



• Increased comfort • Better driveability • More safety

VB-eRRide®

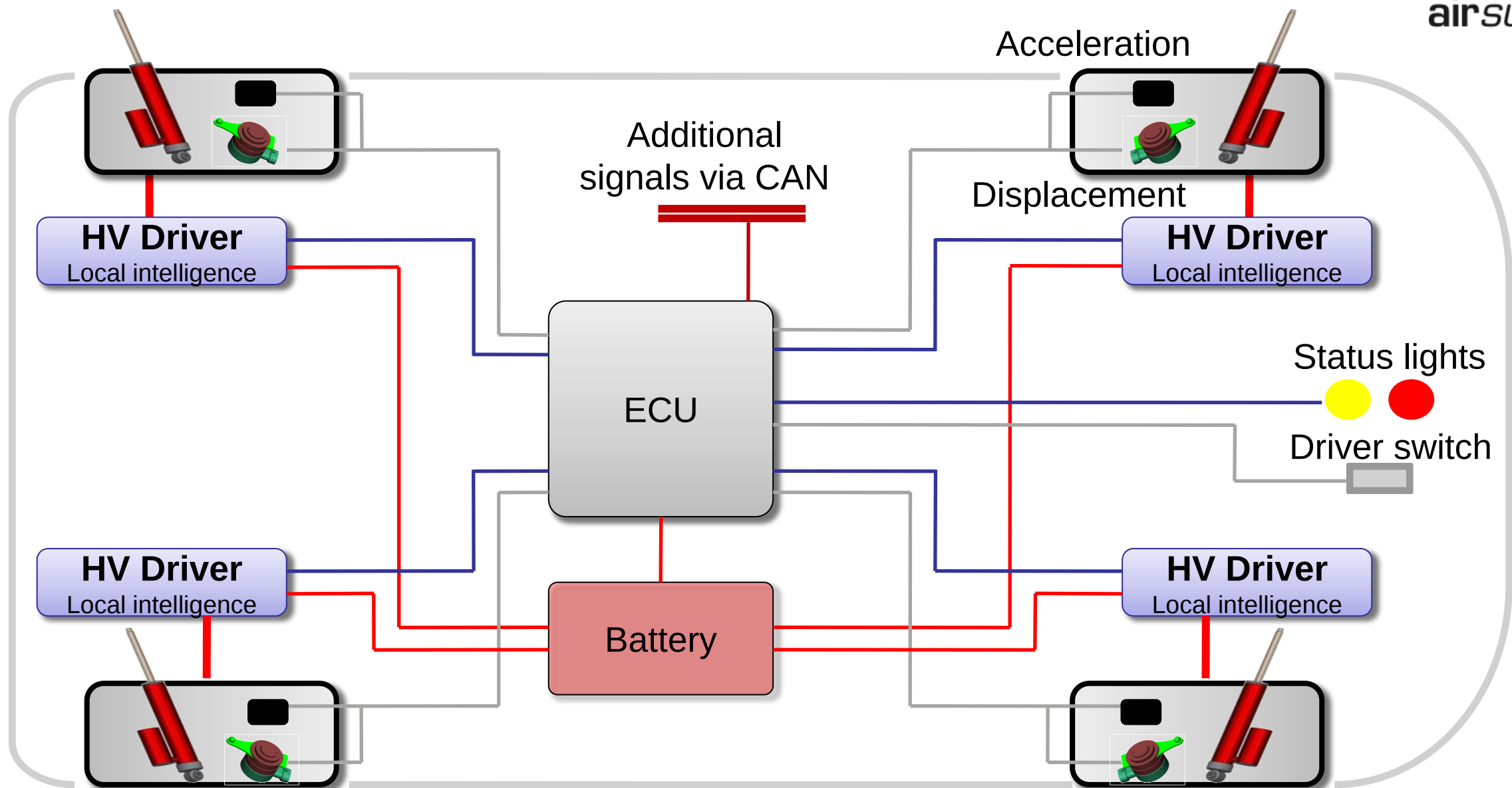
**World's First ER Fluid-Based Semi-Active
Suspension System for Light Commercial Vehicles**



making every day smoother

- Is a suspension control system for Light Commercial Vehicles (LCV) and Vans, such as transport, medical emergency and recreational vehicles.
- Consists of ER fluid-based, continuously variable controlled dampers with local control intelligence, a central ECU and system-specific sensors.
- Includes proprietary, real-time algorithms which adjust the damping force at each corner of the vehicles every 1ms and thus optimize vehicle ride comfort, handling safety and security, save fuel and reduce damage of tyres, roads and bridges.

