

Product Brief 2020

High-Voltage Contactors

Gas-Filled Contactor for High-Voltage DC Disconnection Applications

The HVC series by TDK has been designed to meet the requirements of high voltage DC disconnection applications.

The hermetically sealed design based on our gas filled technology experience exhibits excellent reliability in harsh environments. The HVC series are made for fast and reliable switchings.

Features

- Up to 1200 V DC
- Up to 500 A DC
- Up to one million nominal switching cycles
- Unipolar and bipolar design
- UL, CE, CCC
- Contactless stuck detection available

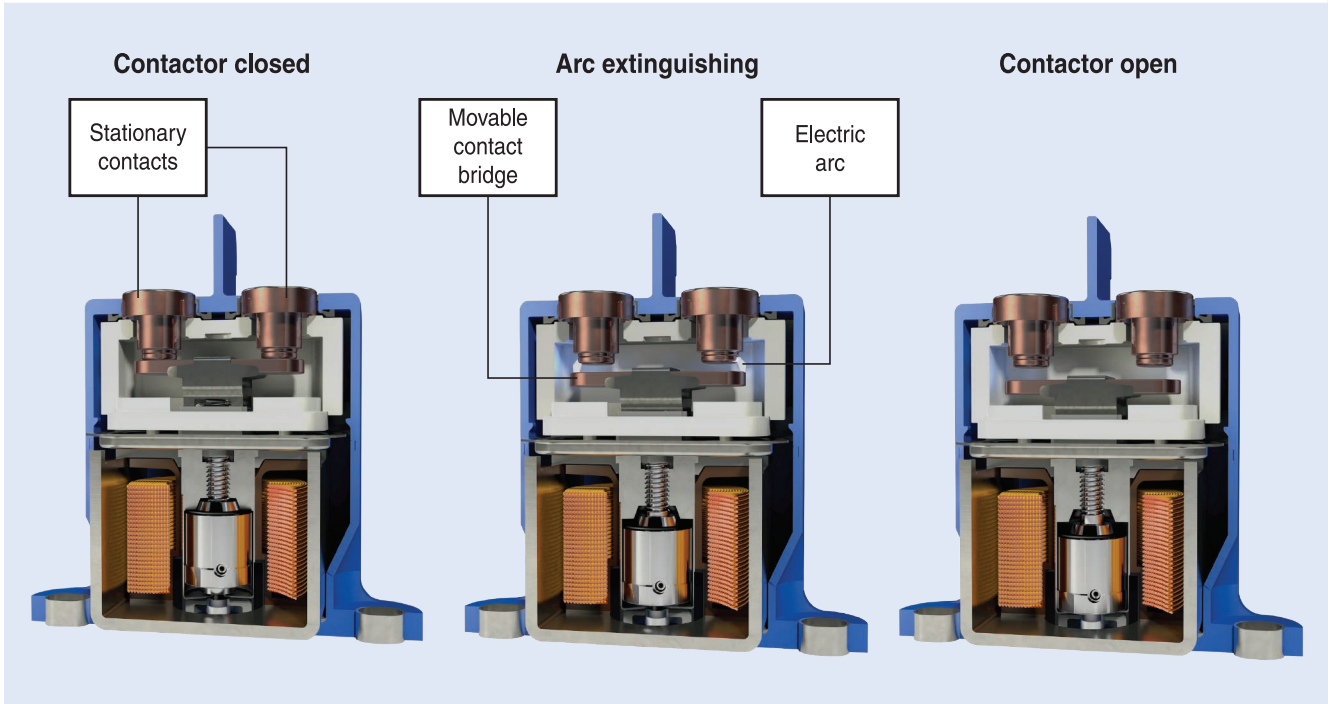
Applications

- DC fast charging stations
- Battery disconnect units and battery junction boxes in electrical vehicles
- Energy storage systems



High-Voltage Contactors for High-Voltage DC Disconnection

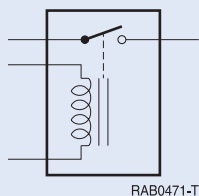
Operating principle



The HVC series are specially designed to disconnect DC circuits. A major challenge is the electric arc occurring between the stationary contacts and the moveable contact bridge, whenever the contacts separate. An uncontrolled electric arc would burn the contacts. This would lead to a decrease of life-time or in worst case to the contacts being stuck. Especially at high voltages extinguishing the arc needs to be taken care by design. Our decade-long experiences with electric arc, gas and ceramic made it easy for us to address the challenge.

