
INDUSTRY STANDARDS

1 Introduction

In 2021, the ISO Central Secretariat continued to prohibit face-to-face international conferences and hold them online (virtually) due to the global COVID-19 pandemic.

The time difference often results in online international conferences taking place at night in Japan. Also, rather than eight hours (9:00 to 17:00) of face-to-face meetings per day, ISO Central Secretariat rules mandated 3- to 4-hour online meetings. Securing time for discussion required joining meetings at night for several consecutive days, placing a heavy mental and physical burden on the experts. Despite these harsh conditions, the efforts of the various experts enabled the discussion on draft standards to proceed without any particular delays.

2 Standardization Activities

2.1. International Standardization Activities

International standardization activities resulted in the publication of 95 TC 22 (Automobiles)-related ISO standards, 19 TC 204 (ITS) ISO standards, and 1 TC 146 (air quality) ISO standard. Japan led or actively participated in 57 standards, which constitutes half (50%) of the total.

ISO/SAE 21434 (Cybersecurity engineering) was published by TC 22. This standard is cited in UNR-155 (Cyber security and cyber security management system) of the United Nations (UN) World Forum for Harmonization of Vehicle Regulations (WP.29). In addition, TC 204 (ITS) issued ISO/SAE PAS 22736 (Taxonomy and definitions for terms related to driving automation systems for on-road motor systems), a standard jointly developed by ISO and SAE, at WG 14 (Driving control), chaired by Japan.

Furthermore, Japan proposed new work items for two TC 22 and five TC 204 ISO standards in 2021.

2.2. Standardization Activities in Japan

Domestic standardization activities led to the publication of 11 JASO standards, 5 technical papers (JASO TP),

and 9 JIS standards.

(1) Japanese Automobile Standards (JASO)

JASO E 018 (Automobiles - Performance requirements and evaluation methods for chassis dynamometer test systems for the purpose of reproducing actual driving conditions [in Japanese]) specifies requirements and evaluation methods when conducting vehicle evaluation tests for vehicles with a mass of 3,500 kg or less using a chassis dynamometer. It is expected that this standard will facilitate the development of vehicles with excellent environmental performance by allowing highly reproducible tests equivalent to actual driving to be conducted reliably and accurately indoors without being affected by model differences in chassis dynamometers.

In addition, JASO TP 22001 (Guidelines for notifying customers accompanying product/process changes for semiconductor products [in Japanese]) is a guideline for conducting efficient PCN (product/process change) procedures. This standard is expected to help avoid semiconductor QCD risks, promote the use of cutting-edge IT parts and lower-priced products, maintain production in the event of a disaster or emergency, realize early parts replacement, and foster improved productivity throughout the automotive industry. Furthermore, JASO TP 18004 (Level Classification and Definition of Automobile Driving Automation Systems [in Japanese]), published in 2018 as a Japanese reference translation of the SAE J3016 standard widely recognized for defining automobile automation levels, was revised and updated to reflect the contents of SAE J3016:2021.

(2) Japanese Industrial Standards (JIS)

JIS D3611 (Direct injection gasoline engines – Installation of the high pressure fuel pump to the engine) is a dimension standard related to the fuel inlet/outlet position in high pressure fuel pumps and the outer shape of pumps. The spread of direct injection in gasoline engines has led to expanded production of such engines in Japan as well. Since such systems are still new, engines from

different manufacturers each use parts with unique shape specifications, triggering efforts to establish a standard at ISO and leading to the publication of ISO 21042 (Gasoline engines with direct fuel injection (GDI engines) — Installation of the high pressure fuel pump to the engine) in 2018. Enacting the regulations established in this ISO standard in a new JIS standard makes it possible to unify specifications related to mounting shapes and dimensions in Japan, contributing to rational and efficient development and production.

2.3. Standardization Activities Concerning Automated Driving

Automated driving-related activities involved conducting surveys on standardization trends at standards-making

organizations outside Japan, in corporate consortiums, and in various countries to ascertain the status of initiatives in Europe, the United States, China, and other regions. At the same time, the *International Standardization Strategy Plan for Autonomous Driving-related Technology and Smart Mobility-related Technology* was created in coordination with WP.29 UN regulatory activities in Japan as parts of an international standardization strategy.

