

E-MOBILITY IN TRUCKS



TAKE CHARGE
100% ELECTRIC

MARTIN BELLANDER

SCANIA

E-MOBILITY IN
TRUCKS

BURGHAUSEN

2024-04-16

SCANIA

Content

An aerial photograph of a large concrete arch bridge spanning a wide river or lake. The sky is filled with soft, golden light from a low sun, creating a warm glow over the water and the bridge. A white bus is visible on the bridge's roadway. The surrounding landscape is lush with green trees and vegetation.

- e-Mobility - Introduction
- Electrification, where are we today?
- Electric vehicles – how it works
- Rubber in ICE vehicles
- Silicone rubber examples in ICE vehicles
- ICE vs Electric vehicles
- Rubber in EV vehicles
- Summary and concluding remarks

Scania



~100 000 vehicles/year

~10 000 engines/year

50 000 employees

HQ and R&D in Södertälje, Sweden

Since 1891 (Scania, 1911 Vabis)

Part of Traton Group (with VW, MAN, Navistar)

Trucks



Buses and coaches



Engines



Services



Four strong Brands under one roof



Truck
Bus



e-Mobility - a real Buzz-word!!!

- 949 M hits on Google

689 M hits for "Democracy"
581 M hits for "Transports"
368 M hits for "Polymer"
16 M hits for "Silicone rubber"

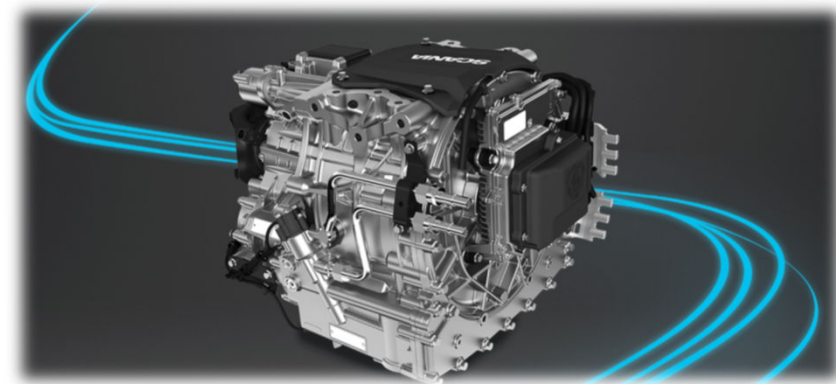


e-mobility

1720 hits for:

... the concept of using electric powertrain technologies, in-vehicle information, and communication technologies and connected infrastructures to enable the electric propulsion of vehicles and fleets.

1. Electric propulsion
2. In vehicle information - Safety
3. Connectivity – Fleet management





In vehicle information – safety

- EU 2019/2144
Regulation

on type-approval requirements for motor vehicles and their trailers, and systems, components and separate technical units intended for such vehicles, as regards their general safety and the protection of vehicle occupants and vulnerable road users.

Mandatory from July 2024:

1. Emergency stop signal
2. Tyre pressure monitoring system
3. Blind spot information system
4. Reversing information system
5. Moving off information system
6. Alcohol Interlock Facilitation Installation
7. Driver drowsiness and inattention warning
8. Intelligent speed assistance

16.12.2019 EN Official Journal of the European Union L 325/1

I
(Legislative acts)

REGULATIONS

REGULATION (EU) 2019/2144 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 27 November 2019
on type-approval requirements for motor vehicles and their trailers, and systems, components and separate technical units intended for such vehicles, as regards their general safety and the protection of vehicle occupants and vulnerable road users, amending Regulation (EU) 2018/858 of the European Parliament and of the Council and repealing Regulations (EC) No 78/2009, (EC) No 79/2009 and (EC) No 661/2009 of the European Parliament and of the Council and Commission Regulations (EC) No 631/2009, (EU) No 406/2010, (EU) No 672/2010, (EU) No 1003/2010, (EU) No 1005/2010, (EU) No 1008/2010, (EU) No 1009/2010, (EU) No 19/2011, (EU) No 109/2011, (EU) No 458/2011, (EU) No 65/2012, (EU) No 130/2012, (EU) No 347/2012, (EU) No 351/2012, (EU) No 1230/2012 and (EU) 2015/166
(Text with EEA relevance)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,
Having regard to the Treaty on the Functioning of the European Union, and in particular Article 114 thereof,
Having regard to the proposal from the European Commission,
After transmission of the draft legislative act to the national parliaments,
Having regard to the opinion of the European Economic and Social Committee (1),
After consulting the Committee of the Regions,
Acting in accordance with the ordinary legislative procedure (1),

Whereas:

(1) Regulation (EU) 2018/858 of the European Parliament and of the Council (1) lays down administrative provisions and technical requirements for the type-approval of all new vehicles, systems, components and separate technical units, with a view to ensuring the proper functioning of the internal market and in order to offer a high level of

Connectivity

- Communication system
- Real time data of fleets
 - Fuel consumption
 - Vehicle uptime
 - Fleet management
 - Vehicle performance
 - Driving time
 - Service planning
 - Geofencing/speed limiting
 - Real-time positioning



