

# 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

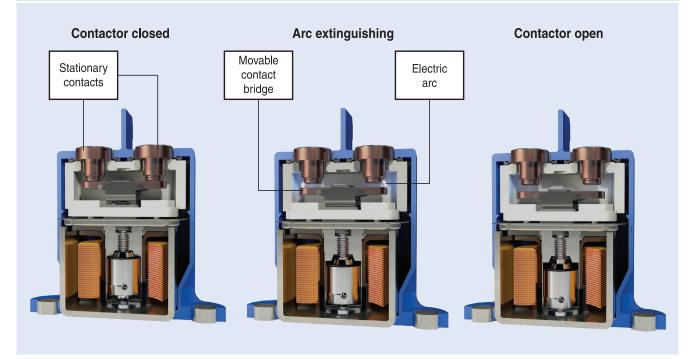
- Up to 1200 V DC
- Up to 500 A DC
- Up to one million nominal switching cycles
- Unipolar and bipolar design
- UL, CE, CCC
- Contactless stuck detection
  available

### Applications

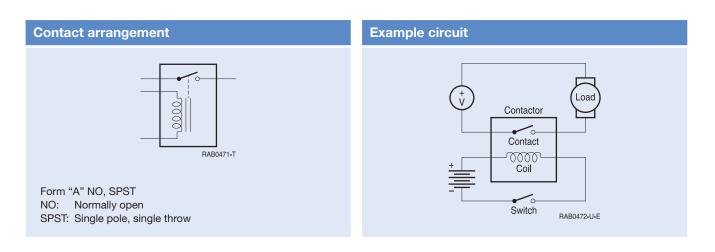
- DC fast charging stations
- Battery disconnect units and battery junction boxes in electrical vehicles
- Energy storage systems



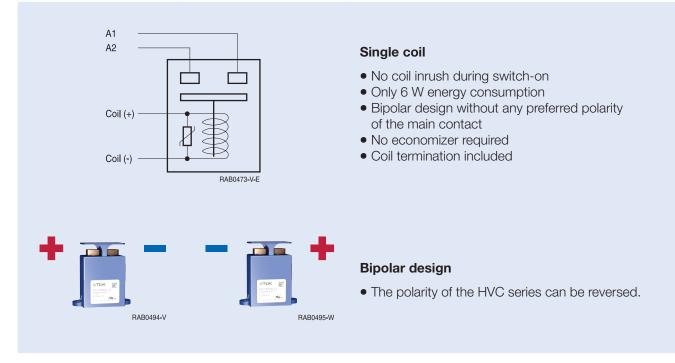
### **Operating principle**



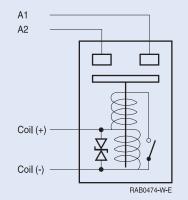
The HVC series are specially designed to disconnect DC circuits. A major challenge is the electric arc occurring between the stationary contacts and the moveable contact bridge, whenever the contacts separate. An uncontrolled electric arc would burn the contacts. This would lead to a decrease of life-time or in worst case to the contacts being stucked. 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 looses energy, which supports extinguishing.



## Single coil



#### **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

Specification single coil version <sup>1)</sup>							
Туре	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 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.

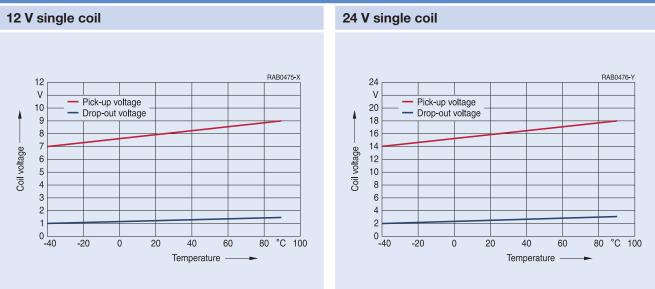
# Specification dual coil version<sup>1)</sup>

Specification dual con version							
Туре	HVC200AE		HVC300AE		HVC500BE		
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 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		

