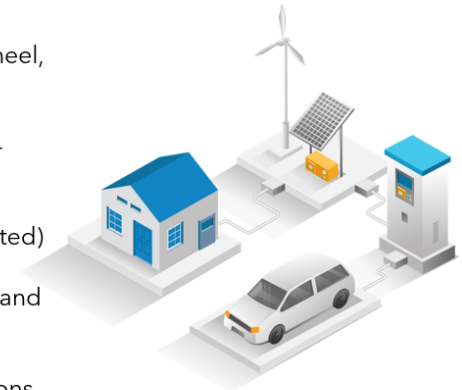
Why is there a need for Charging stations?

- Overall transition to electrical vehicles (passenger, commercial, heavy duty vehicles)
- Passenger cars
more stations and increased charging power to reduce range anxiety
- Commercial vehicles
more stations for fleets supporting
- Heavy duty vehicles
Megawatt charging systems (MCS) are under development to supply a huge charging power in minutes

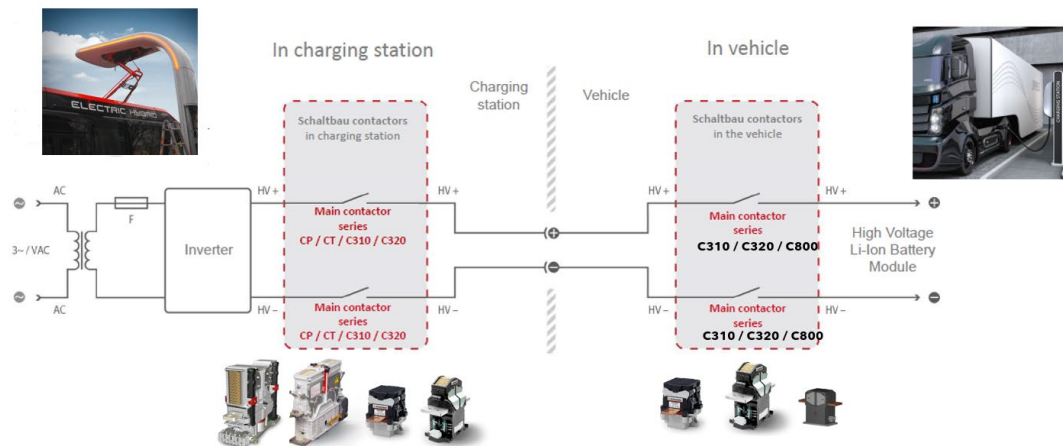


How does a charging station work?

- A connection to energy source: grid, battery buffer, fly wheel, PV panel, ethanol tank
- Energy conversion inside a power conversion unit (AC->DC)
- Energy distribution to one several loads (vehicles connected)
- The use of a connected vehicle as an energy buffer (V2G and V2X)
- Contacts (both + and -) to be disconnected for safety reasons



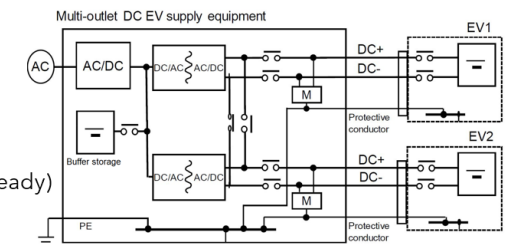
General Overview - Schaltbau Contactors in EV-Charging