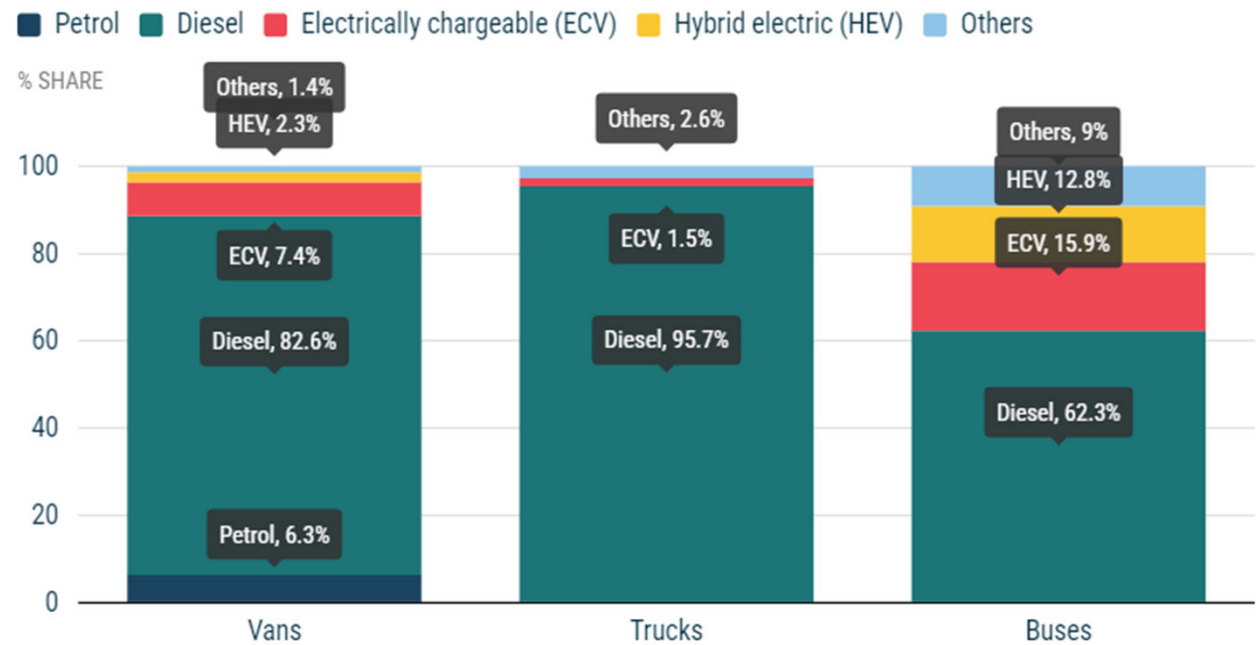
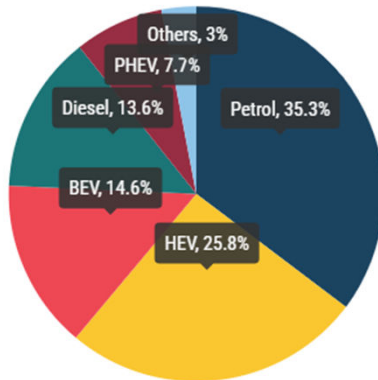


Electrification today

EU 2023:

- 348 000 trucks (5 300 ECV)
- 33 000 buses (5 200 ECV)

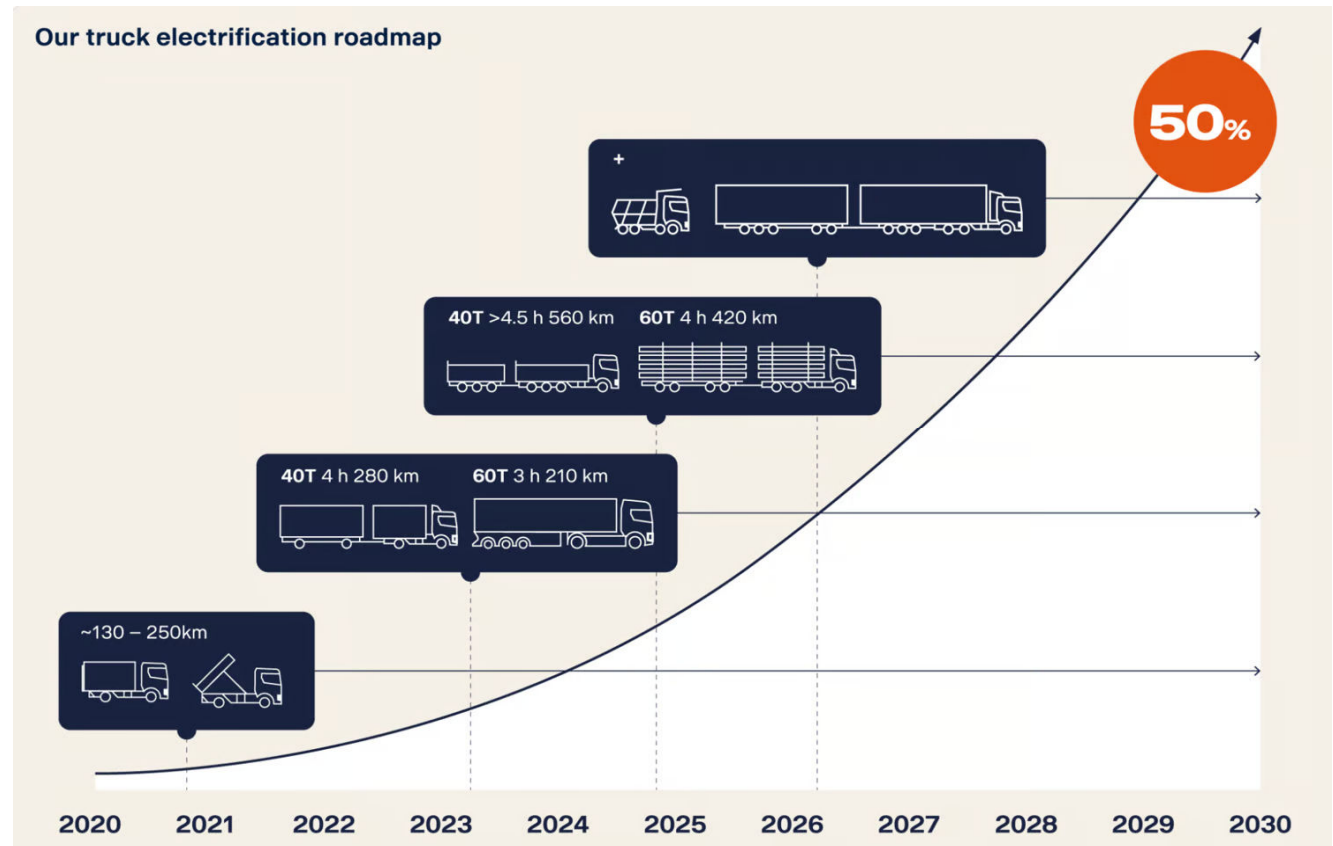
- 10,5 M cars (1,5 M ECV)