VB-eRRide® Architecture

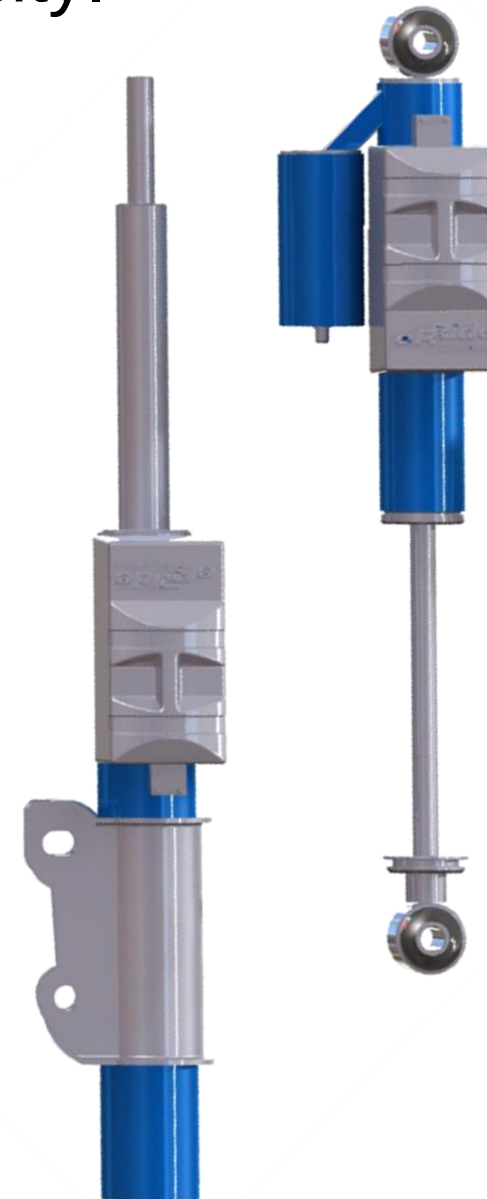


- Distributed network with a central **ECU** and four satellite controllers (**HV Driver**).
- The local controllers contain the HV Drivers that generate high-voltage commands, monitor damper health and perform other local control functions.
- An optional driver's preference switch and warning lights are also provided.

VB-eRRide® ER Dampers



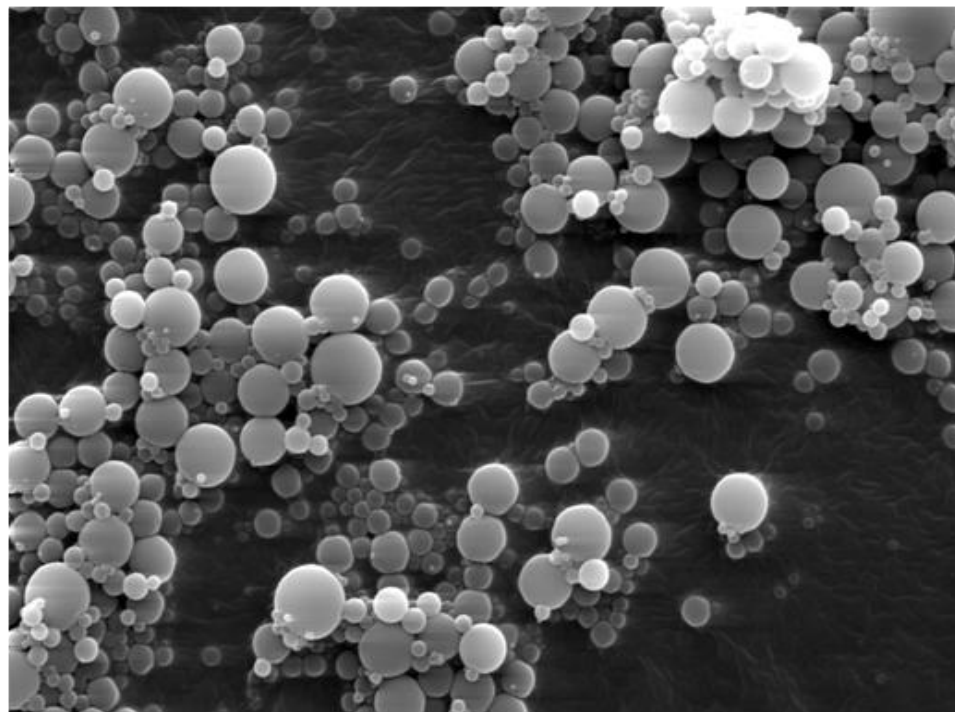
- The controllable dampers are filled with Electrorheologic (ER) fluid, which reacts to externally applied electrostatic fields by a fast and reversible change in yield stress or viscosity.
- The dampers do not use any electro-mechanical valves, are very stable, quiet and extremely responsive, both in terms of dynamic response (fast) and dynamic range (turn up ratio).
- The electrostatic field is generated by the local high-voltage power driver built within the **CarCon**, which is mounted directly on the damper, thus eliminating exposed high-voltage wiring.