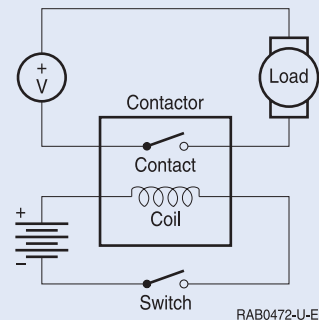
HVC series features two magnets along the side of the stationary contacts and the contactors bridge, letting the arc run along the side to move it away from the contact points to avoid direct contact and therewith higher abrasion. In addition, the arc must cover a longer distance and over the distance the arc loses energy, which supports extinguishing.

Contact arrangement



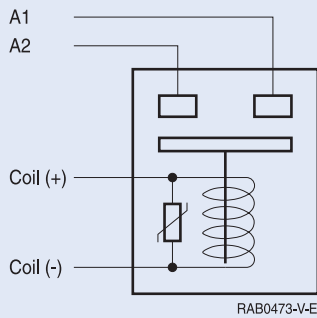
Form "A" NO, SPST
NO: Normally open
SPST: Single pole, single throw

Example circuit



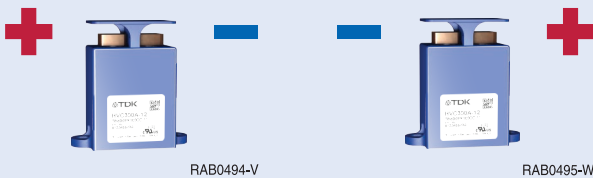
High Voltage Contactors for High-Voltage DC Disconnection

Single coil



Single coil

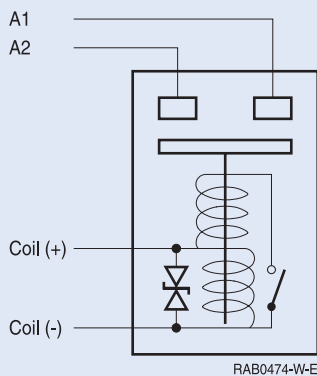
- No coil inrush during switch-on
- Only 6 W energy consumption
- Bipolar design without any preferred polarity of the main contact
- No economizer required
- Coil termination included



Bipolar design

- The polarity of the HVC series can be reversed.

Dual coil



Dual coil

- Dual coil design for highest switch-on performance and highest inrush capability
- 3000 times switch-on and off of 300 A at 450 V (unipolar design)
- 1000 times switch-on and off of 300 A at 750 V
- Only 4 W energy consumption in steady state after start-up phase
- Coil termination included
- Available as unipolar (E) and bipolar (E2) design

