



## High-voltage contactor

Gas-filled contactor for high-voltage DC switching

**Series/Type:** HVC43-MC

**Ordering code:** B88269X\*

**Date:** 2024-04-04

**Version:** 01

**High-voltage contactor**
**B88269X\***
**Gas-filled contactor for high-voltage DC switching**
**HVC43-MC**
**General**

HVC43 series has a robust design for high-voltage DC switching requirements in harsh environments. Our customers deploy HVC43 series in a wide range of applications such as automotive traction battery systems and DC fast charging stations.

**Features**

- Single coil with connector
- No coil termination
- Main terminals without polarity (bi-directional)
- Auxiliary contact is a mirror contact (acc. to IEC 60947-4-1)
- RoHS compatible

**Characteristics**

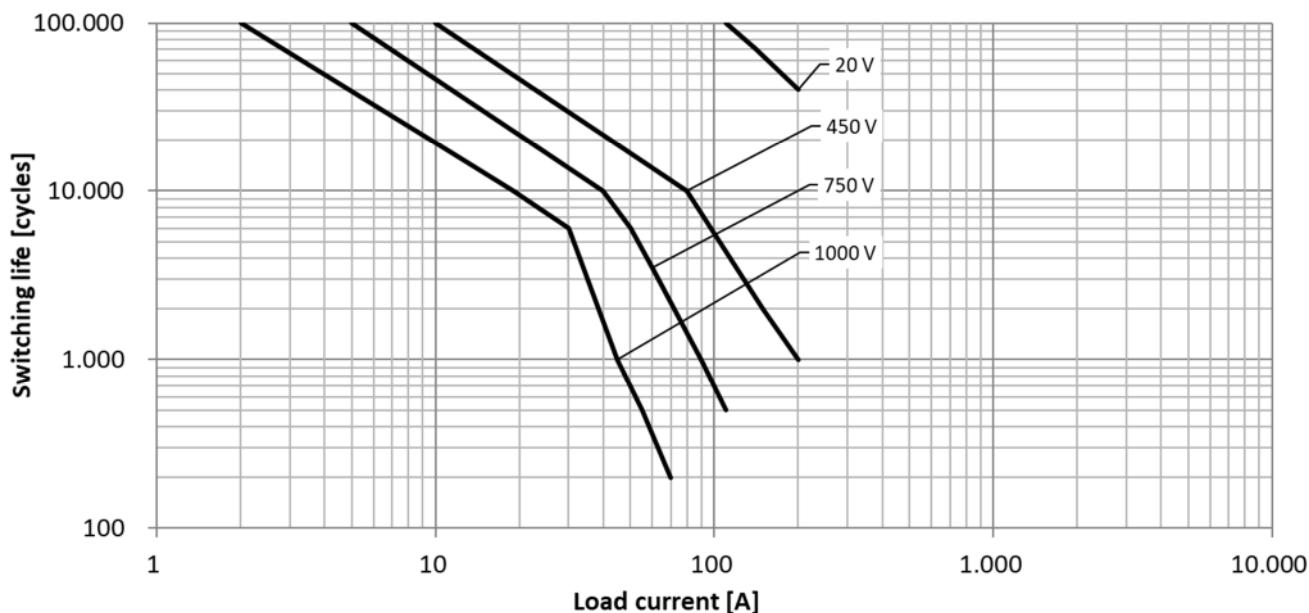
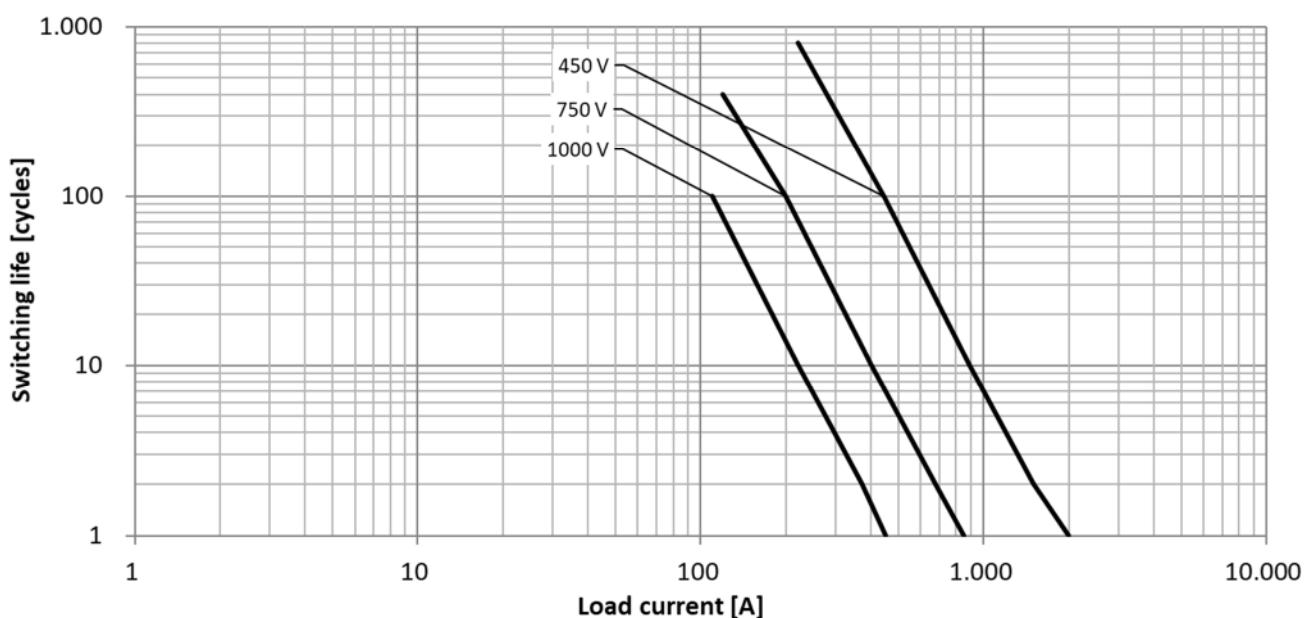
Contact arrangement	1A	
Inner contact material	Cu alloy	