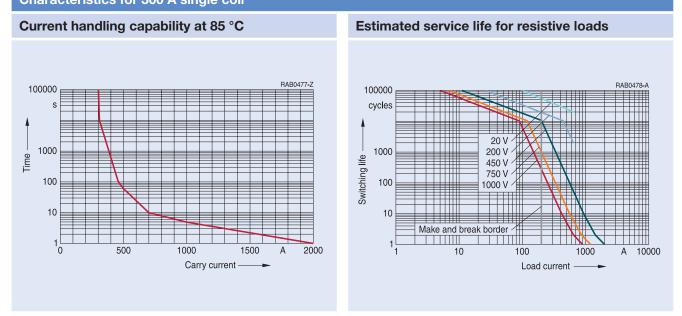
1) Higher operating voltage, different coil voltage, auxiliary contact, voltage sensor and temperature sensor upon request.

Characteristics single and dual coil				
Shock 11 ms 1/2 sine, peak	196 m/s <sup>2</sup>			
Vibration sine 100 2000 Hz, peak	196 m/s <sup>2</sup>			
Wideband random vibration, eff.	196 m/s² RMS			
Temperature	-40 +85 °C			
Weight	approx. 500 g			
Certifications	CE, UL 60947-4-1 (E491412), CCC			

## Operating voltage of coil over temperature

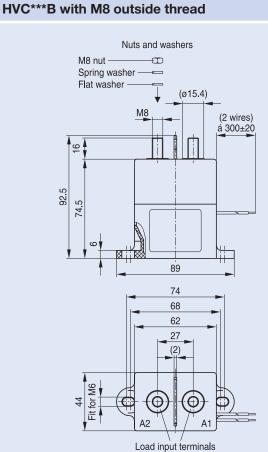


# Characteristics for 300 A single coil

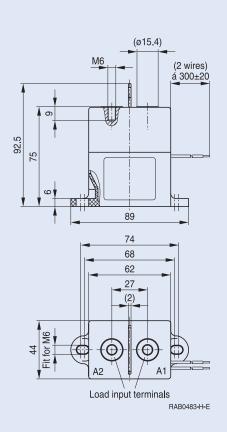


For other types and specifications, please refer to the data sheets.

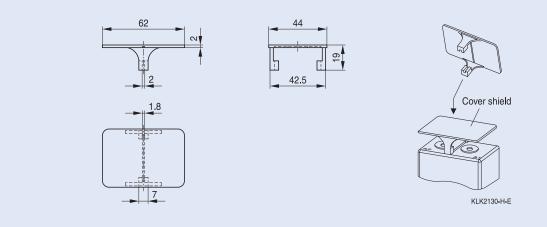
### **Dimensional drawings**



put terminais RAB0479-B-E HVC\*\*\*A with M6 inside thread



Nuts and washers are already included in the packaging unit.



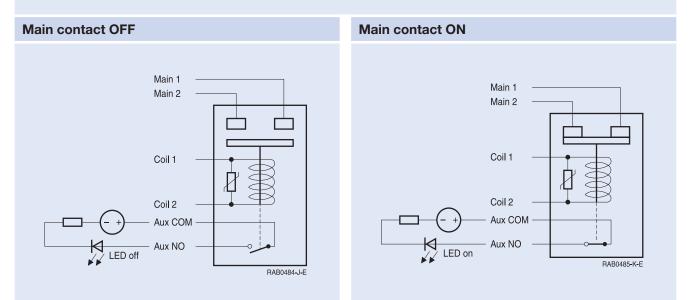
Cover shield to order if required: B88269X2200C101 = 10 pcs. cover shields in a box

### **Stuck detection**

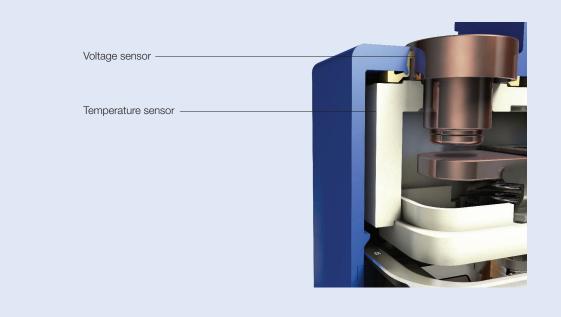
Stuck detection is an auxiliary contact indicating the switching status of the main contacts.

