

## High-voltage contactor

Gas-filled contactor for high-voltage DC switching

<b>Series/Type:</b>	<b>HVC500B-12S</b>
<b>Ordering code:</b>	<b>TBD2070</b>
<b>Date:</b>	<b>2018-11-22</b>
<b>Version:</b>	<b>03</b>

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HVC500B-12S

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### Product description

The HVC series has been especially designed to meet the requirements of high-voltage DC switching applications. The optimized hermetically sealed design exhibits excellent reliability performance against harsh environments. HVC series can be used in a wide range of applications.

### Features

- Gas-filled and hermetically sealed
- No EMI, low operating power
- No polarity of contact terminals
- RoHS compatible

### Applications

- Battery charge/ discharge systems
- Renewable energy storage systems
- DC high-voltage/ high-current applications
- DC fast charging stations

### Characteristics

Contact arrangement	1A	
Inner contact material	Cu alloy	
Internal contact gap (full disconnection)	3.2 (2 × 1.6)	mm
Recommended connection cable cross section <sup>1</sup>	> 200	mm <sup>2</sup>
Coil wires		
- length	300	mm
- cross section	0.5	mm <sup>2</sup>
- material	Cu	
Auxiliary contact		
- max. voltage	36	V
- max. current	250	mA
- max. switching power	3	W
- max. resistance	200	mΩ
- cross section	0.25	mm <sup>2</sup>
Vibration in closed state, xyz-axis		
- shock, 11 ms ½ sine, peak	20	g
- vibration, sine 100 ... 2000 Hz, peak	20	g
- wideband random vibration, 10 ... 1000 Hz <sup>2</sup>	5	g <sub>eff</sub>
Operation and storage <sup>3</sup>		
- temperature	-40 ... +85	°C
- humidity	5 ... 85	%
- air pressure	69 ... 106	kPa
Climatic category (IEC 60068-1)	40/085/21	
Weight	~ 500	g
Certifications	UL 60947-4-1 (E491412)	pending
	CE	pending

See "Notes" on page 7

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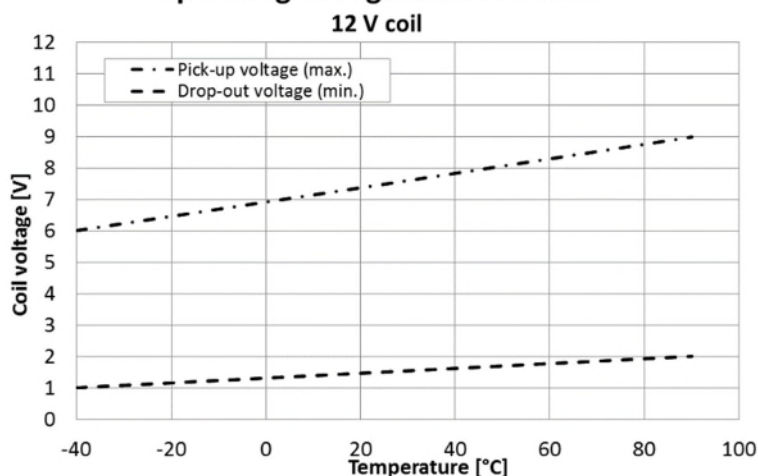
HVC500B-12S

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### Specification <sup>4</sup>

<b>Contact</b>			
Maximum operating voltage		1000	$V_{DC}$
Continuous carry current	$I_{th}$	500	A
Temporary overcurrent (10 min)	$I_{CW1}$	600	A
Temporary overcurrent (1 min)	$I_{CW2}$	750	A
Rated operational voltage <sup>5</sup>	$U_e$	450	V
Rated operational current <sup>5</sup>	$I_e$	100	A
Mechanical life time <sup>6</sup>		1 000 000	switchings
Minimum make and break current		1	A
Maximum cut-off current (1 operation) <sup>7 8</sup>		2000	A
Contact resistance (> 100 A)			
- typical		0.125	mΩ
- max.		0.25	mΩ
Insulation resistance at 1000 V (initial)			
- contact to contact / contact to coil		> 1	GΩ
Dielectric strength			
- contact to contact / contact to coil <sup>9</sup>		> 3800	$V_{AC}$
Operating time			
- make		< 35	ms
- break		< 15	ms
<b>Coil <sup>10</sup></b>			
Rated operation voltage	$U_c$	12	$V_{DC}$
Operating voltage range	$U_1 \dots U_2$	9 ... 16	$V_{DC}$
Pick-up voltage (max.)	$U_1$	9	$V_{DC}$
Drop-out voltage (min.)		1	$V_{DC}$
Minimum holding current		0.16	A
Power at nominal voltage <sup>11</sup>		6	W
Nominal resistance		24	Ω