Internal contact gap (full disconnection)	2.0 (2 x 1.0)	mm
Recommended connection conductor cross section <sup>1</sup>		
- for $I_{th} = 150 \text{ A}_{DC}$	$\geq 50$	$\text{mm}^2$
- for $I_{th} = 200 \text{ A}_{DC}$	$\geq 60$	$\text{mm}^2$
- for $I_{th} = 250 \text{ A}_{DC}$	$\geq 60$	$\text{mm}^2$
Vibration in closed state, xyz-axis <sup>2</sup>		
- shock, 6 ms $\frac{1}{2}$ sine, peak <sup>3</sup>	588	$\text{m/s}^2$
- vibration, sine 100 ... 2000 Hz, peak <sup>4</sup>	98	$\text{m/s}^2$
- wideband random vibration, 10 ... 1000 Hz <sup>5</sup>	49	$\text{m/s}^2_{RMS}$
Operation and storage <sup>6</sup>		
- temperature	-40 ... +85	$^{\circ}\text{C}$
- humidity	5 ... 85	%
- air pressure	60 ... 106	kPa
Utilization category	IEC 60947-4-1	DC-1
Pollution degree	IEC 60947-1	2
IP level	IEC 60529	IP 40
Climatic category	IEC 60068-1	40/085/21
Certifications	UKCA CE UL	pending pending pending
Weight <sup>7</sup>	~ 300	g

