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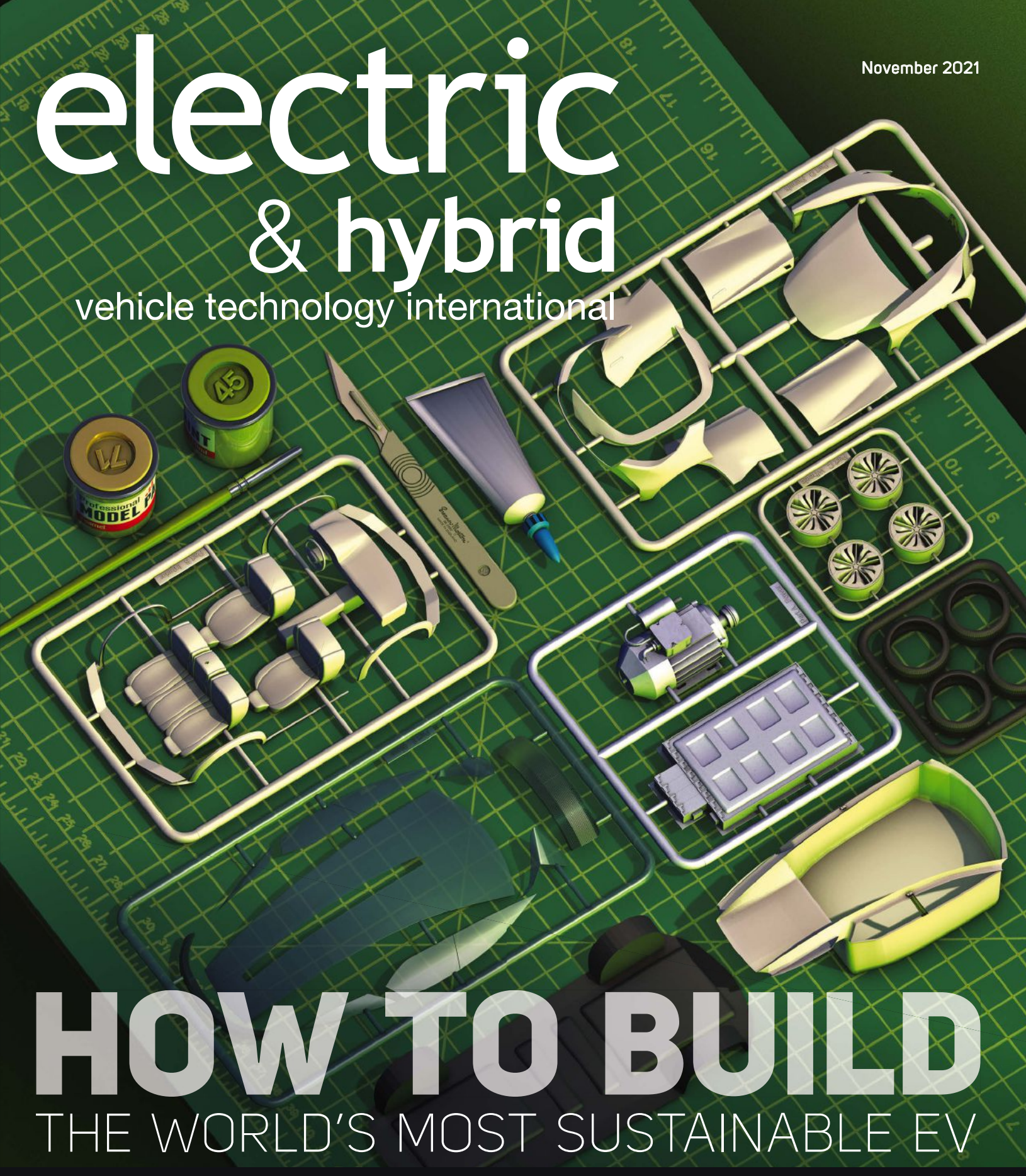


HOW TO BUILD

THE WORLD'S MOST SUSTAINABLE EV

FROM THE GROUND UP

Why the sourcing of electric vehicle battery materials urgently needs a more responsible and secure supply chain

NATURAL SELECTION

An eco-friendly concept sports car built on the principles of efficiency is aiming to redefine the meaning of performance

BEST OF THE TEST

The technologies behind the latest and greatest facilities and proving grounds designed to support the EV revolution