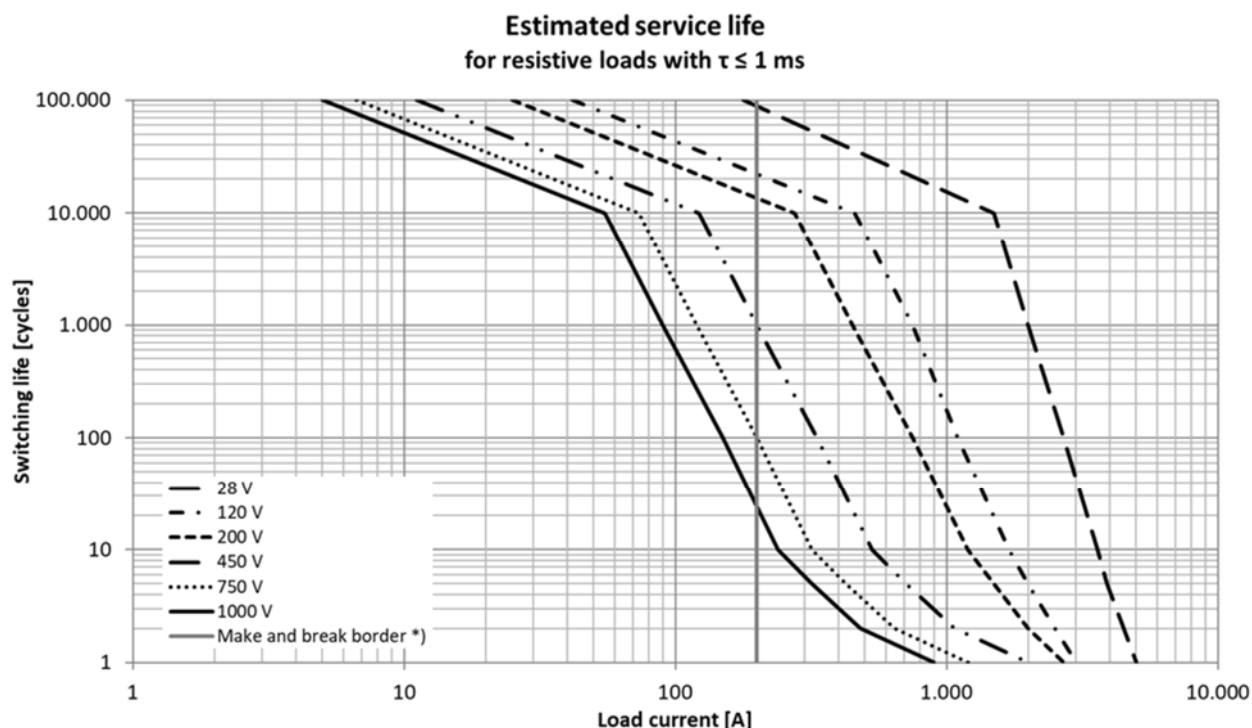
### Operating voltage characteristics



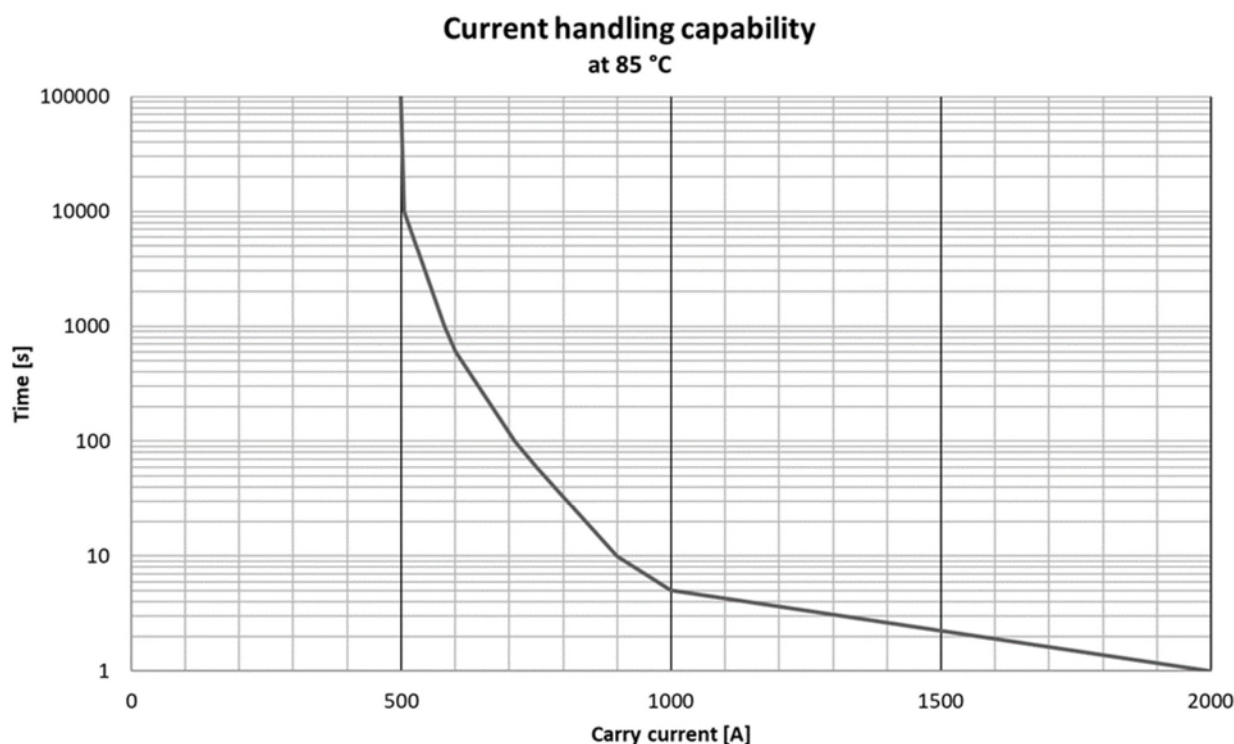
See "Notes" on page 7

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## Characteristics <sup>10 12</sup>



