Road Vehicle Standardization 2022

International standardization for road vehicles

Significance of Participation in International Standardization Activities for Road Vehicles

Since automobiles are conglomerations of many components and parts and also numerous (sub-)systems including software, and standardization related to compliance, compatibility the safety of systems and components/parts used in automobiles hence is important. Furthermore, globalization in recent years has led to production of automobiles with the same specifications in various countries. Standardization to ensure uniform performance and reliability plays an extremely important role from a management standpoint of improving the competitiveness of the automotive industry.

Meanwhile, the World Trade Organization (WTO)'s Agreement on Technical Barriers to Trade (TBT Agreement) aims to eliminate unnecessary trade barriers by aligning domestic standards to international standards.

The Agreement on Government Procurement, an attachment to the TBT Agreement, calls for stipulation of technology specifications based on the subject international standards when international standards exist in the case of government procurement beyond a certain level by Agreement member countries. International procurements are increasingly specifying compliance with international standards by proposed technology in areas with international standards as a necessary condition, in addition to traditional evaluation indicators, such as technology advantage, price (cost performance), and international adoption.

Therefore, active participation in international standardization activities and positioning of Japan's excellent technology in open global standards that reflect international trends in the automotive area too is vital to enhancement of the international competitiveness of the automotive industry, a core industry for Japan.

Standardization in the automotive area is implemented mainly through ISO/TC22, and this pamphlet introduces TC22 and its SCs as well as related TC/SC activities.

Key roles of standardization:

- Securing the compatibility of products. Assurance of interface
- Improvement of production efficiency
- Assurance of quality
- Accurate communication, promotion of mutual understanding
- Prevalence of technologies from research and development
- Assurance of safety and security
- Reduction of environmental burden
- Enhancement of industrial competitive strength, preparation of competitive environment
- Promotion of trade

TC22 Activities

ISO/TC22-Road Vehicles was established and started activities at the same time as the formation of ISO in 1947 as the Technical Committee (TC) on international standardization of automotive technology. It subsequently took shape with 19 subcommittees (SCs), excluding those suspended or disbanded from the original 26 SC by technology area, 62 Working Groups (WGs) under SCs, and eight WGs under direct control of TC22. However, it was reorganized in 2015 to resolve issues, such as disparities in SC activities driven by gaps between mature technologies and growth technologies accompanying advances in electronics, communication and software technologies, operational challenges related to large variety in organizational composition, and heavy burden on secretariat countries. The organization currently consists of 11 SCs (from SC31 to SC41). Japan is the chair and secretariat for SC32 that handles electrical and electronic components and general system aspects, and the chair for SC38 that covers motorcycles and mopeds. Each SC has various WGs, and Japan actively participates in these areas and is involved in formulation and revision of ISO standards.

Structure of TC22

ISO/TC22

Chair: France

Secretariat: AFNOR (France)

SC	Name	Chair	Secretariat
SC31	Data communication	Germany	Germany
SC32	Electrical and electronic components and general system aspects	Japan	Japan
SC33	Vehicle dynamics,chassis components and driving automation systems testing	Germany	Germany
SC34	Propulsion, powertrain and powertrain fluids	U.S.	U.S.
SC35	Lighting and visibility	Italy	Italy
SC36	Safety and impact testing	U.S.	France
SC37	Electrically propelled vehicles	Germany	Germany
SC38	Motorcycles and mopeds	Japan	Italy
SC39	Ergonomics	U.S.	U.S.
SC40	Specific aspects for light and heavy commercial vehicles, busses and trailers	Italy	Italy
SC41	Specific aspects for gaseous fuels	Italy	Italy

The chart shows the Participating Member countries in TC22, TC22 SCs, and TC22-related TC/SCs and the number of International Standards (IS) from these TC and SCs. TC22 currently has 981 IS and another 188 IS under development (as of October 2022).

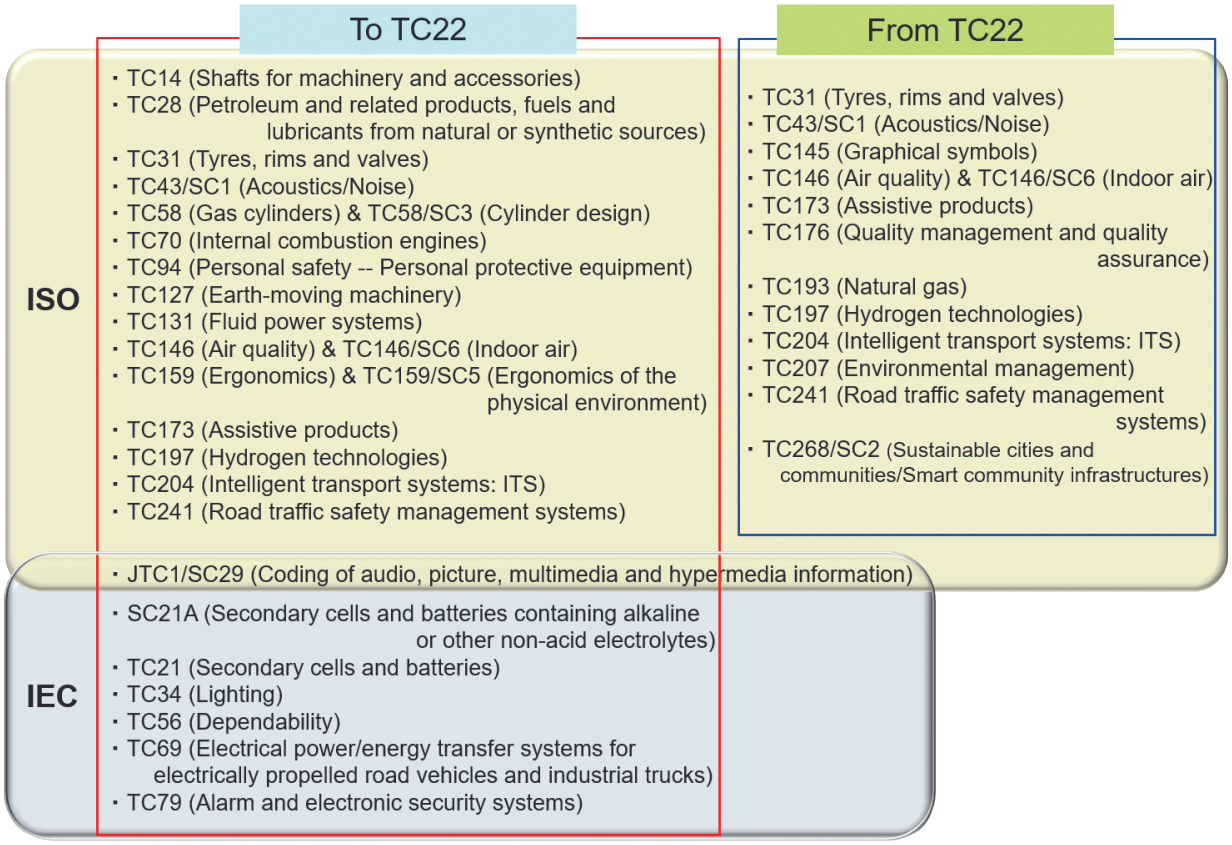
TC22 consists of the 38 Participating Member countries. Furthermore, TC22 has arranged liaisons with many ISO and International Electrotechnical Commission (IEC) TCs and SCs and multiple international organizations.

Participating member countries in automobile-related TC and SC(● chair, secretariat) and number of International Standards (IS) held and under development by each SC

As of October 20, 2022

TC			22												TC43	TC146	TC159
SC				SC31	SC32	SC33	SC34	SC35	SC36	SC37	SC38	SC39	SC40	SC41	SC1	SC6	SC5
Number of participating member countries			38	22	31	22	18	19	23	23	18	20	14	15	29	24	20
Europe & Africa	Eu member	France	●	○	○	○	○	○	●	○	○	○	○	○	○	○	○
		Germany	○	●	○	●	○	○	○	●	○	○	○	○	●	●	○
		Italy	○	○	○	○	○	●	○	○	●	○	●	●	○	○	○
		Netherlands	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
		Sweden	○	○	○	○	○	○	○	○		○	○	○	○	○	○
		Belgium	○	○	○	○	○	○	○	○	○	○			○	○	○
		Austria	○	○	○	○	○		○	○	○				○	○	
		Spain	○	○	○	○	○	○	○	○	○	○		○	○	○	
		Finland	○	○	○	○	○			○		○	○		○	○	○
		Portugal	○		○				○	○		○		○	○		
		Romania	○	○	○	○			○								
		Lithuania	○		○	○											
		Poland		○	○							○				○	
		Denmark		○	○										○	○	○
		Hungary			○	○								○			
		Czech Repunlic			○					○		○			○		
		Luxembourg			○										○		
		Slovakia					○										
		Norway													○	○	
	Others (non-EU)	United Kingdom	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●
		Russia	○	○	○	○	○	○	○	○			○		○	○	○
		Switzerland	○	○	○				○	○	○		○		○	○	
		Belarus	○					○				○					
		Armenia	○														
		Ethiopia	○			○											
		Uganda	○														
		Algeria	○														
		Nigeria	○														
		Eswatini	○														
		Ireland		○	○	○				○					○		
		Slovenia							○								
		Egyot						○									
		Tanzania													○		
		South Africa													○		
		Sudan	○														
		Tunisia			○												
		North Macedonia	○														
Americas		United States	○	○	○	○	●	○	●	○	○	●	○	○	○	○	○
		Canada	○		○	○		○	○	○		○		○	○		○
		Mexico	○		○												
		Brazil					○									○	○
Asia & Oceania		Japan	○	○	●	○	○	○	○	○	●	○	○	○	○	○	○
		Republic of Korea	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
		China	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
		India	○	○	○		○	○	○	○	○			○		○	○
		Israel	○	○	○	○			○		○	○					○
		Malaysia	○					○	○		○	○	○			○	○
		Singapore													○		
		Iran	○		○										○		
		Saudi Arabia	○					○		○							
		Iraq	○														
		Jordan															○
		Kazakhstan	○														
		Indonesia								○							
		Thailand									○						○
		Viet Nam									○						
		Australia							○						○	○	
		New Zealand													○	○	
		Bangladesh	○														
Number of Standards(IS)		Held	981	150	166	119	112	32	93	28	77	27	66	93	137	51	35
		Under development	188	26	42	20	20	5	20	15	5	7	6	19	21	11	7

TC22 Liaison Members (1): ISO, IEC



TC22 Liaison Members (2): Other Organizations

Category A

CLEPA	(European Association of Automotive Suppliers)
EC	(European Commission)
ECOS	(European Environmental Citizens Organization for Standardization)
FIMITIC	(International Federation of Persons with Physical Disability)
IMMA	(International Motorcycle Manufacturers Association)
OICA	(International Organization of Motor Vehicle Manufacturers)
UNECE	(United Nations Economic Commission for Europe)

Category B

UN	(United Nations)
WCO	(World Customs Organization)
WHO	(World Health Organization)

Scope of TC22

All questions of standardization concerning compatibility, interchangeability and safety, with particular reference to terminology and test procedures (including the characteristics of instrumentation) for evaluating the performance of the following types of road vehicles and their equipment as defined in the relevant items of Article 1 of the convention on Road Traffic, Vienna in 1968 concluded under the auspices of the United Nations:

- mopeds (item m);
- motor cycles (item n);
- motor vehicles (item p);
- trailers (item q);
- semi-trailers (item r);
- light trailers (item s);
- combination vehicles (item t);
- articulated vehicles (item u).

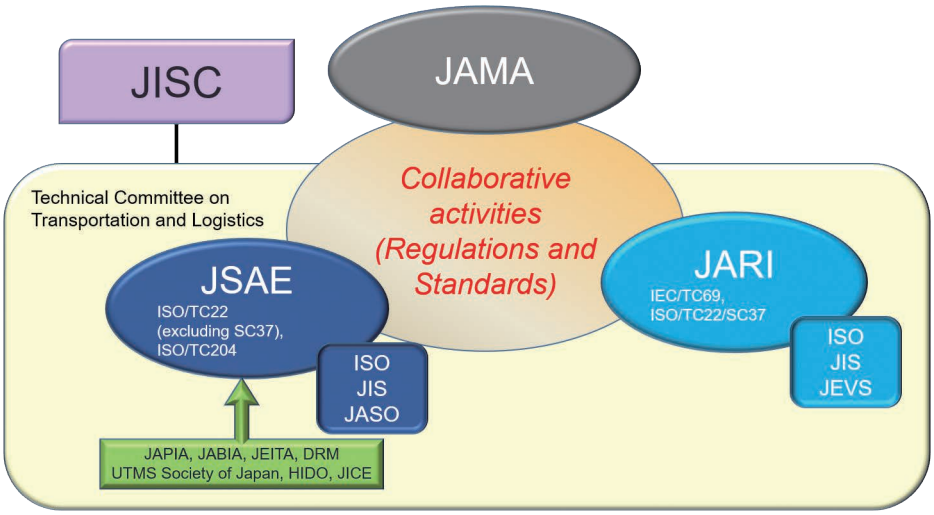
Domestic Activities Related to TC22

ISO only allows one institution per country to be a member body, and in the case of Japan, the Japanese Industrial Standards Committee (JISC) participates in ISO based on Cabinet approval.

Regarding TC22, the Automotive Standardization Committee established in the Society of Automotive Engineers of Japan, which received approval from JISC as the TC22 domestic mirror committee, has the central role. It engages in international standardization activities and promotes standardization of matters handled by TC22 on behalf of JISC.

The Automotive Standardization Committee implements international standardization activities related to TC22 while collaborating with the Ministry of Economy, Trade and Industry (METI), the Japan Automobile Manufacturers Association (JAMA), the Japan Automobile Research Institute (JARI), the Intelligent Transport Systems (ITS) Standardization Committee, and others, and it annually formulates and revises the "Five-Year Plan for Automotive Standardization" that covers the next five years.

TC22, TC204 Domestic deliberation structure



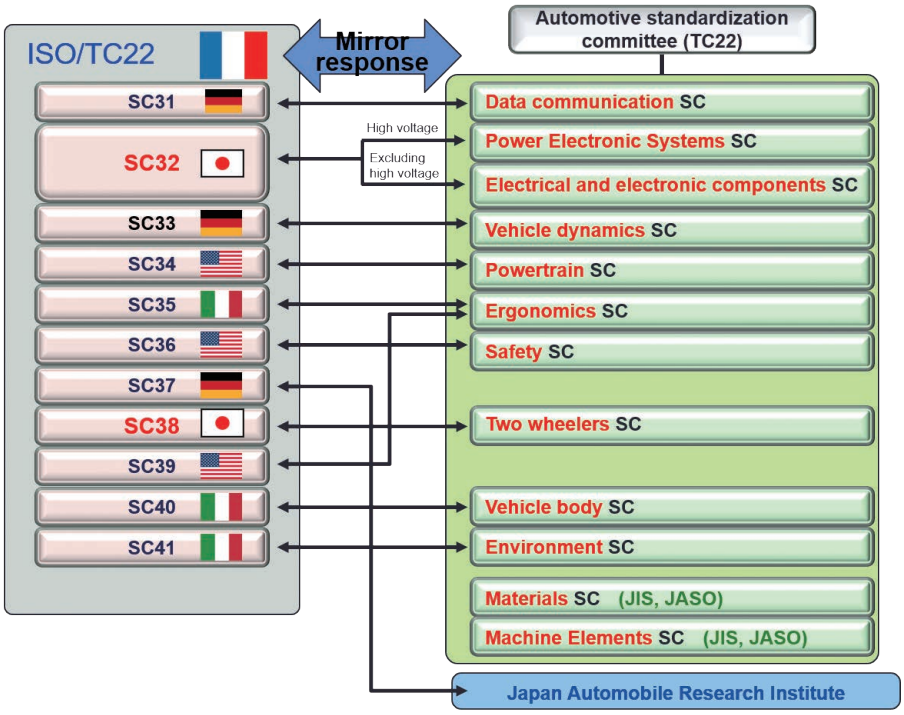
JISC: Japanese Industrial Standards Committee
JAMA: Japan Automobile Manufacturers Association
JSAE: Society of Automotive Engineers of Japan
JARI: Japan Automobile Research Institute
JAPIA: Japan Auto Parts Industries Association
JABIA: Japan Auto-Body Industries Association inc.
JEITA: Japan Electronics and Information Technology Industries Association
DRM: ITS Info-Communications Forum
HIDO: Highway Industries Development Organization
JICE: Japan Institute of Country-ology and Engineering
JIS: Japanese Industrial Standards
JASO: Japanese Automotive Standards Organization
JEVS: Japan Electric Vehicle Standard

There are mirror 10 subcommittees corresponding to ISO/TC22 SCs and 2 subcommittees of JIS and JASO domestic standards mainly, under the Automotive Standardization Committee.

Many experts from the various mirror subcommittees of TC22 are participating in ISO activities and are involved in the development of standards.

Additionally, regarding SC37, JARI is in charge of the domestic mirror committee.

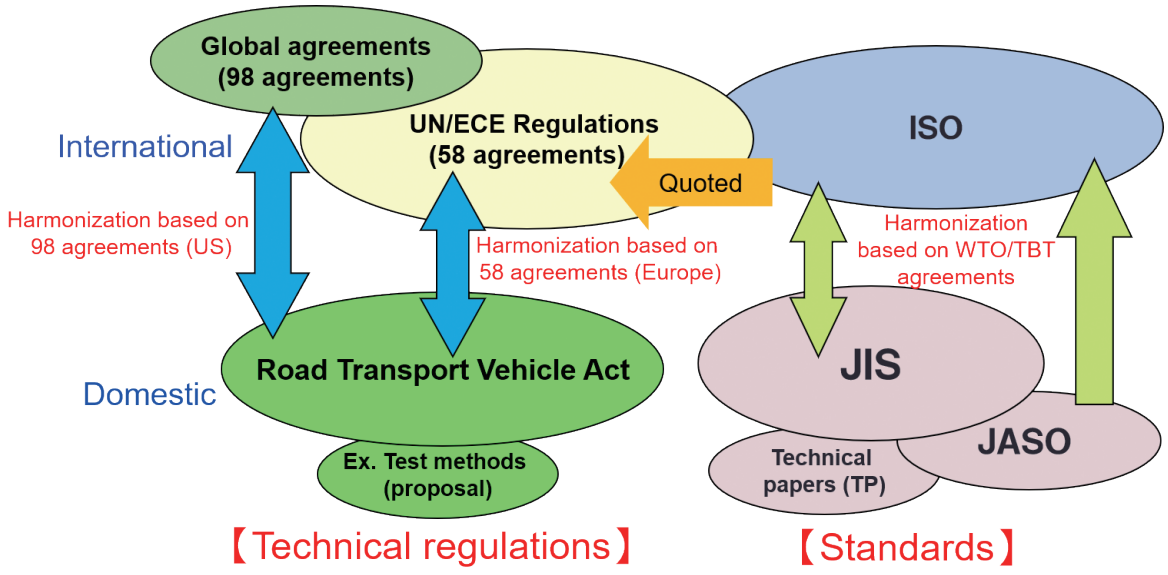
Domestic mirror organization for SCs under TC22



Harmonization of Automotive Technology Regulations and Standards

Standards have the role of supplementing regulations, and standards are making technology contributions to regulations in the automotive area, including adoption of standards formulated by ISO by the United Nations/Economic Commission for Europe (UN/ECE).

Harmonization of automotive technology regulations and standards



43rd TC22 Kyoto Plenary meeting Content

The TC22 General Meeting is typically held once every 18 months, and it has taken place 43 times (including online) thus far. Due to the spread of COVID-19 pandemic beginning in 2020, international conferences suspended in-person events and switched entirely to the online format. Following approval from the ISO Central Secretariat to conduct a hybrid meeting that combined online and in-person forrnats in June, the 43rd meeting took place as a hybrid event in Japan (Kyoto) in September 2022. This was the first meeting in Japan in 20 years since the previous one in 2002 (30th meeting).

Countries that regularly participate in the assemblies are France, which is the TC22 chair and secretariat country, Germany, Italy, Sweden, the United States, Korea, Japan, and other automobile manufacturing countries. Over the past few years, China has been a prominent participant too.

At the 43rd Kyoto Plenary meeting, other participants, besides the above-mentioned regular participants, were Finland, Nigeria, the United Kingdom, Malaysia, Canada (P-member), Hungary (O-member) as well as SC31, SC32, SC33, SC34, SC36, SC37, and SC38 chairs, TC204 and TC268/SC2 chairs as liaisons, and the ISO Central Secretariat. This event matched the all-time high for the number of participating countries (12 countries) from the previous online event (42nd).