Latching solenoid failsafe

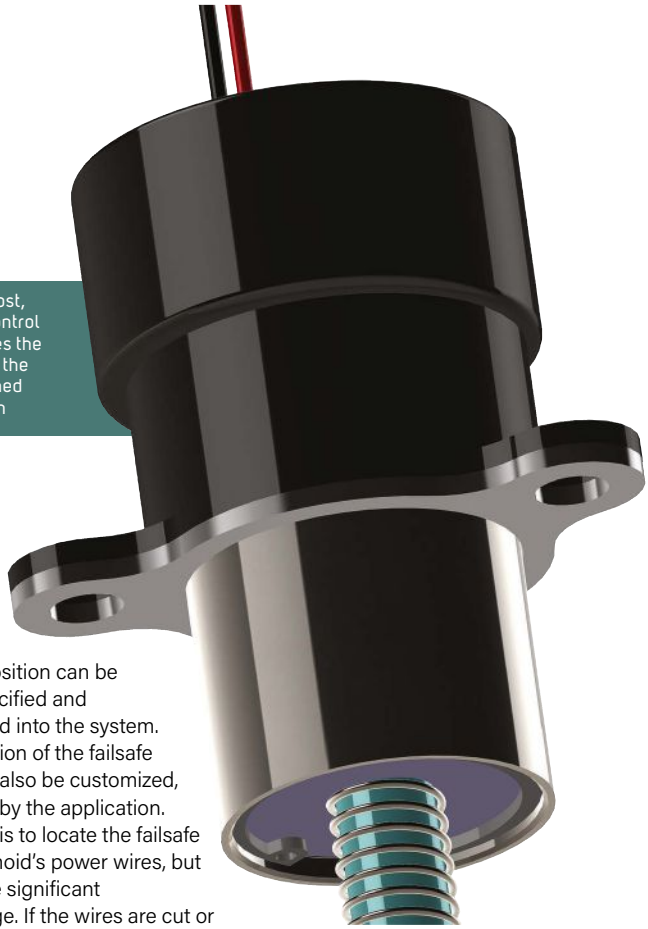
Design teams can take advantage of the technology's low power consumption and low heat generation

The current focus on energy efficiency has renewed interest in latching solenoid technology. Many electric vehicle applications need to be able to make the best use of every available joule, and any component that can minimize power consumption is highly desirable. While latching technology has been available for many years, it has suffered from one major drawback for vehicle applications: the lack of failsafe functionality. If power is lost to the system, the solenoid would remain in its last commanded state. However, over the past few years, innovations with failsafe (latch release) technology can now provide the necessary protection.

Latching solenoids are desirable where energy efficiency is a priority because they draw very little power. This makes them ideal for applications where high cycle rates are not needed. Only a short pulse of power is used to latch or de-latch the solenoid's armature. A pulse of current of one polarity is used to actuate the armature, and either a permanent magnet or residual magnetism is used to hold the armature in position. A short pulse of current of the opposite polarity is used to release the armature.

By drawing so little power, they also generate very little heat. Design teams have at times shied away from taking advantage of these benefits because of the need for a failsafe mode. As previously stated, without power, the solenoid cannot change state, and the armature will remain in the last commanded position if power is lost. This can be a significant safety concern if the last commanded position is not the same as the safe position.

Advances in technology have made incorporating a failsafe control system into the solenoid design a reliable solution to this problem. The failsafe system utilizes a circuit board and a capacitor. The circuit board monitors power availability, and if power is lost, the capacitive charge moves the armature to the designated safe position.



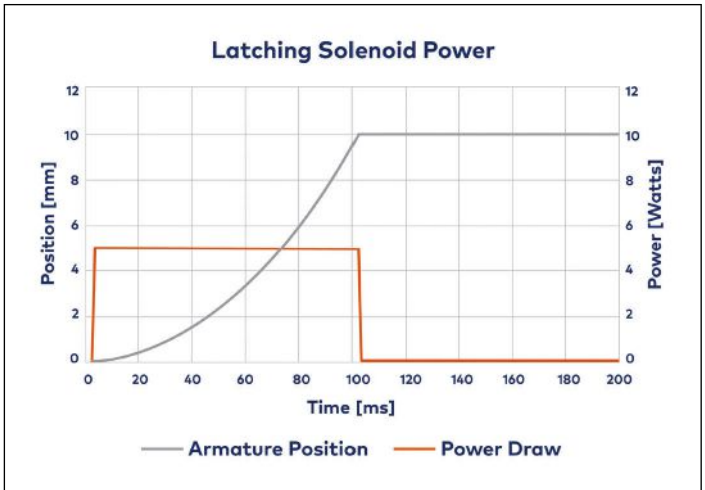
If power is lost, a failsafe control circuit moves the armature to the predetermined safe position

This safe position can be custom specified and programmed into the system.

The location of the failsafe control can also be customized, as required by the application. One option is to locate the failsafe on the solenoid's power wires, but this has one significant disadvantage. If the wires are cut or damaged between the failsafe control and the solenoid, the failsafe will not function. The best and most reliable solution is to mount the failsafe directly on the solenoid. This eliminates the possibility of loss of communication between the failsafe and the solenoid should the power wires suffer damage.

There are numerous applications where latching solenoids equipped with a failsafe control can be successfully used in vehicle applications. A latching solenoid valve in an EV thermal management system could be designed to actuate to a "limp home" valve position in the event of loss of power to the valve. A battery disconnect solenoid could be designed for EVs and HEVs to automatically cut power from the lithium-ion battery in the event of a collision to prevent accidental electrocution of vehicle occupants or first responders. Even if power is lost to the battery disconnect as a result of damage from the collision, the failsafe would still actuate the solenoid, disconnecting the battery.

The advent of reliable failsafe controls makes latching solenoids an ideal solution for vehicle applications with a low cycle rate. They draw very little power, and they generate very little heat. In the event of power loss, they can fail to a customizable safe position.



As illustrated in this diagram, latching solenoids consume no power, produce no heat, and generate no electrical noise to hold in position

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