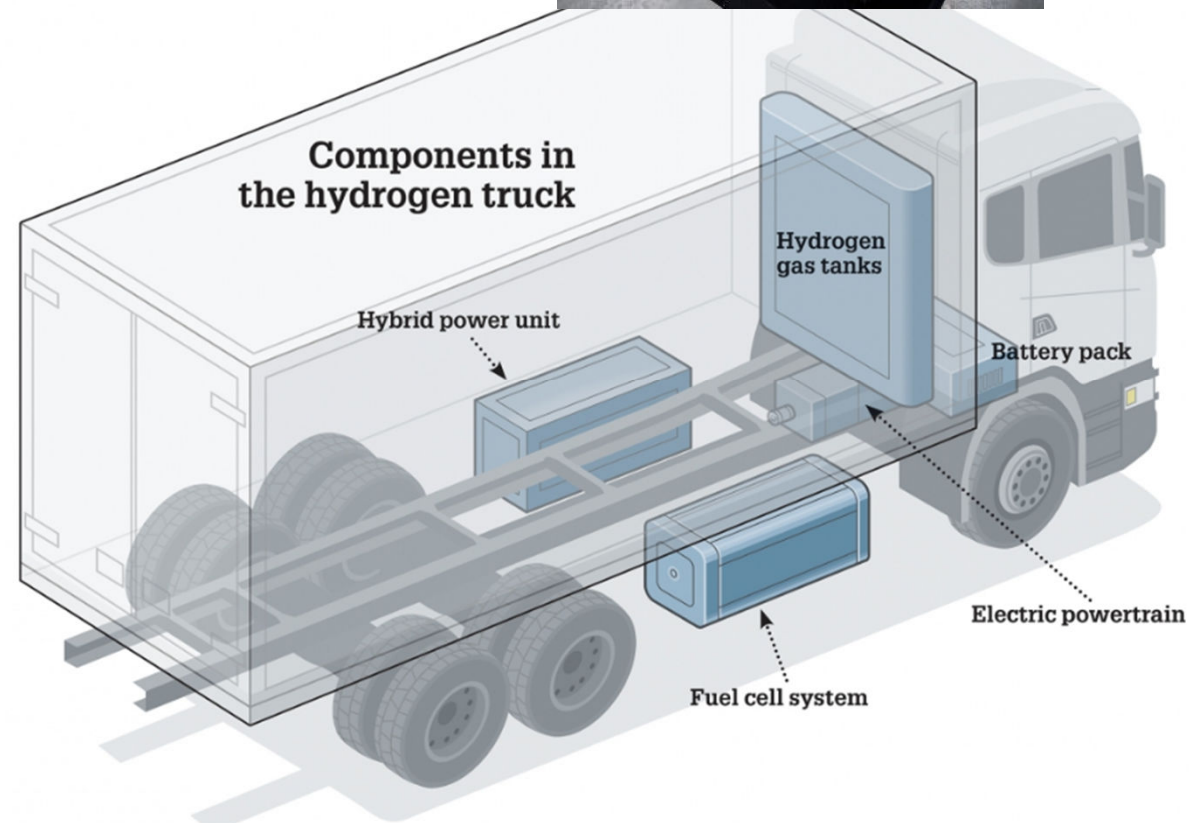
Electrification roadmap(s)

- Scania:
- Volvo
Net zero emission 2040
- Daimler
CO₂ neutral 2050. Battery + Fuel cell
- Renault
50% electric 2030, 100% CO₂ neutral 2040
- MAN
GHG neutral 2050
- DAF
Battery electric and hydrogen



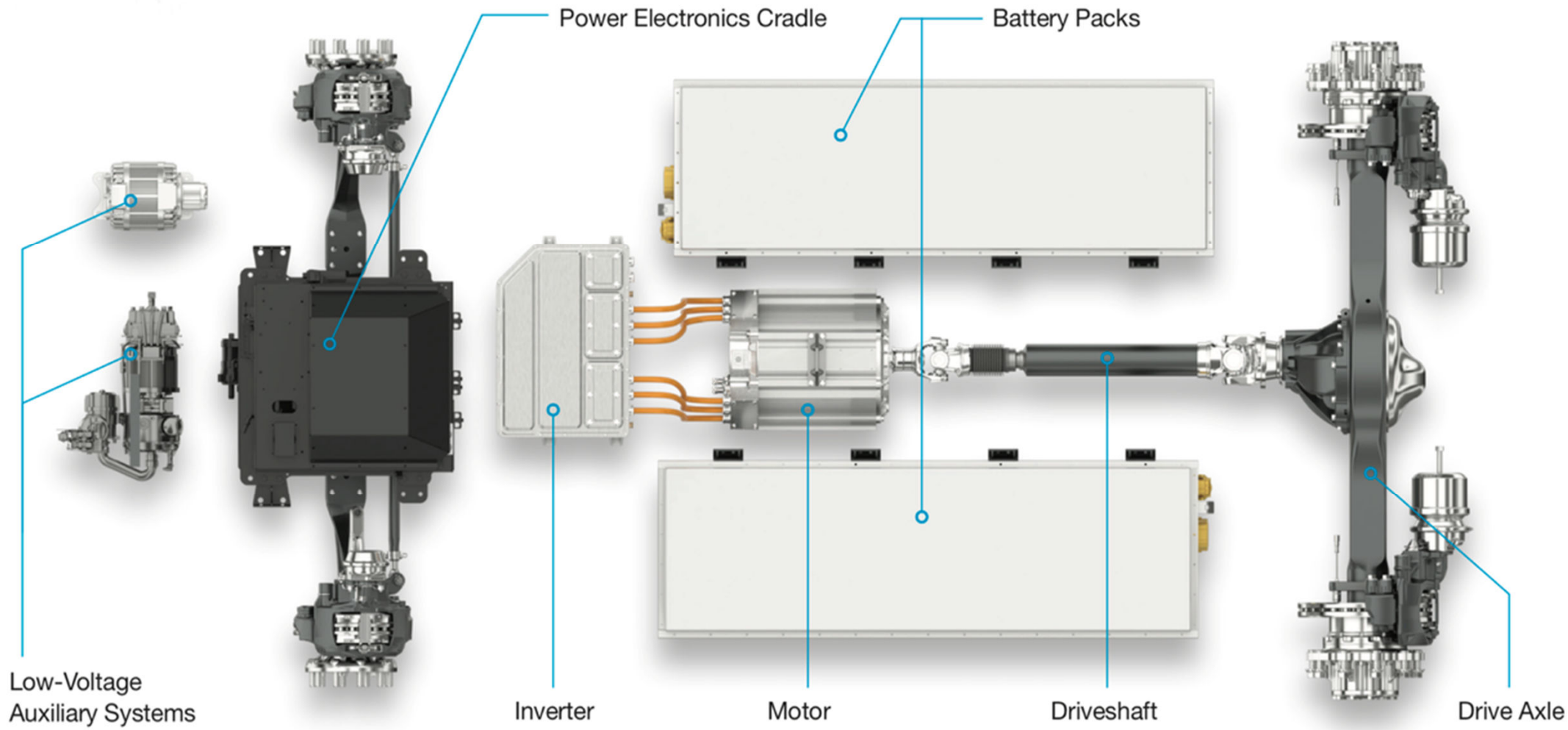
Electrification

- 5 300 electric trucks sold in EU 2023 (345 000 total)
- Hybrides – HEV/PHEV
- Battery electric vehicles
- Fuel cell electric vehicles – customer trials only
- Battery range needed?
 - 624 kWh
 - 520 km range at 29 t GTW
 - 440 km range at 40 t GTW
 - 320 km range at 64 t GTW