TC22 has subordinate SCs, and topics related to standard development are normally discussed at the SC plenary meetings. The TC22 General Meeting mainly addresses operational topics, such as "confirming content of revisions to the ISO/IEC Directives, reporting the activities situation at TC22 and individual SC and liaison TC activities, and confirming the implementation of items decided at the previous meeting."

The 43rd General Meeting discussed various activity reports, TC22 scope revision, SC33 naming and scope revision, the ADCG (Automated Driving Coordination Group) activities report, and the ISO−SAE PSDO (Partner Standards Developing Organization; Joint Standards Development Memorandum situation).

The next general meeting is scheduled to take place in Italy in spring 2024 (between Apr and Jun).

Past TC22 Plenary meetings

【Participation format　○:In-person,　△:Online】

Event	Month/year	Location	Country	Participating countries	P−Member countries																																					
					Algeria	Armenia	Austria	Bangladesh	Belarus	Belgium	Canada	China	Eswatini	Ethiopia	Finland	France (Chair, chair country)	Germany	India	Iran	Iraq	Israel	Italy	Japan	Kazakhstan	Korea	Lithuania	Malaysia	Mexico	Netherlands	Nigeria	North Macedonia	Portugal	Rumania	Russia	Saudi Arabia	Spain	Sudan	Sweden	Switzerland	Uganda	United Kingdom	United States
30th	Oct 2002	Kyoto	Japan	8												○	○					○	○		○													○			○	○
31st	May 2004	Rome	Italy	7												○	○					○	○		○																○	○
32nd	Nov 2005	Suresnes	France	8							○					○	○					○	○													○		○				○
33rd	Jun 2007	Berlin	Germany	7												○	○					○	○				○											○				○
34th	Dec 2008	Seoul	Korea	8								○				○	○					○	○		○		○															○
35th	Jun 2010	Beijing	China	9								○				○	○					○	○		○		○											○				○
36th	Oct 2011	Troy	United States	9								○				○	○					○	○		○		○											○				○
37th	Jun 2013	Gotheborg	Sweden	9												○	○					○	○		○		○								○			○				○
38th	Jun 2014	Paris	France	10												○	○					○	○		○		○								○			○			○	○
39th	Feb 2016	Kuala Lumpur	Malaysia	9								○				○	○					○	○		○		○											○				○
40th	Oct 2017	Berlin	Germany	8								○				○	○					○	○		○													○				○
41st	Jun 2019	Troy	United States	9								○				○	○			△		○	○		○													○				○
42nd	Apr 2021	Online	−	12								△			△	△	△					△	△		△		△											△	△		△	△
43rd	Sep 2022	Kyoto	Japan	12							△	△			○	○	○					○	○		○		△			○								△			△	

Photos from the TC22 Kyoto General Meeting event

SC31 Data Communication

Scope

Data communication for vehicle applications

This includes

- Data buses and protocols (including dedicated sensor communication)
- V2X communication (including V2G)
- Diagnostics
- Test protocols
- Interfaces and gateways (including those for nomadic devices)
- Data formats
- Standardized data content

Activities

Standardization activities related to communication inside and outside of vehicles has been handled by SC3 since ISO launched TC22. With consumer communications technology as the background, communications technology applied to vehicles has advanced in speed, diversity, and complexity accompanying technology advances in the various types of equipment utilized in vehicles, and the expanded scale and lengthening of the standardization development efforts related to vehicle communication accompanying these advances has become a serious issue.

Since vehicle communications, including communications between units within a vehicle and technology for communication with devices outside of the vehicle, is an important technology component that underpins many new technologies and standardization activities are expanding with standardization scope extending to use cases, protocols, and the physical layer, the TC22 reorganization in 2015 created SC31 (Data communication), and eight WGs are conducting activities as of November 2022.

The SC31 general meeting held in November 2022 decided to dissolve WG7 because it completed initial activity goals.

List of subordinate WGs

Subordinate WGs		Name	Chair	Secretariat	Related standardization entities
SC31		Data Communication	Germany	Germany	
	JWG1	Vehicle to grid communication	Germany/ France	Germany/ France	IEC
	WG2	Vehicle diagnostic protocols	Germany	Germany	
	WG3	In-vehicle networks	Germany	Germany	
	WG4	Network applications	Germany	Germany	
	WG5	Test equipment/Data eXchange Formats	France	France	
	WG6	Extended vehicle/Remote diagnostics	France	France	
	WG7	Electronic periodic technical inspection (ePTI)	Germany	Germany	
	WG9	Sensor data interface for automated driving functions	Germany	Germany	

WG activities

● JWG1 Vehicle to grid communication

JWG1 handles development of the ISO 15118 communications standard for charging control between an electrically propelled vehicle and charging point. It started activities as a Joint Working Group (JWG) between ISO/TC22/SC31 and IEC/TC69 (electrically propelled road vehicles) in 2009.

In first-generation standards, ISO 15118-1 (General information and use-case definition), ISO 15118-2 (Network and application protocol requirements), and ISO 15118-3 (Physical and data link layer requirements) were published as IS in 2013-2015 as communication standards to control conductive charging. ISO 15118-4 (conformance standard with ISO 15118-2) and ISO 15118-5 (conformance standard with ISO 15118-3) were published as IS in 2018. Furthermore, ISO 15118-2 and ISO 15118-4 are currently under review with the aim of issuance as 2nd edition international standards in 2023.

In second-generation standards, the security performance is being improved and the scope of application to bidirectional power transfer (BPT), wireless power transfer (WPT), automated connecting devices (ACD) is being expanded. ISO 15118-1 (2nd edition) was published in April 2019, ISO 15118-8 (Physical layer and data link layer requirements for wireless communication; 2nd edition) was published in September 2020, and ISO 15118-20 (Network layer and application layer requirements) was published in April 2022 as IS. Reviews are currently taking place with the goals of international standardization of ISO 15118-9 (conformance test standard with ISO 15118-8) in 2023 and international standardization of ISO 15118-21 (conformance test standard with ISO 15118-20) at the end of 2024.

● WG2 Vehicle diagnostic protocols

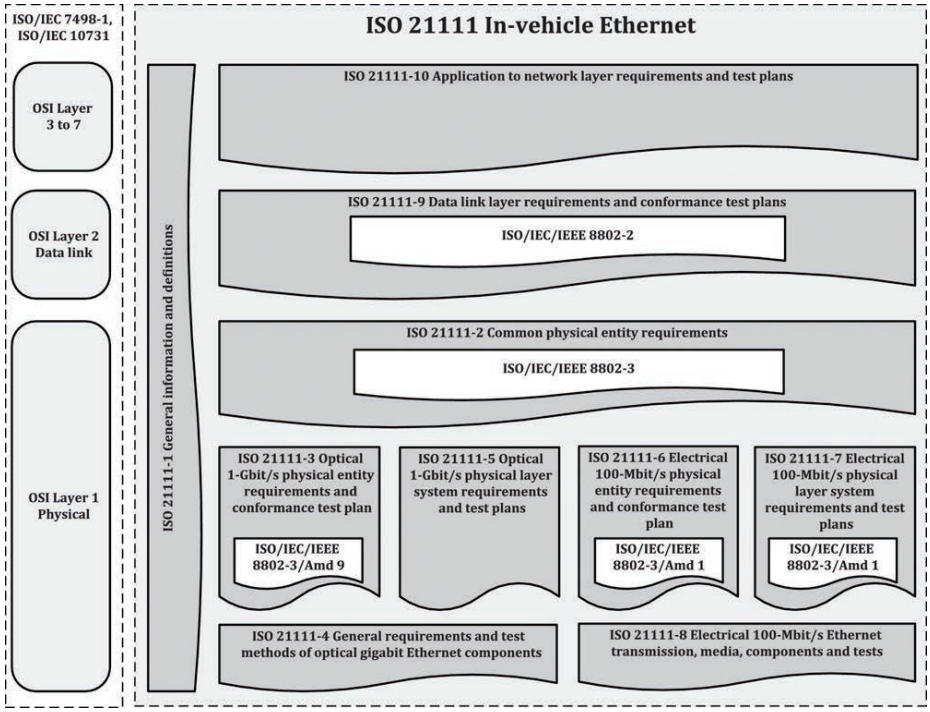
WG2 standardized the diagnostic communication protocol related to vehicle trouble diagnosis. It develops the ISO 15031 standard, which is referenced by passenger vehicle OBD (on-board diagnostics) regulations related to emissions, the ISO 27145 standard, which is referenced by heavy vehicle OBD regulations, and the ISO 14229 standard, which defines UDS (unified diagnostics service) that supports realization of software updates and other expanded functions not requested by OBD regulations via a standardized communication protocol.

Recently, it added security-related functions to address information security and steadily advancing communications methods, developed the ISO 15765 standard, which defines DoCAN (diagnostic communication over Controller Area Network) for deployment of diagnostic communications function over CAN, and developed the ISO 13400 standard, which defines DoIP (diagnostic communication over Internet Protocol) for deployment of diagnostic communications function over the Internet Protocol. It is also reviewing revisions to existing standards to address new demands.

● WG3 In-vehicle networks

WG3 develops standards on the communications protocol in-vehicle networks and evaluation methods. Some examples are CAN (ISO 11898, ISO 16845), LIN (ISO 17987), MOST (ISO 21806), FlexRay (ISO 17458), as well as CXPI (ISO 20794), which Japan has proposed, and vehicle Ethernet (ISO 21111). Regarding CAN, WG3 has started an update of ISO 11898 aimed at integration of the CAN XL standard that supports a larger payload and delivers a data rate up to 10Mbit/s. Since MOST (Media Oriented Systems Transport) conducts synchronous time division multiplexing transmission, it stipulates criteria for deployment in multimedia devices and compatibility tests in accordance with the OSI (Open Systems Interconnection) reference model. Parts 8 and 9 defined the physical layer using plastic optical fiber. CXPI is a standard that covers HMI (Human machine interface) systems, which multiplexes wiring between the electric control device and switches, sensors, motors, relays, and lamps, formulated in 2020. The vehicle Ethernet standard (ISO 21111) series shown in the following figure defines vehicle network criteria not covered in the basic Ethernet communications criteria (ISO/IEC/IEEE 8802-3), such as the wake-up function. The criteria and test plan create document groups based on physical medium and transmission speeds used in adherence to ISO/IEC/IEEE 8802-3 amendments. Parts 3-5 defines 1Gbit/s light, and Parts 6-8 stipulates the 100Mbit/s electric physical layer. Parts 1-5 were published in 2020, Parts 6, 10 and 11 in 2021, and Part 8 in 2022.

ISO 2111 series scheme



Source: ISO 21111-1

● WG4 Network applications

WG4 handles standardization of communications functions used in operating designated applications between ECUs connected over a vehicle network or between an external tool connected via an external electronic interface and an ECU.

The video communication interface for cameras (ISO 17215) was defined in ISO 17215 as an interface that supports efficient communication of information between the camera sensor and control unit to address increase in the volume of information being handled due to the rising number and enhanced functionality of installed cameras amid widespread introduction of driving assistance systems using camera sensors in recent years. SAE J1939, the base for interchange of digital information on electrical connections between towing and towed vehicles (ISO 11992), is a standard designed for the network and communication in the commercial vehicle powertrain with CAN transmission speeds of 250Kbit/second and 500Kbit/second. ISO 11992 is a derivative standard that only defines a transmission speed of 125Kbit/second and is widely used in transmission of trailer ABS signals. Airbag disposal (ISO 26021) is necessary to ensure safe and effective deactivation of airbags installed in vehicles in vehicle recycling. Global automotive industry associations (ACEA, Alliance, JAMA, and KAMA) started development of the realization method and the first edition as the ISO 26021 series was published in 2008-2009 with standardization of communications functions based on ISO 14229-1 (UDS), which is already an international standard, between the airbag disposal tool and airbag control unit utilizing an external electronic interface connected via the trouble diagnosis connector. Discussions are currently taking place for publication of a second edition that strengthens security and supports CAN FD (flexible data rate) and diagnostic communication over Internet Protocol (DoIP).

● WG5 Test equipment/Data eXchange Formats

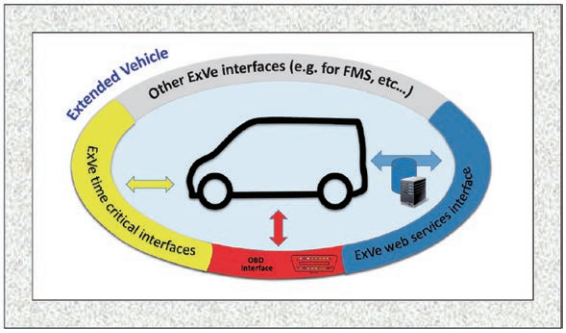
WG5 handles standardization of the data exchange format between development environments and with test equipment. It has defined standards related to specification description formats, such as ODX (Open Diagnostic Data eXchange) and OTX (Open Test sequence eXchange format), and also standardized the open interface for embedded vehicle applications, graphical symbols for the trouble diagnosis system, and the communication interface between test equipment and the ECU called MVCI (Modular Vehicle Communication Interface). These standards are widely used in connections to system development environments, on-board and off-board equipment, and connections to the cloud. Various regulations have been reviewing references in recent years.

● WG6 Extended vehicle/Remote diagnostics

WG6 handles standardization of the interface used to disclose vehicle information from a server managed by the automaker to a third party. This interface standard, which is called Extended Vehicle, aims to provide vehicle information while curtailing information security risk to address the need for use of vehicle information from a remote location that is away from the vehicle, such as in remote trouble diagnosis service. After a proposal as standardization of an interface for vehicle information with a party located outside of the vehicle in May 2014, ISO established TC22/SC31/WG6 as part of its reorganization and began the standardization work. Japan established the Vehicle Information Interface SubCommittee under the Vehicle Communication Committee in FY2015 to handle the process. First-edition IS (ISO 20077-1 Methodology, ISO 20078-1, 2, 3 Web Services, ISO 20080 Remote Diagnostic Service) was published through 2019. Revision discussions were held after IS publication mainly toward publication of a second edition in the ISO 20078 series, and the second edition was published in November 2021. The main change in the revised version was addition of details on the API related to the container function that provides vehicle information as packages of specified combinations.

Separately, activities are proceeding on standardization of the process for third parties to request data disclosure from OEMs and discussion of the necessity of standardizing the vehicle information format. Considering likely increase in new services that utilize vehicle information, there is a possibility of reviews of additional use cases other than remote trouble diagnosis service utilizing the Extended Vehicle concept over the longer term.

Main extended vehicle interfaces

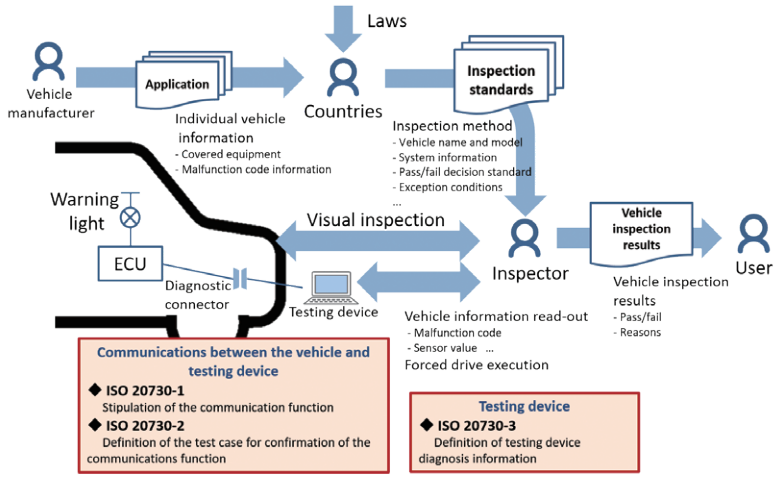


Source: ISO 20077-1

● WG7 Electronic periodic technical inspection (ePTI)

WG7 standardized communication functions needed in the inspection for electronic Periodic Technical Inspection (ePTI), which is one of the vehicle inspection items in European countries, as ISO 20730, including a readout of vehicle information used to reach a judgement on the vehicle state and diagnostic communication for forced drive used in observational judgement. ISO 20370 aimed to improve the inspection capability of the vehicle inspection program and boost inspection efficiency and carried out standardization of communication functions based on ISO 14229-1 (UDS) that has already been adopted as an international standard. It discussed requests for next-generation ePTI, mainly from Germany, and necessary diagnosis communication functions for trouble state and other system information in the vehicle readout and an anticipated use case of inspection in a PTI lane. Documents were prepared for the ISO 20730 series (ISO 20730-1: Diagnosis communication requirements, ISO 20730-2: Diagnosis communication requirements conformance test plan, ISO 20730-3: Diagnosis communication requirements-related data definitions). IS publication occurred for ISO 20730-1 in April 2021 and ISO 20730-3 in October 2021. ISO 20730-2 finished the DIS vote in April 2022 and was published as an IS in November 2022. As a result, the SC31 general meeting held in November 2022 decided to dissolve WG7 because it completed initial activity goals.

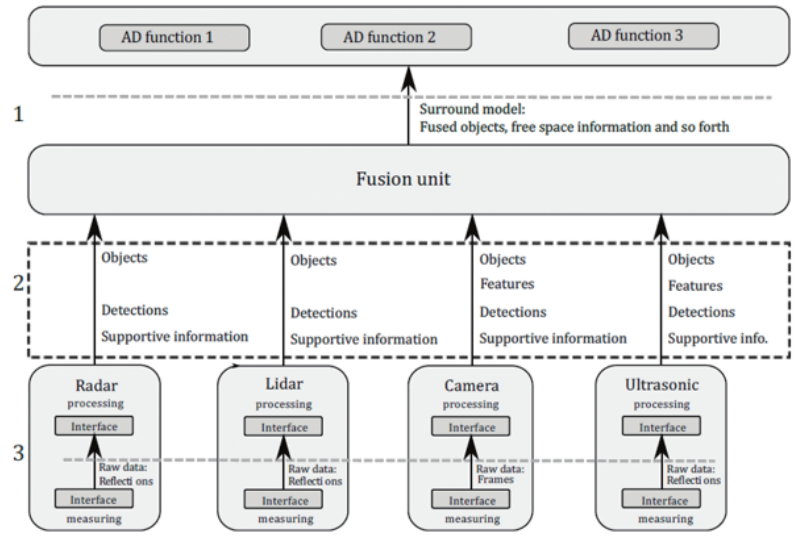
Flow of electronic periodic technical inspection under review for standardization in the ISO 20730 series



● WG9 Sensor data interface for automated driving functions

WG9 handles standardization of the sensor interface for input to the automated driving function. ISO 23150, which is covered by the activities, defines the logical interface between a sensor and the fusion unit and was published as an IS in May 2021. Content stipulated in the standard uses logical and abstract expressions from strictly defined communication content. While it also defines detailed enumerators, it is interpreted as allowing expansion required in actual installation. Discussions on the second edition that target FDIS in December 2022 and IS publication in May 2023 are currently advancing.

Logical interface between sensors and the upper fusion unit standardized by ISO 23150 (section 2 in the diagram)



Key

1 logical interface layer between the fusion unit and AD functions
2 logical interface layer between a single sensor as well as a single sensor cluster and the fusion unit
3 interface layer on raw data level of a sensor's sensing element(s) and its processing

Source: ISO 23150

SC32 Electrical and electronic components and general system aspects

Scope

Electrical and electronic (E/E) components and cross-sectional specifications for E/E systems and components

This includes:

- Wiring harness (e.g. cables, connectors, interconnections)
- Dedicated connectors (e.g. trailer connectors, OBD-connector)
- Dedicated E/E components and parts (e.g. alternators, fuses, ignition equipment)
- EMC
- Environmental conditions
- Functional safety
- Cybersecurity
- Dedicated optical components
- Software update

Activities

SC32, which handles electrical and electronic components and general system aspects that comprise vehicles, covers standardization of a wide range of areas related to electronic components from technology scope of functional safety that defines electrical and electronic components and general system-level safeness and response process to cybersecurity accompanying digitalization of vehicle control systems and other system matters to wiring harnesses and dedicated connectors and EMC-related testing methods.

In recent years, WG7 “Functional characteristics of starting devices and electrical generators” has been disbanded since its activities with the completion of the standard. WG14 “Safety and Artificial Intelligence” has been newly established. Ad-hoc groups have also been established to examine issues related to “test method for automotive LIDAR”, “cooperative interference mitigation of automotive millimeter-wave radar” and “test method for detection performance of mili-meter wave radar”.

Additionally, Japan is SC32’s chair and secretariat and proactively contributes to international standardization activities.

