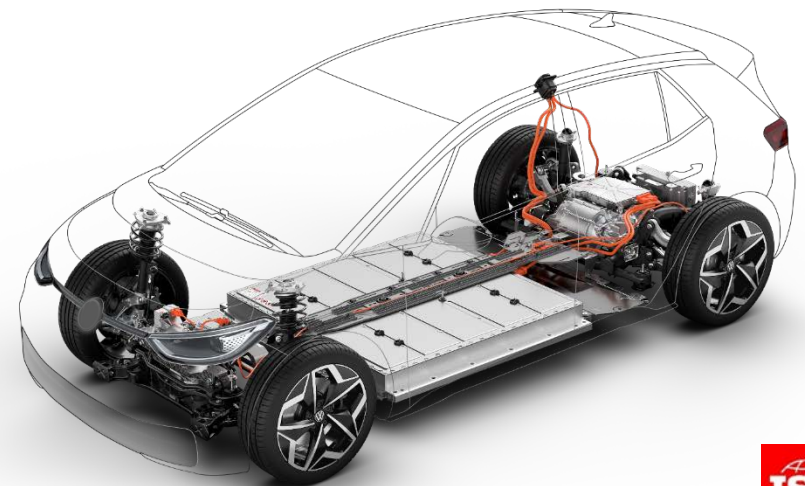


Overview of Standards And Planned Activities Regarding Electric Heavy Duty Vehicles

ISO Technical Committee on Electrically Propelled Vehicles

ISO/TC 22/SC 37 – Chairperson
Dr. Michael Herz





Agenda

- Introduction to ISO/TC 22/SC 37 on electrically propelled road vehicles
- A closer look at potentially required standardization for commercial vehicles
- Summary

Introduction to ISO/TC 22/SC 37

“Electrically Propelled Vehicles”



ISO/TC 22/SC 37

Safety aspects and terminology



Performance and energy consumption



Rechargeable energy storage



Systems and components connected to electric propulsion systems



Scope:

Specific aspects of electrically propelled road vehicles, electric propulsion systems, related components and their vehicle integration.

Participating-Members:

Austria (ASI)
Belgium (NBN)
Canada (SCC)
China (SAC)
Czech Republic (UNMZ)
Denmark (DS)
France (AFNOR)
Germany (DIN)
Indonesia (BSN)
Italy (UNI)
Japan (JISC)

Korea, Republic of (KATS)
Netherlands (NEN)
Portugal (IPQ)
Russian Federation (GOST R)
Spain (UNE)
Sweden (SIS)
Switzerland (SNV)
United Kingdom (BSI)
United States (ANSI)

Observing-Members:

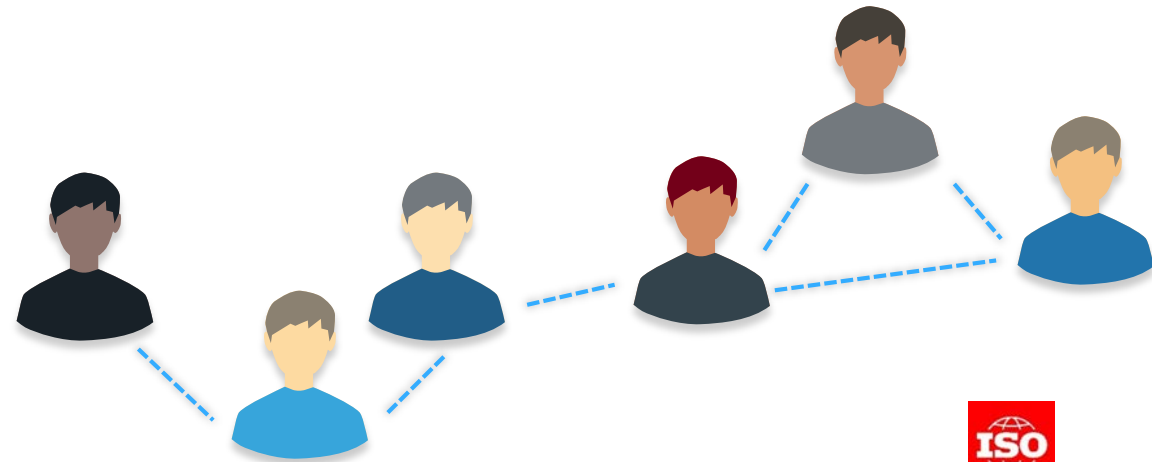
Argentina (IRAM)
Australia (SA)
Croatia (HZN)
Egypt (EOS)
Finland (SFS)
Hungary (MSZT)
India (BIS)
Israel (SII)
Poland (PKN)
Romania (ASRO)
Singapore (SSC)
Slovakia (UNMS SR)
South Africa (SABS)
Ukraine (DSTU)