⌈	🛏	⌈
4.5 hrs	45 mins	4.5 hrs

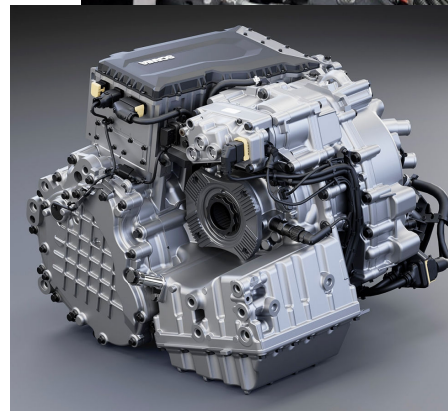
How it works





How it works

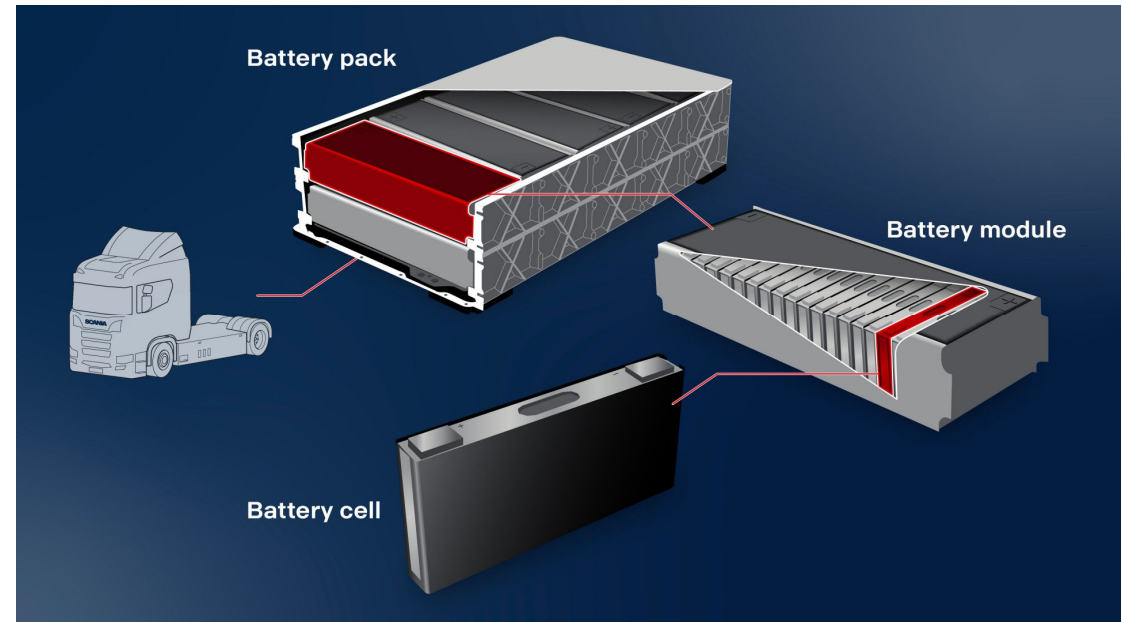
- Battery pack
- Power inverter/converter
- Electric machine
- Gearbox
- Regenerative braking
- Management and control