List of subordinate WGs

Subordinate WGs		Name	Chair	Secretariat	Related standardization entities
SC32		Electrical and electronic components and general system aspects	Japan	Japan	
	WG1	Ignition Equipment	Germany	Germany	
	WG2	Environmental conditions	Germany	Germany	
	WG3	Electromagnetic compatibility	France	France	IEC
	WG4	Automotive electrical cables	U.S.	U.S.	
	WG5	Fuses and circuit breakers	Germany	Germany	
	WG6	On-board electrical connections	Germany	Germany	
	WG8	Functional safety	Germany	Germany	
	WG9	Electrical connections between towing and towed vehicles	U.K.	U.K.	
	WG10	Optical components – Test methods and requirements	Japan	Japan	
	WG11	Cybersecurity	Germany	Germany	SAE
	WG12	Software update	Japan	Japan	
	WG13	Safety for driving automation systems	Germany	Germany	
	WG14	Safety and Artificial Intelligence	Germany	Germany	

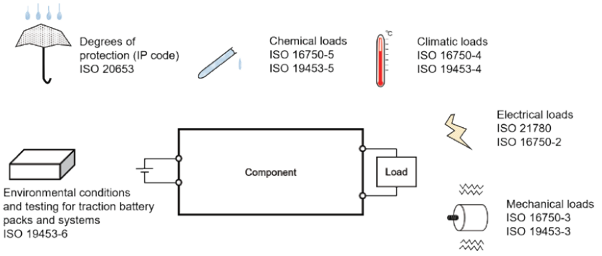
Main WG activities

● WG2 Environmental conditions

WG2 is a working group that covers environmental conditions related to vehicle electronic and electrical components. Handled standards include the ISO 16750 series that stipulates environmental resistance test methods for 12/24V components (Part 1 (general), Part 2 (electrical loads), Part 3 (mechanical loads), Part 4 (climatic loads), Part 5 (chemical loads)), ISO 21780 that stipulates electrical load test methods for 48V hybrid systems that have started commercialization mainly in Europe, the ISO 19453 series that stipulates environmental resistance test methods for voltage class-B components (Part 1 (general), Part 3 (mechanical loads), Part 4 (climatic loads), Part 5 (chemical loads), Part 6 (traction battery packs and systems)), and ISO 20653 that stipulates degrees of protection (IP code) of electrical equipment for automobiles. WG2 contributes to ensuring the reliability of automobiles used in harsh environments through these standards.

Because of advances in technology innovations in the new area (referred to as CASE) in recent years, 12/24V components need to provide even more reliability than previously and high-voltage components are increasing along with widening inroads by electrically propelled vehicles. Given this backdrop, WG2 is proceeding with a review of environmental resistance test methods that go beyond the existing framework for 12/24V electronic and electrical components. Formulation of a new standard that combines high-voltage part environmental resistance test methods (ISO 19453-1/3/4/5) and 12/24V part environmental resistance test methods (ISO 16750-1/3/4/5) with the aim of broadening application scope to trucks, buses, and other electrically propelled commercial vehicles and improving user standard viewing convenience has started based on a Japanese proposal, and review work is proceeding with a goal of publication in 2023. WG2 is also implementing revisions that seek to clarify test methods and requested performance in 12/24V part environmental resistance test methods (ISO 16750-2). It should continue to make steady advances in related standards.

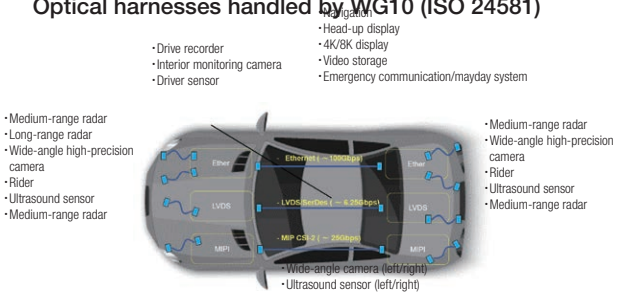
List of standards handled by WG2



● WG4, 6, 10 High-speed communication components and parts and optical communication

Development of ultra-high speed communication standards needed in automated driving systems and other applications is proceeding, and multiple de-facto standard development organizations are discussing 10Gbit/s and faster standards. To support this, standardization of an optical harness (ISO 24581) that complies with a variety of communication standards, including Ethernet communication, and is capable of extension of up to 100Gbit/s communication to a maximum distance of 50m is taking place. Because of limitations on installation range of ultra-high speed communication needed by automated driving systems in electric communication from losses and EMC measures, replacement with optical communication that is broadband and offers excellent noise resistance could extend the installation range of automated driving system units and improve reliability.

Optical harnesses handled by WG10 (ISO 24581)



● WG8 Functional safety/SOTIF

ISO 21448 (Safety of the intended functionality; SOTIF) is an important standard and guide for development of safety in future automated driving and vehicle electronic systems with increasingly advanced and sophisticated functionality, along with ISO 26262 (Functional safety) that has already taken hold. It was officially published at the end of June 2022. While development work is currently proceeding on ISO TS 5083, ISO 34502, UL 4600, and other international standards related to the design method and evaluation method for development of advanced automated driving systems, these standards refer to ISO 26262 and ISO 21448 as main assumptions. Additionally, ISO 26262 has started discussing initiatives with next-generation issues in a scenario of broader CASE advances in the future and anticipates growing utilization of functional safety-related standards.

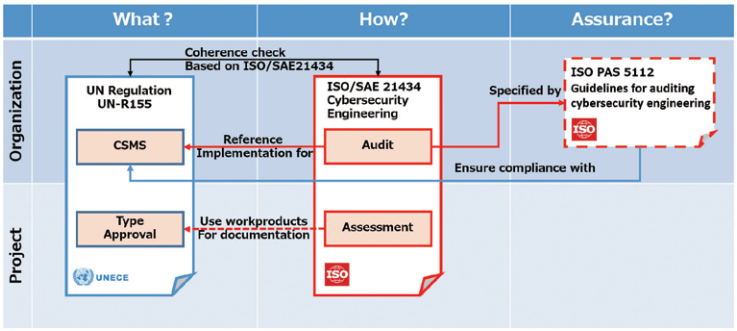
Standards handled by WG8

Safety development standards	Functional safety ISO 26262	SOTIF ISO 21448	
Hazard factor	Malfunction	Functional insufficiency	Misuse (reasonably foreseeable)
Hazard factor example	Hardware failure, software bug	Sensor/algorithm specification insufficiency or performance limit	User mistaken use/operating mistake
			

● WG11 Cybersecurity

ISO/SAE 21434 formulated by SC32/WG11 was published as an IS in August 2021, and ISO PAS 5112 was published in March 2022. ISO/SAE 21434 and PAS 5112 are important standards and guides for regulatory response referenced in the Interpretation Document for UN-R155 (cybersecurity) prepared by UNECE WP29 (World Forum for Harmonization of Vehicle Regulations). Many vehicles headed to countries adapting regulations based on UN-R155 are expected to rely on ISO/SAE 21434 and ISO PAS 5112. Cybersecurity measures are essential considering CASE advances, and almost all vehicles developed in the future are likely to utilize these standards.

WG11 activities



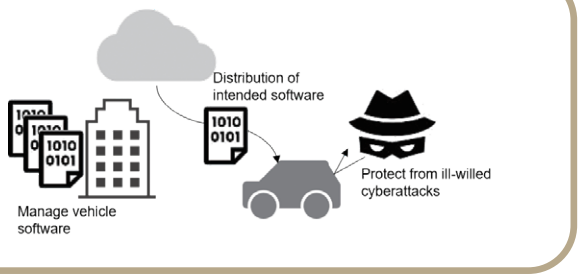
● WG12 Software update

Electronic control systems used in automobiles have become increasingly important and complicated in recent years. The use case of updating vehicle software in order to strengthen control functions or maintain cybersecurity performance in already sold vehicles has emerged. This means it is necessary to not only develop software as part of vehicle development but also fulfill a new process of continuously updating software in already developed vehicles. Establishment of a software update process and application of this process is important in ensuring software quality and also providing sufficient cybersecurity and safety.

Vehicle software updates take place using a customized tool at the dealer or over-the-air (OTA). With wider adoption of the software update use case, it is necessary to correctly manage existing system configuration information (hardware version, software version) of individual vehicles.

With this backdrop, UN-R 156 “Software update” (United Nations regulation) requests proper software management and updates to intended software.

SC32/WG12 formulated ISO 24089 “Software update engineering” as a guideline for the regulation. This standard defines the necessary process to safely and reliably update software and the process to create high-quality software update packages and basic requirements to correctly implement and maintain these processes.



● WG13 Safety for driving automation systems

In February 2021, WG13 (Safety for driving automation systems) was established under SC32 for the purpose of developing standard documents related to the safety of level-2 and above driving automation systems. While technologies that comprise driving automation systems are not limited to electronic and electrical components, this WG was placed under SC32, since functional safety, SOTIF, cybersecurity, and other approaches provide the foundation of safety reviews.

ISO/TS 5083 (Safety for automated driving systems – Design, verification and validation) currently being developed aims to be a document that comprehensively handles system safety considering systematized safety arguments related to automated driving systems. The starting point of this TS refers to TR 4804 published in 2020 which includes aspects such as setting safety goals, risk assessment, attainment of safety goals by design, and verification and validation methods. This effort is attracting strong interest from not only the automotive industry but also related stakeholders due to anticipated impact on United Nations rules and safety standards for automated driving vehicles in various countries.

If development activities proceed smoothly, it could be published as a TS in 2023 and then begin review as an ISO standard. While one of the purposes of this standard is quantification of requirements related to automated driving system safety, the biggest challenge is figuring out alignment of the criteria because of various approaches and implementation examples of automated driving initiatives in various countries. Furthermore, since this standard involves comprehensive content, it needs to be aligned with existing standard documents (functional safety, SOTIF, cybersecurity, driver monitors, safety validation, MRM, etc.).

● WG14 Safety and Artificial Intelligence

In September 2021, Safety and Artificial Intelligence: WG14 was launched under the umbrella of SC32 with the aim of developing standard documents for the safety of automotive electronic systems using artificial intelligence (AI) technology.

As automotive electronic systems such as autonomous driving become more sophisticated, the use of artificial intelligence (AI) technology has increased significantly in recent years, and the benefits of this technology have become indispensable. However, the functions enabled by AI technologies, such as machine learning, can be difficult to explain why they behave in a particular manner or to guarantee their performance, so special care must be taken when applied in and around safety-related systems. Therefore, there was an urgent need to develop guidance on how to apply AI technology to safety-impacting automotive electronic system functions, and the development of PAS 8800 was initiated at WG14. It is being developed with an emphasis on alignment, interrelation and consistency with the existing automotive safety standards ISO 26262 (FuSa), ISO 21448 (SOTIF), and related under developing standards ISO/TS 5083, TR 5469.

List of SC32 work items (as of August 2022)

ISO/AWI 6518-1	Ignition systems — Part 1: Vocabulary	WG1
ISO/AWI 6518-2	Ignition systems — Part 2: Electrical performance and function test methods	WG1
ISO/AWI 11565	Spark-plugs — Test methods and requirements	WG1
ISO 17447-1	Glow-plugs with conical seating and their cylinder head housing — Part 1: Basic characteristics and dimensions for metal-sheath-type glow-plugs	WG1
ISO/CD 28741	Spark plugs and their cylinder head housings — Basic characteristics and dimensions	WG1
ISO/CD 16750-1	Environmental conditions and testing for electrical and electronic equipment — Part 1: General	WG2
ISO/CD 16750-2	Environmental conditions and testing for electrical and electronic equipment — Part 2: Electrical loads	WG2
ISO/CD 16750-3	Environmental conditions and testing for electrical and electronic equipment — Part 3: Mechanical loads	WG2
ISO/CD 16750-4	Environmental conditions and testing for electrical and electronic equipment — Part 4: Climatic loads	WG2
ISO/CD 16750-5	Environmental conditions and testing for electrical and electronic equipment — Part 5: Chemical loads	WG2
ISO/DIS 20653	Degrees of protection (IP code) — Protection of electrical equipment against foreign objects, water and access	WG2
ISO/DIS 7637-1	Electrical disturbances from conduction and coupling — Part 1: Definitions and general considerations	WG3
ISO/TR 7964	Future directions for vehicle EMC validation — Adapting to emerging complex systems and safety considerations (including functional safety and SOTIF)	WG3
ISO/DIS 10605	Test methods for electrical disturbances from electrostatic discharge	WG3
ISO/AWI 11451-1	Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 1: General principles and terminology	WG3
ISO/AWI 11451-2	Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 2: Off-vehicle radiation sources	WG3
ISO/CD 11451-3	Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 3: On-board transmitter simulation	WG3
ISO 11451-4	Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 4: Harness excitation method	WG3
ISO/DIS 11451-5	Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 5: Reverberation chamber	WG3
ISO/CD 11452-1	Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 1: General principles and terminology	WG3
ISO/DIS 11452-8	Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 8: Immunity to magnetic fields	WG3
ISO 11452-9	Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 9: Portable transmitters	WG3
ISO/AWI 11452-11	Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 11: Reverberation	WG3
ISO/AWI TR 17716	Electrical disturbances from narrowband radiated electromagnetic energy — Radiated immunity for V2X	WG3
ISO/DIS 19642-1	Automotive Cables — Part 1: Vocabulary and design guidelines	WG4
ISO/DIS 19642-2	Automotive Cables — Part 2: Test methods	WG4
ISO/DIS 19642-11	Automotive Cables — Part 11: Dimensions and requirements for coaxial RF cables with a specified analog bandwidth up to 6 GHz (20GHz)	WG4
ISO/DIS 19642-12	Automotive cables — Part 12: Unscreened paired or quad RF cables with a specified analog bandwidth up to 1 GHz	WG4
ISO/AWI 8820-3	Fuse-links — Part 3: Fuse-links with tabs (blade type) Type C (medium), Type E (high current) and Type F (miniature)	WG5
ISO/AWI 8820-4	Fuse-links — Part 4: Fuse-links with female contacts (type A) and bolt-in contacts (type B) and their test fixtures	WG5
ISO/AWI 10924-1	Circuit breakers — Part 1: Definitions and general test requirements	WG5
ISO/AWI 10924-2	Circuit breakers — Part 2: User's guide	WG5
ISO/AWI 10924-3	Circuit breakers — Part 3: Miniature circuit breakers with tabs (Blade type), Form CB11	WG5
ISO/AWI 10924-4	Circuit breakers — Part 4: Medium circuit breakers with tabs (Blade type), Form CB15	WG5
ISO/AWI 10924-5	Circuit breakers — Part 5: Circuit breakers with bolt with rated voltage of 450 V	WG5
ISO/AWI 8092-6	Connections for on-board electrical wiring harnesses — Part 6: In-vehicle Ethernet, general performance requirements and interface definitions	WG6
ISO/AWI 8092-7	Connections for on-board electrical wiring harnesses — Part 7: Electrical connection requirements, test methods and interface definition for miniaturized coaxial connections	WG6
ISO 21111-8	In-vehicle Ethernet — Part 8: Electrical 100-Mbit/s Ethernet transmission media, components and tests	WG6
ISO/CD 8092-2	Connections for on-board electrical wiring harnesses — Part 2: Definitions, test methods and general performance requirements	WG6
ISO 24195	Vocabulary for engineering of starting devices	WG7
ISO/AWI PAS 8926	Functional safety — Qualification of pre-existing software products for safety-related applications	WG8
ISO/AWI TR 9839	Application of predictive maintenance to hardware with ISO 26262-5	WG8
ISO/AWI TR 9968	Functional safety — The application to generic rechargeable energy storage systems for new energy vehicle	WG8
ISO 21448	Safety of the Intended Functionality (SOTIF)	WG8
ISO/CD 24581	General requirements and test methods of in-vehicle optical harnesses for up to 100Gbit/s communication	WG10
ISO/PAS 5112	Guidelines for auditing cybersecurity engineering	WG11
ISO/SAE 21434	Cybersecurity engineering	WG11
ISO/SAE PWI 8475	Cybersecurity Assurance Levels (CAL) and Target Attack Feasibility (TAF)	WG11
ISO/PWI 8477	Cybersecurity verification and validation	WG11
ISO/DIS 24089	Software update engineering	WG12
ISO/AWI TS 5083	Safety for automated driving systems — Design, verification and validation	WG13
ISO/AWI PAS 8800	Safety and artificial intelligence	WG14
ISO/PWI 13228	Test method for automotive LiDAR	SC32
ISO/PWI 13377	Guidelines for cooperative interference mitigation of automotive millimeter-wave radar	SC32
ISO/PWI 13389	Test method for detection performance of millimeter-wave radar	SC32

SC33 Vehicle dynamics, chassis components and driving automation systems testing

Scope

Lateral, longitudinal and vertical vehicle dynamics and controls/systems/functions affecting vehicle dynamics, such as chassis components, wheels, steering, brakes and suspension. This includes automated driving, means and performance of collision avoidance and mitigation.

Activities

SC33 was established as part of the ISO/TC22 reorganization in 2015 by combining former SC2 (Braking systems and equipment), former SC9 (Vehicle dynamics and road-holding ability), former SC19 (Wheels), and WG16 (Active Safety test equipment) under TC22 and adding a new WG to cover ADAS (Advanced Driver-Assistance Systems) performance evaluation. Since then, it reorganized and newly established the break-related WG and newly established WG9 (Test scenario of automated driving systems).

At the SC33 plenary meeting in June 2021, there was discussion of changing the SC name because the name did not address the WG3/9/16 projects or the related SC scope. Japan's proposed SC name ultimately obtained support from participating countries and was subsequently confirmed by the TC22 plenary meeting in September 2022. It also adds the term "vertical" to scope in light of the expansion of WG2 activity items.

List of subordinate WGs

Subordinate WGs		Name	Chair	Secretariat
SC33		Vehicle dynamics, chassis components and driving automation systems testing	Germany	Germany
	WG2	Vehicle dynamics of passenger cars	Sweden	Sweden
	WG3	Driver assistance and active safety functions	Germany	Germany
	WG5	Wheels	U.S.	U.S.
	WG6	Vehicle dynamics of heavy commercial vehicles and buses	Sweden	Sweden
	WG9	Test scenarios for automated driving systems	China	China
	WG10	Brake linings and friction couples	Germany	Germany
	WG11	Simulation	Republic of Korea	Republic of Korea
	WG14	Brake fluids	Germany	Germany
	WG15	Field load specification for brake modulation systems	Germany	Germany
	WG16	Active Safety test equipment	Sweden	Sweden

SC33 is a subcommittee handling a very large number of standards, even within TC22, and has already published 118 standards and is currently working on formulation or revision of 28 standards (as of September 2022).

WG activities

● WG2 Vehicle dynamics of passenger cars

Emphasis is shifting to standards that assess passenger comfort in order to address the coming automated driving era. The standard defining general test conditions on ride comfort promoted since FY2020 have been published. The candidate as the next theme is a standard on tests that evaluate motion sickness. Generally, the driver who can forecast vehicle motion more easily is less likely to experience motion sickness while passengers who have difficulty forecasting motion are more susceptible to feeling motion sickness. Since everyone in the vehicle becomes a passenger in automated driving, causing less motion sickness is likely to be an important product feature. WG2 continues to collect information from motion sickness experts in FY2021 with the aim of formulating a standard on a motion sickness indicator and test method. Additionally, Germany submitted a proposal to formulate safety guidelines for a steer-by-wire system as an ADS/ADAS device.

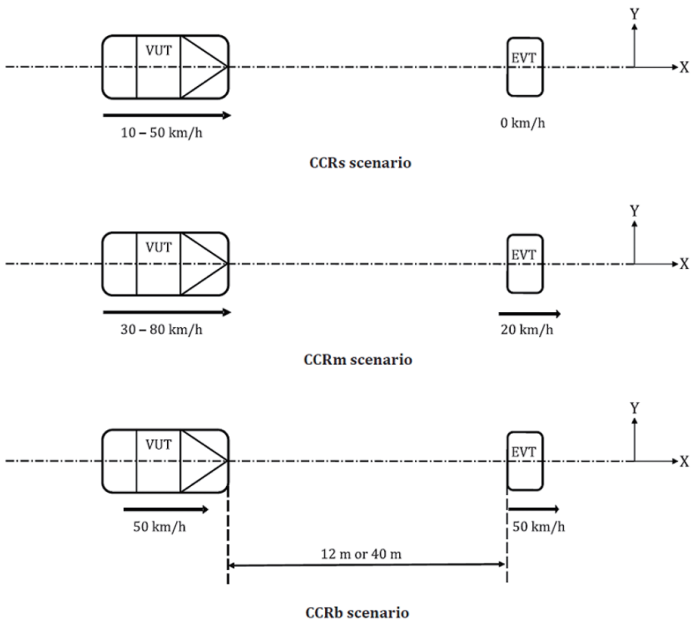
Main work items of WG2

WG2	Standardization themes	ISO Number	Content
1	Road vehicles — Vehicle dynamics test methods — Part 3: General conditions for passenger cars ride comfort tests	ISO 15037-3	Standardize and issue general conditions for passenger car ride comfort tests

● WG3 Driver assistance and active safety functions

This WG is accelerating standardization of a performance evaluation test method related to evaluating performance of an advanced driver assistance system, and multiple standardization themes are moving forward. Since it is necessary to harmonize the domestic assessment test method, Japan is actively participating to ensure reflection of its opinions.