3 List of Standards

The international and Japanese standards published in 2021 and the new standards proposed by Japan are shown below.

Published ISO standards ***Bold: Standards issued under the initiative or active involvement of Japan**

ISO number	Title
TC 22 (Road vehicles (hereinafter referred to as "RV"): 95 standards	
SC 31 (Data communication field)	
ISO 11992-3 : 2021	RV — Interchange of digital information on electrical connections between towing and towed vehicles — Part 3 : Application layer for equipment other than brakes and running gear
ISO 13209-4 : 2021	RV — Open Test sequence eXchange format (OTX) — Part 4 : Expanded extensions interface definition
ISO 14229-2 : 2021	RV — Unified diagnostic services (UDS) — Part 2 : Session layer services
ISO 14229-3 : 2022	RV — Unified diagnostic services (UDS) — Part 3: Unified diagnostic services on CAN implementation (UDSonCAN)
ISO 15765-4 : 2021	RV — Diagnostic communication over Controller Area Network (DoCAN) — Part 4 : Requirements for emissions-related systems
ISO 15765-5 : 2021	RV — Diagnostic communication over Controller Area Network (DoCAN) — Part 5 : Specification for an in-vehicle network connected to the diagnostic link connector
ISO 16844-1 : 2022	RV — Tachograph systems — Part 1 : Electromechanical components
ISO 16844-4 : 2022	RV — Tachograph systems — Part 4 : Display unit communication interface
ISO 17215-3 : 2021	RV — Video communication interface for cameras (VCIC) — Part 3 : Camera message dictionary
ISO 18541-1 : 2021	RV — Standardized access to automotive repair and maintenance information (RMI) — Part 1 : General information and use case definition
ISO 18541-2 : 2021	RV — Standardized access to automotive repair and maintenance information (RMI) — Part 2 : Technical requirements
ISO 18541-3 : 2021	RV — Standardized access to automotive repair and maintenance information (RMI) — Part 3 : Functional user interface requirements
ISO 18541-4 : 2021	RV — Standardized access to automotive repair and maintenance information (RMI) — Part 4 : Conformance test
ISO 20078-1 : 2021	RV — Extended vehicle (ExVe) web services — Part 1 : Content and definitions
ISO 20078-2 : 2021	RV — Extended vehicle (ExVe) web services — Part 2 : Access
ISO 20078-3 : 2021	RV — Extended vehicle (ExVe) web services — Part 3 : Security
ISO 20080 : 2019 / AMD 1 : 2021	RV — Information for remote diagnostic support — General requirements, definitions and use cases — Amendment 1
ISO 20730-1 : 2021	RV — Vehicle interface for electronic Periodic Technical Inspection (ePTI) — Part 1 : Application and communication requirements
ISO 20730-3 : 2021	RV — Vehicle interface for electronic Periodic Technical Inspection (ePTI) — Part 3 : Data definitions
ISO 21111-10 : 2021	RV — In-vehicle Ethernet — Part 10 : Transport layer and network layer conformance test plans
ISO 21111-11 : 2021	RV — In-vehicle Ethernet — Part 11 : Application layer to session layer conformance test plans
ISO 21111-6 : 2021	RV — In-vehicle Ethernet — Part 6 : Electrical 100-Mbit/s physical entity requirements and conformance test plan
ISO 21806-10 : 2021	RV — Media Oriented Systems Transport (MOST) — Part 10 : 150-Mbit/s coaxial physical layer
ISO 21806-11 : 2021	RV — Media Oriented Systems Transport (MOST) — Part 11 : 150-Mbit/s coaxial physical layer conformance test plan
ISO 21806-12 : 2021	RV — Media Oriented Systems Transport (MOST) — Part 12 : 50-Mbit/s balanced media physical layer