See "Notes" on page 10

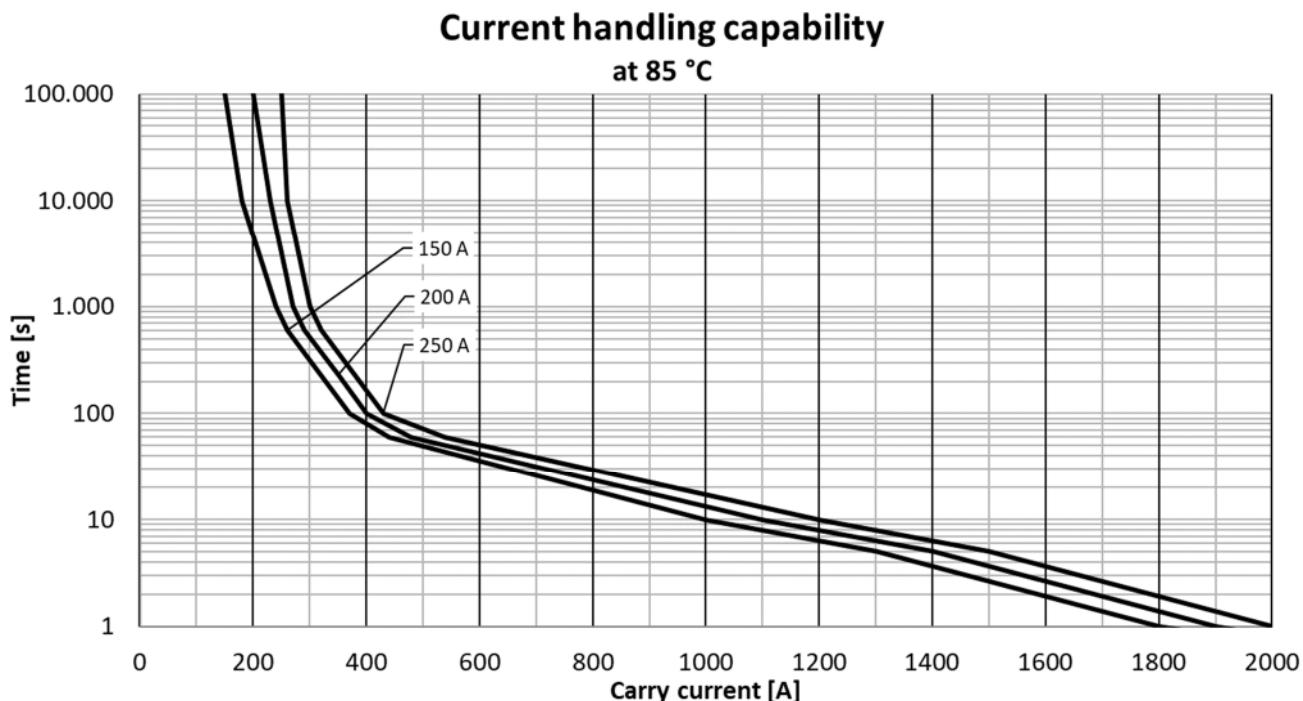
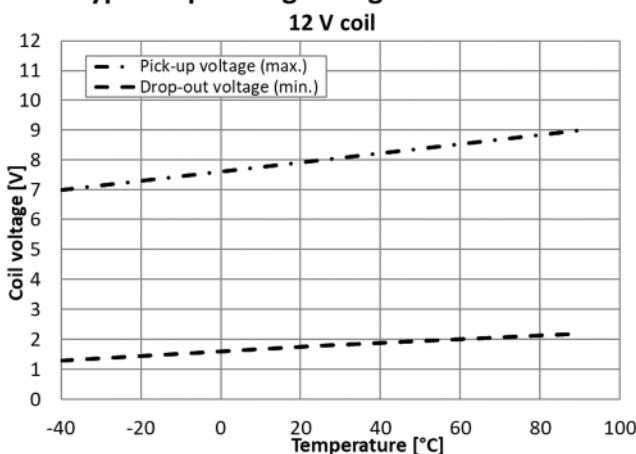
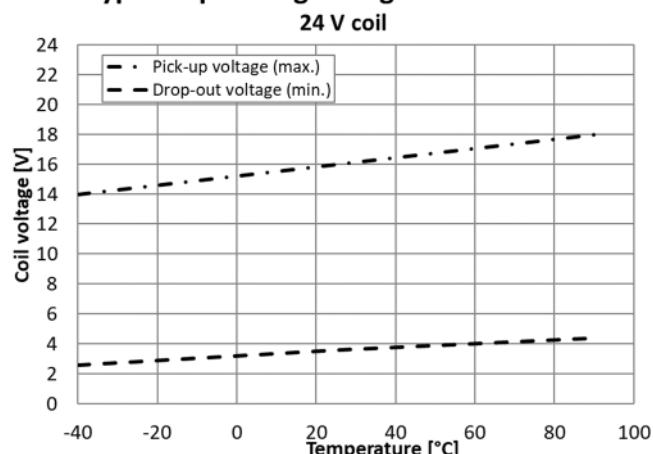
**High-voltage contactor**
**B88269X\***
**Gas-filled contactor for high-voltage DC switching**
**HVC43-MC**
**Specifications<sup>8</sup>**