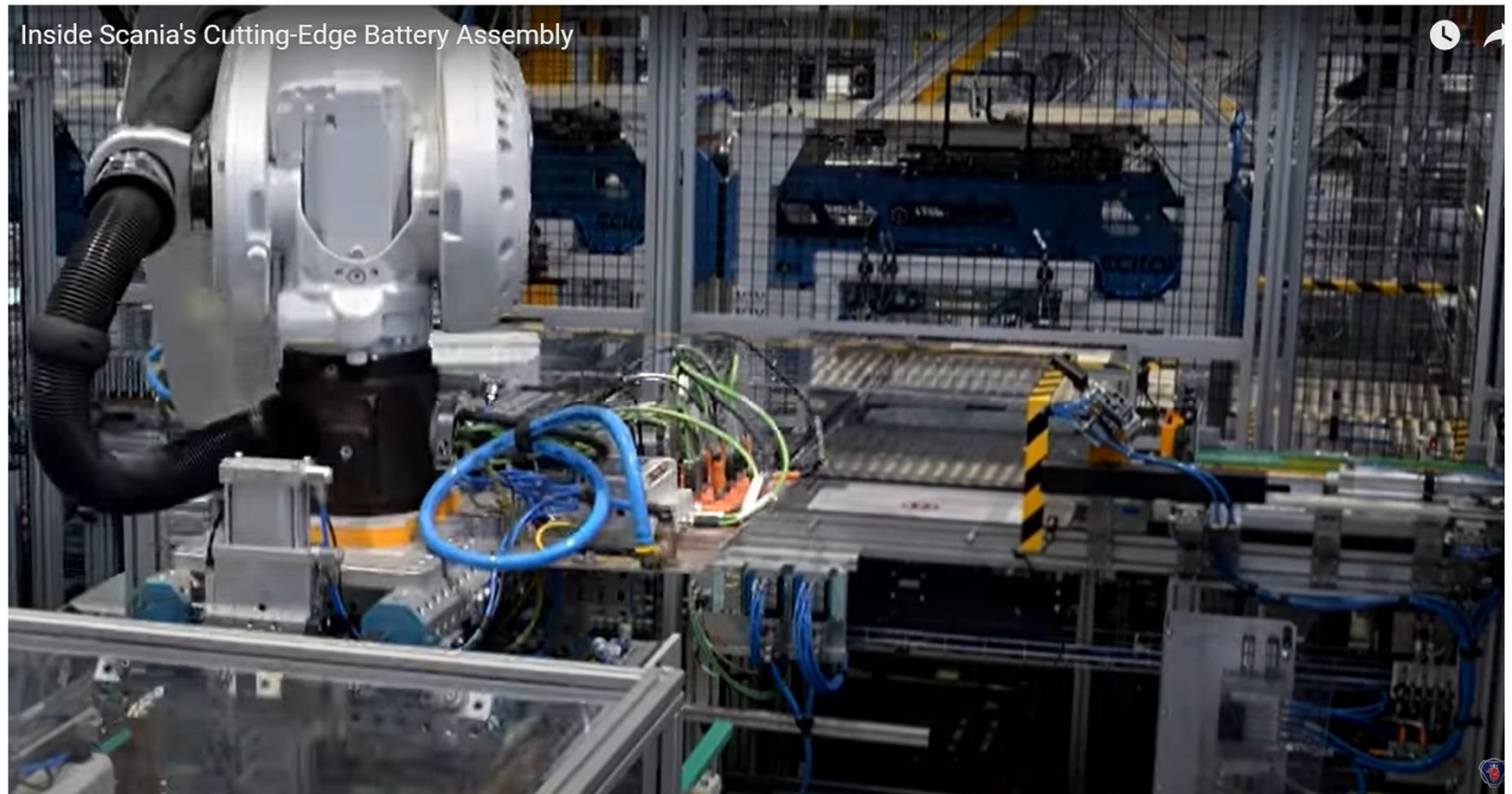
Battery pack

- Cell => Module => Pack
- Busbars, cooling system, compression pads, gap fillers, cooling plates
- **Capacity**
 - 416 kWh/624 kWh (~2,9-4 t)
 - 75/83% SoC-window
 - 520 km range at 29 t GTW
 - 440 km range at 40 t GTW
 - 320 km range at 64 t GTW
- **Charging, CCS2**
375 kW/500 A DC
85 min at 375 kW





Battery assembling

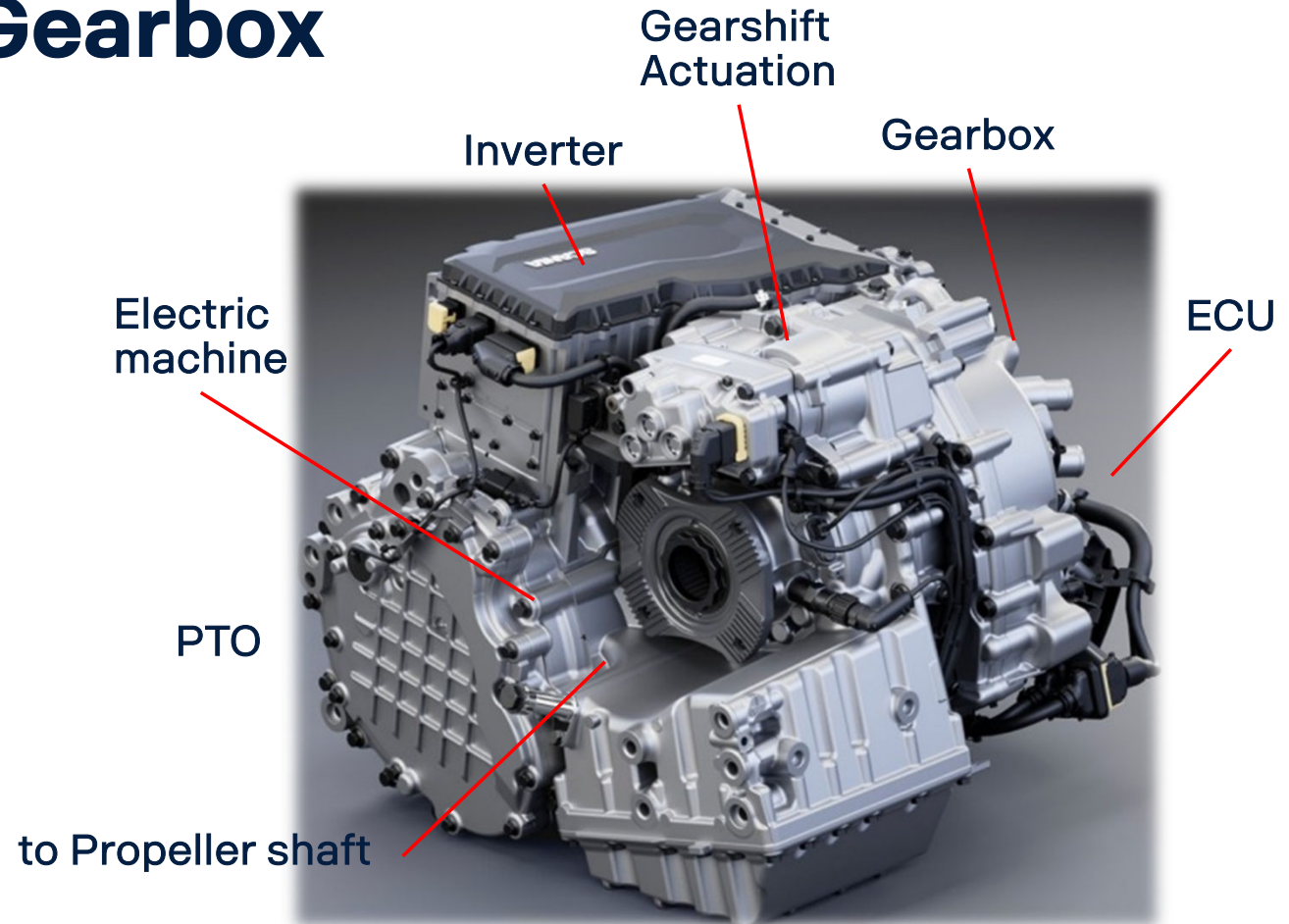




Electric machine/Gearbox

- 270/300/330/360/400 kW
(360/410/440/490/540 hp)
- PTO* 30, 60 och 260 kW
- AC, synchronous
- Permanent magnets rotor
- Oil cooled