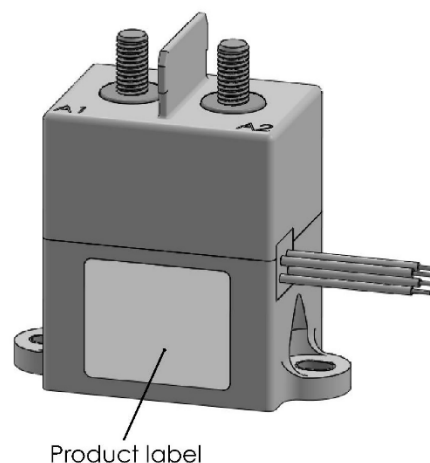
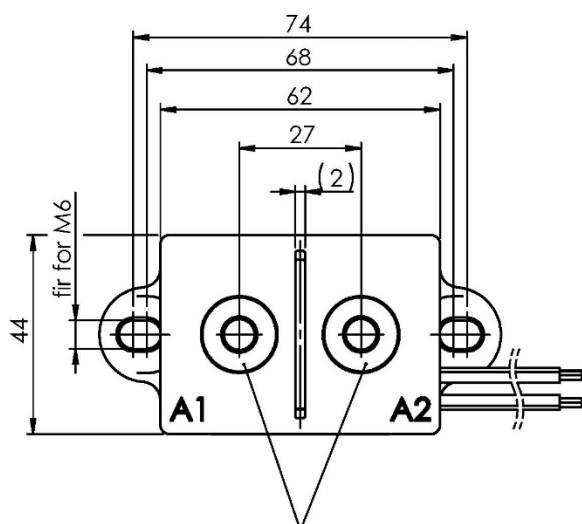
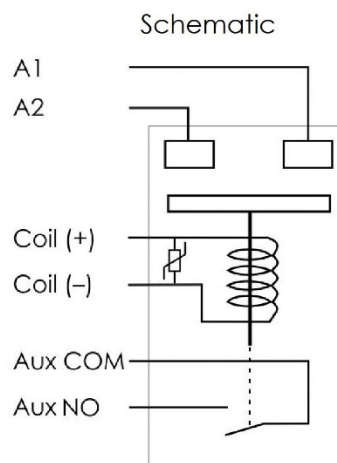
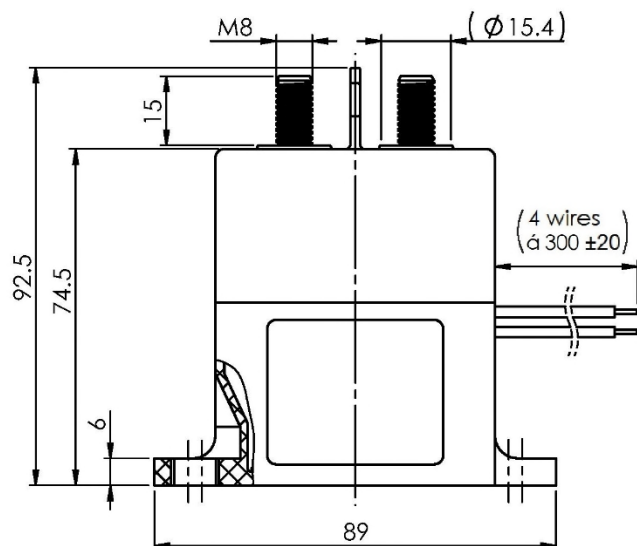
\*) For currents > “make and break border” only break is permitted to avoid tack welding, duty cycle 1%, 600 s cycle duration.  
For currents < “make and break border” make and break is permitted duty cycle 10%, 10 s cycle duration.



See “Notes” on page 7

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### Dimensional drawings in mm



load input terminals - no polarity

General tolerances:  
less than 10 :  $\pm 0.3$   
10 ... 50 :  $\pm 0.6$   
more than 50 :  $\pm 1$

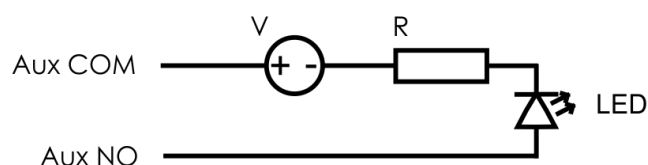
Note:  
Tightening torque of main contacts:  
6 ... 8 Nm for M8 nut

