ZEVonUDS enters series production

Everything OEMs, suppliers, and repair shops should know for MY 2026-2028

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ZEVonUDS (SAE J1979-3) mandates on-board diagnostics for ZEV vehicles. What does this mean for external test tools, and which effects will the transformation into software-defined vehicles bring?

From emissions to efficiency – why OBD is realigning itself in ZEV

SAE J1979-3 (ZEVonUDS) introduces mandatory on-board diagnostics (OBD) for zero-emission vehicles. In the U.S., a phased introduction applies: 40% ZEV/PHEV from model year (MY) 2026, 100% from 2027, and by model year 2028 at the latest, all vehicles must support the standard. At the same time, the California Air Resources Board (CARB) allows for a slightly different phasing-in schedule for MY 2025–2027.

While OBD has historically been used to monitor emission-related components, the perspective in ZEV is changing fundamentally. Battery electric vehicles and fuel cell vehicles do not have traditional exhaust systems, but instead have a variety of components that keep driving efficient and safe. Their condition directly affects range, aging, and operating costs. ZEVonUDS reflects this change and expands the OBD model to include ZEV drive-related diagnostic content.

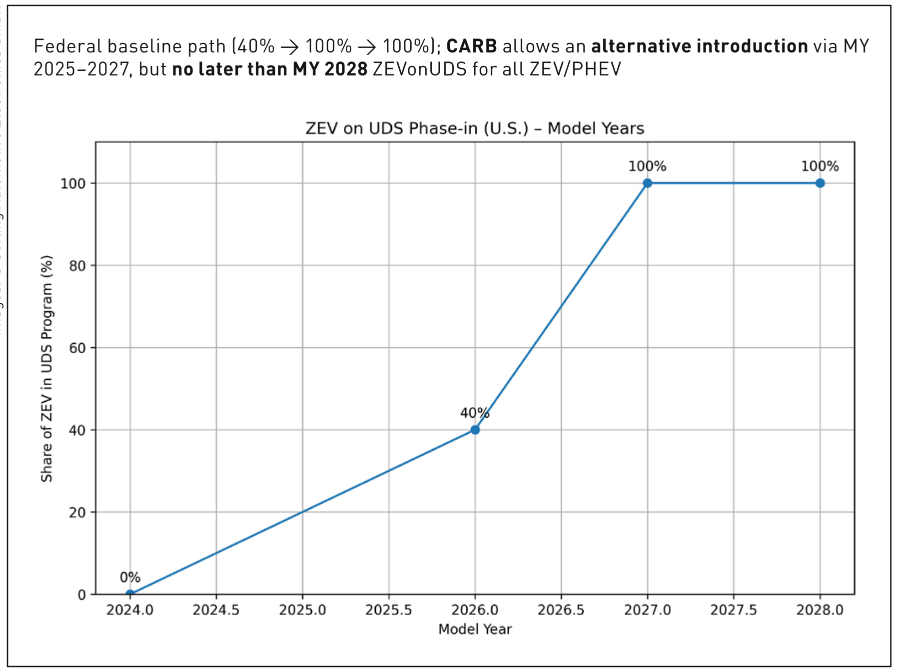
The SAE has essentially outlined OBD in three documents:

- OBD Classic (SAE J1979)
- OBDonUDS (SAE J1979-2)
- ZEVonUDS (SAE J1979-3)

The new standards focus on the following:

OBDonUDS (SAE J1979-2) refers to components whose malfunction has a direct impact on a vehicle's pollutant emissions. The focus is on lambda sensors, catalytic converters, exhaust gas recirculation, particulate filters, and tank ventilation systems.

ZEVonUDS (SAE J1979-3) refers to components whose malfunction has a direct impact on the ZEV drive system. This includes the ZEV drive system itself, but also energy storage systems, high-voltage charging systems regarding recuperation, and thermal control systems to support the drive.



OBDonUDS (SAE J1979-2) vs. ZEVonUDS (SAE J1979-3)

Unified Diagnostic Services (ISO 14229-1) describes the 26 UDS diagnostic services and their semantics for communication between the diagnostic tester and a control unit. The following four of the 26 UDS services replace the original SAE J1979 OBD-II services, namely for OBDonUDS and ZEVonUDS. OBD Classic remains unchanged.

- 0x14 – Clear diagnostic information
- 0x19 – Read DTC information
- 0x22 – Read data by identifier
- 0x31 – Routine control

One advantage of UDS is the use of 3 bytes in error codes, compared to the previous 2 bytes. This allows malfunctions to be localized more accurately. The data identifiers in UDS allow larger value ranges for additional OBD-relevant data.

UDS is already widely used in the field of manufacturer-specific diagnostics, as it is independent of the bus system used and therefore not limited to CAN communication. The CAN bus system is one of the most important in the automotive industry and connects control units with a data rate of up to 1 Mbit/s. Even higher data rates of over 100 Mbit/s can be achieved with Automotive Ethernet. The associated transport protocols are DoCAN and DoIP.

In a direct comparison, SAE J1979-2 and J1979-3 show the following differences: J1979-3 does not support freeze frame data or permanent fault codes, and the "Routine Control" service (0x31) is available in principle, but without defined test routines. J1979-2 communicates exclusively via CAN, while J1979-3 enables DoIP with a higher data rate.