Schaltbau Contactors - Competitive Advantages

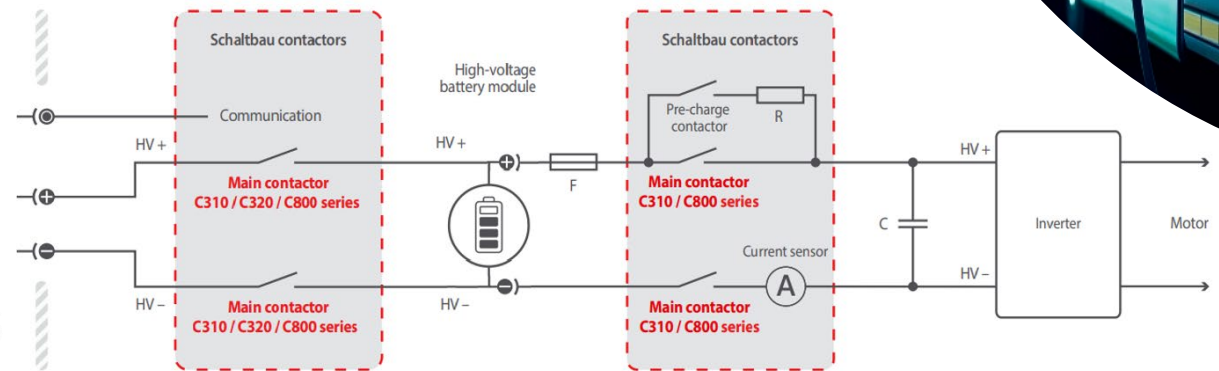
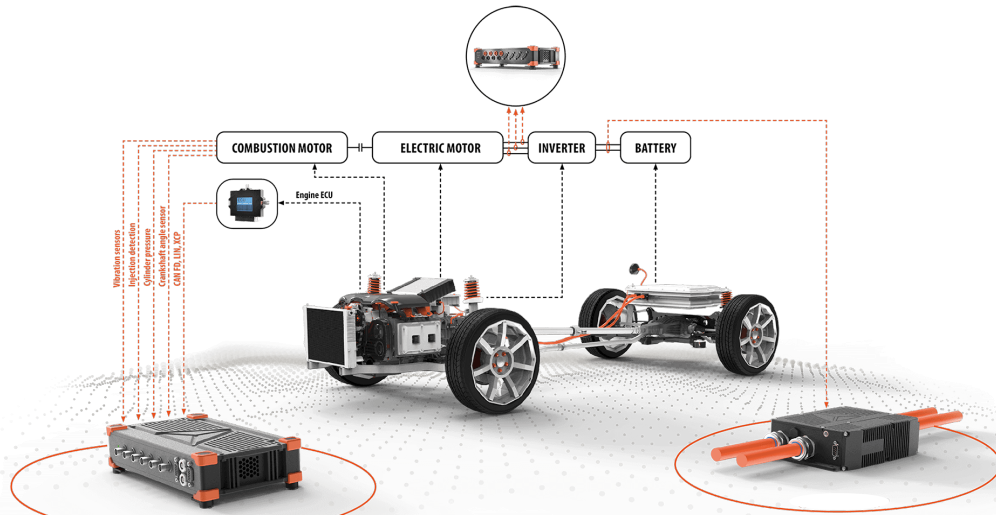
Typically used contactors: C300, C310, C320

- Excellent isolation parameters (up to 1,500V)
- Reinforced isolation at specific variants
- High bi-directional current interruption capability (V2X ready)
- Robust design (non encapsulated)
- Very low contact resistance (low heat dissipation - high current carry capability)
- Robust „contact-tip“ design (lowest probability of „stuck-on“ failure)
- Auxiliary contacts for safe feedback loop acc. to IEC 60947-4-1, Annex F
 - Mechanically linked to the main contact
 - „Diagnostic Coverage“ up to 99%



E-mobility

Control of high voltages in e-vehicles



C303



C800



C310



C320

SB Application Definition for e-Mobility (non-IATF)

What is considered as e-Mobility?

Unlike to huge and slow running automotive OEMs, which require IATF certification and control everything on our side, there is a number of smaller, but more flexible, easy going and quite prospective battery driven applications.

Demarcation to Business Segment Automotive:

- Non passenger cars
- No specific standards required (e.g. IATF 16949)

Examples: Off-Highway, Municipal vehicles, Light Commercial Vehicles (LCV), Utility vehicles, Heavy Duty vehicles, Agriculture vehicles, Mining, Special purpose vehicles, etc.