Type HVC43-...		150A	200A	250A	
Contact					
Maximum operating voltage			1000		V <sub>DC</sub>
Continuous current	I <sub>th</sub>	150	200	250	A <sub>DC</sub>
Temporary overcurrent (10 min)	I <sub>CW1</sub>	260	290	320	A <sub>DC</sub>
Temporary overcurrent (1 min)	I <sub>CW2</sub>	440	480	540	A <sub>DC</sub>
Rated operational voltage <sup>9, 10</sup>	U <sub>e</sub>		1000		V <sub>DC</sub>
Rated operational current <sup>9, 10</sup>	I <sub>e</sub>		60		A <sub>DC</sub>
Contact resistance at 100 A <sub>DC</sub>				0.125	mΩ
- typical				0.25	mΩ
- max.					
Insulation resistance at 1000 V <sub>DC</sub>			≥ 1		GΩ
- contact to contact / contact to coil					
Dielectric strength <sup>11</sup>			≥ 4400		V <sub>AC</sub>
- contact to contact / contact to coil			8		kV
Rated impulse withstand voltage <sup>12</sup>	U <sub>imp</sub>				
Operating time <sup>13</sup>			≤ 30		ms
- make				≤ 15	ms
- break					
Electrical endurance <sup>10, 14, 15</sup>					
Mechanical <sup>16</sup>			350000		operations
- max. 1 V, 1 A <sub>DC</sub> (make & break)					
Capacitive			70000		operations
- at 20 V <sub>DC</sub> , 140 A <sub>DC</sub> (make)					
Resistive			1000		operations
- at 450 V <sub>DC</sub> , 200 A <sub>DC</sub> (make & break)			550		operations
- at 450 V <sub>DC</sub> , 250 A <sub>DC</sub> (break) <sup>17</sup>					
Maximum cut-off <sup>18</sup>			1		operation
- at 450 V <sub>DC</sub> , 2000 A <sub>DC</sub> (break) <sup>19</sup>			1		operation
- at 1000 V <sub>DC</sub> , 450 A <sub>DC</sub> (break) <sup>20</sup>					
Coil type <sup>14</sup>		12 V	24 V		
Rated control voltage (nominal)	U <sub>c</sub>	12	24		V <sub>DC</sub>
Operating voltage range	U <sub>1</sub> ... U <sub>2</sub>	9 ... 16	18 ... 32		V <sub>DC</sub>
Pick-up voltage (max.)	U <sub>1</sub>	9	18		V <sub>DC</sub>
Drop-out voltage (min.)		1	2		V <sub>DC</sub>
Minimum holding current		0.16	0.08		A <sub>DC</sub>
Power at nominal voltage <sup>21</sup>		5.8	5.8		W
Nominal resistance		24	96		Ω
Auxiliary contact					
- operating voltage range		1...24			V <sub>DC</sub>
- max. operating current		1			A <sub>DC</sub>
- min. operating current		10			mA <sub>DC</sub>
- max. resistance		500			mΩ