Example: Traction Battery Pack State of Health, BAT_SoH: xxx.x%

ZEVonUDS offers the option of reading out the health status of the high-voltage drive battery, i.e., the ratio of the current capacity to the nominal capacity when newly installed (in percent):

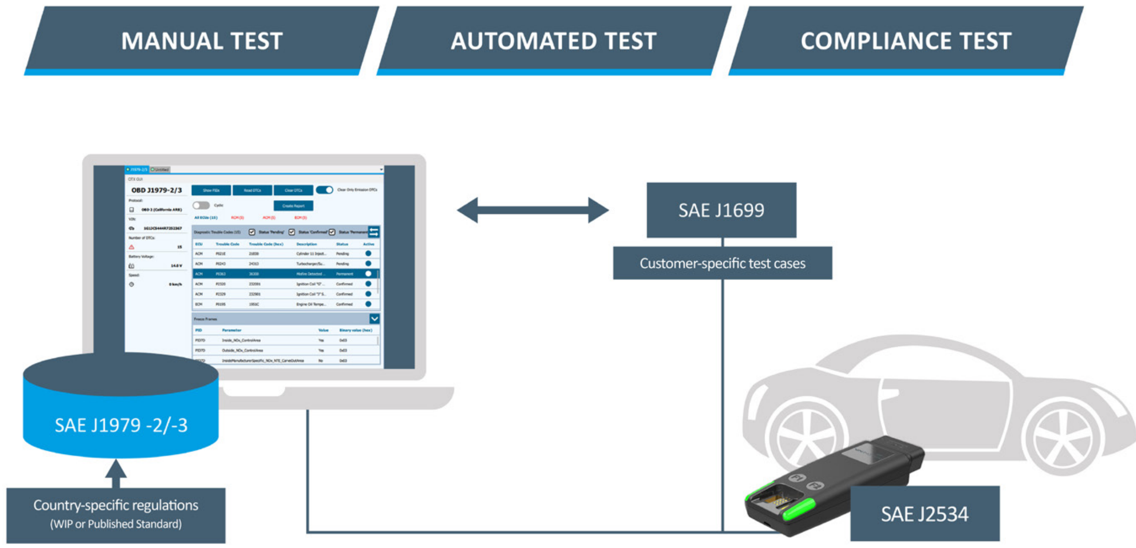


Figure 1: Softing's OBD support throughout the entire life cycle

Request (functional or physical addressing):

0x22 F4 B2

(0x22 =service identifier; 0xF4 B2 = data identifier)

Response (positive):

0x62 F4 B2 FE

Interpretation: 0xFE = 99.6 % SoH

These values are crucial for warranty decisions, residual value models, and battery life assessment.

Challenges for implementation

OEMs and suppliers are responsible for implementing and validating the new communication rules, including standardized diagnostic addresses, request/response formats, and timing rules.

Development testers and after-sales scan tools must combine "old" and "new" and support DoCAN and DoIP. Due to possible changes and country-specific differences in the legal framework, a high degree of flexibility is required in the data of such tools.

SAE emphasizes that some regional regulations have not yet been finalized. In this respect, vehicles must also meet regulatory requirements in the field, and additional time must be allowed for updating the data in the test software!

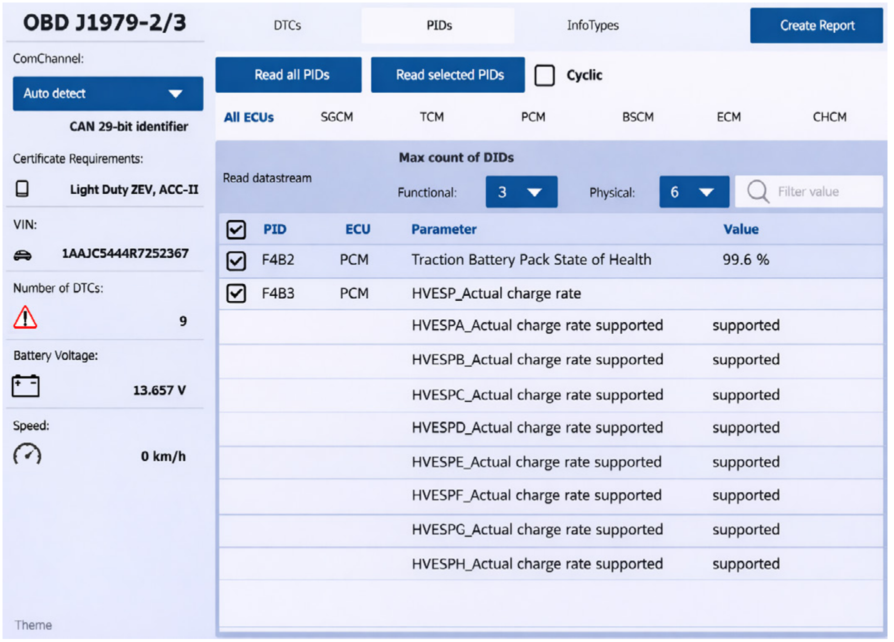


Figure 2: The user interface in Softing DTS.monaco for SAE J1979-2/3

Compliance without re-engineering

Softing Automotive Electronics offers complete OBD support, including flexible configurations and expandability in its tools, thereby supporting customers throughout the entire life cycle from the development tester Softing DTS.monaco to the After-sales tester Softing TDX. One example is the user interface in Softing DTS.monaco. With just a few clicks, the ZEV drive-related parameters (PIDs) can be retrieved. Error codes (DTCs) and InfoTypes can also be determined and displayed in a central report.

The future of diagnostics in the SDV - SOVD

The shift to software-defined vehicles (SDVs) means that diagnostic intelligence is moving from the tester to the vehicle. The new diagnostic standard of tomorrow is called Service-Oriented Vehicle Diagnostics (SOVD). ASAM SOVD defines three types of access: in-vehicle, proximity, and remote. This means that OBD data can also be used without local access. ZEVonUDS and SOVD complement each other: ZEVonUDS defines the data, while SOVD defines access. Together, they enable a modern diagnostic path for highly efficient monitoring of OBD-relevant data and regulatory compliance of the vehicle via the cloud.

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