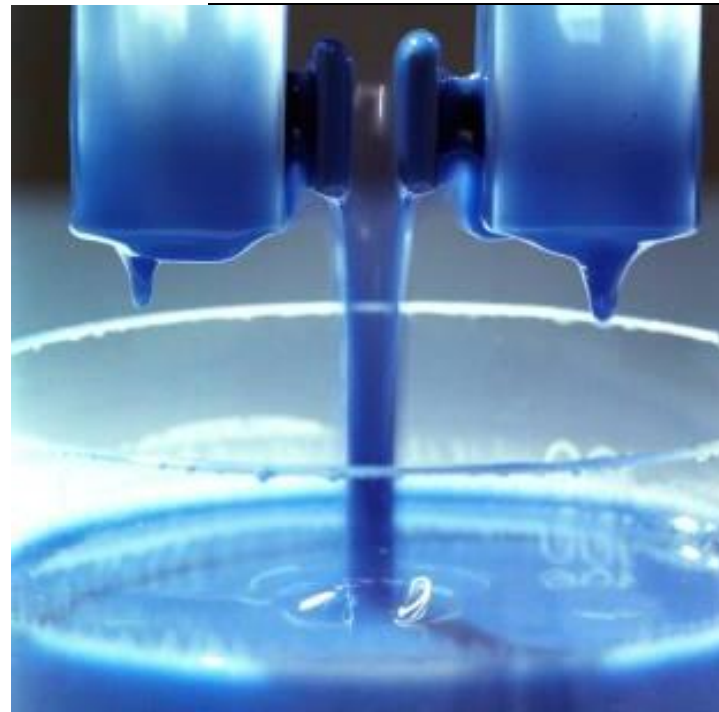
Fludicon's ER Fluid, RheOil®



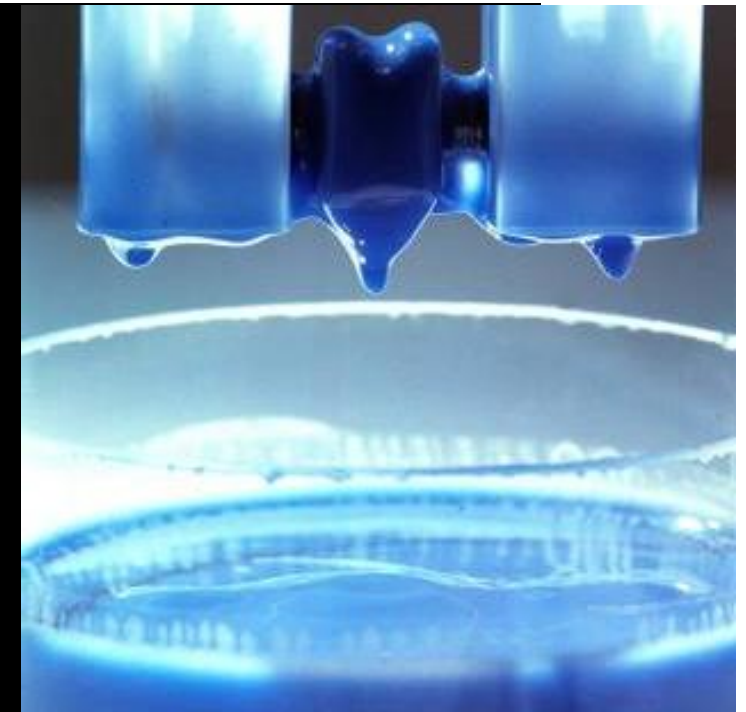
- Fludicon's ER fluid consists of silicone oil and micron-sized polyurethane particles and other proprietary additives; it is produced by Fludicon's proprietary process.
- The yield stress of the ER fluid changes in the presence of an external electric field.
- The ER effect is very fast and completely reversible.
- Fluid is light (specific gravity = 1.04), non-abrasive, non-toxic and eco-friendly.