See "Notes" on page 10

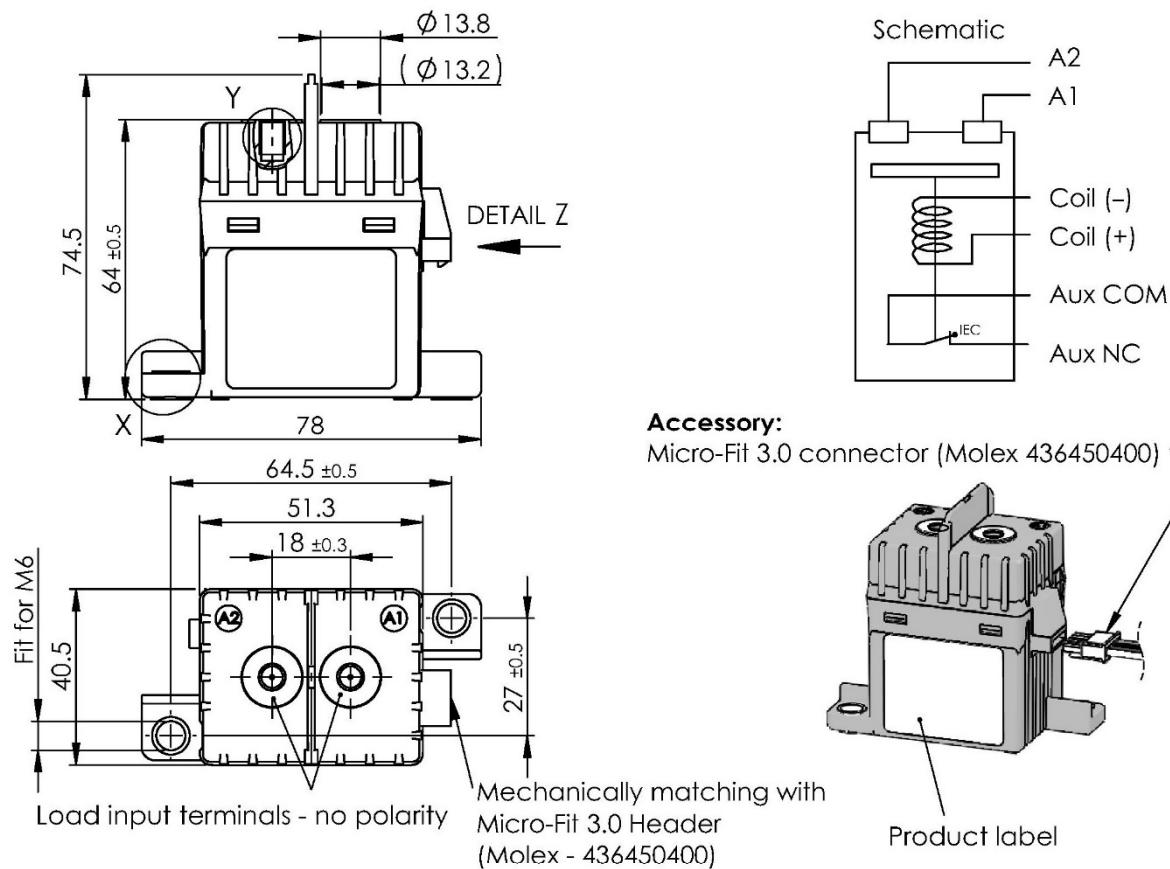
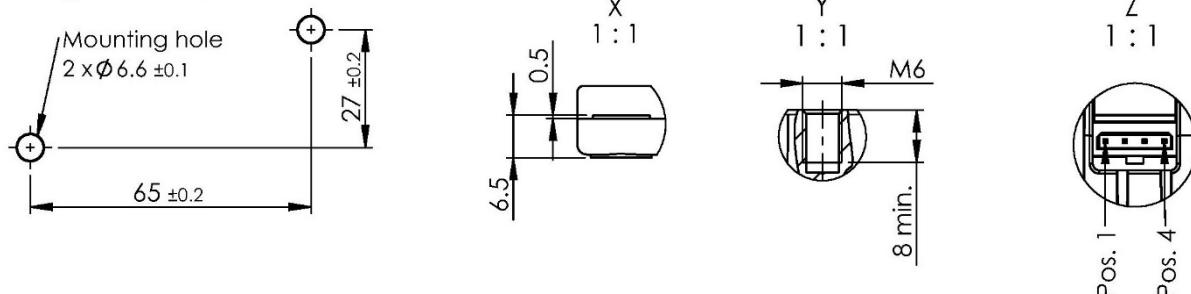
**Characteristics** <sup>10, 14, 15, 22</sup>
**Estimated make & break life curves  
for resistive loads**

**Estimated break-only life curves  
for resistive loads**


See "Notes" on page 10


**Typical operating voltage characteristics**

**Typical operating voltage characteristics**


**High-voltage contactor**
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**Dimensional drawing**

in mm


**Mounting dimensions:**


In case of no tolerance shown in dimensional drawing, general tolerances apply:  
dimension ≤ 10 mm: ± 0.3 mm; dimension 10 to 50 mm: ± 0.6 mm; dimension > 50 mm: ± 1 mm

**High-voltage contactor**
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**Installation information**

Connection name	Type	Marking	Finishing	Remarks
A1	Main terminal M6	A1	Copper contact surface	Tightening torque 6...8 Nm
A2	Main terminal M6	A2		
Coil (+)	Coil terminal	Pos. 3	Micro-fit 3.0 (Molex)	Max. allowable pull force 10 N
Coil (-)	Coil terminal	Pos. 2		
Aux COM	Auxiliary contact	Pos. 4		
Aux NC	Auxiliary contact	Pos. 1		
Case mounting	Contactor mounting M6	None	Stainless steel insert	Tightening torque 4...6 Nm

**Important:**

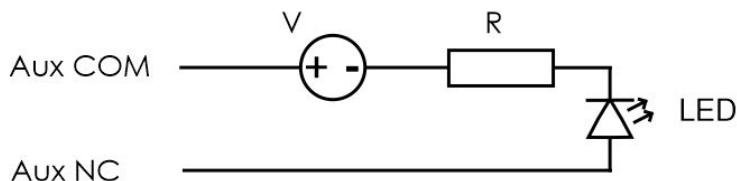
Coil terminations should be suppressed with a surge protection device. Preferably a varistor (e.g. S10K30, B72210S0300K101 or equivalent) should be installed in parallel, see "Cautions and warnings". If an alternative coil suppression device is used, the clamping voltage must not be smaller than 50 V.