ISO 21806-13 : 2021	RV — Media Oriented Systems Transport (MOST) — Part 13 : 50-Mbit/s balanced media physical layer conformance test plan
ISO 21806-14 : 2021	RV — Media Oriented Systems Transport (MOST) — Part 14 : Lean application layer
ISO 21806-15 : 2021	RV — Media Oriented Systems Transport (MOST) — Part 15 : Lean application layer conformance test plan
ISO 23150 : 2021	RV — Data communication between sensors and data fusion unit for automated driving functions — Logical interface
ISO 23239-1 : 2021	RV — Vehicle domain service (VDS) — Part 1 : General information and use case definitions
ISO 26021-1 : 2022	RV — End-of-life activation of in-vehicle pyrotechnic devices — Part 1 : Application and communication interface
ISO/TR 20078-4 : 2021	RV — Extended vehicle (ExVe) web services — Part 4 : Control
SC 32 (Electrical/Electronic components field)	
ISO 11452-9 : 2021	RV — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 9 : Portable transmitters
ISO/SAE 21434: 2021	RV — Cybersecurity engineering
ISO 24195 : 2022	RV — Vocabulary and characteristics for engineering of starting devices
ISO/PAS 5112 : 2022	RV — Guidelines for auditing cybersecurity engineering
SC 33 (Vehicle dynamics and chassis components field)	
ISO 13988 : 2021	Passenger car and light truck vehicle wheels — Clip and adhesive balance weight and rim flange nomenclature, test procedures and performance requirements
ISO 14400 : 2021	RV — Wheels and rims — Use, general maintenance and safety requirements and out-of-service conditions
ISO 19206-3 : 2021	RV — Test devices for target vehicles, vulnerable road users and other objects, for assessment of active safety functions — Part 3 : Requirements for passenger vehicle 3 D targets
ISO 21233 : 2021	Heavy commercial vehicles and buses — Vehicle dynamics simulation and validation — Closing-curve test
ISO 22140 : 2021	Passenger cars — Validation of vehicle dynamics simulation — Lateral transient response test methods
ISO 22733-1 : 2021	RV — Test method to evaluate the performance of autonomous emergency braking systems — Part 1 : Car-to-car
ISO 22735 : 2021	RV — Test method to evaluate the performance of lane-keeping assistance systems
ISO 3911 : 2021	Wheels and rims for pneumatic tyres — Vocabulary, designation and marking
ISO 4138 : 2021	Passenger cars — Steady-state circular driving behaviour — Open-loop test methods
ISO/PAS 5101 : 2021	RV — Field load specification for brake actuation and modulation systems
SC 34 (Powertrain field)	
ISO 12345 : 2021	Diesel engines — Cleanliness assessment of fuel injection equipment
ISO 17536-1 : 2015 / AMD 1 : 2021	RV — Aerosol separator performance test for internal combustion engines — Part 1 : General — Amendment 1
ISO 18669-1 : 2021	Internal combustion engines — Piston pins — Part 1 : General specifications
ISO 31120-1 : 2022	RV — Injection water — Part 1 : Quality requirements
ISO 6621-3 : 2021	Internal combustion engines — Piston rings — Part 3 : Material specifications
ISO 6622-1 : 2021	Internal combustion engines — Piston rings — Part 1 : Rectangular rings made of cast iron
ISO 6627 : 2022	Internal combustion engines — Piston rings — Expander/rail oil-control rings
ISO 7299-2 : 2021	Diesel engines — End-mounting flanges for pumps — Part 2 : High-pressure supply pumps for common rail fuel injection systems
ISO 7876-5 : 2021	Fuel injection equipment — Vocabulary — Part 5 : Common rail fuel injection system
SC 35 (Lamp and visibility field)	
ISO 13837 : 2021	RV — Safety glazing materials — Method for the determination of solar transmittance
ISO 16505 : 2019 / AMD 1 : 2021	RV — Ergonomic and performance aspects of Camera Monitor Systems — Requirements and test procedures — Amendment 1 : ORP, FeV, MTF10 MIN (1 : 1) /hor, MTF10 MIN (1 : 1) /ver
SC 36 (Collision safety field)	
ISO 17840-1 : 2022	RV — Information for first and second responders — Part 1 : Rescue sheet for passenger cars and light commercial vehicles
ISO/TS 13396 : 2021	RV — Sled test method to enable the evaluation of side impact protection of child restraint systems — Essential parameters
ISO/TS 21002 : 2021	RV — Multidimensional measurement and coordinate systems definition
ISO/TS 23521 : 2021	RV — Calibration procedure for displacement devices
ISO/TR 19222 : 2021	RV — Injury risk curves for the THOR dummy
ISO/TR 21934-1 : 2021	RV — Prospective safety performance assessment of pre-crash technology by virtual simulation — Part 1 : State-of-the-art and general method overview
SC 37 (Electric vehicle field) (In charge of Japan Automobile Research Institute (JARI))	
ISO 21782-4 : 2021	Electrically propelled RV — Test specification for electric propulsion components — Part 4 : Performance testing of the DC/DC converter