What's special about e-Mobility?

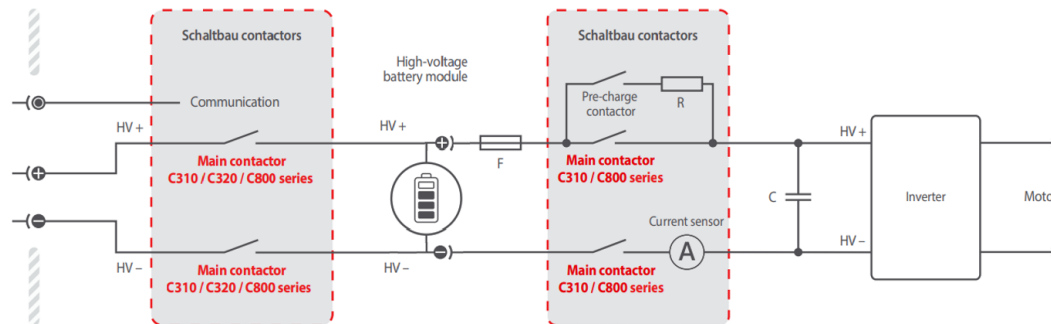
There is a huge demand on those vehicles, as:

- Government incentives are there
- Safe operation in dangerous areas (mines) is required
- Access to urban zones might be restricted
- Quiet operation is important
- Fleet management is easier

There is a battery inside of every single vehicle which is to be mechanically connected and disconnected to/from a charger and a motor so there is a demand for contactors.



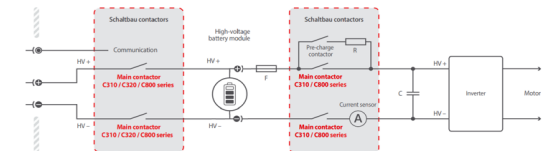
General Overview - Schaltbau Components in E-Mobility



Schaltbau Components - Competitive Advantages

Typically used contactors: C300, C310, C320

- Excellent isolation parameters (up to 1,500V)
- Reinforced isolation at specific variants
- High bi-directional current interruption capability
- Robust design (non encapsulated)
- Very low contact resistance (low heat dissipation - high current carry capability)
- Robust „contact-tip“ design (lowest probability of „stuck-on“ failure)
- Auxiliary contacts for safe feedback loop acc. to IEC 60947-4-1, Annex F