Example of a completed AEBS car-to-car performance test method (ISO 22733-1)



VUT: Vehicle under test
Test vehicle equipped with a collision damage alleviation or collision avoidance device
EVT: Equivalent Vehicle Target
Vehicle target defined by ISO19206-1
CCRs: Car-to-Car Rear Stationary
Collision with the rear of a stationary vehicle scenario
CCRm: Car-to-Car Rear Moving
Collision with a moving vehicle scenario
CCRb: Car-to-Car Rear Braking
Collision with a braking vehicle scenario

Main work items of WG3

WG3	Standardization themes	ISO Number	Content
1	Test method to evaluate the performance of autonomous emergency braking systems — Part 2: Car-to-pedestrian	PWI 22733-2	Standardizes the method to evaluate AEBS (car-to-pedestrian) performance
2	Technical characteristics for partial automated hands-free driving system	AWI PAS 11585	Standardize the definition of a hands-free advanced driving assistance system
3	Test method to evaluate the performance of Acceleration Control for Pedal Error (ACPE)	PWI PAS	Standardize a test method to evaluate the performance of Acceleration Control for Pedal Error (ACPE)

● WG5 Wheels

This WG has published 11 ISO standards, including the former SC19 era, but is currently entirely focused on standard updates and revisions. While there was interest in formulating an ISO standard for biaxial testing, a new test method, a few years ago, nothing specific is occurring at this point. Additionally, despite mention at the WG5 meeting in October 2022 of intent to review a biaxial testing method for commercial vehicle wheels and ISO standardization of the CFRP wheel test method as possible future WG5 meeting work, nothing specific has started yet.

Main work items of WG5

WG5	Standardization themes	ISO Number	Content
1	Road vehicles — Wheels/rims for commercial vehicles — Test methods	PRF 3894	Commercial vehicle wheel test method – Mistake correction and overall content revision
2	Commercial vehicles — Wheel-hub attachment dimensions	AWI 4107	Commercial vehicle wheel-hub attachment dimensions – Dimension allowance mistake correction and revision

● WG6 Vehicle dynamics of heavy commercial vehicles and buses

While efforts mainly involved standardization of the open-loop test method for evaluation of vehicle dynamics of heavy commercial vehicles and buses up to now, standardization related to the recent development trend of automated driving and advanced driver assistance systems and model-based development has increased. For automated driving and advanced driver assistance systems, activities involve standardization of the evaluation method for vehicle systems from the vehicle dynamics perspective. For model-based development, activities have a broad scope from the simulation method to the measurement method of actual vehicle features that are the major parameters. This is a WG that has been sensitive to societal and industry trends, and recent scope clearly commented on handling these new areas. However, despite the vehicle dynamics approach, the extent to which meaningful standardization is possible remains unclear in areas that do not have established base technology such as automated driving and advanced driver assistance systems.

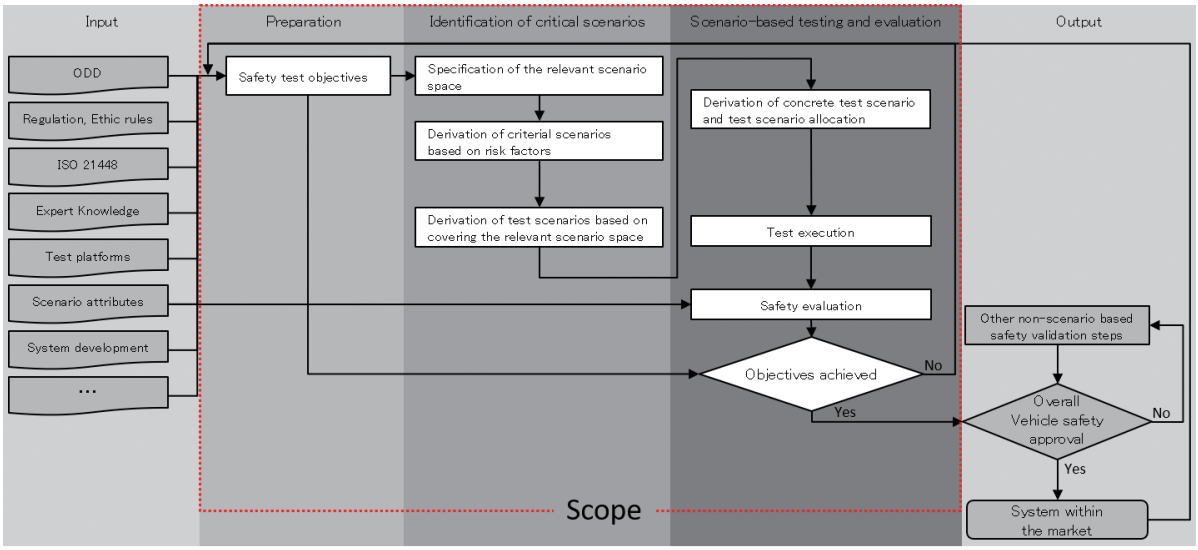
Main work items of WG6

WG6	Standardization themes	ISO Number	Content
1	Heavy commercial vehicles and buses — Calculation method for steady-state rollover threshold	FDIS 22135	Standardize the desk test method for tilt angle factoring in tyre, suspension, and other deformation
2	Heavy commercial vehicles and buses — Tyre model for linear range lateral stability estimation of heavy vehicle combinations	AWI 23373	Standardizes the linear tyre model for lateral stability estimation of vehicle combinations

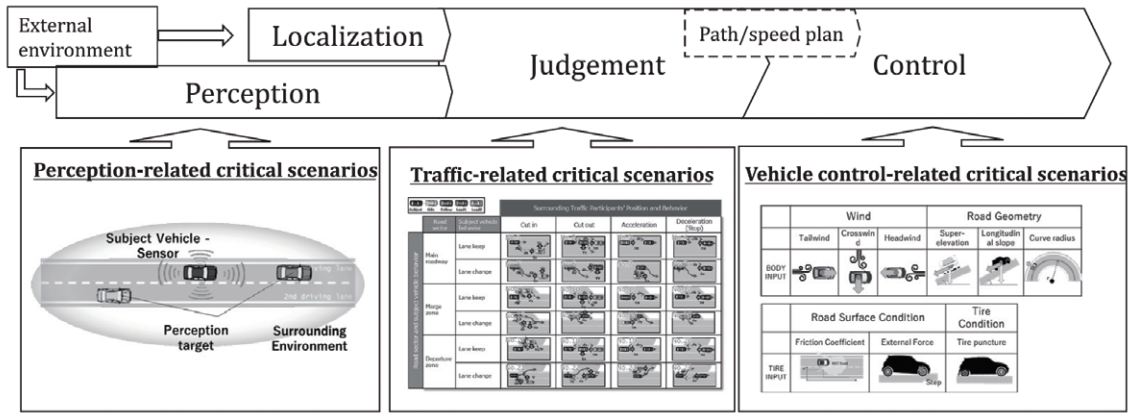
● WG9 Test scenarios for automated driving systems

WG9 (Test scenarios for automated driving systems), which covers standardization of the test scenarios for automated driving, was established in 2018 and started standardization of a framework to evaluate safety. In 2022, it issued the Scenario based safety evaluation framework (ISO34502:2022), as the main standard and proposed the scenario-based safety evaluation process (Figure a below) and the physical principles scenario-based approach as a detailed method (Figure b below). Japan proposed the scenario-based safety verification scheme, which it is proposing to UN/ECE's VMAD, as an international standard too and is leading discussion of automated driving safety in international society.

a) Scenario-based safety evaluation flow



b) Outline of the physics principles scenario-based approach for ADS safety evaluation



Main work items of WG9

WG9	Standardization themes	ISO Number	Content
1	Road vehicles — Test scenarios for automated driving systems — Vocabulary	ISO 34501:2022	Standardizes terms and definitions of test scenarios for automated driving systems
2	Road vehicles — Test scenarios for automated driving systems — Scenario based safety evaluation framework	ISO 34502:2022	Standardizes the guidance and framework of test scenarios and scenario based safety evaluation for automated driving systems
3	Road Vehicles — Test scenarios for automated driving systems — Taxonomy for operational design domain	DIS 34503	Standardizes ODD taxonomy for automated driving systems
4	Road vehicles — Test scenarios for automated driving systems - Scenario categorization	CD 34504	Standardizes categorization in test scenarios for automated driving systems
5	Road vehicles — Test scenarios for automated driving systems – Scenario evaluation and test case generation	NWIP 34505	Standardizes test scenario evaluation and test case generation for automated driving systems

● WG10 Brake linings and friction couples

Friction-related activities picked up again in 2015, and WG10 (Brake linings and friction couples) was established as a new WG in October 2018. WG10 holds a WG meeting at EuroBrake, an annual event, and experts from various countries (mainly European countries) participate. Japan participates in not only individual standardization themes but also reports and promotes progress in standardization activities with JSAE/JAMA/JARI collaboration. These efforts led to Japan's presence on the brake emission measurement method (WP29.GRPE.PMP-IWG), the brake friction-material metal pick-up test method (ISO PAS 22596), and other themes.

Main work items of WG10

WG10	Standardization themes	ISO Number	Content
1	Road vehicles — Dynamometer metal pick-up generation procedure for disc brakes	PAS 22596	Converts the dynamometer metal pick-up test procedure for disc brakes from PAS to IS
2	Road vehicles — Friction-relevant brake disc specification	PWI 4792	Standardizes friction-relevant brake disc characteristic specifications
3	Road vehicles — Brake linings — Compressive strain test methods	ISO 6310	Revises the friction materials compression strain test method
4	Road vehicles — Brake linings frictions materials — Visual inspection	DIS 22574	Converts visual inspection guidelines from PAS to IS
5	Road vehicles — Brake linings frictions materials — Drag mode friction test for hydraulic and pneumatic vehicle brakes	AWI PAS 13146	Drag mode test method

● WG11 Simulation

For simulation, the vehicle model classification standard related to steering, powertrain, braking amongst others (ISO 11010-1) was published. Verification using the vehicle dynamics simulation model is increasingly needed as a method of curtailing design and test verification work related to automated driving and advanced driver assistance systems, and WG11 proposes a model verification standard for vehicle behaviors above, such as micro-steering, letting-go and parking as PWI. In addition, Germany proposed a perception sensor model standard as a PWI candidate. From now on, the definition of simulation of to be handled by SC33 in cooperation with other SCs will be discussed.

Main work items of WG11

WG11	Standardization themes	ISO Number	Content
1	Passenger cars — Simulation model classification — Part 1: Vehicle dynamics	ISO 11010-1:2022	Standardizes and publishes the model composition for vehicle dynamics performance

● WG14 Brake fluids

Japan is taking the initiative in revisions to Specification of non-petroleum-based brake fluids for hydraulic systems (ISO 4925) in order to sustain and enhance brake fluid quality in the global market, including emerging countries. It is continuing activities to revise Motor Vehicle Brake Fluid (SAE J1703), Borate Ester Based Brake Fluids (SAE J1704), and other global standards in fluid performance and reflect the revised SAE standards in ISO 4925. Within this context, WG14 (Brake fluids), which specializes in the brake fluid area, was ramped up in 2018 and aims to incorporate standardization of fluid specifications and fluid test methods for the purpose of curtailing operation noise of the brake fluid pressure control unit enhancing machine lubricity related to inroads by advanced driver assistance systems into ISO 4925 and others.

Main work items of WG14

WG14	Standardization themes	ISO Number	Content
1	Road vehicles — Specification of non-petroleum based brake fluids for hydraulic systems	PWI 4925	Revises the brake corrosion resistance test method and newly defines the lubricity performance evaluation test method

● WG15 Field load specification for brake modulation systems

WG15 (Field load specification for brake modulation) was ramped up in FY2020 and completed formulation of load specifications (ISO PAS 5105) in the brake control system market in October 2021 roughly as planned. It is currently continuing to enhance precision and prepare for IS conversion with additions to ISO PAS 5101, such as extra items and a load coefficient. These efforts are taking place with the aim of IS issuance in 2025.

Main work items of WG15

WG15	Standardization themes	ISO Number	Content
1	Road vehicles — Field load specification for brake actuation and modulation systems	PAS 5101	Standardizes examples of field load on the brake modulation system and frequency

● WG16 Active Safety test equipment

This WG is accelerating standardization of equipment used in performance evaluation of advanced driver assistance systems, and multiple standardization themes are advancing. Since it is necessary to harmonize the domestic assessment test method, Japan is actively participating to ensure reflection of its opinions.

Example of a completed test surrogate target

Figure C.6 — Example measurement cart (top), turntable (bottom)

Figure C.1 — Distribution of RCS, front and rear view

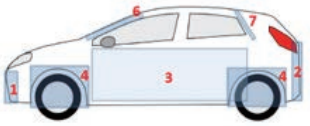


Figure C.2 — Distribution of RCS, side view

Number	Segment
1	front bumper
2	rear bumper
3	side panels
4	wheel casing
5	front
6	A-pillar
7	C-pillar

Passenger vehicle 3D target (ISO 19206-3)

Source: ISO19206-3

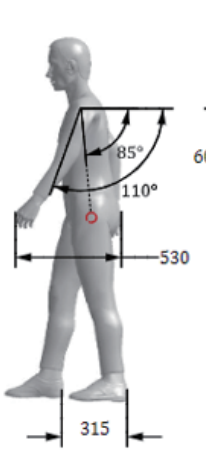


Figure A.1a

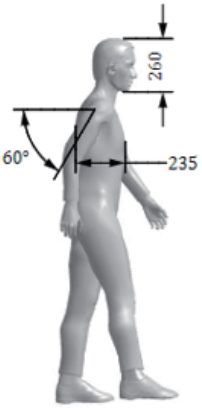


Figure A.1b

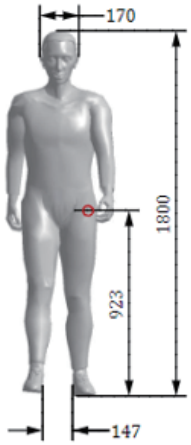


Figure A.1c

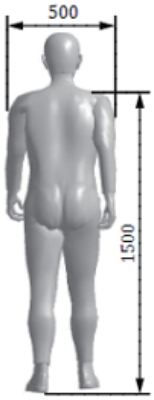


Figure A.1d

Pedestrian surrogate targets (ISO 19206-2) — Adult pedestrian

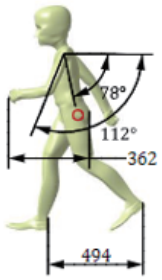


Figure A.2a

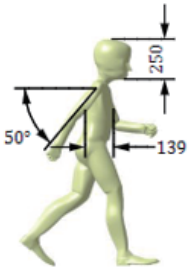


Figure A.2b

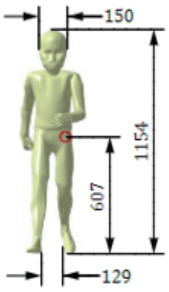


Figure A.2c

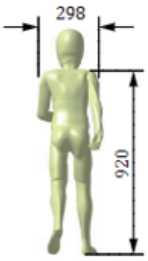


Figure A.2d

Pedestrian surrogate targets (ISO 19206-2) — Child pedestrian

Source: ISO19206-2

Main work items of WG16

WG16	Standardization themes	ISO Number	Content
1	Test devices for target vehicles, vulnerable road users and other objects, for assessment of active safety functions — Part 5: Requirements for powered two-wheeler targets	AWI 19206-5	Standardizes powered two-wheeler targets used in tests assessing active safety functions
2	Road vehicles — Test devices for target vehicles, vulnerable road users and other objects, for assessment of active safety functions — Part 6: Research data and guidelines for surrogate animal targets	AWI TR 19206-6	Formulates guidelines for surrogate animal targets used in tests assessing active safety functions
3	Road vehicles — Test devices for target vehicles, vulnerable road users and other objects, for assessment of active safety functions — Part 9: Research data and guidelines for small child targets	PWI TS 19206-9	Standardizes infant targets used in tests assessing active safety functions

SC34 Propulsion, powertrain and powertrain fluids

Scope

Systems and components for combustion based propulsion (such as; coolant, engines, filters, piston pins/rings, powertrain), testing methods, testing procedures, measurement testing apparatus, fuel injection equipment, as well as characteristics and additive fluids definitions (e.g. AUS32), except lubricants, brake fluids, and fuels.

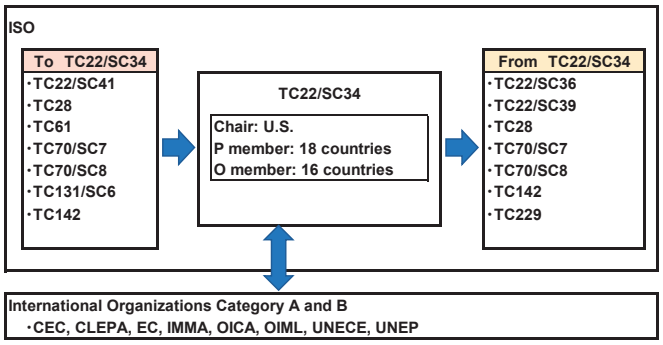
Activities

TC22/SC34 conducts standardization activities for material quality, features, shape, and dimension of engines (not just for use in automobiles) and related fuel injection equipment, filters (fuel, air, and blow-by), piston pins/rings, heat exchangers, urea reducing agent, and others, and apparatus, methods, and procedures used in tests of these components, systems, and engines. The SC34 plenary meeting takes place once annually. The recent event was a web meeting in October 2022. Experts participate in the WG under this subcommittee, and the WG promotes standardization activities while seeking collaboration with various countries.

Meanwhile, TC22 has a very large number of standards of which titles start with “Road Vehicles” due to being in the automotive field. Just under 40% of all of the standards handled by TC22/SC34 contain the term “Road Vehicles” in the titles. Many of the other ones begin with “Diesel Engine” or other engine-related term. This indicates that ISO standards made by SC34 are also applied to the general-purpose engine area (TC70). The WG experts share related knowledge and information used in standard formulation and revision. Since general-purpose engines have more useful years than automotive engines and former-type components and parts, etc., are often utilized, SC34 needs to sustain and handle maintenance of older standards formulated years earlier.

SC34 promotes activities in collaboration with the ISO internal experts committee and external entities. The relationships are presented below.

SC34 activities scheme



·TC22/SC41	(Specific aspects for gaseous fuels)
·TC22/SC36	(Safety and impact testing)
·TC22/SC39	(Ergonomics)
·TC28	(Petroleum and related products, fuels and lubricants from natural or synthetic sources)
·TC61	(Plastics)
·TC70/SC7	(Tests for lubricating oil filters)
·TC70/SC8	(Exhaust gas emission measurement)
·TC142	(Cleaning equipment for air and other gases)
·TC229	(Nanotechnologies)
·CEC	(Coordinating European Council)
·CLEPA	(European Association of Automotive Suppliers)
·EC	(European Commission)
·IMMA	(International Motorcycle Manufacturers Association)
·OICA	(International Organization of Motor Vehicle Manufacturers)
·OIML	(International Organization of Legal Metrology)
·UNECE	(United Nations Economic Commission for Europe)
·UNEP	(United Nations Environment Programme)

List of subordinate WGs

Subordinate WGs		Name	Chair	Secretariat	Related standardization entities
SC34		Propulsion, powertrain and powertrain fluids	U.S.	U.S.	
	AG1	Paraffinic Fuel Lubricity	U.S.	U.S.	TC28
	WG1	Fuel Filters	Germany	Germany	
	WG2	Injection equipment	U.S.	U.S.	
	WG3	Air Filters	Germany	Germany	
	WG4	Piston Rings	Germany	Germany	
	WG5	Engine Test Code	U.S.	U.S.	
	WG6	Water Injection	France	France	
	WG9	Piston Pins	Germany	Germany	
	WG11	Separator performance, laboratory and engine test methods for crankcase ventilation systems	U.S.	U.S.	
	WG14	Nox reduction additive	Germany	Germany	
	WG17	Road vehicles — Cleanliness of components	France	France	

WG activities

● AG1 Paraffinic Fuel Lubricity

AG1 was established as an ad-hoc working group in 2019 to conduct a survey of detailed issues related to the diesel fuel lubricity assessment standard (ISO 12156-1 and -2) formulated as a standard and revised in collaboration with TC28 in response to concerns about supplication of these standards to paraffinic fuel that has seen increased use recently.