ISO/TC 22/SC 37 – Coverage

- Scope covers all aspects of the electric vehicle
- All road vehicles with electric propulsion system are included except motorcycles and mopeds
- Majority of experts focus on passenger cars
- Commercial vehicle industry especially from Europe is continuously represented
- The majority of the standards is generic with regard to the vehicle category

Standardization in ISO is Voluntary And Corresponds to Industry Needs

- Standards are proposed by stakeholders respectively p-members
- Projects need a minimum number of supporting p-members
- Incremental development of standards for new technologies possible



Standards Covered by WG 1 “Safety Aspects And Terminology”



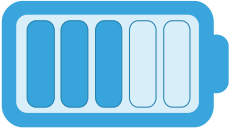
Reference	Document title
ISO TR 8713	Electrically propelled road vehicles — Vocabulary
ISO 6469-2	Electrically propelled road vehicles — Safety specifications — Part 2: Vehicle operational safety
ISO 6469-3	Electrically propelled road vehicles — Safety specifications — Part 3: Electrical safety
ISO 6469-4	Electrically propelled road vehicles — Safety specifications — Part 4: Post crash electrical safety
ISO 17409	Electrically propelled road vehicles — Conductive power transfer — Safety requirements
ISO 19363	Electrically propelled road vehicles — Magnetic field wireless power transfer — Safety and interoperability requirements
ISO 23273	Fuel cell road vehicles — Safety specifications — Protection against hydrogen hazards for vehicles fuelled with compressed hydrogen

Standards Covered by WG 2 “Performance And Energy Consumption”



Reference	Document title
ISO 23828	Fuel cell road vehicles — Energy consumption measurement — Vehicles fuelled with compressed hydrogen
ISO 23274-1	Hybrid-electric road vehicles — Exhaust emissions and fuel consumption measurements — Part 1: Non-externally chargeable vehicles
ISO 23274-2	Hybrid-electric road vehicles — Exhaust emissions and fuel consumption measurements — Part 2: Externally chargeable vehicles
ISO 20762	Electrically propelled road vehicles — Determination of power for propulsion of hybrid electric vehicle
ISO TR 11954	Fuel cell road vehicles — Maximum speed measurement
ISO 8714	Electric road vehicles — Reference energy consumption and range — Test procedures for passenger cars and light commercial vehicles
ISO 8715	Electric road vehicles — Road operating characteristics
ISO TR 11955	Hybrid-electric road vehicles — Guidelines for charge balance measurement

Standards Covered by WG 3 “Rechargeable Energy Storage”



Reference	Document title
ISO 6469-1	Electrically propelled road vehicles — Safety specifications — Part 1: Rechargeable energy storage system (RESS)
ISO 12405-4	Electrically propelled road vehicles — Test specification for lithium-ion traction battery packs and systems — Part 4: Performance testing
ISO PAS 16898	Electrically propelled road vehicles — Dimensions and designation of secondary lithium-ion cells
ISO 18300	Electrically propelled vehicles — Test specifications for lithium-ion battery systems combined with lead acid battery or capacitor

Standards Covered by WG 4 “Systems And Components Connected to Electric Propulsion Systems”



Reference	Document title
ISO 21782-1	EV*) — Test specification for electric propulsion components — Part 1: General test conditions and definitions
ISO 21782-2	EV*) — Test specification for electric propulsion components — Part 2: Performance testing of the motor system
ISO 21782-3	EV*) — Test specification for electric propulsion components — Part 3: Performance testing of the motor and the inverter
ISO 21782-4	EV*) — Test specification for electric propulsion components — Part 4: Performance testing of DC/DC converter
ISO 21782-5	EV*) — Test specification for electric propulsion components — Part 5: Operating load testing of motor system
ISO 21782-6	EV*) — Test specification for electric propulsion components — Part 6: Operating load testing of motor and inverter
ISO 21782-7	EV*) — Test specification for electric propulsion components — Part 7: Operating load testing of DC/DC converter
ISO PAS 19295	EV*) — Specification of voltage sub-classes for voltage class B
ISO 21498-1	EV*) — Electrical specifications and tests for voltage class B systems and components — Part 1: Voltage sub-classes and characteristics
ISO 21498-2	EV*) — Electrical specifications and tests for voltage class B systems and components — Part 2: Electrical tests for components

