

# Environmental conditioning for EV components

The efficiency of powertrain components relies on optimization under representative conditions

**E**nvironmental conditioning plays a critical role in ensuring the efficiency, performance and durability of EV components. From batteries to electronics and motors, the thermal management of these components is crucial to ensure maximum performance and reliability.

## ENVIRONMENTAL CHALLENGES

The environmental conditions to which EV components are exposed are varied and can present several challenges.

Temperature has a significant impact on the performance and life of EV batteries and electronics. Extreme heat or cold can affect the performance and efficiency of the battery chemistry and increase charging times. Fast-charging processes place increasingly demanding requirements on safe heat dissipation with high outputs.

Humidity can cause corrosion and short circuits in electronic components, especially in sensitive areas such as control units and sensors. Meanwhile, ambient air quality affects the efficiency of cooling systems and increases the susceptibility of components to contamination.

Managing the thermal needs of electric vehicle components involves complex challenges due to temperatures ranging from -40°C to +150°C and the use of different coolants. Standard equipment isn't sufficient to meet these needs; specialized circuits are necessary to meet precise temperature, pressure and flow demands and deal with rapid temperature changes. Components often operate across multiple circuits using various media, necessitating advanced sensor setups for accurate thermal management.

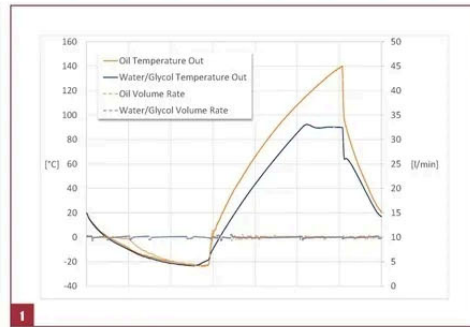
The requirements described above summarize a recurring need that arises in many testing tasks and therefore gives rise to the call for a standardized solution.

EUTECH Scientific Engineering has harnessed the know-how it has acquired over many years in the field of test rig development and component conditioning and incorporated it into the development of a mobile conditioning unit, tailored to current requirements while retaining sufficient flexibility to respond to specific customer needs. The EUMedicon mobile conditioning unit focuses on the testing and test operation of electric motors and gearboxes as well as converters and control units.

At the core of the system is a single unit with one or two independently conditional secondary circuits, available in different variants and freely configurable in terms of capacity, flow rate and other

1. Trace showing the increasing viscosity of oil at lower temperatures

2. The EUMedicon unit is able to cater to the media conditioning needs of current and future EV powertrains



features. The two fluid circuits can operate with different media such as water-glycol and various oils, and be controlled independently of each other in a temperature range of -40°C to +150°C.

The trace shown in Figure 1 reveals that the increasing viscosity of oil during cooling at temperatures below -10°C affects the maximal achievable flow rate in this specific test case. During the heating period, the desired flow rate of 10 l/min is restored when the -10°C temperature value is exceeded. The media circuit operated with water-glycol shows no temperature influence on the volume rate. The temperature control keeps a safety margin on the boiling temperature. Higher temperatures are achievable in the water-glycol circuit by choosing a closed circuit with active pressure control up to 10 bar. EUMedicon's flexibility is made possible by its modular control software, which enables many other features such as pressure and flow control, and active recirculation for open circuits.

The system is operated either as a standalone solution via a local display or remotely via various interfaces including EtherCAT and CAN. In this way, it seamlessly integrates into users' test stand automation and safety circuits.

Due to the compact mobile setup, the conditioning unit can be rapidly deployed in various test environments without any specific modifications, only power and water supplies are required. The modular platform design and the use of standard components allow flexible configuration and quick adaptation to specific requirements.



**EUTECH Scientific Engineering**

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