AG1 extended its activity period beyond the initial length mainly because of the impact of COVID-19, and currently plans to summarize and report survey results, provide a recommendation on whether standard revisions are needed, and complete its activities in fall 2022.

● WG1 Fuel Filters

WG1 handles standardization related to fuel filters, including filtering efficiency test and water separation efficiency test method of fuel filters in a real-use environment. Formulation of the standard should support suitable assessment of fuel filter performance and selection of high-quality filters. Japan exchanges opinions with experts from various countries based on the test results and actively promotes ISO standard formulation and revisions while obtaining consensus.

● WG2 Activities related to injection equipment

WG2 handles standardization of shape specification for components related to diesel engine and direct-injection gasoline engine injection equipment (specifically, the fuel pump, fuel injector, high-pressure fuel pipe, and other components) and standardization of test methods for confirming component performance and quality. Recently, it has placed priority on preparing standards for the injection equipment of direct-injection gasoline engines in response to widening global adoption.

Japan is a country that is leading technologically in this area. It is extensively involved in ISO standard formulation and revision activities too, including serving as the project leader, and is highly trusted by experts from other countries.

● WG3 Air Filters

WG3 handles revisions to the weight efficiency test standard and standardization related to tests on actual usage, such as methods related to the air-filter performance test using nano-particles (soot). Japan is extensively involved in ISO standard formulation and revision activities too.

● WG4 Piston Rings

WG4 is promoting standardization related to piston rings used in internal combustion engines (ICEs).

Piston rings are required to maintain the durability and reliability and contributing to lower fuel usage in ICEs. Japan is extensively involved in ISO standard formulation and revision activities in order to lead this cutting-edge technical standard.

● WG5 Engine Test Code

WG5 handles standardization of the engine output test method. This WG covers gross output that was the previously utilized in tests and net output that is currently the mainstream choice. Recent activities have been alignment of expressions for common requirements and revisions that address advances in engine control technology in recent years for these two engine output test methods that have not been revised for a long time. This WG needs to continue conducting activities that address revision trends, such as the United Nations' harmonized test method.

● WG6 Water Injection

WG6 handles ISO standard formulation activities mainly for the properties of water injected into the cylinders.

This technology has not taken hold in Japan but activities should be closely monitored to prevent formation of an international standard that is disadvantageous to Japan.

● WG9 Piston Pins

WG9 handles standardization related to piston pins used in ICEs.

Piston pins are required to maintain the durability and reliability and contributing to lower fuel usage in ICEs.

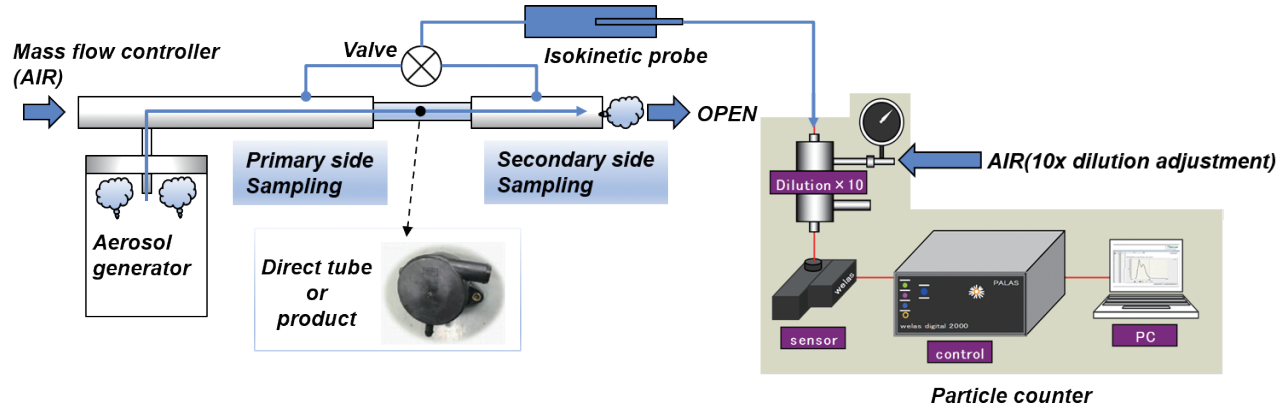
Japan is extensively involved in ISO standard formulation and revision activities in order to lead this cutting-edge technical standard.

● WG11 Separator performance, laboratory and engine test methods for crankcase ventilation systems

WG11 handles standardization that includes blow-by oil separator separation efficiency tests.

While requests to remove oil in blow-by gas are increasing to address stricter regulations on emissions, companies had mixed views on the approach due to the lack of an international standard that evaluates the separation efficiency of oil separators. Establishment of a standard, meanwhile, provides a suitable method of comparing separation efficiency and enables selection of a high-efficiency separator. Japan is exchanging opinions with experts in other countries based on test results and actively promotes ISO standard formulation and revisions while obtaining consensus.

ISO 17536-4 test circuit



● WG14 NOx reduction additive

WG14 handles ISO standard formulation and revisions related to urea aqueous solution used as a reducing agent in SCR systems that clean nitrous oxide (NOx) from diesel engine emissions. It discusses not only urea aqueous solution required specifications and test methods, but also stipulations on handling, transport, and storage, dimensions of the vehicle-tank water intake and water nozzle, and other details and is promoting standardization activities for a common water supply interface among countries.

● WG17 Road vehicles — Cleanliness of components

WG17 handles ISO standard formulation and revisions related to cleanliness of components. Recent revisions updated the standard to broaden coverage from engine-related fluid components to all vehicle components and reflect cutting-edge technologies in analysis methods. Domestic analytical equipment manufacturers are aware of the subject revisions. While issues have not occurred at this point, the Society of Automotive Engineers of Japan and other industries need to closely monitor impacts with coordination.

SC35 Lighting and visibility

Scope

Visibility and Conspicuity; Lighting and light-signalling and safety glazing materials.

Activities

SC35 handles standardization related to driving visibility. Driving visibility includes direct visibility through windows and indirect visibility through mirrors and camera monitors.

Direct visibility addresses the window glass itself and wipers, headlamps, and other devices that secure visibility.

Recently discussions are taking place on the performance of automated driving sensors accompanying advances in automated driving technology.

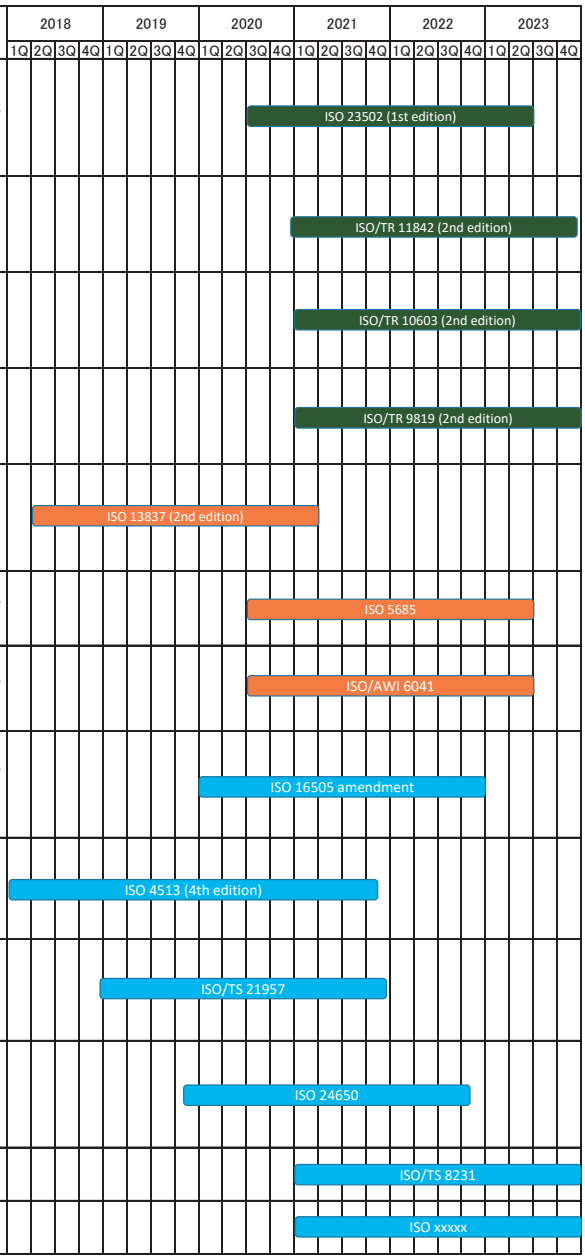
List of WG under TC22/SC35 (Lighting and visibility)

TC22/SC35 consists of the former organization TC22/SC17 (Visibility) as the core and the following three WGs. JAPIA and the lamp subcommittee follow WG1 via the ergonomics subcommittee, the Flat Glass Manufacturers Association of Japan and Japan Plastics Industry Federation are mainly involved in WG2 activities, and the driving visibility subcommittee covers WG3.

- ISO/TC 022/SC 35/WG1 “Lighting and light-signalling” Functions
- ISO/TC 022/SC 35/WG2 “Safety glazing” Functions
- ISO/TC 022/SC 35/WG3 “Visibility” Functions

The following table presents items being reviewed by SC35 as of 2022.

SC35 Roadmap No	Item	Charged WG	Title/Scope	Comments
1	ISO/PWI 23502	SC35/WG1	Lots of different OEMs and lighting manufacturers specifications are existing for anti-fog coatings. A unique standard would allow a standardization of requirements in the benefit of both suppliers and cars manufacturers.	NWIP ballot to be launched
2	ISO/TR 11842	SC35/WG1	The regulations evolved, and as this report details the differences between regulations from country to country for photometric requirements for lighting devices, it should be updated.	SR ballot to be launched
3	ISO/TR 10603	SC35/WG1	The regulations evolved, and as this report details the differences between regulations from country to country for lighting and light-signalling devices, it should be updated.	SR ballot to be launched
4	ISO/TR 9819	SC35/WG1	The regulations evolved, and as this report details the differences between regulations from country to country for photometric requirements of light-signalling devices, it should be updated.	SR ballot to be launched
5	ISO 13837	SC35/WG2	The regulations evolved, and as this document details the differences between anthroprometric data from country to country for driver’s eyellipses, it should be reviewed and potentially updated.	DIS ballot to be launched
6	ISO 5685	SC35/WG2	Road vehicles — Testing the abrasion resistance of automotive glazing with the windscreen wiper test	NWIP ballot to be launched
7	ISO/AWI 6041	SC35/WG2	Road vehicles — Safety glazing materials — Method for the determination of relevant optical characteristics in camera sensing areas	NWIP ballot to be launched
8	ISO 16505	SC35/WG3	The regulations evolved, and as this document details the differences between regulations from country to country for camera monitoring systems, it should be corrected with a potential amendment, and updated.	amendment to be sent for DIS ballot
9	ISO 4513	SC35/WG3	The regulations evolved, and as this document details the differences between anthroprometric data from country to country for driver’s eyellipses, it should be reviewed and potentially updated.	FDIS ballot to be launched. 9-months extension required
10	ISO/TS 21957	SC35/WG3	Due to the large benefits of Head-up Displays (HUDs), which are being deployed more rapidly, it would be beneficial to create a standard to document on how to evaluate the performance of HUDs.	under drafting
11	ISO 24650	SC35/WG3	Adverse conditions of driving (weather, dirt/dust, ···) have a huge influence on the performance of sensor systems on automotive vehicles	waiting for first draft proposal 9-months extension required
12	ISO/TS 8231	SC35/WG3	Road vehicles — Requirements for Automotive Display System	
13	ISO xxxxx	SC35/WG3	Minimum target point definitions	



List of subordinate WGs

Subordinate WGs		Name	Chair	Secretariat
SC35		Lighting and visibility	Italy	Italy
	WG1	Lighting and light-signalling	France	France
	WG2	Safety glazing	U.S.	U.S.
	WG3	Visibility	U.S.	U.S.

WG activities

● WG2 (Safety glazing) activities related to the Flat Glass Manufacturers Association of Japan and Japan Plastics Industry Federation

TC22/SC35/WG2 works on standardization of performance related to glass and plastic materials utilized in windows with support from the Flat Glass Manufacturers Association of Japan and Japan Plastics Industry Federation.

In recent years, ISO 5685 (Road vehicles ― Testing the abrasion resistance of automotive glazing with the windscreen wiper test) standard development began in November 2020 and was approved by a FDIS vote in April 2022 and issued on May 21st. For the standard on abrasion resistance to windscreen wipers, Japan proposed two revision comments. These efforts enhanced its voice and secured acceptance of test conditions utilized in Japan. Standard content has improved for us.

Recently ISO AWI 6041 (Road vehicles ― Safety glazing materials ― Method for the determination of relevant optical characteristics in camera sensing areas) standard development was proposed. We are working to compile the WD by the end of the year, including not only glass but also camera-side evaluation methods. ISO NP TS 8231 (Road vehicles ― Requirements for Automotive Display System) standard development is for the purpose of ensuring visibility through displays. The WD is being prepared collaboratively with WG3 handling content related to the display system and WG2 handling content related to glass performance. Japan is objecting to one of the test items proposed by the United States and is currently discussing it.

ISO 11983 (Safety glazing materials ― Test method for electro-switchable glazing) standard development for testing methods for dimmable glass began in January 2022, and the WD has been prepared. We plan to discuss whether to move to CD voting at the next WG meeting.

Development of standards related to automated driving and peripheral technology is likely to involve standardization for which evaluation methods that address glass on a standalone basis are insufficient. This requires promotion of activities with participation by experts from respective areas and revisions of existing standards in response to technology progress. Japan aims to lead these activities while cooperating with related WGs.

● WG3 (Visibility) activities related to ergonomics and visibility

TC22/SC35/WG3 covers ergonomics and visibility and handles standardization of performance of direct visibility when driving, related wipers, and indirect visibility via mirrors. Recently, standardization efforts extending scope to information display devices as replacements to conventional mirrors, such as camera monitor systems (CMS) and head-up displays (HUD), have been the main emphasis.

ISO 16505 (Road vehicles ―Ergonomic and performance aspects of Camera Monitor Systems ― Requirements and test procedures), which stipulates the ergonomic performance requirements and measurement methods of CMS as an indirect visibility device that replaces a mirror, was newly formulated in May 2015, and a revised edition was published in July 2019 (16505; 2019 edition). In formulation of this ISO standard, Japan played a central role in activities related to reflecting knowledge from suppliers of components and parts in the various specialties, including stipulation of optical characteristics related to CMS and the measurement method and stipulation of layout, image size, and other physical features and usage requirements.

Regarding standardization of HUD evaluation methods, the subcommittee of HUD experts, including electronic component/part manufacturers, repeatedly discussed content and reached agreement on Japan's proposal for NWIP (including scope revision and resolution measurement method) at the Kyoto international meeting held in May 2019. Additionally, France submitted a proposal on standardization of the performance evaluation method for the sensor cleaner system in 2021 in light of future inroads by automated driving vehicles. Japan also launched a subcommittee of experts and is moving forward with standardization as a leader of the activities.

Since ISO 16505 is likely to require revisions accompanying improvements in CMS performance and standardization of HUD and sensor cleaner performance evaluation methods is an important issue for adoption and promotion of automated driving vehicles, Japan intends to continue its strategic response while collaborating with JAMA to facilitate taking the initiative.

SC36 Safety and impact testing

Scope

Protection of occupants and vulnerable road users, including

- Passive safety assessment (including vehicle safety preconditioning):
  - Functional analysis
  - Evaluation of devices and systems
  - Virtual testing
- Accident analysis
- Post crash safety

Activities

SC36 is the subcommittee that handles standardization related to passive vehicle safety assessment, traffic accident analysis, and post crash safety. The SC36 plenary meeting is held at a pace of once every 1.5 years and utilized an online meeting in November 2022 as the most recent event. With 23 participating member countries and 17 observing member countries, SC36 has many members, including Japan, the US, and European countries. The chair country is the US, and the secretariat is France. These countries have occupied the roles for many years and are highly trusted by experts from various countries. The SC plenary meeting considers proposals of international standardization work items related to the above-mentioned scope and actively discusses international standardization.

Japan dispatches experts to all WGs under SC36 and actively contributes to international standardization related to passive safety, including proposals for international standardization coordinated with experts from other countries.

Advanced Pedestrian Legform Impactor (aPLI) with Upper Mass

Doctor confirmation of occupant injury with an algorithm and emergency dispatch to the site by a doctor helioscope (photo from HEM-Net)

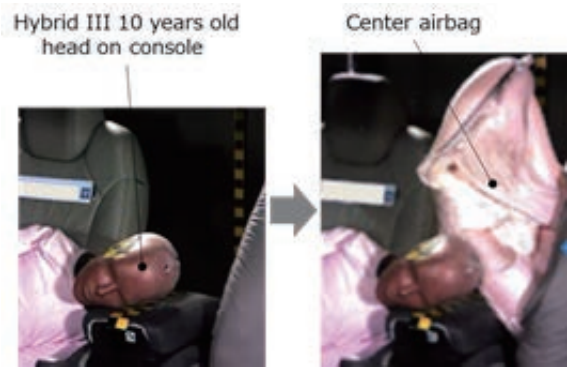
List of subordinate WGs

Subordinate WGs		Name	Chair	Secretariat
SC36		Safety and impact testing	U.S.	France
	WG1	Car collision test procedures	France	France
	WG2	Child restraint systems	Sweden	Sweden
	WG3	Instrumentation	France	France
	WG5	Anthropomorphic test devices	U.S.	U.S.
	WG6	Performance criteria expressed in biomechanical terms	France	France
	WG7	Traffic accident analysis methodology	Sweden	Sweden

WG activities

● WG1 Car collision test procedures

Alleviation of injury from traffic accidents requires a collision test method that recreates real-world accidents, including collision direction, location, speed, collision object, occupant location and posture, and other details. WG1 handles standardization of the collision test method based on the format of traffic accidents in the world's road traffic environment. It recently started additional review of standardization on test and evaluation methods for side airbags for out-of-position vehicle occupants. WG2 has recently been discussing revisions to the usability test method to address CRS in the current market environment.



Far-side airbag (Center airbag)
Example of a static deployment test conditions proposal
From https://www-esv.nhtsa.dot.gov/Proceedings/23/files/23ESV-000495.PDF

Main work items of WG1 (as of November 2022)

Standardization themes	ISO Number	Content
Test procedures for evaluating out-of-position vehicle occupant interactions with deploying side airbags	AWI TR 14933	This is standardization related to static deployment test procedures for side airbags with an out-of-position vehicle occupant. Addition of the far-side airbag test method is under review.

● WG2 Child restraint systems

Alleviation of injury from traffic accidents requires a collision test method that recreates real-world accidents, including collision direction, location, speed, collision object, occupant location and posture, and other details. WG1 handles standardization of the collision test method based on the format of traffic accidents in the world's road traffic environment. It recently started additional review of standardization on test and evaluation methods for side airbags for out-of-position vehicle occupants. WG2 has recently been discussing revisions to the usability test method to address CRS in the current market environment.

Verification that ISO 13216-3 fixtures do not interfere with the vehicle's interior components and parts (under review in WG2)

Main work items of WG2 (as of November 2022)

Standardization themes	ISO Number	Content
CRS misuse test procedures	ISO 13215-2, 3	Test procedures aimed at reduction of misuse risk of CRS
Anchorages for CRS	ISO 13216-3, 4	Standardizes vehicle and CRS specifications for anchoring CRS
CRS usability test method	ISO 29061-1,3,-4,-5	Standardization of the evaluation method for CRS installability

● WG3 Instrumentation

Information output is obtained from variety of measuring devices in collision test in order to ascertain the level of occupant injury using an impact anthropomorphic test devices (ATD) and test vehicle behavior. These outputs must not have major discrepancies due to a change in the measuring device or test lab. WG3 hence formulates standards related to measuring devices. Recently it has been conducting standardization discussions for a standard on the zero-position correction procedures in multi-axis displacement meters, a standard on the lateral sensitivity measuring procedure in multi-axis load cells, a data exchange format standard for calibration of measuring devices in tests and easy collection of settings information.

