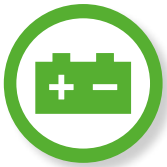


# Electrified Vehicle Safety Components.



## TYPICAL APPLICATIONS OF CIRCUIT BREAKERS & CLOSERS

- FHEV (Full Hybrid Electric Vehicle)
- PHEV (Plugin Hybrid Electric Vehicle)
- BEV (Battery Electric Vehicle)
- EREV (Extended Range Electric Vehicle)
- Charging infrastructure to secure battery charging
- Conventional vehicle to secure the battery circuit

## CIRCUIT BREAKERS & CLOSERS SUPPORT ELECTRICAL SAFETY (POST CRASH)

- Safe interruption of high short-circuit currents
- Disconnecting powertrain from battery system
  - Safe car condition post-crash for first responders and occupants

Short-circuiting to ensure safe car condition

- Discharging of DC link capacitor
- Short-circuiting the drive unit

## CIRCUIT BREAKER 500 / 500-2

- Provides secure separation over full current range
- Low internal resistance
- Developed according to latest industrial standards
- One component to protect high voltage circuits
- Constant properties over lifetime and temperature
- Separation time less than 2 ms independent from current height within separation capacity



TECHNICAL DATA	CB 500	CB 500-2
Dimensions	Distance between screw holes: 84 mm Length 49 mm, Width 49 mm (without conductor), Height 78 mm	Distance between screw holes: 70 mm Length 46 mm, Width 46 mm (without conductor), Height 67 mm
Weight	270 g	150 g
Separation Capacity (DC voltage   current   inductance)	500 V   16 kA   20 μH (higher/alternative values on request)	500 V   12 kA   12.5 μH (higher/alternative values on request)
Separation Time	< 1.5 ms (typical < 0.9 ms)	< 2 ms (typical < 0.8 ms)
Nominal Current	400 A @ 85 °C (higher values with active cooling)	300 A @ 60 °C for 24 h (higher values with active cooling)
Pyrotechnics	GTMS Igniter (LV 16 & USCAR-28)	GTMS Igniter (LV 16 & USCAR-28)
Pyrotechnic Interface	Pin Type AK-1/AK-2 following ISO 19072-1 (un-sealed)	Pin Type AK-1/AK-2 following ISO 19072-1 (un-sealed)
Operating Temperature / Ambient Temperature	-40 °C to 85 °C / -40 °C to 85 °C	-40 °C to 120 °C / -40 °C to 85 °C
Busbar Resistance	≤ 50 μΩ (before activation), > 50 MΩ (after activation)	≤ 50 μΩ (before activation), > 50 MΩ (after activation)
Busbar - Igniter - Insulation Resistance	> 50 MΩ (before and after activation)	> 50 MΩ (before and after activation)
Qualification	in accordance with LV 123 and LV 124	in accordance with LV 123 and LV 124

## CIRCUIT BREAKER 1000

- Provides secure separation over full current range
- Low internal resistance
- Developed according to latest industrial standards
- One component to protect high voltage circuits
- Constant properties over lifetime and temperature
- Separation time less than 2 ms
- Rated voltage up to 1000 VDC



TECHNICAL DATA	
Dimensions	Distance between screw holes: 98 mm Length 72 mm, Width 72 mm (without conductor), Height 90 mm
Weight	410 g
Separation Capacity (DC voltage   current   inductance)	900 V   30 kA   5 μH, 900 V   20 kA   15 μH (higher/alternative values on request)
Separation Time	< 2 ms (typical < 1 ms)
Nominal Current	370 A @ 85 °C (higher values with active cooling)
Pyrotechnics	GTMS Igniter (LV 16 & USCAR-28)
Pyrotechnic Interface	Pin Type AK-1/AK-2 following ISO 19072-1 (un-sealed)
Operating Temperature / Ambient Temperature	-40 °C to 120 °C / -40 °C to 85 °C
Busbar Resistance	≤ 70 μΩ (before activation) / > 50 MΩ (after activation)
Busbar - Igniter - Insulation Resistance	> 50 MΩ (before and after activation)
Qualification	in accordance with LV 123 and LV 124

## CIRCUIT BREAKER 60-2

- Provides secure separation over full current range
- Low internal resistance
- Developed according to latest industrial standards
- Constant properties over lifetime and temperature
- Separation time less than 2 ms
- Weldable busbar connection possible