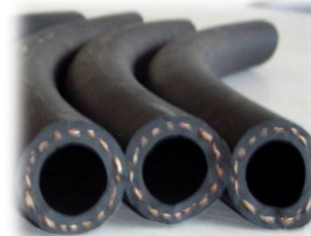
* PTO – Power Take off



Rubber in ICE* vehicles

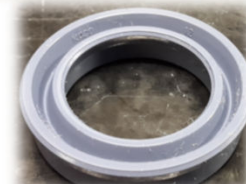
- NR, SBR – tyres, engine mounts, dampers, anti-rollbar bush, floor mats, air bellows
- IIR – tyre liners
- NBR – seals, hydraulic hoses (steering)
- CR – hose layers, dampers/isolators, membranes, air bellows
- ECO – hose layers
- CM/CSM – hose layers (steering hydraulic), cable insulation
- PUR – floor mats, bushings, seals, cable insulation, bellows

*ICE – Internal Combustion Engine



Rubber in ICE* vehicles

- EPDM – air hoses, coolant hoses and seals/gaskets, door seals, sealing strips, isolators
- ACM – oil seals/gaskets, air hoses
- AEM – oil seals/gaskets, piston seals, hoses/layers (brake, oil, air)
- HNBR – oil gaskets
- FKM – fuel and coolant gaskets, hose layers, rotary shaft seals





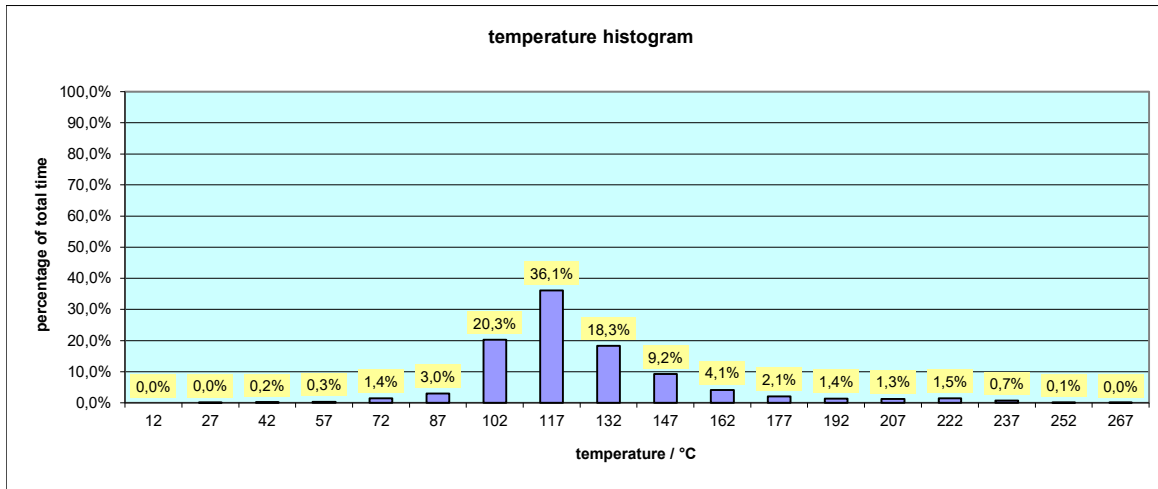
Silicone rubber in ICE vehicles

- Charge air (CAC) hoses
- Air hoses
 - Compressor
 - Diff pressure,
 - Waste gate and dump valve
- AdBlue dosing hoses
- Coolant hoses





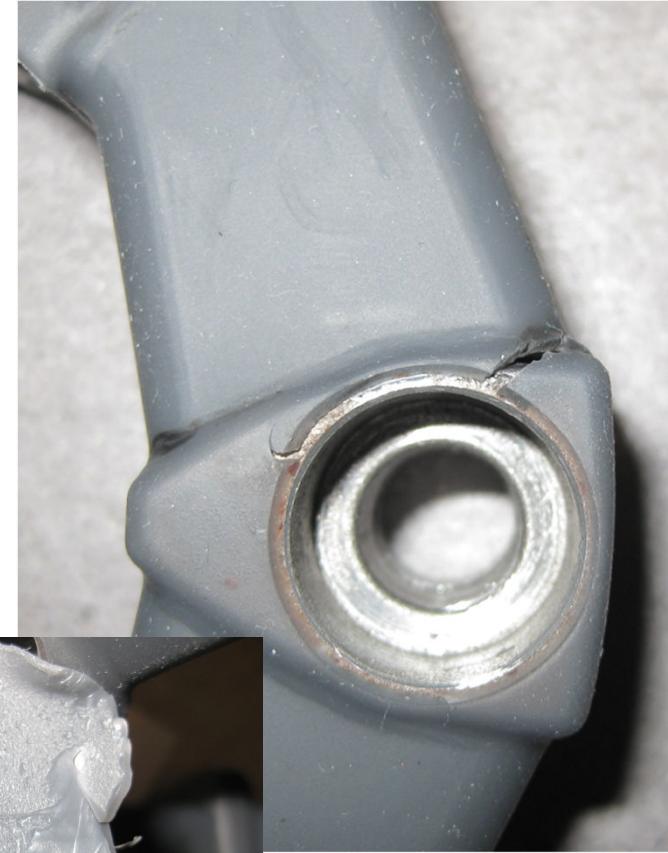
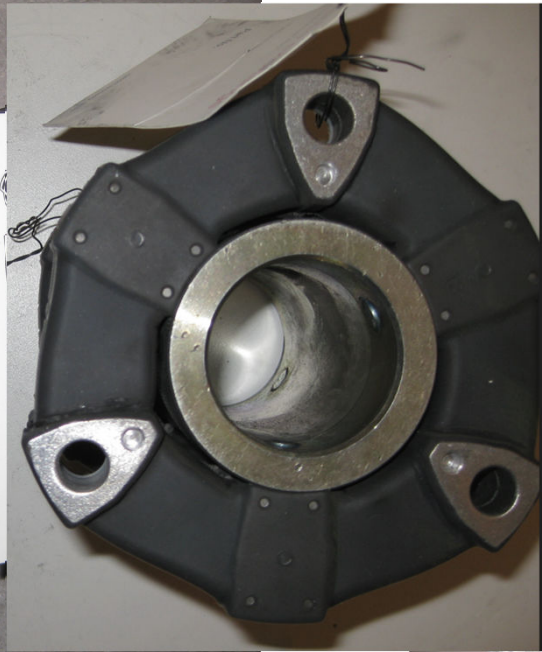
Crank case ventilation (CCV) hoses