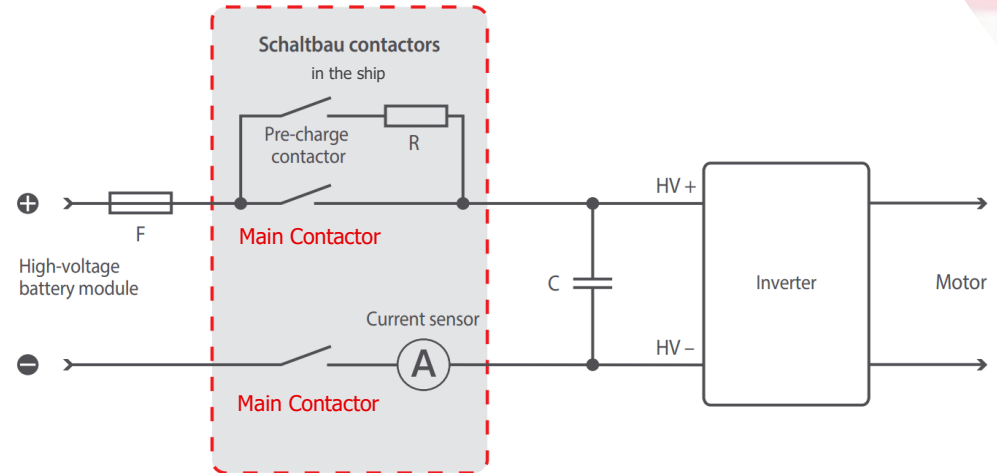
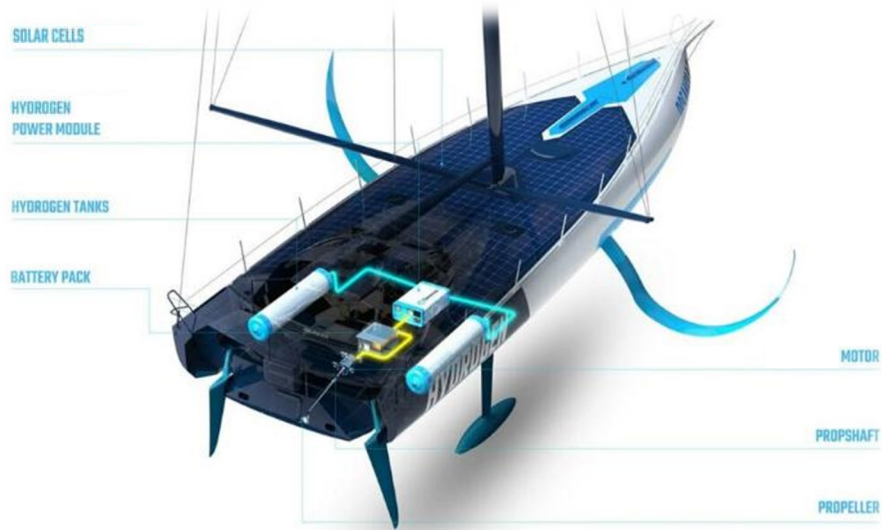
New Approach: HV-DC Connector

- Up to 1000VDC
- Up to 470A
- Robust design (railway origin)



Marine

Charging towards decarbonization on water



C303



C360



C320



CP

DNV Certified !

SB Application Definition for Electrified marine systems

Why is there a need for Electrified marine propulsion systems?

- Reduced emissions and lower carbon footprint (ships transport about 80% of world's commodities)
- Governmental regulations
- Higher efficiency with decentralised system
- Less maintenance and lower operating costs
- Noise reduction – important for tourism
- Global trend

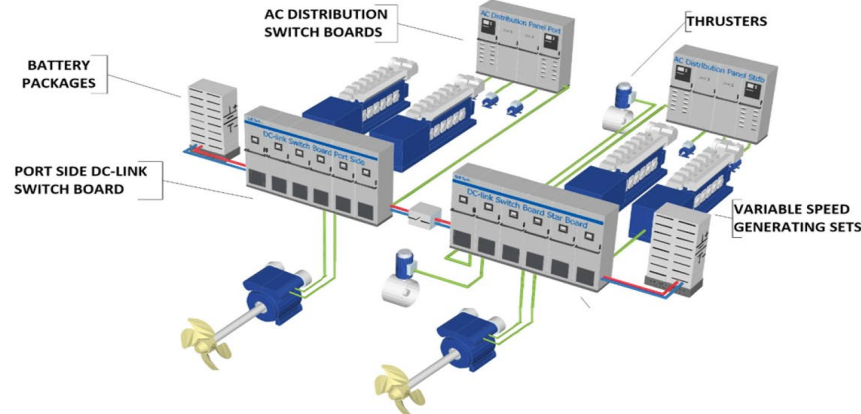


What's special about Electrified marine systems?

- Can be considered as a mix of BESS (battery energy storage system) and eMobility example
- Both hybrid and full electric vessels are in use
- Battery size and number of electrical drives depend on ship – huge variety and no universal solutions
- Till now mostly ferries, tug ships and touristic boats are fully electric. For cargo and cruise ships battery technology is not really developed