Connection name	Type	Marking	Finishing
A1	Main terminal	A1	copper contact surface
A2	Main terminal	A2	copper contact surface
Coil (+)	Coil wire	red	stripped and tinned
Coil (-)	Coil wire	black	stripped and tinned
Aux COM	Auxiliary contact wire	white	stripped and tinned
Aux NO	Auxiliary contact wire	blue	stripped and tinned
Notes: Coil (+) and coil (-) are suppressed with a surge protection device, see "Cautions and warnings".			

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### Auxiliary contacts

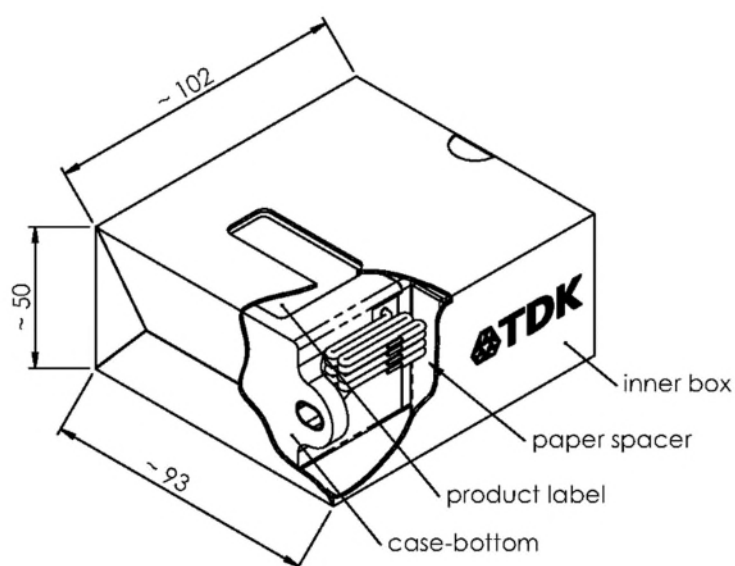
Example circuit to realize stuck detection:



In case the contactor is stuck, the Aux COM (white) and Aux NO (blue) wires will be short, hence the circuit is closed and the LED will be on.