Silicone rubber in ICE vehicles



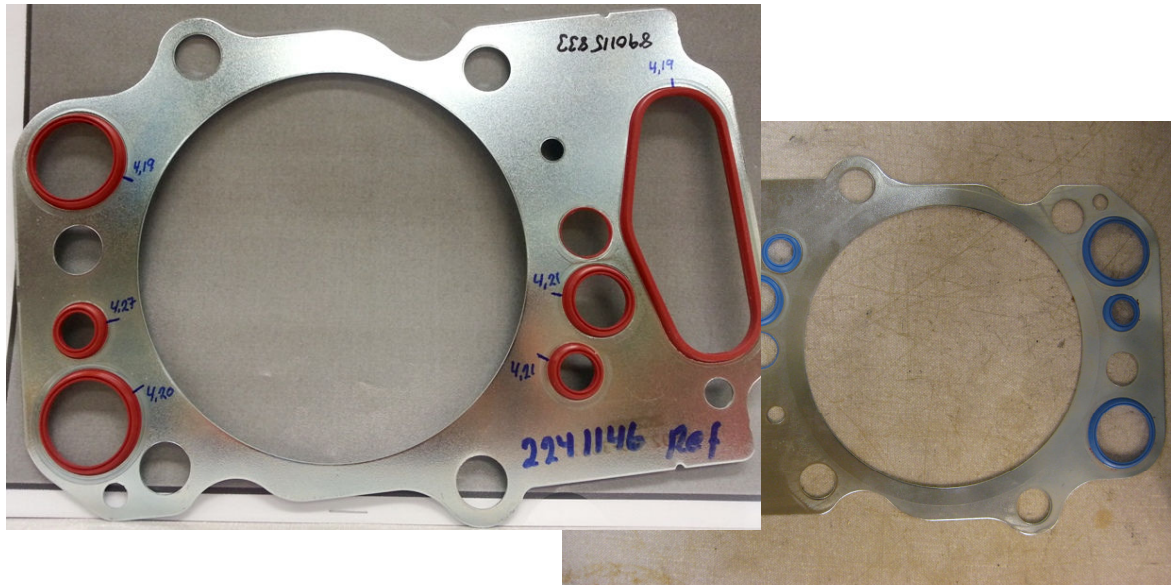
Coupling Compressor, bus





Silicone rubber in ICE vehicles

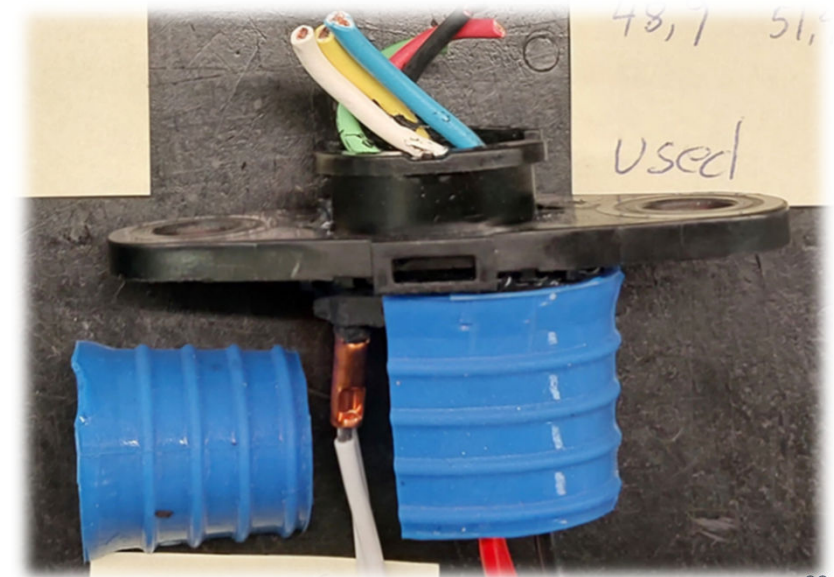
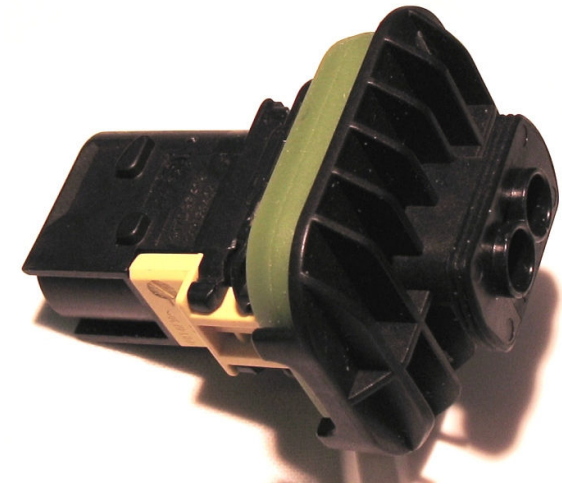
- Cylinder head gasket
- RTV sealants, flange sealing





Silicone rubber in ICE vehicles

- Seals and gaskets to sensors
- Cable connectors and grommets
- Cable isolation, outer
- Fuel hoses, outer layer



ICE vehicle vs Electric vehicle



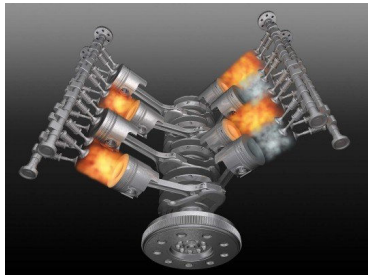
Differences:

- Combustion engine => Electric machine
- Fuel lines => VCB cables*
- Fuel tanks => Battery pack
- Filler hose/cap => Charging device
- NA => Inverter/Power electronics

Similarities:

- Gearbox/oil
- Power take off (PTO)
- Propeller shaft
- Axle gear (still)
- Wheels
- Chassis
- Cab
- Cooling system, glycol based
- Steering (hydraulic =>electric)
- Compressed air
- ECU:s (electronic control units)
- Auxillary systems, low voltage

HIGH Temperature



LOW Temperature



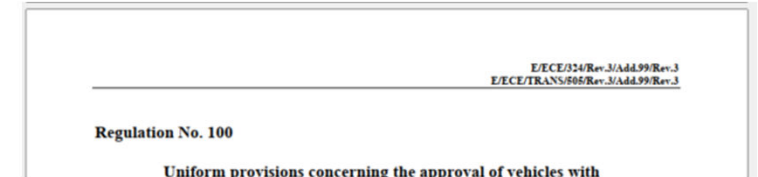
*VCB – Voltage Class B:
DC: 60 V -1500 V
AC: 30 V – 1000 V

"Rechargeable Electrical Energy Storage System (REESS)" means the rechargeable energy storage system that provides electric energy for electrical propulsion.