Three-dimensional displacement meter*

Three-dimensional displacement meter zero-position correction device*

*From https://humanetics.humaneticsgroup.com/sites/default/files/2020-11/thor-50m_3d_ir-tracc_um-rev_c.pdf

Main work items of WG3 (as of November 2022)

Standardization themes	ISO Number	Content
Multi-dimensional measurement and coordinate systems definition	ISO 21002	Standardizes the zero-position correction procedure in multi-axis displacement meters
Lateral sensitivity measuring procedure in multi-axis load cells	ISO 21612	Standardizes lateral sensitivity to improve the possibility of comparing measurement results among test labs
Data exchange format	ISO 23520	Standardizes the data exchange format to facilitate collection of information from test measuring devices

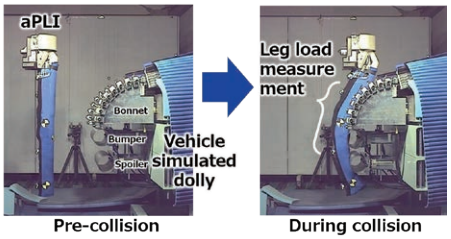
● WG5 Anthropomorphic test devices

Quantitative determination of the extent of injuries to vehicle occupants and vulnerable road users in a collision is important to alleviating injury from traffic accidents. This process requires faithful reproduction of the human body's movement, occupant ATD that reproduces the deflection characteristics of a vehicle occupant's chest ribs to a high degree of precision, and human body injury evaluation devices, such as a leg impactor that appropriately reproduces and measures the bending moment and distortion volume that occur in the legs of a pedestrian on collision with a vehicle. WG5 develops and formulates standards for next-generation human body injury evaluation devices for collision experiments that provide a high degree of biofidelity and suitable injury assessment. Japan has been actively contributing to development and evaluation of these evaluation devices over multiple years and has held the key posts of WorldSID Task Group Tri-Chair Committee and advanced Pedestrian Legform Impactor (aPLI) with Upper Mass Task Group project leader in recent years. It also contributes substantially to the standardization project being promoted by WG5 in cooperation with JAMA, JARI, and other groups to share Japan's research results, standard proposals, and other content with exports from other countries.

WorldSID side-impact ATD
From https://humanetics.humaneticsgroup.com/products/anthropomorphic-test-devices/side-impact/worldsid-50m

Advanced Pedestrian Legform Impactor (aPLI) with Upper Mass

Car collision test using aPLI



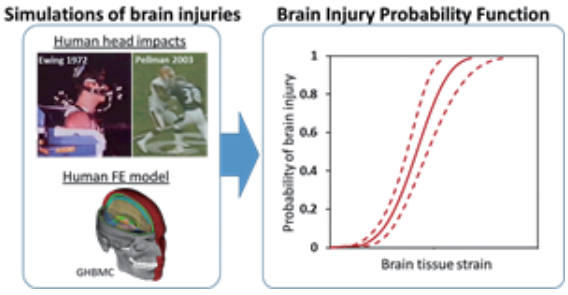
Pre-collision　　During collision

Main work items of WG5 (as of November 2022)

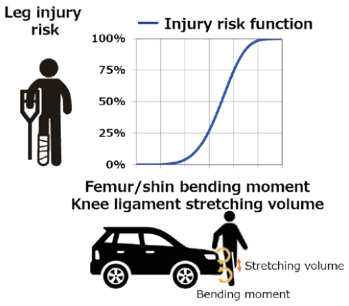
Standardization themes	ISO Number	Content
Design and performance specifications for WorldSID side-impact ATD	ISO 15830-1~4 TS 15830-5	Standardizes design and performance specifications for WorldSID side-impact ATD and prepares the specifications document with latest update content on design and performance specifications of WorldSID side-impact ATD
Advanced Pedestrian Legform Impactor (aPLI) with Upper Mass	AWI TS 20458	Standardizes the advanced Pedestrian Legform Impactor with Upper Mass to broaden applicable scope of the vehicle category and injury assessment spot
ATD industrialization	PWI ISO 6172	Standardizes required procedure to transition the ATD from research use to volume-ouptut use (handling, inspection, reproducibility, repeatability, etc.)

● WG6 Performance criteria expressed in biomechanical terms

Alleviation of injury from traffic accidents requires estimation of possible injury occurrence to the human body from measurement values obtained by occupant ATDs, pedestrian leg impactors, and other human body injury evaluation devices. WG6 prepares and standardizes injury risk functions that link the measurement values from evaluation devices and human body injury occurrence probability utilizing experiment data, computer simulation analysis, and other information. Japan cooperates with JAMA, JARI, and other groups and has served as the leader in preparing and standardizing injury risk functions for brain injuries using the frontal impact THOR dummy and leg injuries using the advanced Pedestrian Legform Impactor (aPLI) with Upper Mass and taken a leading role in standardization activities related to these injury risk functions in recent years.



Injury risk functions



Leg injury risk function

Main work items of WG6 (as of November 2022)

Standardization themes	ISO Number	Content
Injury risk curves for the THOR dummy	TR 19222	Standardizes the injury risk curves for next-generation frontal impact THOR dummy
Injury risk functions for advanced Pedestrian Legform Impactor (aPLI)	AWI TS 20459	Standardizes the femur, knee, and shin injury risk functions required in vehicle safety performance assessment using advanced Pedestrian Legform Impactor (aPLI) with Upper Mass

● WG7 Traffic accident analysis methodology

Review based on objective survey and analysis results from traffic accidents in the market is essential to vehicle safety assessment, and WG7 handles standardization and documentation of definitions related to terms and categories needed in traffic accident surveys and analysis and parameter concepts and calculation methods. As one of these activities, Japan proposed standardization of injury prediction algorithms and parameters for the Advanced Automatic Collision Notification (AACN) system that predicts the extent of injury to injured parties based on information recorded by the vehicle EDR or other devices at the time of the traffic accident and notifies the fire department and emergency hospital and is actively promoting this proposal, which has been registered as TS 4654 (AWI), as the project leader along with an all-Japan delegation of related parties. Additionally, Japan has contributed through provision of domestic information and in other ways to activities aimed at consolidating and documenting the category framework of conditions prior to collision in traffic accidents (pre-crash categorization system) registered as TR 8234 (PWI).

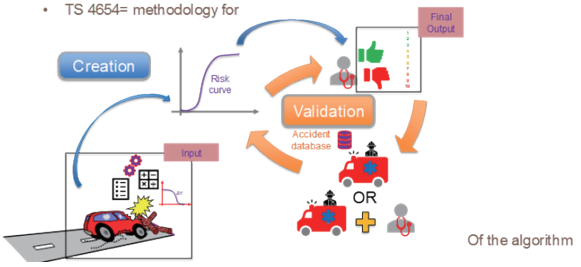


Image of standardization of injury prediction algorithms and parameters in ISO/TS 4654
(From ISO/TC22/SC36/WG7 N0601)

Main work items of WG7 (as of November 2022)

Standardization themes	ISO Number	Content
Advanced Automatic Collision Notification (AACN) systems — Algorithm and parameters for injury level prediction	AWI TS 4654	Standardizes the AACN system injury prediction algorithm and parameters and algorithm assessment method
Pre-crash categorization system	PWI TR 8234	Reviews the categorization system for situations prior to collision in traffic accidents and proposes a unified categorization system

SC37 Electrically propelled vehicles

Scope

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

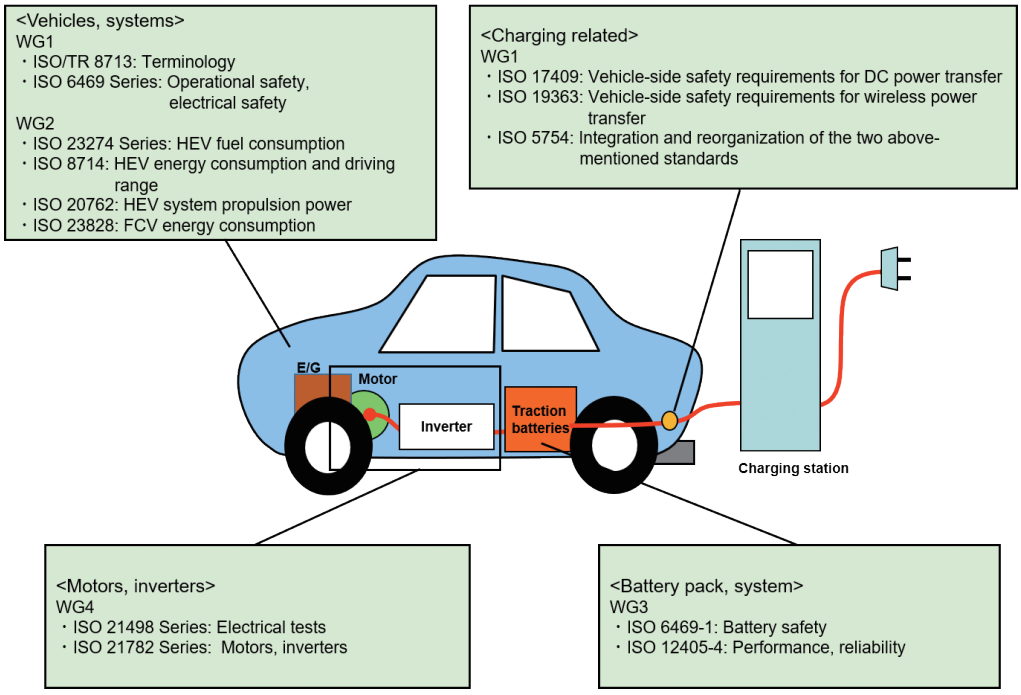
Activities

SC37 broadly promotes international standardization of technology related to vehicles, systems, and components for battery electric vehicles (BEVs), hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), and fuel cell vehicles (FCVs).

List of subordinate WGs

Subordinate WGs		Name	Chair	Secretariat	Related standardization entities
SC37		Electrically propelled vehicles	Germany	Germany	
	WG1	Safety aspects and terminology	Germany	Germany	IEC
	WG2	Performance and energy consumption	Japan	Japan	SAE
	WG3	Rechargeable energy storage	Germany	Germany	IEC
	WG4	Systems and components connected to electric propulsion systems	Japan	Japan	IEC
	WG5	Requirements for energy transfer	Germany	Germany	IEC

Standardization items handled by TC22/SC37



WG activities

● WG1 Safety aspects and terminology

WG1 stipulates definition of terms related to electrically propelled vehicles and test methods related to operability safety, electrical safety for humans, electrical safety after collisions, and hydrogen safety in FCVs. Additionally, functional requirements and safety requirements related to energy transfer on the vehicle side covered by WG1 previously moved to WG5 newly created in FY2020.

Main work items of WG1

	ISO Number	Content
1	ISO 6469-2	Stipulates driving restrictions and notification to the driver during driving operation and charging of an electrically propelled vehicle, prevention of sudden start in the case of a primary failure, and other requirements
	ISO 6469-3	Stipulates necessary markings on voltage class B components as well as the method for protection of persons against electric shock and thermal incidents in ordinary use and the protection method in a single failure
	ISO 6469-4	Stipulates the protection method of the human body from voltage class B components for vehicle post-crash conditions
2	ISO/TR 8713	Establishes a vocabulary of terms and the related definition used in TC22/SC37
3	ISO 23273	Stipulates protection requirements against hydrogen-related hazards in vehicles that use compressed hydrogen as fuel

● WG2 Performance and energy consumption

WG2 stipulates test methods related to power consumption volume, fuel consumption, driving range on a single charge as vehicle performance.

Main work items of WG2

	ISO Number	Content
1	ISO 20762	Stipulates the measurement method for vehicle total system propulsion power in an HEV with engine power and motor power
2	ISO 23274-1	Stipulates exhaust emissions and fuel consumption measurements in non-externally chargeable HEVs
	ISO 23274-2	Stipulates exhaust emissions and fuel consumption measurements in externally chargeable HEVs
3	ISO/TR 11955	Guidelines for charge balance measurement to supplement battery SOC in HEV fuel consumption measurement
4	ISO/TR 11954	Stipulates the measurement method for maximum speed in an FCV
5	ISO 23828	Stipulates the measurement method for energy consumption in a vehicle fuelled with compressed hydrogen
6	ISO 8714	Stipulates single-charge driving range; currently considering an abbreviated test method
7	ISO 8715	Stipulates road performance measurement methods for BEVs
8	ISO/TR17326	Deliberation started in March 2022 as a standard that defines the low-temperature starting performance of FCVs.

● WG3 Rechargeable energy storage

WG3 stipulates performance and safety test methods for traction battery packs and systems. TC22/SC32 formulates the environment test method as ISO 19453-6. This fiscal year, as a proposal from Japan, we launched two standard deliberations as the ISO18006 series of standards that define the requirements for battery pack information.

Main work items of WG3

	ISO Number	Content
1	ISO 6469-1	Stipulates safety performance tests for battery packs and systems; The thermal propagation test has been published the end of 2022 as an amendment(Amd).
2	ISO 12405-4	Stipulates test specification for lithium-ion traction battery packs and systems
3	ISO/IEC PAS 16898	Stipulates dimensions and symbol display of lithium-ion cells
4	ISO 18300	Stipulates requirements for lithium-ion battery systems combined with lead acid battery or capacitor
5	ISO 18006-1	It provides labeling, QR/barcode information for affixing to battery packs regarding specifications, safety and sustainability.
6	ISO 18006-2	It defines the information required when removing the battery pack from the vehicle for battery reuse, repurpose and recycle.

● WG4 Systems and components connected to electric propulsion systems

WG4 stipulates performance, reliability tests, and electrical tests for voltage class B propulsion systems and components (except the propulsion battery). TC22/SC32 stipulates environment tests for components in the ISO 19453 series.

Main work items of WG4

	ISO Number	Content
1	ISO 21782-1	Stipulates general test coniditons and definitions related to the series for electric propulsion components
	ISO 21782-2	Stipulates measuring methods for total loss, total efficiency, and torque characteristics, and other motor system features
	ISO 21782-3	Stipulates measuring methods for loss and efficiency of the motor and inverter on a standalone basis and torque characteristics of the motor
	ISO 21782-4	Stipulates test methods for loss and efficiency of the DC/DC converter in electrically propelled vehicles
	ISO 21782-5	Stipulates methods for operating load testing of the motor system
	ISO 21782-6	Stipulates methods for operating load testing of the motor and inverter on a standalone basis
	ISO 21782-7	Stipulates methods for operating load testing of the DC/DC converter in electrically propelled vehicles
2	ISO 21498-1	Stipulates sub-classes within the voltage range of volatage class B
	ISO 21498-2	Stipulates test methods for assessing system operation stability to fluctuations in input voltage to voltage class B components

● WG5 Requirements for energy transfer

Regarding the power transfer system between the charger and the vehicle, we are deliberating general requirements, safety requirements, and compatibility requirements on the vehicle side. The published standards ISO17409 and ISO19363 are integrated into the ISO5474 series, which has separate parts for each system: AC power transfer, DC power transfer, wireless power transfer, automated connection power transfer, and dinamic power transfer.

Main work items of WG5

	ISO Number	Content
1	ISO 17409	Stipulates safety requirements for conductive charging vehicles in a connection with an external energy source
2	ISO 19363	Stipulates functional, safety, and interoperability requirements related to magnetic field wireless power transfer
3	ISO 5474-1	Combines ISO 17409 and 19363 as vehicle-side functional and safety requirements in an energy transfer system, adds an automatic connection charging system, and begins review of a new framework; Part 1 stipulates general requirements related to the series
	ISO 5474-2	Stipulates vehicle-side functional and safety requirements for AC power transfer
	ISO 5474-3	Stipulates vehicle-side functional and safety requirements for magnetic field wireless power transfer
	ISO 5474-4	Stipulates vehicle-side functional and safety requirements for magnetic field wireless power transfer (static and dinamic) of light duty vehicle
	ISO 5474-5	Stipulates vehicle-side functional and safety requirements for an automatic connection power transfer
	ISO 5474-6	Stipulates vehicle-side functional and safety requirements for magnetic field wireless power transfer (static and dinamic) of heavy duty vehicle

● WG6 Charging performance

Established in February 2022 for charging performance, it is deliberating test methods for measuring the distance traveled with respect to the amount of charge per unit time. Deliberations have started as a joint WG with SAE.

Main work items of WG6

	ISO Number	Content
1	ISO 12906	As charging performance, a test method is specified to measure the distance traveled against the amount of charge per unit time.

SC38 Motorcycles and mopeds

Scope

Standardization of motorcycles, mopeds and their components, concerning compatibility, interchangeability, safety, terminology and test procedures (including the characteristics of instrumentation), in order to evaluate their performances.

Motorcycles and mopeds are to be intended as defined in the relevant definition of ISO 3833.

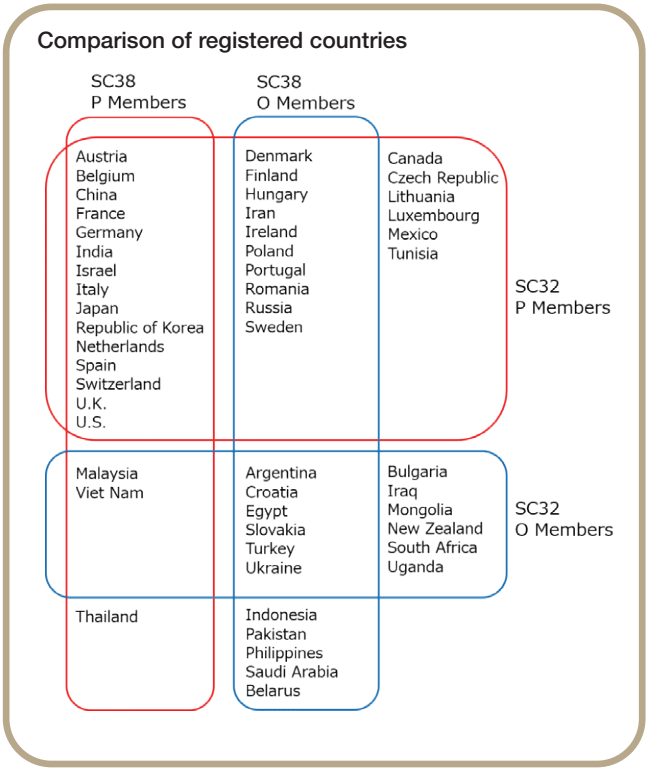
Activities

Prior to the SC reorganization in 2015, activities took place under SC22 (Motorcycles) led by Japan and SC23 (Mopeds) led by Italy. These two entities merged as SC38 in the SC reorganization with Japan as the chair country and Italy as the secretariat.

SC38 promotes standardization suited to motorcycles and mopeds because of cases that require different standardization than four wheeled vehicles due to unique features of motorcycles and mopeds.

Comparison of the composition of member body countries in SC38 and the composition of SC32, a leading four wheeled vehicle entity, shows that SC38 has Asian countries as registered participating members that reflect characteristics of motorcycle demand, such as Vietnam, Malaysia, and Thailand. Reflection of the opinions of these countries too is an important role of SC38.

Motorcycles and mopeds have smaller industry scale than four wheeled vehicles, and it is not possible for these segments to have permanent expert participation in all SCs under TC22. When IS scope cites "vehicles," it includes not only four wheeled vehicles but also motorcycles and mopeds. To ensure understanding of this concern, the TC22 plenary meeting approved a resolution on giving notification to SC38 when the scope includes motorcycles and mopeds.



List of subordinate WGs

Subordinate WGs		Name	Chair	Secretariat
SC38		Motorcycles and mopeds	Japan	Italy
	WG1	Pollution and energy	Japan	Japan
	WG2	Electric mopeds and motorcycles	Italy	Italy
	WG3	Functional safety	Japan	Japan
	WG5	Controls	Italy	Italy

WG activities

● WG1 Pollution and energy

- WG1 promoted a TR project for a stable, easy-to-use test method in total running resistance force verification of a chassis dynamometer that uses electric inertia, and this project reached the DTR stage (ISO/TR 5262).
- WG1 is conducting a review of the VT-SHED method used in four wheeled vehicles, etc. as the measurement method for evaporative emissions (ISO 21755-3) and reached an agreement on submitting an NP proposal at the WG01 international meeting in 2022.
- The WG added emissions test methods using the SSV-type CVS and the NMHC measuring method using a CH4 meter in revisions to ISO 6460-1 (Measurement method for gaseous exhaust emissions and fuel consumption).
- It decided to add the fuel unit (L/100km) and revise the equation in revisions to ISO 6460-3 (Measurement method for gaseous exhaust emissions and fuel consumption volume) and agreed to proceed to the IS stage.