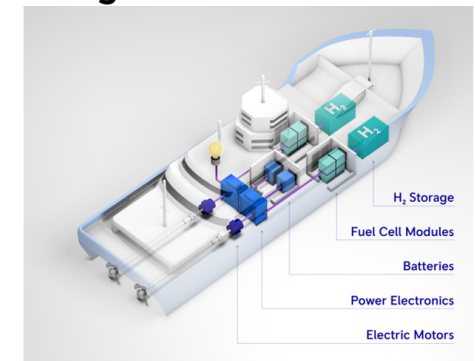
General Overview - Schaltbau Contactors in Electrified Marine Systems



Schaltbau Contactors - Competitive Advantages

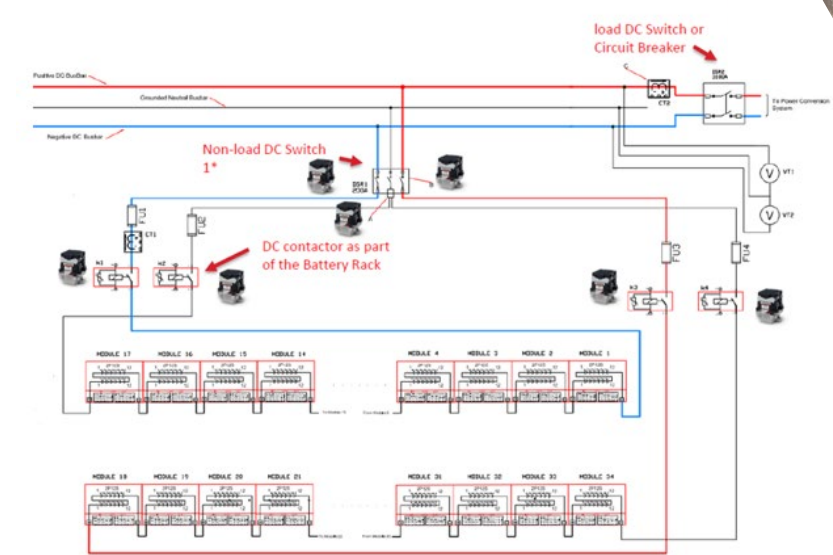
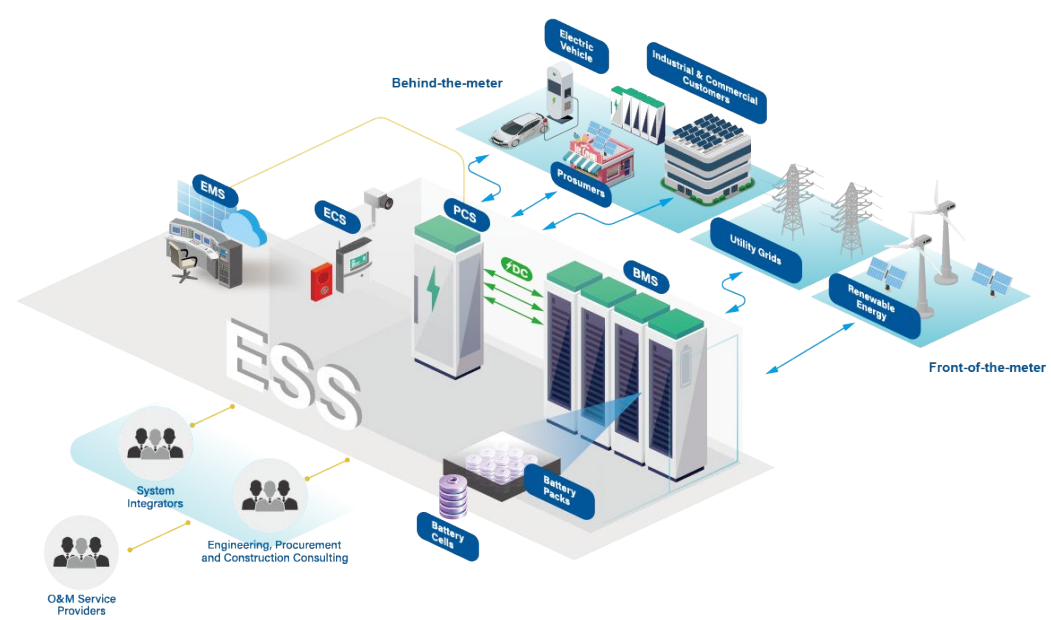
Typically used contactors: CT, CP, „BESS contactors“