Auxiliary contacts NC and COM are normally closed.

When the contacts are open and the coil voltage is "0 V", the part is stuck.

**Auxiliary contact**

Example circuit to realize stuck detection:



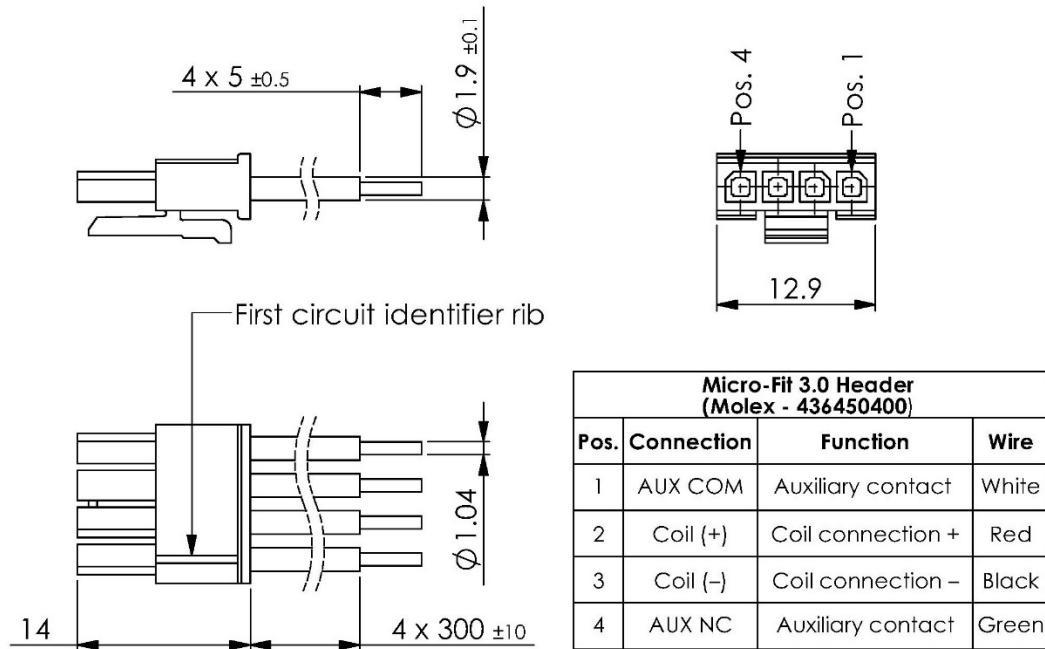
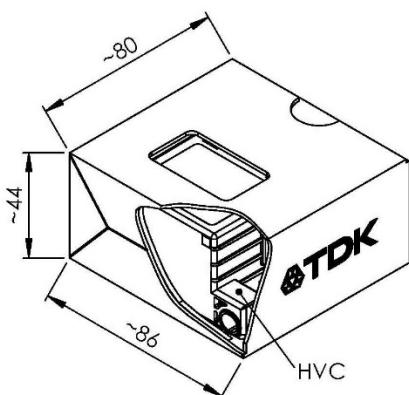
The LED will be ON when the contactor is OFF.

In case the contactor is stuck, the Aux COM and Aux NC contacts will remain open, hence the circuit is open and the LED will be off, indicating the malfunction.