*) Electrically propelled road vehicles

ISO/TC 22/SC 37 Roadmap

Reference	Explanation
Functional requirements for conductive power transfer	standardized functional vehicle requirements for conductive connections of electrically propelled road vehicles to an external electric circuit including V2G applications
Automatic charging	specifies requirements for conductive connections of electrically propelled road vehicles to an external electric power supply using an automatic connection device
Charging time	standardized method to determine charging time for electric vehicles
Marking of interoperability	standardized indication for users of compatibility between charging infrastructure and electric vehicle
EV requirements for automated driving functions	specific electric vehicle requirements related to automated driving features



A closer look at potentially required standardization for commercial vehicles



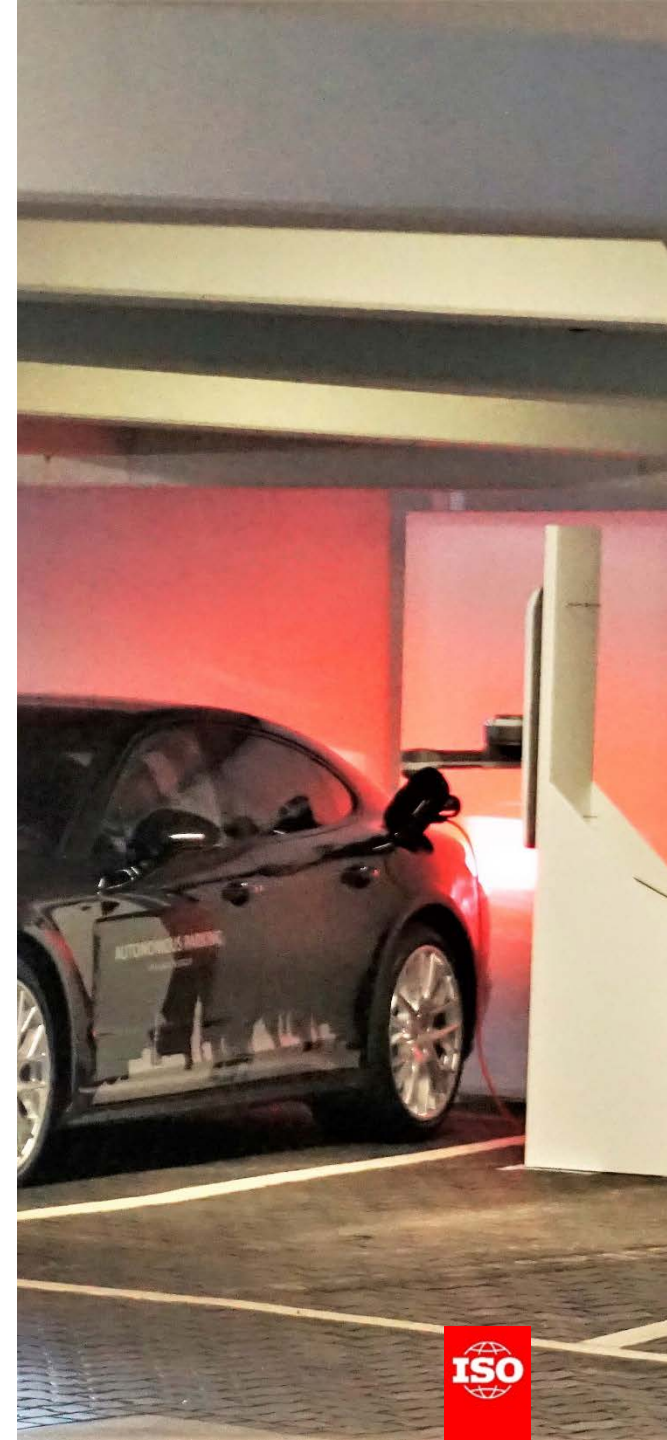


Charging Systems And Vehicle Aspects

- Today's charging systems are designed with a focus to address the specific needs of passenger cars
- Size of vehicle and battery as well as vehicle usage profiles cause differences between passenger cars and commercial vehicles
- Dedicated charging systems for commercial vehicles are currently under development

Automatic Charging

- Focus areas:
 - Passenger cars using inlet or underbody connection in combination with automatic parking
 - Busses using pantograph systems
- Roadmap item in ISO/TC 22/SC 37 – currently no dedicated project
- Functional requirements should be the same for passenger cars and commercial vehicles
- Requirements on contact location and power may be different