Legal requirements

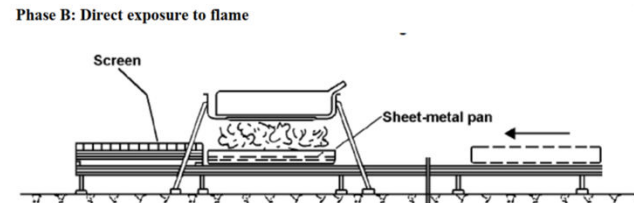
- EU 2019/2144
- ELV regulation (to come)
- PFAS?
- ECE R100 rev 3



Uniform provisions concerning the approval of vehicles with regard to **specific requirements for the electric power train**

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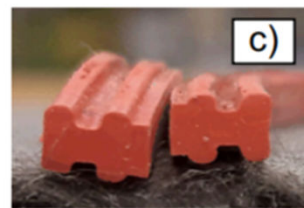
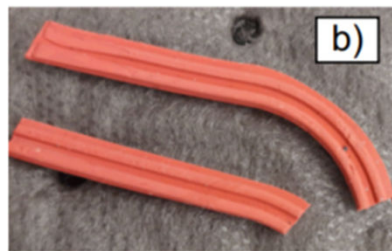
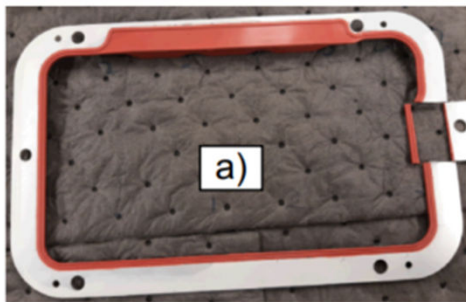
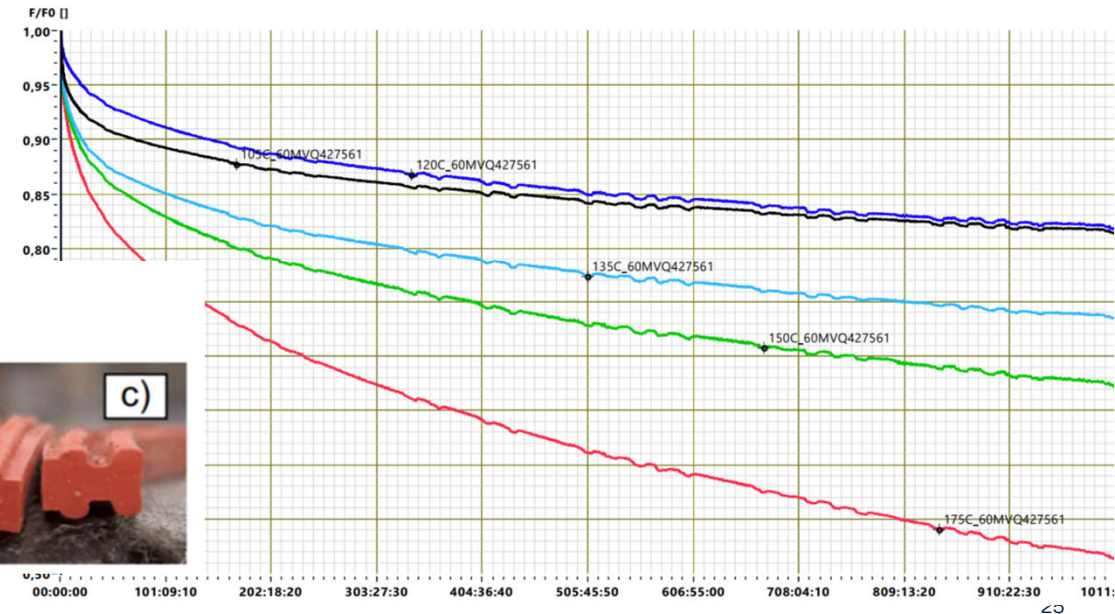
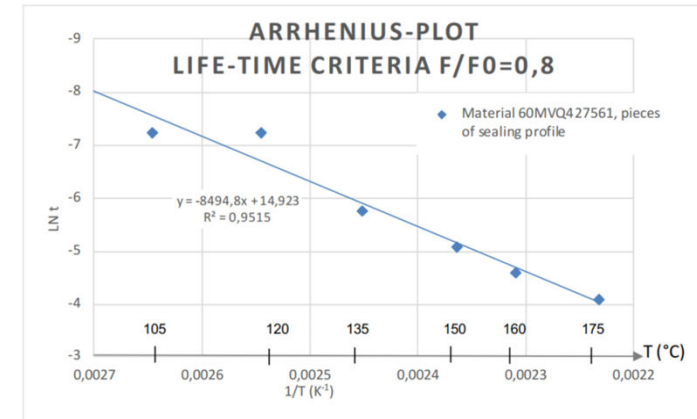
- Fire resistance
- Thermal runaway protection





Battery frame gaskets and additional gaskets

- Silicone rubber, 60 IRHD
- UL94-V0
- Life time estimation
Stress relaxation
105°C, 120°C, 135°C, 150°C, 175°C
- 6 000 h at 100 °C continuous exposure,
80% remaining force





Charging device, seals and protection





Cables and connections

- Silicone rubber - Cables with temp. class E, (-40 - +175)°C





Future for Rubber in EV - Electric Vehicles

- Electric motor, oil cooled => oil resistance
- Power electronics
- Gear box/transmission => oil resistance
- Battery pack
 - Seal from water and dust protrusion
 - Seal from inside during thermal event
 - Fire resistance from outside
 - Junction boxes
 - Cooling/heating system – glycol
- Powertrain and battery damping isolators
- Charging connector/hatch
- Cables & connectors (VCB)
- Electrical boxes and ECU:s (electronic control units)
- Propeller shaft
- Axle gear
- Wheels
- Chassis
- Compressed air, brake system





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