TC22/SC38/WG01 Main standards related to pollution and energy

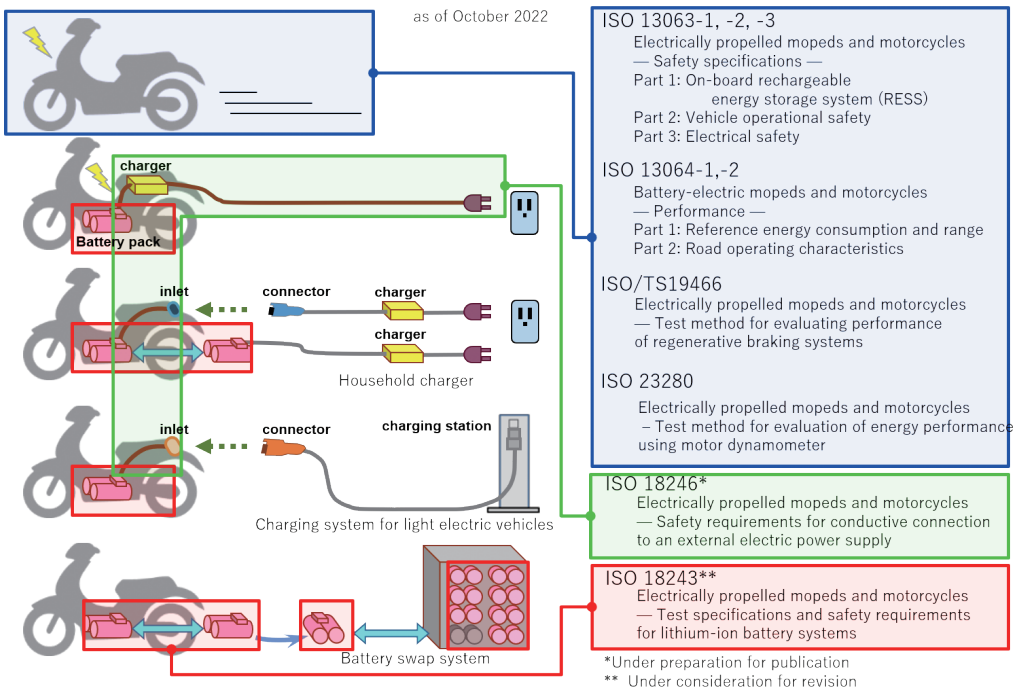
				EURO3 2006	EURO4 2016	EURO5 2020	WG01
Measurement method for gaseous exhaust emissions and fuel consumption	ISO6460 -1 -2 -3		CO	✓	✓	✓	ISO6460-1 ·SSV-type CVS Addition of an NMHC measuring method
			THC	✓	✓	✓	
			NMHC			✓	
			NOx	✓	✓	✓	
			CO_2	✓	✓	✓	ISO6460-3 ·Addition and amendment to fuel consumption unit calculation formula
			PM (DI only)			✓	
			Energy consumption	✓	✓	✓	
Measurement method for evaporative emissions	ISO21755	-1	SHED		✓	✓	Published in 2019
		-2	Permeation		✓	✓	Published in 2020
		-3	VT-SHED				NP planned in 2023

● WG2 Electric mopeds and motorcycles

WG2 handles standards related to vehicles, motors, batteries, and charging for electrically propelled mopeds and motorcycles. Although Japan is not the chair country, it is involved as one of the leading countries.

- For ISO 13063 (Electrically propelled mopeds and motorcycles — Safety specifications), the WG divided it into three parts as ISO 13063-1/2/3 to align with the updated vehicle standard for four wheeled vehicles ISO 6469-1/2/3 (Electrically propelled road vehicles — Safety specifications) and conducted a review. It then published them as IS on July 11, 2022. The next Systematic Review will occur in 2027.
- For ISO 18246 (Electrically propelled mopeds and motorcycles — Safety requirements for conductive connection to an external electric power supply) the WG has prepared the second edition. The DIS was approved in February 2022 then the FDIS was skipped in July 2022. The final draft that reflects DIS comments was sent to the ISO Central Secretariat in October 2022, and is scheduled to be published in December 2022.
- ISO 18243 (Electrically propelled mopeds and motorcycles — Test specifications and safety requirements for lithium-ion battery systems) underwent Systematic Review in May-September 2022. Japan voted in favor of revisions. WG2 plans to discuss the revision content in future.
- ISO 23280 (Electrically propelled mopeds and motorcycles — Test method for evaluation of energy performance using motor dynamometer) proposed by Korea was published as an IS on May 11, 2022. The next periodic Systematic Review occur in 2027.

Major working items and publications of ISO TC22/SC38/WG2



● WG3 Functional safety

- For WG3, Japan serves as convener and secretary and also has participation by many experts.
- ISO 26262-12 (Road vehicles — Functional safety — Adaptation of ISO 26262 for motorcycles) was published in 2018 as an IS related to motorcycle functional safety. WG3 is developing a TR to reinforce ISO 26262-12 based on the roadmap. It is also gathering important points for motorcycles that should be reflected in ISO 26262 revisions and preparing for publication as a TR. Japan is promoting (1) and (2) as the project leader.

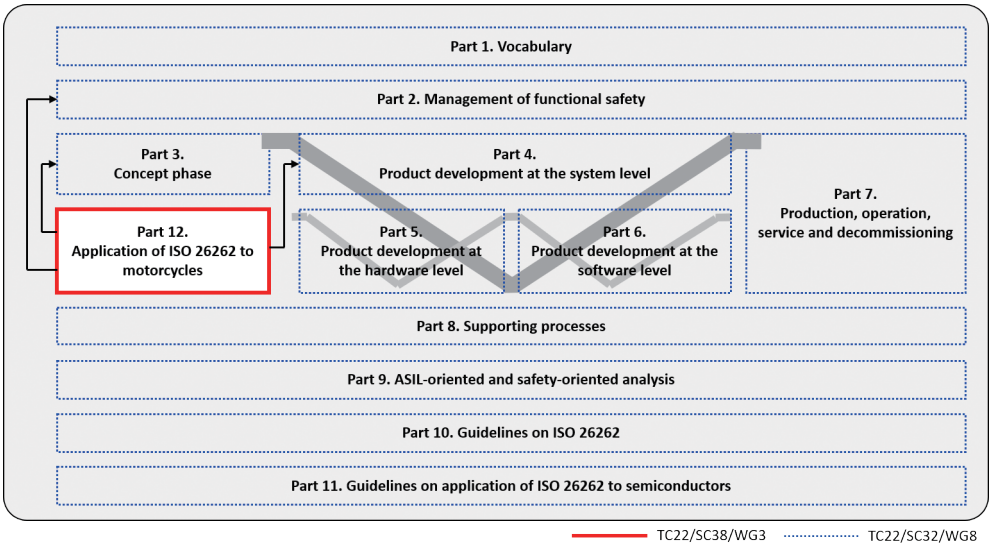
(1) ISO/TR 3152 (Comparison of Part 12 with other parts of ISO 26262) completed development and was published in Feb 2022.

(2) ISO/TR 5340 (Considerations for use cases of ISO 26262 Part 12 MSIL classification) received approval to start development in May 2020.The draft version was completed in Oct 2022 and will be completed by the 2nd quarter of 2023.

(3) Considerations for functional safety for next version: Efforts are currently on obtaining opinions from experts in various countries on the next periodic updates and revisions of ISO 26262-12.

(4) Considerations for SOTIF for MC: In accordance with the consideration of motorcycle application of ISO21448— Road vehicles — Safety of the intended functionality, published in Jun 2022, WG3 is assuming some impact to ISO 26262-12. Compiling necessary adjustment to ISO26262-12 is under consideration.

Outline of ISO 26262: 2018 series and range handled by WG3

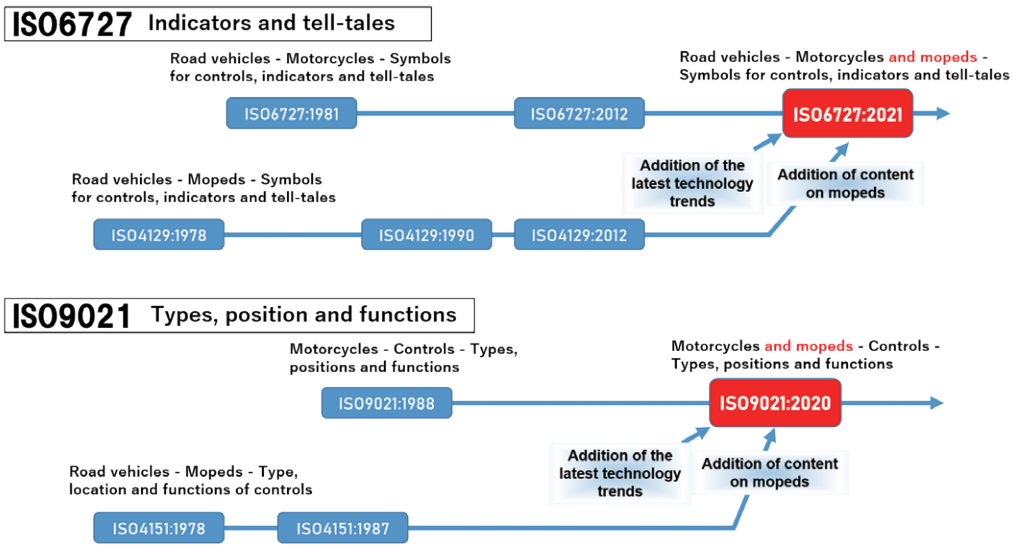


● WG5 Controls

Symbols, displays, and operating equipment used without changes in a mature state for a long time needed updating to reflect recent technological progress and electrification. For ISO 6727 concerning symbols for controls, indicators and tell-tales and ISO 9021 related to the types, positions and shapes of the operating equipment, preliminary discussions started in 2014 on absorbing the same moped-related standards (4129 and 4151) and adding electrically propelled vehicle-related items, the WG resumed work in May 2016 and formulated NWIP, and approval came in May 2018.

For ISO 9021, revision work finished, and the revised edition was published in March 2020, and for ISO 6727 too, it was published, including symbol registration in ISO 7000, in March 2021. Regarding ISO 6727, we are proposing NP as an amendment to the addition of symbols due to technological progress.

Both standards intend to continue revision work in accordance with technology trends.



SC39 Ergonomics

Scope

Driver interaction with driver environment and driver systems

Activities

Accompanying steady development of advanced driving assistance systems for automated driving and changes in visibility performance related to camera monitors and other new technologies, industry calls to reinforce standards from an ergonomics perspective that aims to ensure the safety of these capabilities have risen. Within this context, SC39 (Ergonomics) emerged in ISO/TC22's SC reorganization in 2015. As ergonomics related to vehicles, SC39 handles a wide range of topics from basic driving tasks such as interior packaging and display and operation systems to HMI (human machine interface) of new systems, including automated driving and OTA.

Due to the wide range of human characteristics used as the basis, activities are proceeding in collaboration with the industrial community and academia aimed at standardization that advances technology in the ergonomics field and strengthens Japan's international competitiveness.

List of subordinate WGs

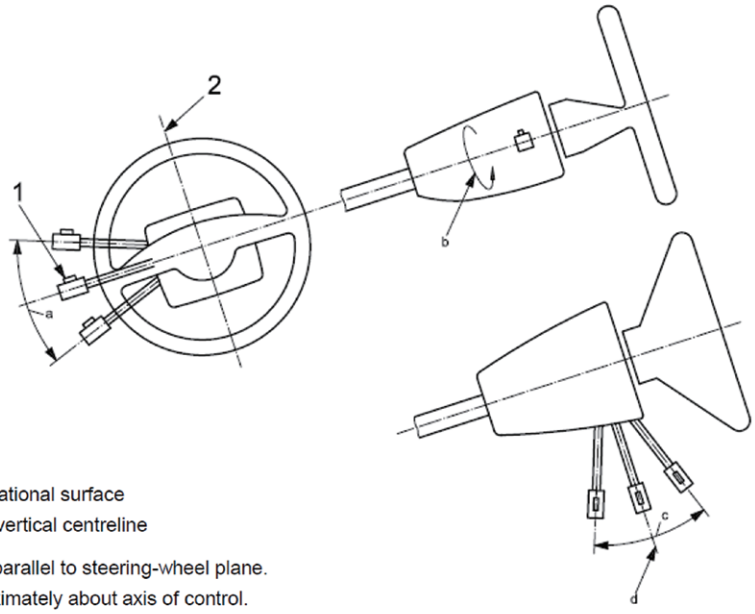
Subordinate WGs		Name	Chair	Secretariat
SC39		Ergonomics	U.S.	U.S.
	WG3	Controls, displays, and tell-tale localization	U.S.	U.S.
	WG5	Symbols	U.S.	Germany
	WG7	Hand reach and R and H point determination	U.S.	U.S.
	WG8	TICS on-board-MMI	Germany	Germany

WG activities

● WG3 (Controls, displays and tell-tale localization)

WG3 formulates standards for matters related to basic driving tasks such as interior indicator displays and shifts, switches, and other operational features. It is also addressing standard formulation for placement of the electronic shift and OTA HMI as the latest technologies.

WG3: ISO 4040

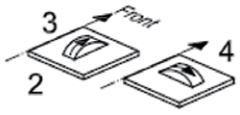
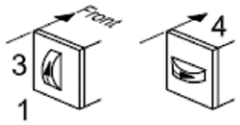
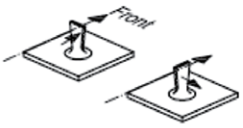
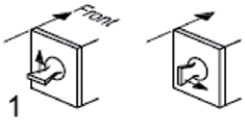
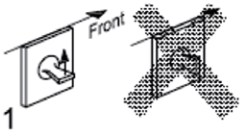
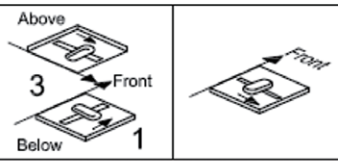
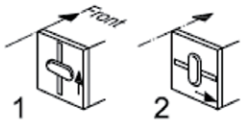
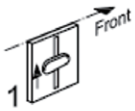
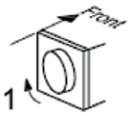
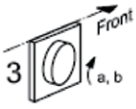
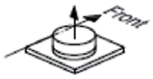
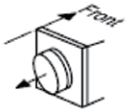
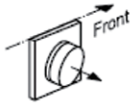


Key

1 secondary operational surface
2 steering-wheel vertical centreline

a Approximately parallel to steering-wheel plane.
b Rotation approximately about axis of control.
c Approximately parallel to steering-wheel axis.
d Directed towards steering-wheel axis (push, includes buttons on end of control).

WG3: ISO 12214

Control type	Mounting plane		
	Horizontal (X-Y)	Vertical/transverse (Y-Z)	Vertical/longitudinal (X-Z)
Thumb wheel			
Toggles and levers			
Linear slide			
Rotary knob			
Push/pull			

NOTE 1 Unbroken arrows indicate the direction-of-motion for on/increase control; the dotted reference line is parallel to the x-axis (front-rear); crossed-out configurations are not recommended.

NOTE 2 Toggle controls mounted in the X-Z plane can be used for controlling the fore/aft (X) or up/down (Z) motion of a seat.

Key

1 very strong stereotype
2 very strong when mounted to the right of steering wheel in left-hand drive vehicle
3 not recommended in Japan
4 moderately strong stereotype on right side in Japan

a Not on left in Japan.
b Strong on right in Japan.
c Not on right in Japan.

Main work items of WG3

	Standardization themes	ISO Number	Content
1	Road vehicles — Location of hand controls, indicators and tell-tales in motor vehicles	ISO 4040	Defines the location of displays within meters and the location of hand controls around the steering column
2	Road vehicles — Direction-of-motion stereotypes for automotive hand controls	ISO 12214	Defines human stereotypes by hand control types
3	Road vehicles — Ergonomics aspects of transport information and control systems — Human machine interface specifications for keyless ignition systems	ISO 21956	Defines design specifications for easy-to-use keyless ignition systems

● WG5 (Symbols)

ISO 2575 (Road vehicle — Symbols for controls, indicators and tell-tales) standardizes symbols because of the necessity of having controls and other displays in road vehicles distributed as international products utilize identification marks that do not rely on language. SC39/WG5 (Symbols WG) is handling standardization of new symbols and updates to symbols no longer recognized by users due to changing times with a team of experts from various countries.

Lively discussion is currently taking place on standardization of symbols for new functions related to connected functions and automated driving that are likely to advance rapidly in the future. Furthermore, information is being shared with the Chinese regulatory entity with the aim of supporting further internationalization.

Examples of symbol marks currently under review by WG5

<Driving Automation System>

<Connected Driving data >

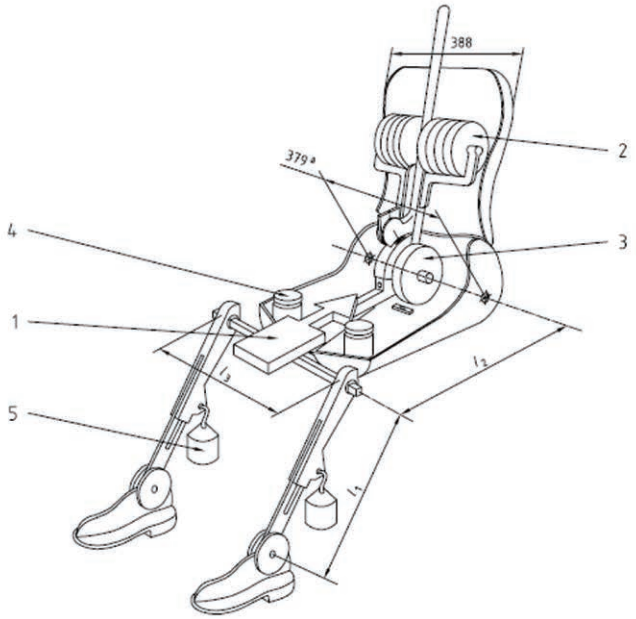
● WG7 (Hand reach and R and H point determination)

WG7 handles standardization of the determination method for the driver seating position standard that it is origin point of interior design and the three-dimensional manikin used in the process. It also prepares definitions and standards for suitable layout and dimension examples for controls related to driving tasks with the driver seating position standard as the origin point. As a new initiative, it plans to construct a simulation methodology that factors in driver posture during automated driving.

Main work items of WG7

	Standardization themes	ISO Number	Content
1	Road Vehicles — Ergonomic Aspects of Foot Control Layout, Location, Spacing, and Clearance	NWI 23408	Stipulates location of the accelerator, brake, and clutch pedal and three-dimensationl measurement method
2	Road vehicles — Procedure for H- and R-point determination	ISO 6549	Stipulates the procedure for determination of the driver seating position (H- and R-point) for comparison of vehicle space and the three-dimensional manikin used in the procedure
3	Road Vehicle — H-Point Machine (HPM-II) Specifications and Procedure for H-Point Determination	ISO 20176	Advanced version of above-mentioned ISO 6549 three-dimensional manikin (HMP-I); supports manikin posture recreation that reflects seat performance
4	Passenger Cars — Driver Hand-Control Reach	ISO 3958	Defines the boundaries of hand-reach by driver proportions

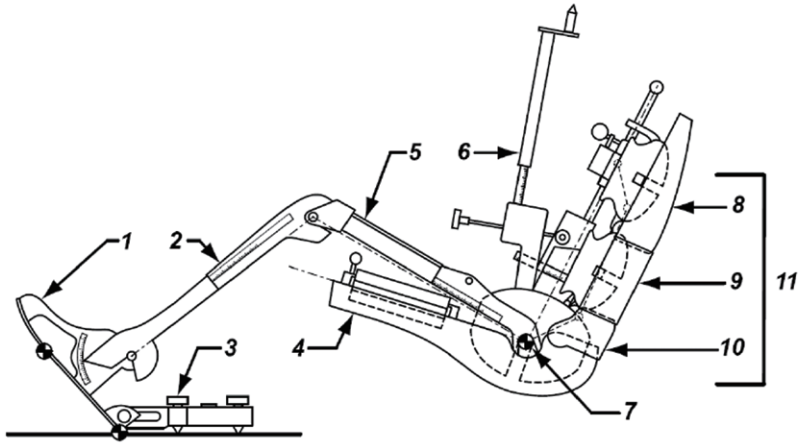
WG7: ISO 6549



Key

1 Direction and point of load application
2 Torso weights
3 Buttock weights
4 Thigh weights
5 Leg weights
a Excludes H-point buttons

WG7: ISO 20176



Key

1 shoe
2 lower leg
3 shoe fixture
4 cushion pan
5 thigh
6 headroom probe
7 H-point
8 thoracic segment
9 lumbar segment
10 pelvic segment
11 back pan segments

● WG8 TICS on-board-MMI

WG8 handles standardization of HMI for in-vehicle information systems. HMI is an important issue in automated driving that is exhibiting fierce development competition. We therefore are addressing this area using results of the SIP-adus project promoted by the Cabinet Office. WG8 is also looking at new standardization for IT shift in information systems and the development environment.