Pantograph Charging

- Basic vehicle concepts covered by ISO 17409
- No commonly agreed safety concept for pantograph charging
- The power supply circuit for pantograph charging and for standard DC charging (e.g. system C) is likely not fully interoperable

High Power Charging for Commercial Vehicles – HPC-CV

- HPC-CV addresses typical usage profiles and charging requirements to enable long range commercial vehicles
- Currently no dedicated project
- Safety concepts covered by ISO 17409
- The power supply circuit for HPC-CV and for standard DC charging (e.g. system C) is likely not fully interoperable

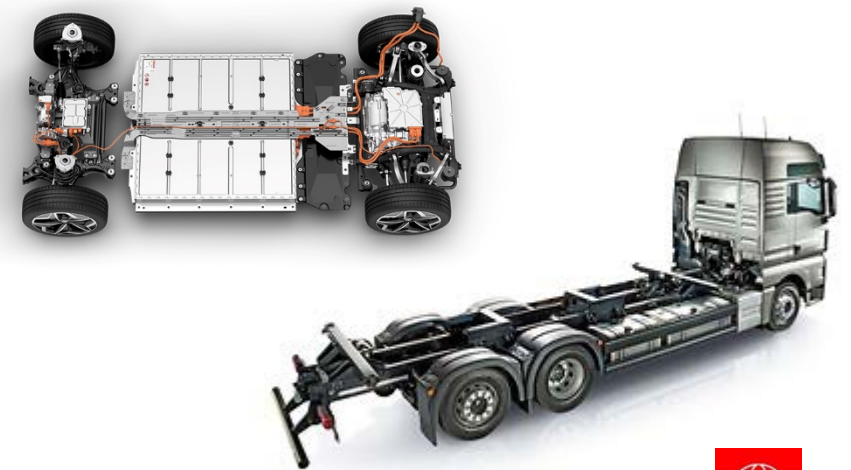


Vehicle Lifetime And Component Standards

- Component standards: ISO 21498 series, ISO 12405/19453 series*
- Battery related standards: ISO 6469-1, ISO 12405, ISO 19453-6*

Specific aspects of commercial vehicles are not covered adequately as commercial vehicles and passenger car are very different with respect to:

- Environmental conditions
- Vehicle lifetime



*) Responsible committee: ISO/TC 22/SC 32

Electric Safety – ISO 6469-3

Characteristics of commercial vehicles are mostly not specifically addressed – some aspects may need extra attention:

- Accessibility of high voltage components
- Actual size and differences in construction of commercial vehicles





Driving Automation Features – Specific Requirements For EVs

- Roadmap item in ISO/TC 22/SC 37 – currently no project
- First conceivable application is platooning with battery electric trucks



Potential New Area For Standardization For Commercial Vehicles

Battery modules: size, package space and connectors

Potential benefits:

- Increased volume for batteries
- Reevaluate the idea of battery swap

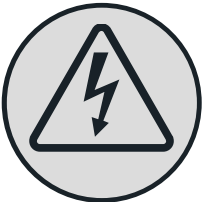
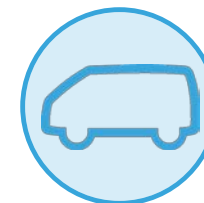
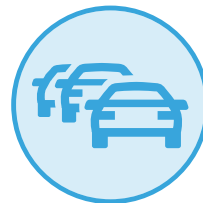


Summary



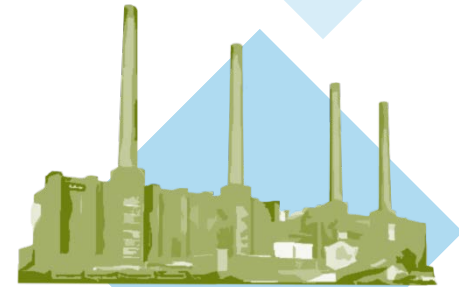
Status at ISO/TC 22/SC 37

- The automotive industry in general is very active
- Key elements of electric vehicles covered
- Commercial vehicle industry is represented
- Commercial vehicles share the majority of requirements in existing standards
- Currently there are no specific standards for commercial vehicles



Conclusions

- Standardization is driven by the industry, i.e. the industry defines the state of the art and time of standardization
- Good coverage of the state of the art
ISO/TC 22/SC 37 – the maturing of technology is captured in the revisions of our standards
- Several areas for dedicated standardization for commercial vehicles identified





**Thank you for
your attention!**