Polyurethane Particles (@ 2,000 x)



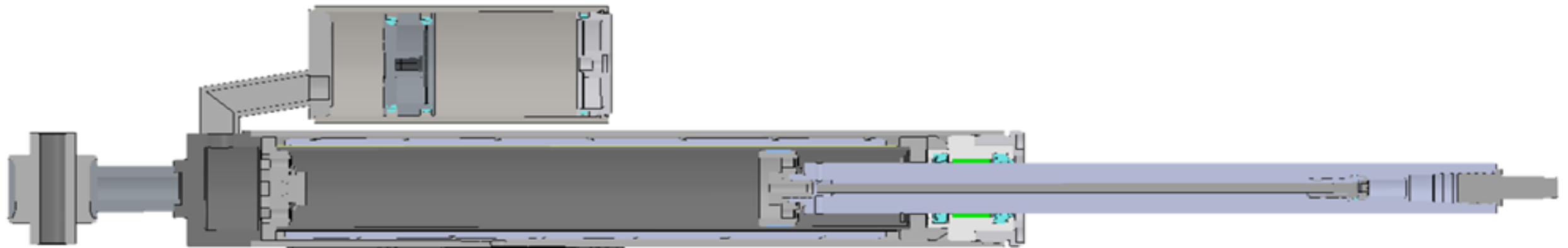
Electric Field = 0
ER fluid flows freely
between the electrodes



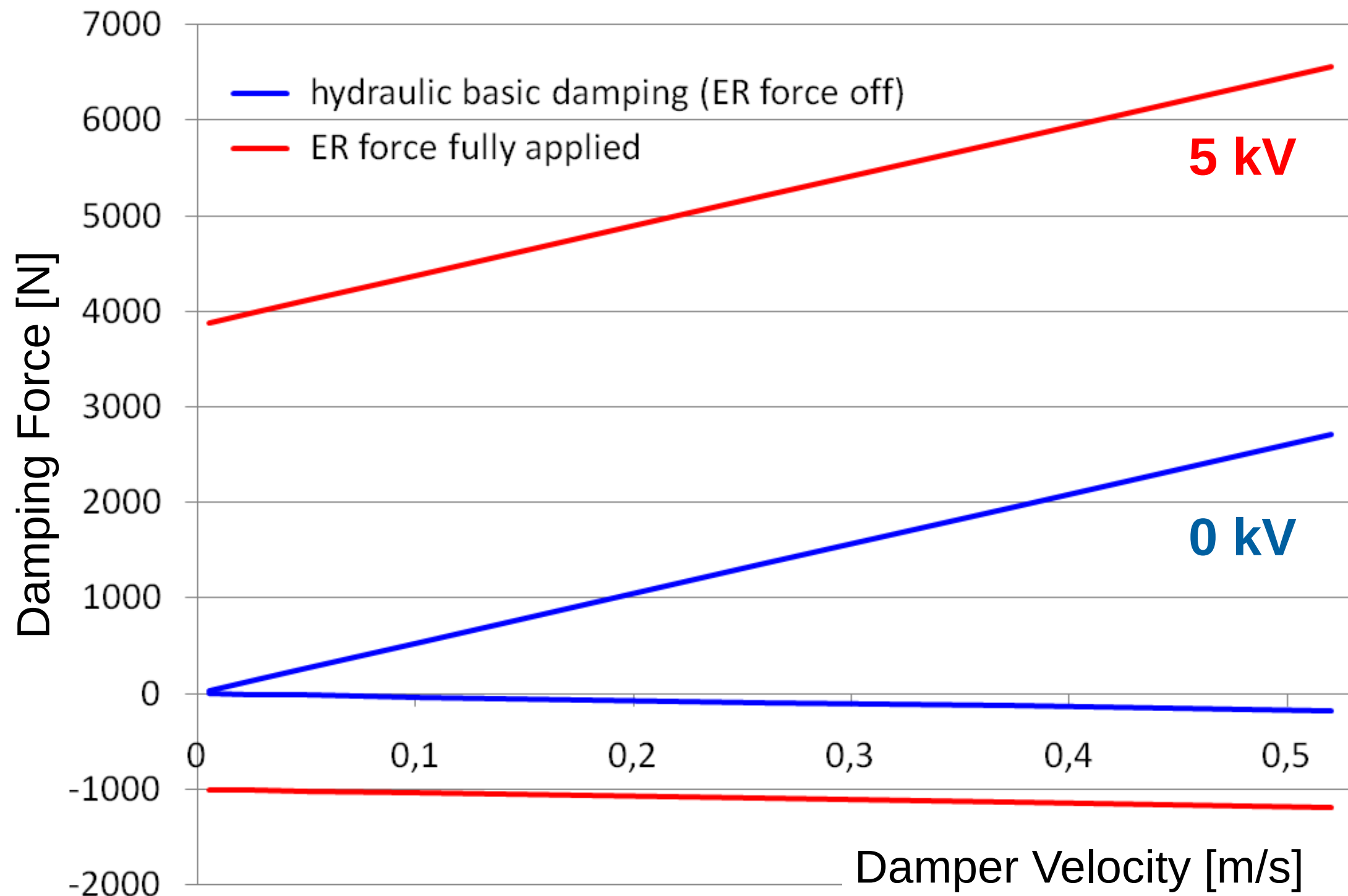
Electric Field $\neq$ 0
ER fluid "solidifies" between
the electrodes