ISO 21782-5 : 2021	Electrically propelled RV — Test specification for electric propulsion components — Part 5 : Operating load testing of the motor system
ISO 21782-7 : 2021	Electrically propelled RV — Test specification for electric propulsion components — Part 7 : Operating load testing of the DC/DC converter
ISO 23274-2 : 2021	Hybrid-electric RV — Exhaust emissions and fuel consumption measurements — Part 2 : Externally chargeable vehicles
ISO 6469-3 : 2021	Electrically propelled RV — Safety specifications — Part 3 : Electrical safety
SC 38 (Motorcycle and moped field)	
ISO 6460-1 : 2022	Motorcycles — Measurement method for gaseous exhaust emissions and fuel consumption — Part 1 : General test requirements
ISO/TR 3152 : 2022	RV — Comparison between ISO 26262-12 and other parts of the ISO 26262 series to support motorcycle adaptation
SC 39 (Ergonomics field)	
ISO 2575 : 2021	RV — Symbols for controls, indicators and tell-tales
SC 41 (Gas fuel vehicle field)	
ISO 12614-1 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 1 : General requirements and definitions
ISO 12614-2 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 2 : Performance and general test methods
ISO 12614-3 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 3 : Check valve
ISO 12614-4 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 4 : Manual valve
ISO 12614-5 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 5 : Tank pressure gauge
ISO 12614-7 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 7 : Pressure relief valve (PRV)
ISO 12614-8 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 8 : Excess flow valve
ISO 12614-9 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 9 : Gas-tight housing and ventilation hose
ISO 12614-10 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 10 : Rigid fuel line in stainless steel
ISO 12614-11 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 11 : Fittings
ISO 12614-12 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 12 : Rigid fuel line in copper and its alloys
ISO 12614-13 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 13 : Tank pressure control regulator
ISO 12614-14 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 14 : Differential pressure fuel content gauge
ISO 12614-15 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 15 : Capacitance fuel content gauge
ISO 12614-16 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 16 : Heat exchanger-vaporizer
ISO 12614-17 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 17 : Natural gas detector
ISO 12614-18 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 18 : Gas temperature sensor
ISO 12614-19 : 2021	RV — Liquefied natural gas (LNG) fuel system components — Part 19 : Automatic valve
ISO 15500-17 : 2021	RV — Compressed natural gas (CNG) fuel system components — Part 17 : Flexible fuel line
ISO 20766-13 : 2022	RV — Liquefied petroleum gas (LPG) fuel system components — Part 13 : Multivalve
ISO 20766-14 : 2022	RV — Liquefied petroleum gas (LPG) fuel system components — Part 14 : Vaporizer/pressure regulator
ISO 20766-16 : 2022	RV — Liquefied petroleum gas (LPG) fuel system components — Part 16 : Injectors and gas mixing device/fuel rail
ISO 20766-24 : 2022	RV — Liquefied petroleum gas (LPG) fuel system components — Part 24 : Gas tubes
ISO 20766-25 : 2022	RV — Liquefied petroleum gas (LPG) fuel system components — Part 25 : Gas connections
TC 146 (Interior air of road vehicles): 1 standard	
SC 6 (Indoor air field) (In charge of Japan Environmental Management Association for Industry)	
ISO 12219-10 : 2021	Interior air of RV — Part 10 : Whole vehicle test chamber — Specification and methods for the determination of volatile organic compounds in cabin interiors — Trucks and buses
TC 204 (Intelligent Transport Systems (hereinafter referred to as "ITS")): 19 standards	
WG 5 (Automatic toll collection field) (In charge of Highway Industry Development Organization)	
ISO/TS 17573-3 : 2021	Electronic fee collection — System architecture for vehicle-related tolling — Part 3 : Data dictionary
ISO/TS 21719-3 : 2021	Electronic fee collection — Personalization of on-board equipment (OBE) — Part 3 : Using integrated circuit(s) cards
WG 7 (Commercial freight vehicle operation management field) (In charge of Highway Industry Development Organization)	
ISO 15638-24 : 2021	ITS — Framework for collaborative telematics applications for regulated commercial freight vehicles (TARV) — Part 24 : Safety information provisioning