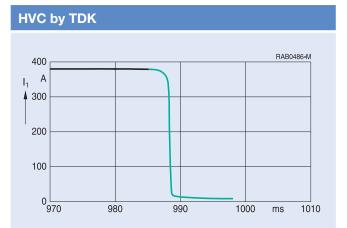
### **Design advantages**

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



#### Integrated sensors

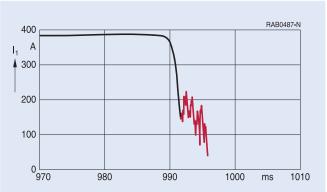




HVC part extinguishes in 1.2 ms with a clear break of current.

- Longer life-time
- Highest reliability

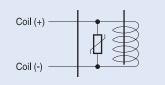
## Typical contactor

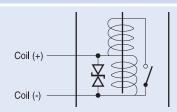


Typical contactor part extinguishes in 4.6 ms with lots of fluctuations, which heats up the main contacts.

### **Coil terminations**

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





#### Reliability



> One million mechanical switching cycles



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



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



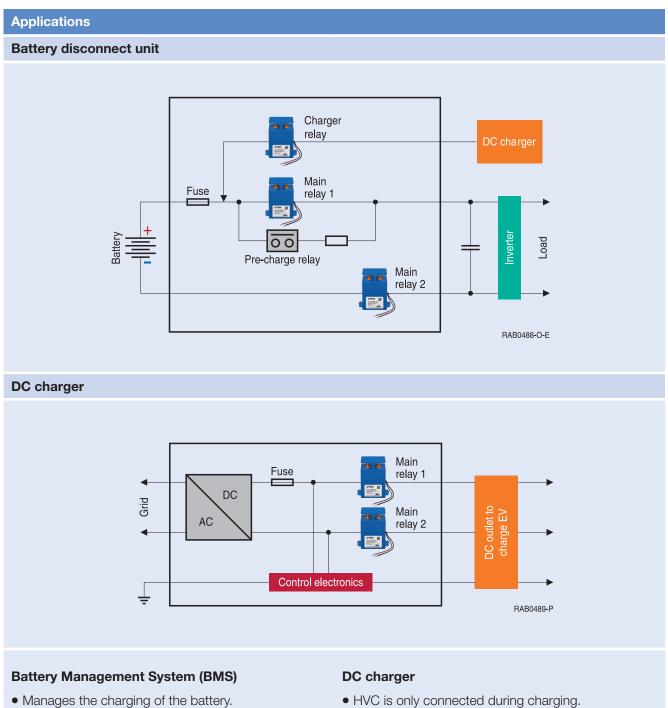
CE marking, complies with EC Low Voltage Directive 2014/35/EC



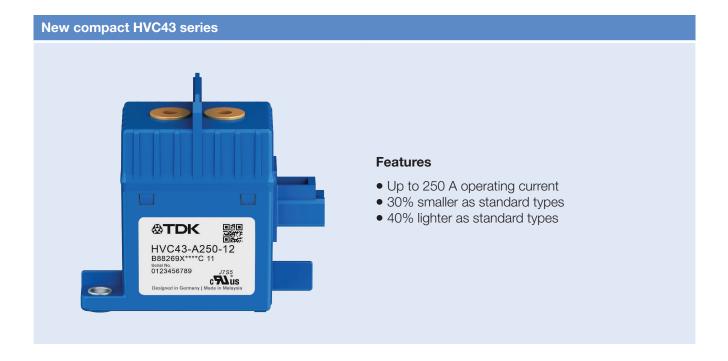
UL 60947-4-1 certified File No: E491412



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



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



# 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.