- Excellent isolation parameters
- High bi-directional current interruption capability
- Compact design (compared to commonly used solutions)
- Very low contact resistance (low heat dissipation – high current carry capability)
- Auxiliary contacts for safe feedback loop acc. to IEC 60947-4-1, Annex F or IEC 60077



Energy Storage (BESS)

Safety of energy storage systems



C300



C310



C320

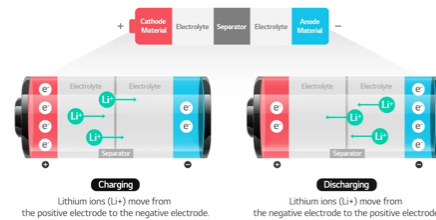


CP

SB Application for Energy Storage System (ESS/BSS)

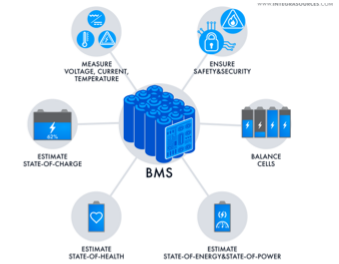
Why is there a need for Battery Storage Systems (BESS)?

- Easy opportunity to store Energy with LI-Ion batteries
- Surplus power needs to be stored
- Advantage in domestic use
 - → lower energy costs in combination with PV plant on the roof
- Industrial Energy Storage for grid stabilization
- Grid Decentralization
- Electric Vehicle Charging Infrastructure

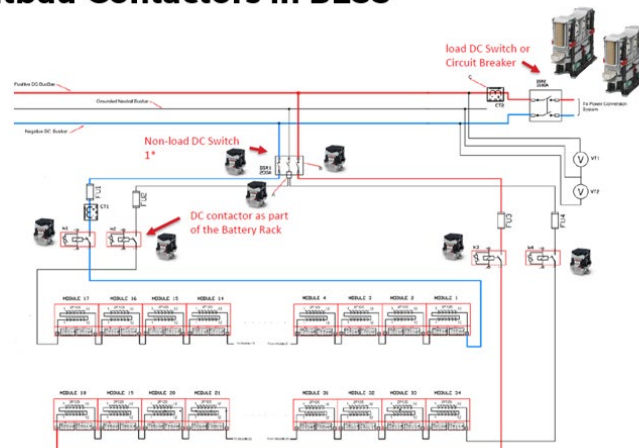


How does a BESS works?

- Electrical Energy will be converted to chemical energy in cell
- Cells are connected in to battery packs/modules
- A battery management systems (BMS) takes cares about the cells
- Both energy store and energy release are foreseen (charge and discharge)



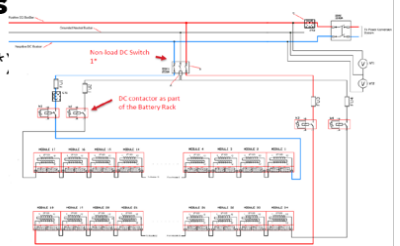
General Overview - Schaltbau Contactors in BESS



Schaltbau Contactors - Competitive Advantages

Typically used contactors: C300, C310, C320, C110B, AFS, (MD500)*,

- Excellent isolation parameters (up to 1,500V)
- Reinforced isolation at specific variants
- High bi-directional current interruption capability
- Robust design (non encapsulated)
- Very low contact resistance (low heat dissipation – high current carry capability)
- Robust „contact-tip“ design (lowest probability of „stuck-on“ failure)
- Auxiliary contacts for safe feedback loop acc. to IEC 60947-4-1, Annex F
 - Mechanically linked to the main contact
 - „Diagnostic Coverage“ up to 99%