High-Voltage Contactors for High-Voltage DC Disconnection

Specification single coil version ¹⁾						
Type	HVC200A		HVC300A		HVC500B	
Contact						
Max. operating current	200 A		300 A		500 A	
Max. operating voltage	1000 V		1000 V		1000 V	
Contact resistance (typ.)	0.125 mΩ		0.125 mΩ		0.125 mΩ	
Contact resistance (max.)	0.25 mΩ		0.25 mΩ		0.25 mΩ	
Coil						
Coil voltage	12 V	24 V	12 V	24 V	12 V	24 V
Coil voltage range	9 ... 16 V	18 ... 32 V	9 ... 16 V	18 ... 32 V	9 ... 16 V	18 ... 32 V
Coil pick-up voltage range (max.)	9 V	18 V	9 V	18 V	9 V	18 V
Coil drop-out voltage range (min.)	1 V	2 V	1 V	2 V	1 V	2 V
Coil power	6 W	6 W	6 W	6 W	6 W	6 W
Electrical characteristics						
Operating time switch on	< 35 ms		< 35 ms		< 35 ms	
Operating time switch off	< 15 ms		< 15 ms		< 15 ms	
Insulation resistance at 500 V (initial) contact to contact / contact to coil	1 GΩ		1 GΩ		1 GΩ	
Dielectric strength contact to contact / contact to coil	> 4400 V AC		> 4400 V AC		> 4400 V AC	
Auxiliary contact REED (optional)						
Max. voltage	36 V		36 V		36 V	
Max. current	250 mA		250 mA		250 mA	
Max. switching power	3 W		3 W		3 W	

1) Higher operating voltage, different coil voltage, auxiliary contact, voltage sensor and temperature sensor upon request.

High-Voltage Contactors for High-Voltage DC Disconnection

Specification dual coil version ¹⁾						
Type	HVC200A-...E		HVC300A-...E		HVC500B-...E	
Contact						
Max. operating current	200 A		300 A		500 A	
Max. operating voltage	1000 V		1000 V		1000 V	
Contact resistance (typ.)	0.2 mΩ		0.2 mΩ		0.2 mΩ	
Contact resistance (max.)	0.3 mΩ		0.3 mΩ		0.3 mΩ	
Coil						
Coil voltage	12 V	24 V	12 V	24 V	12 V	24 V
Coil voltage range	9 ... 16 V	18 ... 32 V	9 ... 16 V	18 ... 32 V	9 ... 16 V	18 ... 32 V
Coil pick-up voltage range (max.)	9 V	18 V	9 V	18 V	9 V	18 V
Coil drop-out voltage range (min.)	1 V	2 V	1 V	2 V	1 V	2 V
Coil power after 120 ms (pick-up phase)	4 W	4 W	4 W	4 W	4 W	4 W
Electrical characteristics						
Operating time switch on	< 30 ms		< 30 ms		< 30 ms	
Operating time switch off	< 20 ms		< 20 ms		< 20 ms	
Insulation resistance at 500 V (initial) contact to contact / contact to coil	1 GΩ		1 GΩ		1 GΩ	
Dielectric strength contact to contact / contact to coil	> 4400 V AC		> 4400 V AC		> 4400 V AC	
Auxiliary contact REED (optional)						
Max. voltage	36 V		36 V		36 V	
Max. current	250 mA		250 mA		250 mA	
Max. switching power	3 W		3 W		3 W	

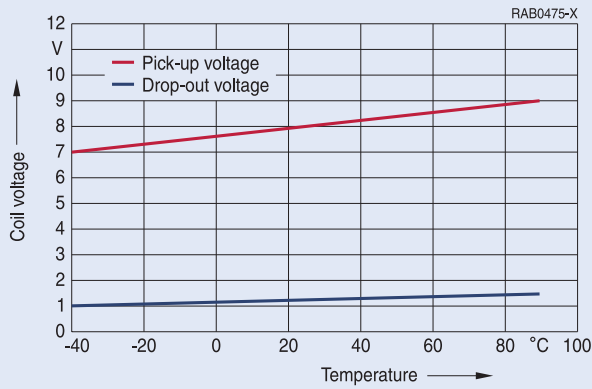
1) Higher operating voltage, different coil voltage, auxiliary contact, voltage sensor and temperature sensor upon request.