WG 8 (Public transportation field) (In charge of Japan Institute of Country-ology and Engineering)	
ISO/TR 20527 : 2022	ITS — Interoperability between interoperable fare management (IFM) systems and near field communication (NFC) mobile devices
WG 9 (Traffic management field) (In charge of UTMS)	
ISO 20684-1 : 2021	ITS — Roadside modules SNMP data interface — Part 1 : Overview
ISO/TS 19468 : 2022	ITS — Data interfaces between centres for transport information and control systems — Platform-independent model specifications for data exchange protocols for transport information and control systems
ISO/TS 20684-2 : 2021	ITS — Roadside modules SNMP data interface — Part 2 : Generalized field device basic management
ISO/TS 20684-10 : 2021	ITS — Roadside modules SNMP data interface — Part 10 : Variable message signs
WG 14 (Driving control field)	
ISO/SAE PAS 22736 : 2021	Taxonomy and definitions for terms related to driving automation systems for on-road motor vehicles
ISO 22737 : 2021	ITS — Low-speed automated driving (LSAD) systems for predefined routes — Performance requirements, system requirements and performance test procedures
ISO 23376 : 2021	ITS — Vehicle-to-vehicle intersection collision warning systems (VVICW) — Performance requirements and test procedures
WG 16 (Communication field) (In charge of Japan Electronics and Information Technology Industries Association (JEITA))	
ISO 16460 : 2021	ITS — Localized communications — Communication protocol messages for global usage
ISO 4426 : 2021	ITS — Lower layer protocols for usage in the European digital tachograph
ISO/TR 4286 : 2021	ITS — Use cases for sharing of probe data
WG 17 (Nomadic device field) (In charge of Japan Electronics and Information Technology Industries Association (JEITA))	
ISO 20529-2 : 2021	ITS — Framework for Green ITS (G-ITS) standards — Part 2 : Integrated mobile service applications
ISO 22085-2 : 2021	ITS — Nomadic device service platform for micro mobility — Part 2 : Functional requirements and dataset definitions
ISO 22085-3 : 2022	ITS — Nomadic device service platform for micro mobility — Part 3 : Data structure and data exchange procedures
WG 19 (Mobility integration field) (In charge of Highway Industry Development Organization)	
ISO/TS 5255-1 : 2022	ITS — Low-speed automated driving system (LSADS) service — Part 1 : Role and functional model
ISO/TR 4445 : 2021	ITS — Mobility integration — Role model of ITS service application in smart cities