ER Damper Design Details

- Shocks and struts of twin-tube construction.
- Low Nitrogen pre-charge pressure for low friction and low gas spring force.
- Standard damper parts and materials used extensively.
- ER fluid flow annulus formed by inner cylinder tube (+ electrode) and outer damper tube (ground electrode) where the ER effect takes place.
- Simple base and piston check valves rectify the flow (ER fluid flows only in one direction through the annulus).



ER Damper Performance



VB-eRRide® Control Strategies for Various Vehicle Applications



Ambulances, Release I

- At low vehicle speeds, comfort is emphasized, and control parameters (gains) are set low.
- At higher vehicle speeds, improved road holding is emphasized.

Ambulances, Release II (with CAN access, lateral acceleration sensor or steering wheel sensor)

- Skyhook control emphasizes road isolation and comfort when driving straight
- Groundhook control emphasizes road holding when manoeuvring (steering, braking, accelerating)

RV's and Transports

- Driver's preference switch (Sport/Comfort settings) can be added

Specialty Vehicles (e.g., armoured)

- Driver's preference switch (Sport/Comfort settings, Offroad, Traction setting)

The Reasons Behind **VB-eRRide**®



- VB-Airsuspension specializes in air suspension systems for LCV and Van.
- The company is an OE supplier to eight top-range LCV and VAN manufacturers and is an active partner for new developments.
- In the LCV and Van market there is no doubt about the fact that air suspension will make an even stronger entrance in the future.
- Discussions with several vehicle manufactures have shown that the benefits of air over mechanical suspensions need to be more substantial to justify the cost and to achieve larger volumes. Cost vs. Performance vs. Safety are not properly balanced today.
- VB sees a need for a combined, low-cost leveling system together with a semi-active damping control system. Next generation VB-Airsuspension system will be such a combination of a VB-NivoAir like system with a **VB-eRRide**® Phase I.
- For special applications and low market volumes there will be a VB-FullAir with a **VB-eRRide**® Phase II system which will serve the high-end applications.
- To prove the principle of **VB-eRRide**® system, VB has started to apply it in conventionally sprung vehicles.

Initial Applications of **VB-eRRide**® (Conventionally Sprung Vehicles)



Mercedes-Benz Sprinter

- First project of VB-eRRide is based on Mercedes-Benz Sprinter 5,0T. The application for a Letter of Non Objection (LONO) from Daimler AG is in process. VB-Airsuspension is a GU-Partner for Mercedes-Benz Vans they work closely together to introduce this revolutionary system as a future option to their Vans.
- At Stand 5120, you can see one of the first vehicles with the **VB-eRRide**® system installed.
- VB-Airsuspension has started testing of the system with a selective number of partners in the following markets:
 - Bus / Coach application, VDL-Kusters in Holland
 - RV / Camper application, Le Voyageur France
 - Rescue / Ambulance application, GSF Germany

AL-KO AMC chassis on Fiat Ducato

- Second project for **VB-eRRide**® will be based on Fiat Ducato vehicle equipped with an AL-KO AMC low-floor chassis. Since 2010 VB-Airsuspension and AL-KO are development partners and as a result of this both companies see the need for this revolutionary system to go into the AMC chassis.

THE END