Characteristics single and dual coil	
Shock 11 ms 1/2 sine, peak	196 m/s ²
Vibration sine 100 ... 2000 Hz, peak	196 m/s ²
Wideband random vibration, eff.	196 m/s ² RMS
Temperature	-40 ... +85 °C
Weight	approx. 500 g
Certifications	CE, UL 60947-4-1 (E491412), CCC

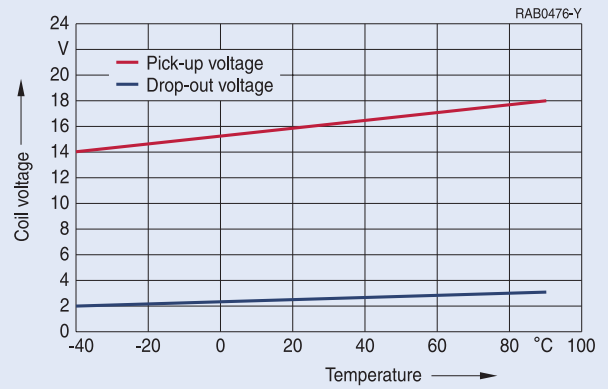
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Operating voltage of coil over temperature

12 V single coil

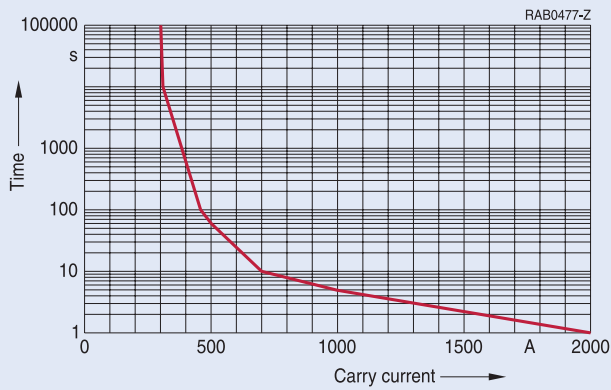


24 V single coil

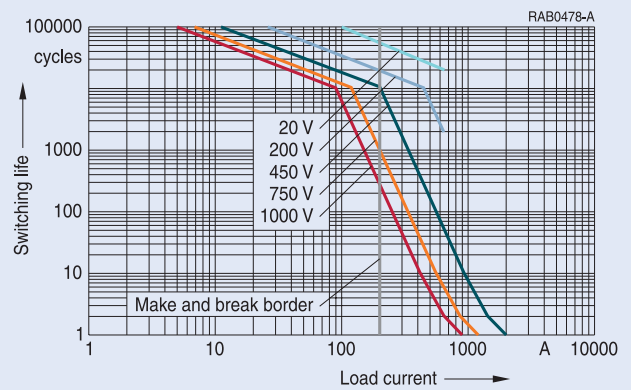


Characteristics for 300 A single coil

Current handling capability at 85 °C



Estimated service life for resistive loads

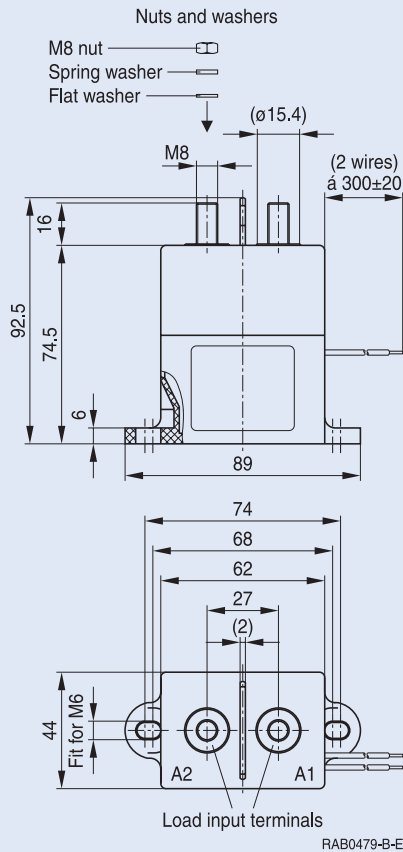


For other types and specifications, please refer to the data sheets.