ISO standards proposed by Japan

ISO number	Title
TC 22 (Road vehicles (hereinafter referred to as "RV")): 2 standards	
SC 38 (Motorcycle and moped field)	
ISO 13232-7 CD Amd2	Motorcycles — Test and analysis procedures for research evaluation of rider crash protective devices fitted to motorcycles — Part 7 : Standardized procedures for performing computer simulations of motorcycle impact tests — Amendment 2
ISO 6727 Amd	Road vehicles — Motorcycles and mopeds — Symbols for controls, indicators and tell-tales
TC 204 (Intelligent Transport Systems (hereinafter referred to as "ITS")): 5 standards	
WG 7 (Commercial freight vehicle operation management field) (In charge of Highway Industry Development Organization)	
ISO 15638-25	ITS — Framework for collaborative telematics applications for regulated commercial freight vehicles (TARV) — Part 25 : Overhead clearance monitoring
WG 14 (Driving control field)	
ISO 7856	ITS — Remote support for LSAD system (RS-LSADS) — Performance requirements, system requirements and performance test procedures
WG 16 (Communication field) (In charge of Japan Electronics and Information Technology Industries Association (JEITA))	
ISO/PWI TR17732	ITS — Communications — ITS communication role and functional model
WG 19 (Mobility integration field) (In charge of Highway Industry Development Organization)	
ISO/PWI 12770	ITS — Mobility integration — ITS data aggregation role and functional model
ISO/PWI 17783	ITS — Mobility integration — Role model using Low Earth Orbit (LEO) satellites

[Published JASO standards/JASO technical papers and JIS standards]

Type	Standard No. and name
JASO (11 standards)	<p>Established: 4 standards</p> <p>D625-5 Automotive parts — Automotive Cables — Part 5 : High voltage copper cables [in Japanese]</p> <p>D625-6 Automotive parts — Automotive Cables — Part 6 : High Aluminum cables [in Japanese]</p> <p>E018 Automobiles — Performance Requirements and Evaluation Methods for Chassis Dynamometer Test Systems Aimed at Reproducing Actual Driving Conditions [in Japanese]</p> <p>M367 Automotive Gasoline Engine Lubricating Oil — Degraded Oil Firing Fuel Efficiency Test Method [in Japanese]</p> <p>Revised: 4 standards</p> <p>D625-1 Automotive parts — Automotive cables — Part 1 : Glossary of terms</p> <p>D625-2 Automotive parts — Automotive cables — Part 2 : Test methods</p> <p>F118 Automotive parts — Hexagon nut and washer assemblies</p> <p>F409 Old name) Automotive parts — Polyamide (nylon) tube fittings — Performance requirements New name) Automotive parts — Air brake resin piping fittings [in Japanese]</p> <p>Minor revision: 3 standards</p> <p>E401 Radiators for Automobiles</p> <p>M101 Metal pipes for automobile tubing</p> <p>M350 Automatic transmission fluids — Compatibility test with plastic material</p>
JASO Technical Papers: 5 papers	<p>Established: 4 papers</p> <p>TP22001 Customer notification guidelines for semiconductor device product/process changes [in Japanese]</p> <p>TP22002 Automotive — Driver Override Classification and Use Cases (Autonomous Driving Level 3) [in Japanese]</p> <p>TP22003 Technical background for “JASO C469 : Passenger car-Brake pad metal pick-up-Test procedure” [in Japanese]</p> <p>TP22004 Daily inspection guideline for measurement equipment for the number of solid particles in automobile exhaust gas [in Japanese]</p> <p>Revised: 1 paper</p> <p>TP18004 Classification of the Levels of Automated Driving Systems for Automobiles and their Definitions [in Japanese]</p>
JIS (9 standards)	<p>Established: 1 standard</p> <p>D3611 Direct Injection Gasoline Engine — Mounting Dimensions of High — Pressure Fuel Pump</p> <p>Revised: 8 standards</p> <p>D3607-1 Diesel engines — Steel tubes for high-pressure fuel injection pipes — Part 1 : Requirements for seamless cold-drawn single-wall tubes</p> <p>D3608 Diesel engines — Tapers for shaft ends of fuel injection pumps and hubs</p> <p>D0106 Road vehicles — Brake types, braking mechanics and brake operation — Vocabulary</p> <p>D0107 Road vehicles — Braking equipment — Vocabulary</p> <p>D0210 General rules of brake test method of automobiles and motor cycles</p> <p>D5103 Automotive parts — Glow plugs for diesel engines — General requirements and dimensions</p> <p>K2247-4 Diesel engines — NOx reduction agent AUS 32 — Part 4 :Refilling interface</p> <p>K2247-5 Diesel engines — NOx reduction agent AUS 32 — Part 5 :Refilling interface for passenger cars</p>