### Packing unit

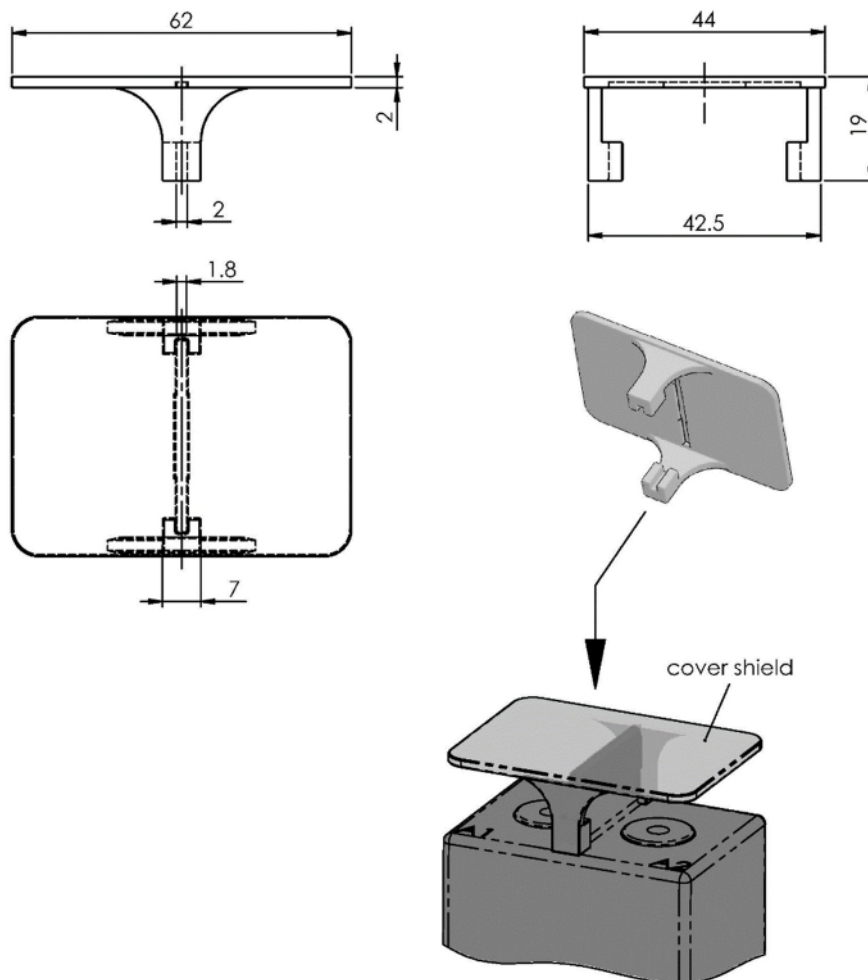
*B88269X....C 11 = 1 pc. in cardboard box*



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### Accessory

B88269X2200C101 = 10 pcs. cover shields in a box



### Notes:

- <sup>1</sup> The diameter must be matched to actual current and operation temperature (see: Cautions and warnings).
- <sup>2</sup> Acc. to IEC 60068-2-64
- <sup>3</sup> Freezing or condensing must be avoided.
- <sup>4</sup> Acc. to IEC/EN 61810-1
- <sup>5</sup> Acc. to IEC 60947-4-1, 6000 operations make & break
- <sup>6</sup> Duty cycle 50%, cycle duration 1 s, value represents B10 life time acc. to Weibull analysis.
- <sup>7</sup> Tested at 450 V for resistive loads with  $\tau \leq 1$  ms
- <sup>8</sup> No fire and no explosion will occur after this break. Afterwards, the dielectric strength and insulation resistance may not meet initial data sheet specification.
- <sup>9</sup> Detection limit 10 mA
- <sup>10</sup> Specified according to JIS C 5442 (temperature 15 °C to 35 °C, humidity 25% to 85% RH).
- <sup>11</sup> Tolerance  $\pm 10\%$  at thermal equilibrium
- <sup>12</sup> End of life is reached when insulation resistance is  $< 50$  M $\Omega$  at 1000 V.