TECHNICAL DATA	
Dimensions	Distance between screw holes: 64 mm Length 37 mm, Width 37 mm (without conductor), Height 37 mm
Weight	50 g
Separation Capacity (DC voltage   current   inductance)	60 V   2 kA   15 μH (higher/alternative values on request)
Separation Time	< 2 ms (typical < 1 ms)
Nominal Current	250 A @ 85 °C
Pyrotechnics	GTMS Igniter (LV 16 & USCAR-28)
Pyrotechnic Interface	Pin Type AK-1/AK-2 following ISO 19072-1 (un-sealed)
Operating Temperature / Ambient Temperature	-40 °C to 120 °C / -40 °C to 85 °C
Busbar Resistance	≤ 90 μΩ (before activation)   > 50 MΩ (after activation)
Busbar - Igniter - Insulation Resistance	> 50 MΩ (before and after activation)
Qualification	in accordance with LV 123 and LV 124

## CIRCUIT BREAKER 60-SIWAP

- Prevents fires caused by short circuits and protects the electric system
- Provides irreversible secure separation over full current range
- Low internal resistance
- High insulation resistance after activation
- Lightweight design at small formfactor
- Waterproof housing in accordance with IPx4K



TECHNICAL DATA	
Dimensions	Distance between screw holes: 64 mm Length 49 mm, Width 37 mm (without conductor), Height 32 mm
Weight	50 g
Separation Capacity (DC voltage   current   inductance)	60 V   2 kA   15 μH (higher/alternative values on request)
Separation Time	< 2 ms (typical < 1 ms)
Nominal Current	250 A @ 85 °C
Pyrotechnics	GTMS Igniter (LV 16 & USCAR-28)
Pyrotechnic Interface (incl. Signal Wire)	Pin Type (4 pin sealed connector)
Operating Temperature / Ambient Temperature	-40 °C to 120 °C / -40 °C to 85 °C
Busbar Resistance	≤ 90 μΩ (before activation)   > 50 MΩ (after activation)
Busbar - Igniter - Insulation Resistance	> 50 MΩ (before and after activation)
Qualification	in accordance with LV 124

## CIRCUIT BREAKER 60-SMART

- Self detection of hazardous currents – independent from control unit → automatic separation
- Permanent current measurement
- Measurement accuracy 5%
- Communication via CAN – BUS
- Robust against power supply interruptions
- Low standby current



### TECHNICAL DATA

Dimensions	Distance between screw holes: 81 mm Length 64 mm, Width 50 mm (without conductor), Height 52 mm
Weight	130 g
Separation Capacity (DC voltage   current   inductance)	60 V   2 kA   15 µH (higher/alternative values on request)
Separation Time	< 2 ms
Nominal Current	250 A @ 85 °C
Pyrotechnics	GTMS Igniter (LV 16 & USCAR-28)
Pyrotechnic Interface (incl. 2 Wire-Interface)	Pin Type (4 pin sealed connector)
Operating Temperature / Ambient Temperature	-40 °C to 120 °C / -40 °C to 85 °C
Busbar Resistance	< 100 µΩ (before activation)   > 50 MΩ (after activation)
Busbar - Igniter - Insulation Resistance	> 50 MΩ (before and after activation)
Qualification	in accordance with LV 124

## CIRCUIT CLOSER 500

- Closing switch for a secure and permanent electrical connection activated by trigger signal
- Used for discharging capacitors in a power converter
- Short circuits a load circuit or the drive unit (recuperation) to eliminate the risk of electric shock for occupants and first responders
- Less than 1 ms switching time



### TECHNICAL DATA

Dimensions	Diameter 26 mm, Height 40 mm
Weight	20 g
Operating Voltage	500 VDC (1000 VDC on request)
Continuous & Peak Current	300 A for 0.5 s + 4 kA for 5 ms (superimposed) (higher/alternate values on request)
Switching Time	< 1 ms
Pyrotechnics	GTMS igniter (LV 16 & USCAR-28)
Pyrotechnic Interface	Pin Type, AK-1/AK-2 following ISO 19072-1 (un-sealed)
Busbar Connection	FASTON mating tab: 6.35 x 0.5 mm
Operating Temperature / Ambient Temperature	-40 °C to 95 °C / -40 °C to 85 °C
Busbar Resistance	> 100 MΩ (before activation)   < 10 mΩ (after activation)
Busbar - Igniter - Insulation Resistance	> 100 MΩ (before and after activation)
Qualification	in accordance with LV 123 and LV 124