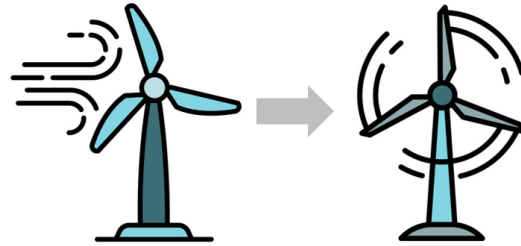


* No project yet – general suitability for application is given

SB Application Definition for Wind Energy Systems

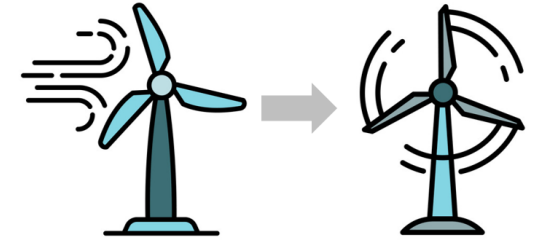
Why is there a need for wind power plants?

- Decarbonization is necessary
- Since ancient times wind and water power are used
- No fossile energy needed
- No carbon footprint during operation
- Energy Independence
- Reduction in Water Usage



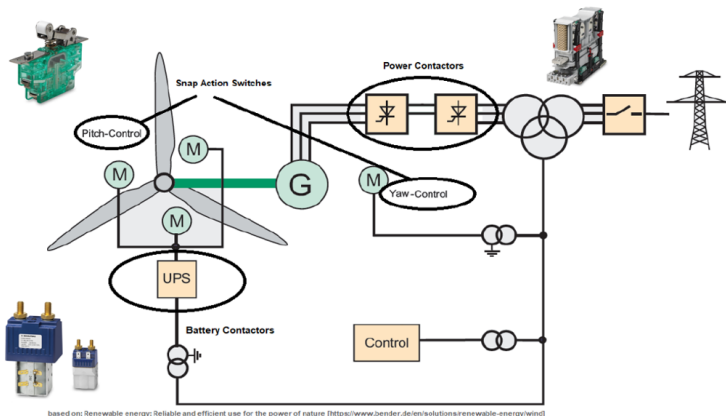
How does a wind turbine works?

- Air flow through the rotor blades causes rotate
- Kinetic energy is transformed to electricity
- The speed of rotation can controlled by the position of the Rotor blades
 - vane position → no rotation
- Nacelle can also rotate for optimised wind tracking



General Overview - Schaltbau Components in Wind Energy Systems

- CP/CT Contactors
- Battery Contactors
- Snap action switches



based on: Renewable energy: Reliable and efficient use for the power of nature (<https://www.schaltbau.de/en/solutions/renewable-energy/wind>)

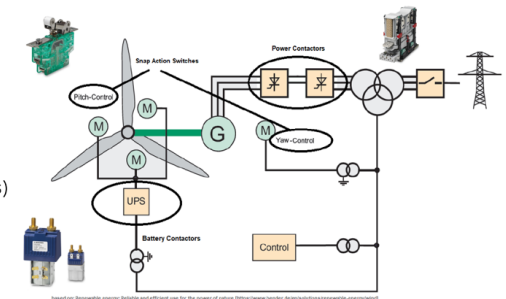
Schaltbau Contactors - Competitive Advantages

Typically used contactors: CT, CP, „BESS contactors“

- Excellent isolation parameters
- High bi-directional current interruption capability (also suitable for low frequency AC, that's similar to DC)
- Compact design (compared to commonly used solutions)
- Very low contact resistance (low heat dissipation - high current carry capability)

Typically used snap action switches: S880

- Compact, cost efficient, reliable



based on: Renewable energy: Reliable and efficient use for the power of nature (<https://www.schaltbau.de/en/solutions/renewable-energy/wind>)