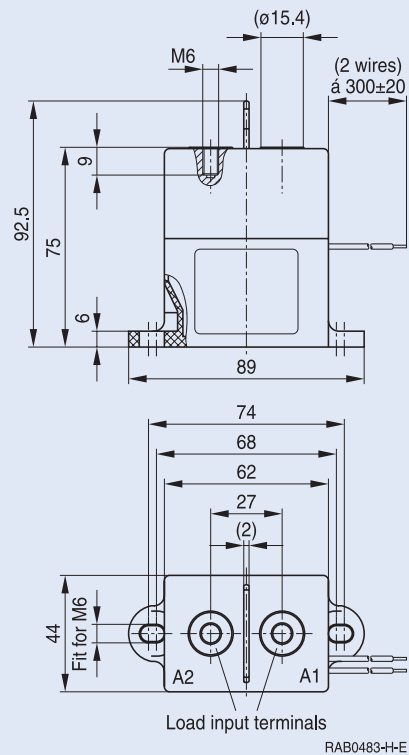
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Dimensional drawings

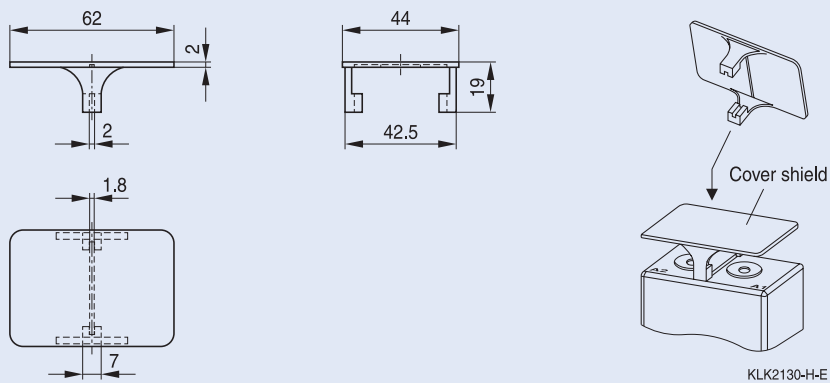
HVC***B with M8 outside thread



HVC***A with M6 inside thread



Nuts and washers are already included in the packaging unit.



Cover shield to order if required:
B88269X2200C101 = 10 pcs. cover shields in a box

High-Voltage Contactors for High-Voltage DC Disconnection

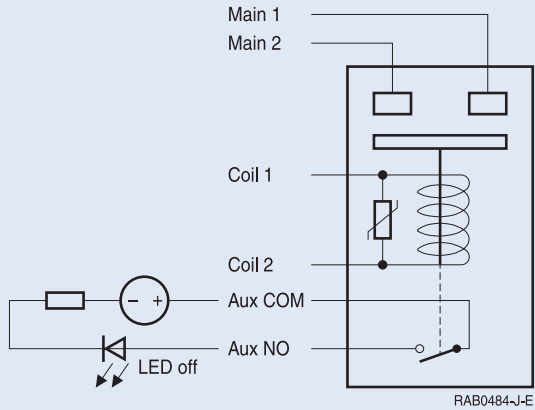
Stuck detection

Stuck detection is an auxiliary contact indicating the switching status of the main contacts.

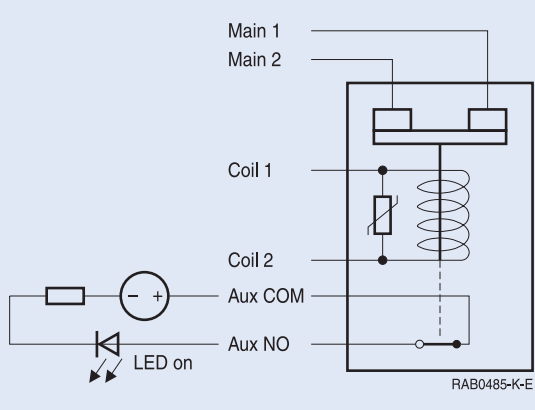
Design advantages

- Contactless
- No impact on breaking capability
- No impact on dielectric strength