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### Cautions and warnings

- To guarantee a satisfying performance of this contactor in the application 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 is dependent on several factors: e.g. load type, driving circuit and ambient conditions. We recommend checking the performance of the part under actual conditions.
- For capacitive loads, the inrush current through the contactor should not exceed the specified limit (see make and break border), otherwise tack welding and permanent failure will occur.
- In the event of inductive loads with  $\tau > 1\text{ms}$  the lifetime will be shortened and break failure may occur.
- In order to ensure safe operation, the voltage at the connection terminals of the contactor must not exceed the nominal operating voltage by more than 10% in the event of a break under load. (inductive load)
- For continuous high current operation make sure that the temperatures of the connection terminals do not exceed 120 °C by selecting an appropriate connection cable cross section or active cooling.
- The leads 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 suitable screws or bolts and nuts for all mechanical connections to the contactor and verify their functionality in the application.
- 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 is installed in parallel. No further protection device shall be used parallel to the coil.
- For 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.
- 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.
- For contactors equipped with auxiliary contacts (S type): The auxiliary contact ("stuck detection") is no real parallel contact and delivers only an indirect source of information about the actual switching status.
- For additional safety, 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.
- 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 20 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.



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- The contactor must not be operated without any load, as 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.
- Damaged contactors must not be re-used.
- The manufacturer cannot be held liable for failures caused by condensation or icing. The customer has to apply suitable measures to avoid these circumstances.
- This contactor is not waterproof.
- 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.
- This contactor is tested and classified according to UL as an open-type device. This means the contactor is intended to be installed in an ultimate enclosure provided by a third party.

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## Important notes

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## The Netherlands



Elektrostraat 17  
NL-7483 PG Haaksbergen

T: +31 (0)53 573 33 33  
F: +31 (0)53 573 33 30  
E: [nl@texim-europe.com](mailto:nl@texim-europe.com)

## Belgium



Zuiderlaan 14 bus 10  
B-1731 Zellik

T: +32 (0)2 462 01 00  
F: +32 (0)2 462 01 25  
E: [belgium@texim-europe.com](mailto:belgium@texim-europe.com)

## UK & Ireland



St. Mary's House, Church Lane  
Carlton Le Moorland  
Lincoln LN5 9HS

T: +44 (0)1522 789 555  
F: +44 (0)845 299 22 26  
E: [uk@texim-europe.com](mailto:uk@texim-europe.com)

## Germany North



Bahnhofstrasse 92  
D-25451 Quickborn

T: +49 (0)4106 627 07-0  
F: +49 (0)4106 627 07-20  
E: [germany@texim-europe.com](mailto:germany@texim-europe.com)

## Germany South



Martin-Kollar-Strasse 9  
D-81829 München

T: +49 (0)89 436 086-0  
F: +49 (0)89 436 086-19  
E: [germany@texim-europe.com](mailto:germany@texim-europe.com)

## Austria



Warwitzstrasse 9  
A-5020 Salzburg

T: +43 (0)662 216 026  
F: +43 (0)662 216 026-66  
E: [austria@texim-europe.com](mailto:austria@texim-europe.com)

## Nordic region



Sdr. Jagtvej 12  
DK-2970 Hørsholm

T: +45 88 20 26 30  
F: +45 88 20 26 39  
E: [nordic@texim-europe.com](mailto:nordic@texim-europe.com)

## Italy



Via Matteotti 43  
IT-20864 Agrate Brianza (MB)

T: +39 (0)395 967 226  
F: +39 (0)395 967 226  
E: [italy@texim-europe.com](mailto:italy@texim-europe.com)

## General information



[info@texim-europe.com](mailto:info@texim-europe.com)  
[www.texim-europe.com](http://www.texim-europe.com)