Intralogistics

Safe intralogistics with DC contactors and connectors



C130 Combi



C100



C303

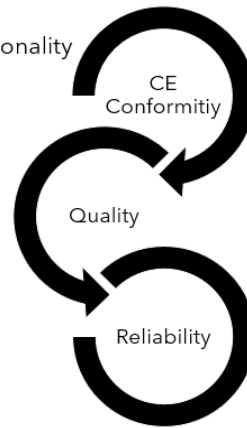


LV

SB Application Definition for Test bench

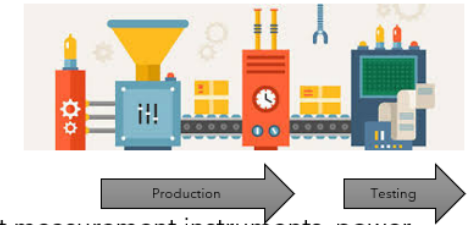
Why is there a need for Test Benches?

- Every supplier has to take care for his sold products for safety and functionality
 - CE Conformity
 - Products according the standards → e.g. contactors EN60947-4-1 and EN60077-2
 - Directives from the EU → e.g. machinery directive
- Quality
- Reliability

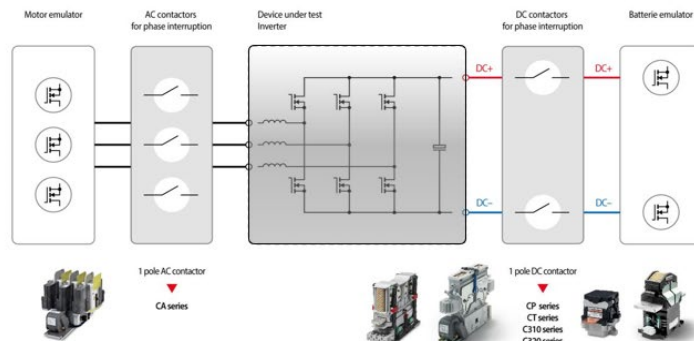
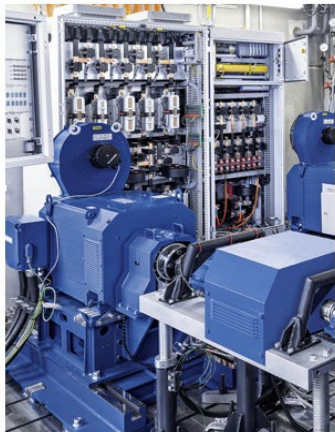


What is a test bench?

- A system to test the function and defined parameters of a DUT
- Theoretically every measurable value can be tested
- End-of-Line testing (fixed parameters)
- Development test bench (variable parameters)
- Contactors and relays are used to connect the different measurement instruments, power supplies, converters, etc. to the DUT during the test sequences



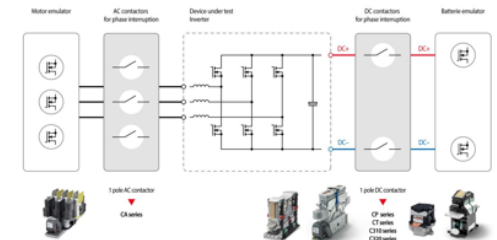
General Overview - Schaltbau Contactors in a Converter Test Bench



Schaltbau Contactors - Competitive Advantages

Typically used contactors: complete [SB-Portfolio](#)

- Excellent isolation parameters (>6,000V*)
- High bi-directional current interruption capability
- Special variants for AC / higher frequency AC
- Robust design (non encapsulated)
- Very low contact resistance (low heat dissipation - high current carry capability)
- Robust „contact-tip“ design (lowest probability of „stuck-on“ failure)
- Auxiliary contacts for safe feedback loop acc. to IEC 60947-4-1, Annex F or IEC 60077-2



* under specific circumstances (e.g. PD2/OV2)

**"Together, we will
electrify the world
for a sustainable,
carbon-free future."**

Steffen Munz,
CEO Schaltbau
GmbH Group





SCHALTBAU

Discover more on our website
www.schaltbau.com