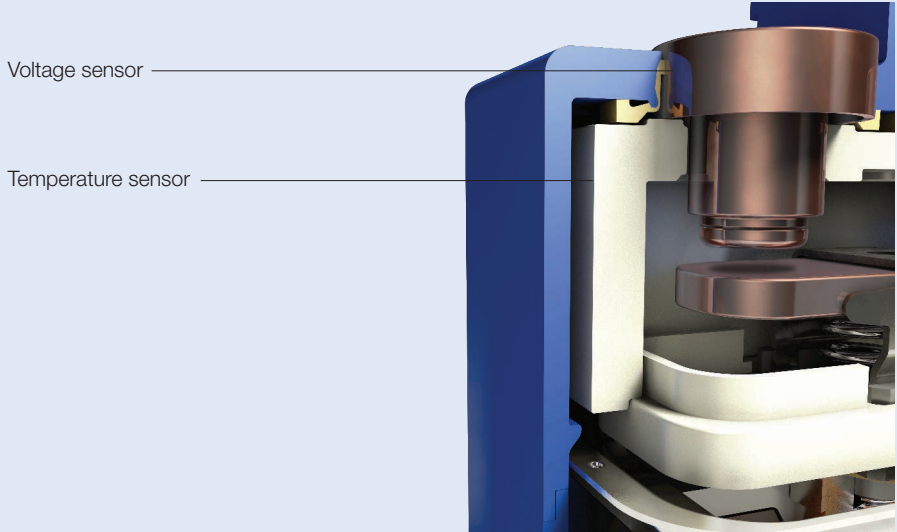
Main contact OFF



Main contact ON

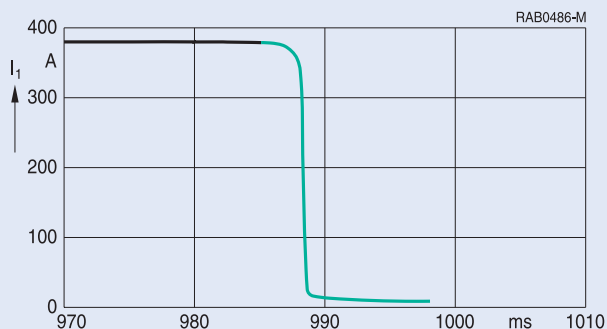


Integrated sensors



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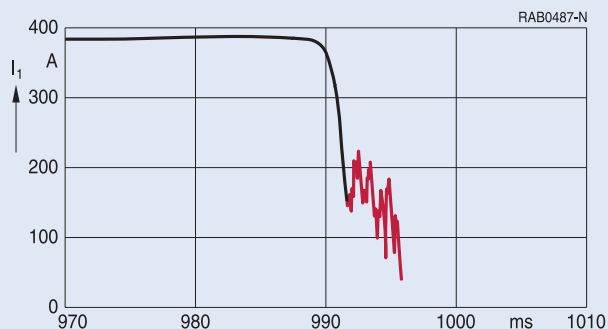
HVC by TDK



HVC part extinguishes in 1.2 ms with a clear break of current.

- Longer life-time
- Highest reliability

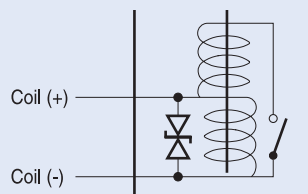
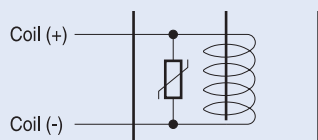
Typical contactor



Typical contactor part extinguishes in 4.6 ms with lots of fluctuations, which heats up the main contacts.