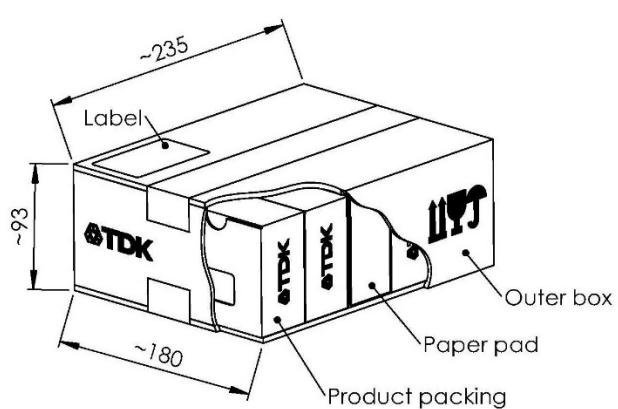
**High-voltage contactor**
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**Accessory**

Mating connector plug (corresponding to Molex-436450400)

To order if required:

Order code **B88269X9970C101** = 10 pcs. or **B88269X9970C102** = 100 pcs. in a box

**Packing unit**
**B88269X...C011** = 1 pc. in cardboard box

**Delivery unit**

10 pcs. in cardboard box



**High-voltage contactor**
**B88269X\***
**Gas-filled contactor for high-voltage DC switching**
**HVC43-MC**
**Nomenclature of type name**
Example (other digits may indicate customized version or special option)

**HVC 43 – 200 A – 24 MC**
**High-Voltage Contactor**
**Series**
**43 ...Version 4.3**
**Continuous current  $I_{th}$** 
**150 ..150 A**
**200 ..200 A**
**250 ..250 A**
**Main terminal**
**A ..M6 inner thread**
**Coil**
**12 ..12 V**
**24 ..24 V**
**Auxiliary contact**
**MC ..Mechanical NC**
**Ordering codes**

Continuous current $A_{DC}$	Coil voltage $V_{DC}$	Type name	Ordering code *
150	12	HVC43-150A-12MC	B88269X7290C011
	24	HVC43-150A-24MC	B88269X7320C011
200	12	HVC43-200A-12MC	B88269X7300C011
	24	HVC43-200A-24MC	B88269X7330C011
250	12	HVC43-250A-12MC	B88269X7310C011
	24	HVC43-250A-24MC	B88269X7340C011

\* The ordering code can be followed by a three-digit internal suffix.

## Notes:

- 1 The recommended cross section refers to pure copper. In other cases it must be matched to actual current, conductor material properties and operation temperature (see: Cautions and warnings).
- 2 Detection time 10  $\mu$ s: micro-openings  $\leq$  10  $\mu$ s may occur between main contacts
- 3 Referring to IEC 60068-2-27
- 4 Referring to IEC 60068-2-6
- 5 Referring to IEC 60068-2-64
- 6 Freezing or condensing must be avoided.
- 7 Valid for base-model without accessory, other configurations will lead to deviations.
- 8 The specified values apply to unused contactors acc. to IEC 61810-1.
- 9 Referring to IEC 60947-4-1, 6000 operations make & break
- 10 Referring to IEC 60947-4-1, 50% of operations in positive and 50% in negative direction (see: Cautions and warnings)
- 11 Detection limit 10 mA
- 12 Referring to IEC 60947-4-1
- 13 Measured at rated control voltage  $U_c$  including contact bouncing time.
- 14 Specified referring to JIS C 5442 (temperature 15 °C to 35 °C, humidity 25% to 85% RH).
- 15 End of life is reached when insulation resistance is  $< 50 \text{ M}\Omega$  at 1000 V.
- 16 Duty cycle 50%, cycle duration 1 s, value represents B10 life time acc. to Weibull analysis.
- 17 Duty cycle 1%, cycle duration 600 s.
- 18 No fire and no explosion will occur after this break
- 19 Tested with resistive loads with  $\tau \leq 1 \text{ ms}$
- 20 Tested for maximum break at 1000 V, 450 A with  $\tau \leq 0.3 \text{ ms}$ .
- 21 Tolerance  $\pm 10\%$  at thermal equilibrium
- 22 For „make & break life curves“ duty cycle is 10% and cycle duration is 6 s. For “break-only life curves” duty cycle is 1% and cycle duration is 600 s.