Coil terminations

Integrated coil termination (varistor in single coil / diode in dual coil)



Reliability



> One million mechanical switching cycles



CE marking, complies with EC Low Voltage Directive 2014/35/EC



All sites are certified according the following standards:
ISO 9001, IATF 16949, ISO 14001



UL 60947-4-1 certified
File No: E491412



Tested in accordance with
AEC Q-200, Rev. D

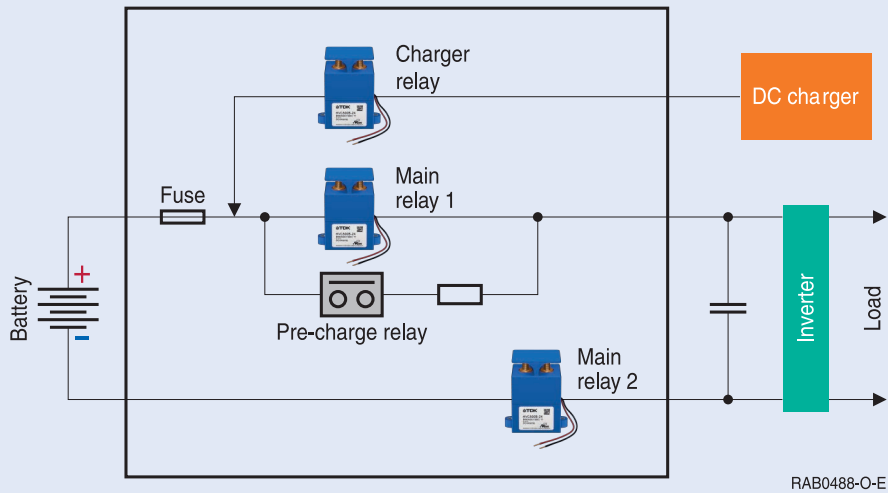


Up to 1200 V DC operating voltage
and 500 A DC continuous current
capability

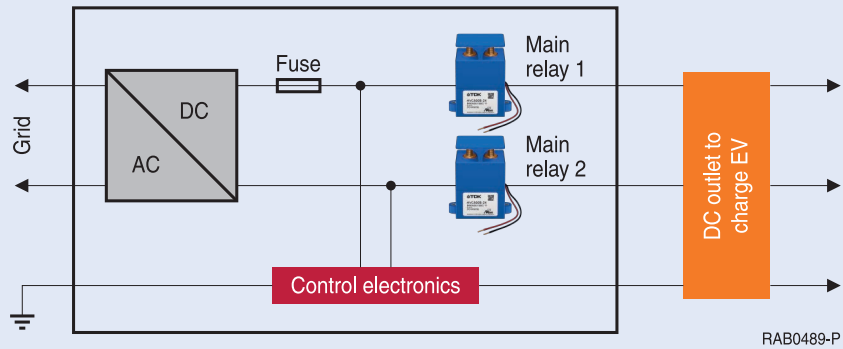
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Applications

Battery disconnect unit



DC charger



Battery Management System (BMS)

- Manages the charging of the battery.
- Controls the battery and the HVC.
- In an emergency the battery has to be disconnected from the load. Therefore the Battery Disconnect Unit (BDU) belongs or is part of the BMS.
- The bipolar HVC allows charging (regenerative break) and discharging using the same contactor.

DC charger

- HVC is only connected during charging.
- HVC is used to disconnect charger from the battery in case of an emergency.

High-Voltage Contactors for High-Voltage DC Disconnection

New compact HVC43 series



Features

- Up to 250 A operating current
- 30% smaller as standard types
- 40% lighter as standard types

More information

More information on our high-voltage series, data sheets and 3D data can be found on https://www.tdk-electronics.tdk.com/en/hvc_presentation

Important information: Some parts of this publication contain statements about the suitability of our products for certain areas of application. These statements are based on our knowledge of typical requirements that are often placed on our products. We expressly point out that these statements cannot be regarded as binding statements about the suitability of our products for a particular customer application. It is incumbent on the customer to check and decide whether a product is suitable for use in a particular application. This publication is only a brief product survey which may be changed from time to time. Our products are described in detail in our data sheets. The *Important notes* (www.tdk-electronics.tdk.com/ImportantNotes) and the product-specific *Cautions and warnings* must be observed. All relevant information is available through our sales offices.

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