## Cautions and warnings

- We strongly recommend to implement redundancy, take measures to prevent the spread of fire, take the possibilities of malfunction into account, and perform regular maintenance.
- It is also required to always use a suitable backup fuse for the contactor.
- It is not allowed to use the contactor outside of the parameter range specified in this datasheet. This also includes temperature and humidity. Overloading the contactor may destroy the component.
- The lifetime depends on several factors: e.g. load type, driving circuit and ambient conditions. We recommend checking the performance of the part under actual conditions.
- To avoid damage to the contactor (e.g. welding of main contacts) the inrush current through the contactor should not exceed the specified limit of the estimated make & break life curves. Please ensure that any connected capacitances are pre-charged to a minimum of 98% (5  $\tau$ ) of the system voltage.
- Break of inductive loads with time constant  $\tau > 1 \text{ ms}$  will shorten the lifetime and failure may occur.
- In the event of a break under inductive load, the voltage at the connection terminals of the contactor must not exceed the nominal operating voltage by more than 10 %.
- For continuous high current operation, make sure that the temperature at the connection terminals does not exceed 130 °C by selecting an appropriate connection-cable cross section or active cooling.
- The main connections of the contactor also act as a heat sink. Please ensure that the connection surface area is fully covered with a matched cable lug and/or busbar and that the connection hole

in the cable lug and/or busbar is according to DIN ISO 20273 (middle clearance).

- The contactor must be mounted onto a flat surface using the designated fixation holes, in addition to the busbars attached to the main connections. It is not allowed to mount the contactor using only the busbars.
- The cable lug and/or busbar to the contactor must be securely tightened to the terminals (check torque specification in data sheet) otherwise current stress may generate sparks and heating. Use only fitting screws for all mechanical connections to the contactor and verify their functionality in the application. The recommended torque range is suitable for multiple fixations.
- After long-term operation the contactor coil resistance is increased due to the temperature rise. If the contactor is switched on immediately afterwards, the coil characteristics may be deteriorated.
- The coil contacts need to be protected from overvoltage when switching off. Therefore, a protection device needs to be installed in parallel.
- For a successful pick-up, the voltage cannot be ramped up slowly. The voltage needs to be applied instantly to at least the maximum pick-up voltage.
- The contactor is not intended to be used with pulse width modulation (PWM) controllers.
- Simultaneously applied maximum operation parameters for e.g. coil voltage, over currents, temperature, vibration etc. may lead to reduced lifetime. We recommend applying rated settings to achieve optimum life performance.
- The service life curves are estimated based on the requirements of IEC 60947-4-1; Chapter 8.2.4 where 50% of the required operations are performed in positive direction and 50% in negative direction.
- The auxiliary contact is a mirror contact acc. to IEC 60947-4-1 Annex F.
- During vibration in the unpowered state of the contactor the auxiliary contact may be displaced from its resting position. The resulting short interruptions of the auxiliary contact do not necessarily indicate closing of the main contact.
- We recommend to separate or shield the low voltage side (coil and auxiliary connection) from the high voltage side (main working contact).
- The contactor must be mounted in a way that the vertical axis of the part (Z-axis) is not in line with the main shock axis inside the application. Still, it must be mounted either upright standing or horizontal lying on either side. Upside down mounting must be avoided and only the original mounting holes are allowed to be used to mount the part.
- Contactors radiate magnetic and electromagnetic fields. Please ensure that other components mounted in close proximity are not affected.
- In case two contactors are mounted in close proximity, a clearance distance of 10 mm has to be kept.
- The operating life of the contactor can be affected by strong magnetic fields. Please ensure that there are no magnetic field sources in close proximity and avoid nearby installed heat sources.
- The contactor must not be operated without any load. This may increase the contact resistance.
- Contactors may become hot during extended periods of current overload (burn hazard).
- Contactors must be handled with care and must not be dropped. Attached plugs and wires are not allowed to be used for lifting and handling the part (maximum allowed pull-force is 10 N).
- If a current occurs that exceeds the maximum breaking current by more than 50% or triggers a series fuse, the contactor is considered damaged and must be replaced.
- The manufacturer cannot be held liable for failures caused by condensation or icing. The customer has to apply suitable measures to avoid these circumstances.

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- This contactor is not waterproof.
- It must be ensured that during usage, storage, or transportation direct sunlight is avoided. The ambient temperature during usage must not exceed the value specified in this data sheet.
- It is forbidden to use this contactor in atmospheres loaded with organic solvents (alcohol, petroleum, etc.) or strong alkaline substances (ammoniac, acids in general, etc.).
- It must be ensured that during installation and operation no kind of foreign matter adheres to the main contact. Especially oils and silicones must be avoided.
- It is forbidden to attach any kind of additional construction to or on the contactor.

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2. We also point out that **in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified**. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
3. **The warnings, cautions and product-specific notes must be observed.**
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## Important notes

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