Main work items of WG8

	Standardization themes	ISO Number	Content
1	Road Vehicles — Driver readiness and system intervention management: Part 1 - partial automation	TR 5283 part 1	Introduces state-of-the-art concepts and issues for important safety factors in for the Level 2 driving automation of “Driver readiness” and “Driver intervention management.”
2	Road Vehicles — Ergonomic design guidance for external visual communication from automated vehicles to other road users	TR 23735	Stipulates ergonomic design guidance related to messages that should be communicated from level 4/5 automated vehicles to other road users and communication methods from the standpoints of safety and traffic efficiency
3	Bench evaluation method of demand from non-driving tasks from two dimensional tracking tasks Road vehicles — Box task to measure cognitive and visual-manual workload	ISO 8202	Stipulates content of a two dimensional tracking task capable of readily measuring secondary task load while driving and impact on driving operations
4	Naturalistic driving studies — Vocabulary — Part 1: Safety critical events Part 2: Driver misbehavior, condition, and activity	TR 21974	Stipulates perspectives to be annotated based on video analysis of natural driving behavior of drivers during real-world driving (1) Safety critical events (2) Driver misbehavior, condition, and activity
5	Road vehicles — Principles for Human Remote Support of Automated Driving Systems	TS 17691	Stipulates principles of the human remote support for the driving of low speed automated driving vehicles and safe passenger and cargo transportation in terms of human capabilities and limitations

SC40 Specific aspects for commercial vehicles, busses and trailers

Scope

Specific aspects for heavy duty trucks, commercial vehicles, busses, trailers, as well as their bodyworks and interfaces (e.g. couplings) which are not covered by other SCs of TC22.

Activities

SC40 handles the vehicle bodywork body, interior components and parts, and other elements, though these are mature areas in terms of standards and technology and new technology development and major market changes and needs have not occurred in recent years.

Mechanical couplings in compact vehicles are a mature area in standards and technology. As a recent trend in Japan, tow bar demand as the towing method is increasing with upswing in popularity of camping trailers (the tow bar method is widely seen in Europe).

List of subordinate WGs

Subordinate WGs		Name	Chair	Secretariat
SC40		Specific aspects for commercial vehicles, busses and trailers	Italy	Italy
	WG1	Mechanical couplings	Italy	Italy
	WG2	~~Bodywork Exchange Parameters for commercial vehicles (BEP)~~ ⇒ Disbanded in September 2022	Sweden	Sweden
	WG3	Negative pressure compartment for ambulances ⇒ Newly launched in September 2022	China	China

WG activities

● WG1 Mechanical couplings

WG1 handles standards on mechanical couplings for connection to the vehicle and interoperability of couplings.

Formulation of a standard on electric wiring that factors in automated coupling (following diagram) has been moving forward in recent years. Domestic manufacturers are not necessarily adopting the standard at this point as the standardization trend and instead making products suited to market needs and providing assurance with proprietary technology. This reflects the difficulty of standardization (particularly harmonization) due to differences in the market environment.

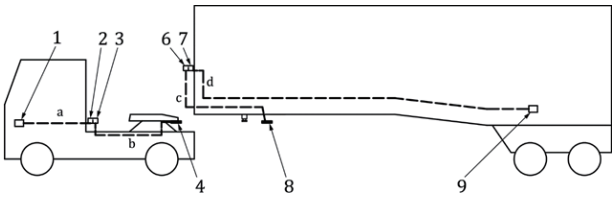
Mechanical couplings in compact vehicles are a mature area in standards and technology. As a recent trend in Japan, tow bar demand as the towing method is increasing with upswing in popularity of camping trailers (the tow bar method is widely seen in Europe).

● WG2 Bodywork Exchange Parameters for commercial vehicles (BEP) ⇒ Disbanded in September 2022 at the SC40 plenary meeting

SC40 participants unanimously decided to disband WG2 (Bodywork Exchange Parameters for commercial vehicles) based on the level of activity in recent years.

Example of an electrical wiring diagram of a tractor and semi-trailer, both equipped with FACS and for mixed mode operation

ISO 13044-2



1 ISO 11992-2 or ISO 11992-3 node in tractor, e.g. ECU ABS/EBS or databus device according to ISO 12098
4 EPI socket module
8 semi-trailer-sided EPI
9 ISO 11992-2 or ISO 11992-3 node in semi-trailer, e.g. ECU ABS/EBS or databus device according to ISO 12098
a Cable harness from 1 to 2.
b Cable harness from 3 to 4.
c Cable harness from 8 to 6.
d Cable harness from 7 to 9.

SC41 Specific aspects for gaseous fuels

Scope

Specifications of construction, installation and test of components for vehicles using gaseous fuels, including their assemblies and the interface with refuelling systems.

Activities

SC41 is the subcommittee formulating standards related to gaseous fuel vehicles. It was established in 2015 as an advanced entity from SC25 and currently holds meetings with 16 participating member countries and 14 observing member countries.

Standard scope covers items related to fuel device component parts and safety requirements and requirements related to handling qualifications for gaseous fuel vehicles.

SC41 consists of seven WGs with each WG assigned to a particular fuel type.

List of subordinate WGs

Subordinate WGs		Name	Chair	Secretariat
SC41		Specific aspects for gaseous fuels	Italy	Italy
	JWG5	Blends of Natural Gas and Hydrogen	Italy	Italy
	WG3	Compressed Natural Gas (CNG)	Argentina	Italy
	WG4	Liquefied Natural Gas (LNG)	Spain	Italy
	WG6	Liquefied Petroleum Gas (LPG)	Italy	Italy
	WG7	General safety requirements for gaseous fueled vehicles and terminology	Netherlands	Italy
	WG8	Dimethyl Ether (DME)	Sweden	Italy
	WG9	Training, competence and conformity assessment	Argentina	Italy

WG activities

● JWG5, WG3, 4, 7, and 9 Fuel devices (CGH2, CNG, LNG) and device safety and handling qualification requirements

As WG characteristics, WG3, WG4, and JWG5 handle activities related to proposing and formulating standards for component parts that comprise fuel systems, and WG3, which covers CNG that has the furthest inroads, currently categorizes component parts that comprise the fuel device into 23 types and formulates and updates ISO standards for each component part.

WG4, which covers LNG that is still in the process of taking hold, similarly implements standard formulation and updates in response to parts advances as well. For hydrogen blended fuel, JWG activities with hydrogen fuel have started, and JWG5 plans to implement future standard formulation in step with hydrogen fuel vehicles.

WG7 and WG9 are working groups that seek to standardize safety requirements related to gaseous fuel vehicles and handling qualification requirements for vehicle operation. Harmonization with the laws of various countries already applied in participating countries is an issue.

WG7 stipulates and formulates standards for safety requirements and related testing methods for each of the natural-gas fuel types (CNG/LNG, CGH2).

WG9 stipulates and formulates standards for handling qualification requirements to operate gaseous fuel vehicles.

● WG6 Liquefied Petroleum Gas (LPG)

WG6 has been conducting formulation activities for a total of 26 standards on the refuelling connector and various component parts that comprise the LPG fuel system since 2014. It already completed and published 17 standards and is working on the remaining standards.

◇ LPG refuelling connector (ISO 19825)

This standard stipulates the refuelling connector in LPG vehicles. It restricts the refuelling connector in LPG vehicles, which currently exist in a variety of shape types worldwide, to two size types and defines their shape, performance, and the testing method. In formulation activities taking place since 2014, Japan proposed acceptance of the refuelling connector shape currently used in Japan as one of the two types, and the WG approved the proposal and published the standard in 2018.

LPG refuelling connector

Japan refuelling connector (ISO 19825 J15)

European refuelling connector (ISO 19825 K15)

◇ LPG fuel system (ISO 20766-1 to 25)

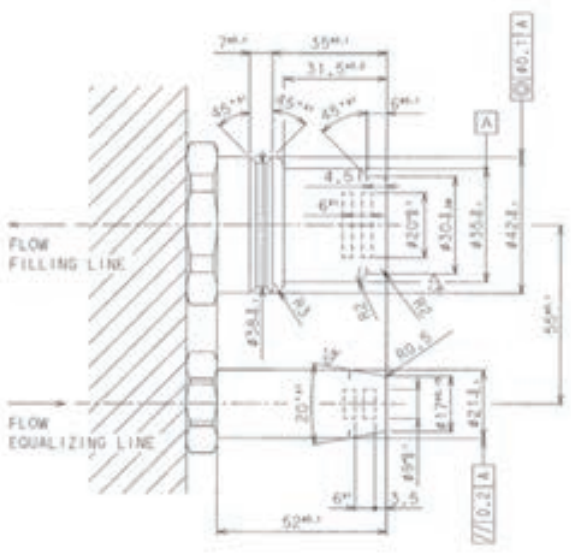
This standard addresses component parts used in the fuel system of an LPG vehicle. It stipulates definitions and testing methods in Part 1 and 2 and individual system parts in Part 3 to 25. These documents cover the non-return valve, level indicator, and fuel pump that are unique to liquid gas fuel and other valves and component parts. Japan promoted standardization activities as the project leaders for 24 (Gas tubes) and 25 (Gas connections) and published the standard in 2022.

● WG8 Dimethyl Ether (DME)

WG8 formulates standards for DME fuel devices. It already published three standards as of October 2022 and is currently handling WD deliberations for five standards.

DME comes under the liquid gas category similar to LPG. The standard formation process references the LPG vehicle fuel device and factors in differences in physical characteristics and vehicle features. Additionally, Japan reflects results and knowledge from development of DME vehicle technology in the standards and has submitted a proposal for the refueling connector with a pressure equalization fuelling system that is currently in WD review.

ISO WD 24605 Refuelling connector with pressure equalization port



TC43 Acoustics/SC1 Noise

Scope

ISO/TC43 handles standardization of methods of measuring and evaluating the impact of acoustic phenomena and all aspects of their effects on man and his environment. The three subcommittees are SC1 (Noise), SC2 (Building acoustics), and SC3 (Underwater acoustics). Road vehicle noise comes under SC1. The aim of SC1 is realizing a quiet environment to improve the quality of daily life and alleviating annoyance from noise, noise-induced hearing loss, and other risks.

Specifically, SC1 handles standardization of methods of measurement of sound attenuation of hearing protectors, methods of measurement of machinery noises and application method to products, noise control in work environments, noise from various modes of transportation (road vehicles, railways, airplanes, and ships) and measuring noise levels inside vehicles and at work sites, measuring and evaluation of environment noise, and transmission of outdoor noise.

TC43 (Acoustics)/SC1 (Noise) WG composition

TC43 ; Acoustics

- **SC1:Noise**
- SC2:Building acoustics
- SC3:Underwater acoustics

WG23	Measurement of noise from information technology, business and tele-communications equipment
WG27	**Effect of temperature on tyre/road noise testing**
WG28	Basic machinery noise emission standards
WG33	**Measuring methods for comparing traffic noise on different road surfaces**
WG39	**Characterization of pavement texture using surface profiles**
WG42	**Measurement of noise emission (external) from road vehicles**
WG45	Description and measurement of environmental noise
WG51	Noise from shooting ranges
WG54	Perceptual assessment of soundscape quality
WG57	In-stu measurements of blocked forces
WG58	Sound power levels of air-terminal devices
WG61	Attenuation of sound during propagation outdoors
WG62	Assessment of noise annoyance by means of social and socio-acoustic surveys
WG64	Statistical methods for determining and verifying stated noise emission values of machinery and equipment
WG65	Acoustic quality of open office spaces
WG66	Acoustic insulation of pipes, valves and flanges
WG67	Determination of occupational noise exposure
WG68	Non-acoustic factors

P-Member (29 countries)

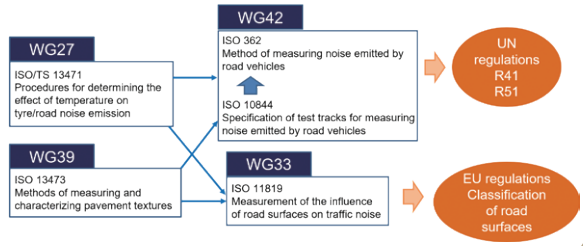
Australia , Austria, Belgium, Canada, China, Czech Republic, Denmark, Finland, France, Germany, Iran, Ireland, Italy, Japan , Korea, Luxemburg, Netherlands, New Zealand, Norway, Portugal, Russian, Singapore, South Africa, Spain, Sweden , Switzerland, Turkey, United Kingdom, United States

Activities

The United Nations Noise Regulations and noise rules in various countries adopt the ISO standard related to road vehicle noise test methods as their test methods. WG42 (Measurement of noise emission from by road vehicles) reviews test methods utilized in vehicle certification tests, and related normative references are prepared by WG27 (Effect of temperature on tyre/road noise testing), WG33 (Measuring method for comparing traffic noise on different road surfaces), and WG39 (Characterization of pavement texture using surface profiles).

Test methods need to be upgraded for EVs, HEVs, and other new technologies, and discussions of revisions of UN Regulation No.51 (Noise of M and N categories of vehicles) and No.138 (Approval of Quiet Road Transport Vehicles) are continuing. ISO participates in WP29/GRBP, the working group formulating Untied Nations Regulations on Noise, and submits technology proposals.

Relationship diagram for ISO standards



List of TC43/SC1/WG27, WG33, WG39, and WG42 work items

WG	ISO No	INTERNATIONAL STANDARD
WG27	ISO/TS 13471-1	Temperature influence on tyre/road noise measurement— Part 1: Correction for temperature when testing with the CPX method
WG27	ISO/TS 13471-2	Temperature influence on tyre/road noise measurement — Part 2: Correction for temperature when testing with the pass-by methods
WG33	ISO 11819-1	Measurement of the influence of road surfaces on traffic noise — Part 1: Statistical Pass-By method
WG33	ISO 11819-2	Measurement of the influence of road surfaces on traffic noise — Part 2: The close-proximity method
WG33	ISO/TS 11819-3	Measurement of the influence of road surfaces on traffic noise — Part 3: Reference tyres
WG39	ISO 13472-1~2	Measurement of sound absorption properties of road surfaces in situ
WG39	ISO 13473-1~6	Characterization of pavement texture by use of surface profiles
WG42	ISO 362-1	Measurement of noise emitted by accelerating road vehicles — Part 1: M and N categories
WG42	ISO 362-2	Measurement of noise emitted by accelerating road vehicles— Part 2: L category
WG42	ISO 362-3	Measurement of noise emitted by accelerating road vehicles— Part 3: Indoor testing M and N categories
WG42	ISO 5128	Measurement of noise inside motor vehicles
WG42	ISO 5130	Measurements of sound pressure level emitted by stationary road vehicles
WG42	ISO 10844	Specification of test tracks for measuring sound emitted by road vehicles and their tyres
WG42	ISO 16254	Measurement of sound emitted by road vehicles of category M and N at standstill and low speed operation — Engineering method

(TC146/TC22) SC6 Indoor air

Scope

SC6 covers the measuring method and general items related to air quality. It handles air measurement from a stationary source, air measurement in a work environment, measurement of environment air, and measurement methods for indoor air and air pollutants (particles, gases, odors, and microorganisms) and standardization and quality control (QA/QC) of air quality characteristic assessment tools including weather parameters, measurement plans, and quality assurance procedures.

Activities

TC22 does not have a subcommittee on vehicle interior air quality. TC146/SC6/WG13 proposed standardization related to air quality in vehicle cabins and JWG13 started activities in 2008. Since JWG13 is a WG under TC146, it brings together academics and engineers who are active in a wide range of areas, including experts researching substance toxicity and experts who assess interior air quality. Japan plays an important role in JWG13 with its understanding of automobile materials and their usage.

Interest has risen globally in vehicle cabin comfort (reduction of chemical substances) amid advances in development of technology that eases the driver's burden with EVs and automated driving. Since countries and companies assess vehicle interior air quality using proprietary test methods, it is important to unify methods in an international standard (IS). Furthermore, discussions have started on standardization related to volatile organic compounds from vehicle interior parts used in vehicles and substances that infiltrate the vehicle cabin from the air. It needs to implement initiatives that address the situation, including liaison with other WGs.

JWG13 Determination of volatile organic compounds in car interior

SC6 ; Indoor air

SC	Group name	WG
SC1	Stationary source emissions	3
SC2	Workplace atmospheres	9
SC3	Ambient atmospheres	2
SC4	General aspects	3
SC5	Meteorology	5
SC6	**Indoor air**	10

WG13

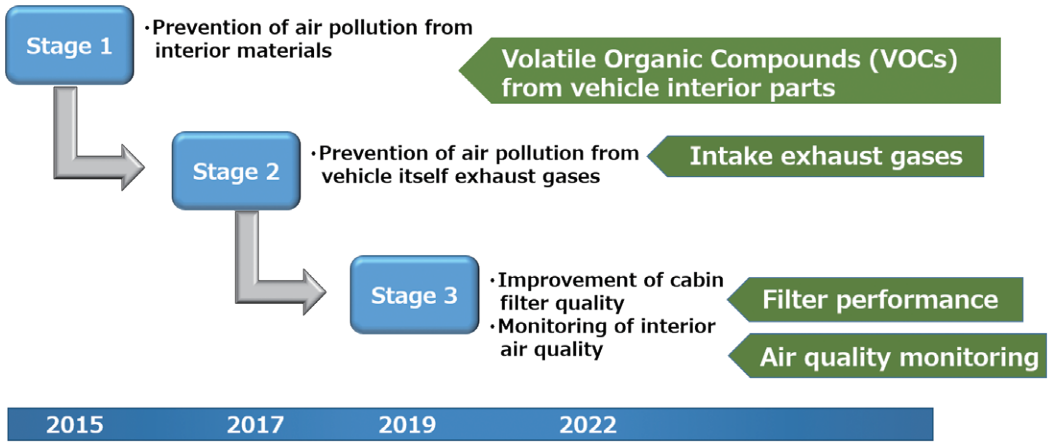
WG3 : Determination of volatile organic compounds (VOCs) in indoor air
WG10 : Microbial contaminants
JWG13 : Determination of volatile organic compounds in car interior
WG17 : Sensory testing of indoor air
WG18 : Flame retardants
WG20 : Determination of phthalates
WG21 : Strategies for the measurement of airborne particles
WG22 : Brominated flame retardants
WG24 : Indoor Air Quality management system
WG25 : Testing air cleaners by the assessment of perceived air quality

P-Member (22 countries)+Secretariat(Germany)

Australia , Austria, Belgium, Brazil, Denmark, Finland, France, Germany, Italy, Japan, Korea Republic, Malaysia, Netherlands, New Zealand, Norway, Poland, Russian, Spain, Sweden , Switzerland, United Kingdom, United States

ISO No	INTERNATIONAL STANDARD	Status	Host
ISO 12219-1	Interior air of road vehicles - Part 1:Whole vehicle test chamber - Specification and method for the determination of volatile organic compounds in cabin interiors	IS	GER
ISO 12219-2	Interior air of road vehicles - Part 2:Screening method for the determination of the emissions of volatile organic compounds from vehicle interior parts and materials - Bag method	IS	JPN
ISO 12219-3	Interior air of road vehicles - Part 3:Screening method for the determination of the emissions of volatile organic compounds from vehicle interior parts and materials - micro-scale chamber method	IS	GBR
ISO 12219-4	Interior air of road vehicles - Part 4:Method for the determination of the emissions of volatile organic compounds from vehicle interior parts and materials - Small chamber method	IS	USA
ISO 12219-5	Interior air of road vehicles - Part 5:Screening method for the determination of the emissions of volatile organic compounds from vehicle interior parts and materials - Static chamber method	IS	KOR
ISO 12219-6	Interior air of road vehicles - Part 6:Method for the determination of the emissions of semivolatile organic compounds from vehicle interior parts and materials at higher temperature - Small chamber method	IS	GER
ISO 12219-7	Interior air of road vehicles - Part 7: Odour determination in interior air of road vehicles and test chamber air of trim components by olfactory measurements	IS	GER
ISO 12219-8	Interior air of road vehicles - Part 8:Handling and packaging of materials and components for emissions testing	IS	USA
ISO 12219-9	Interior air of road vehicles - Part 9: Determination of the emissions of volatile organic compounds from vehicle interior parts - Large bag method	IS	JPN
ISO 12219-10	Interior air of road vehicles -Part 10: Whole vehicle test chamber - Specification and method for the determination of volatile organic compounds in cabin interiors - Trucks and buses	IS	JPN
ISO 12219-11	Interior air of road vehicles - Part 11: Thermal desorption analysis of organic emissions for the characterization of non-metallic materials for vehicles	CD	GER
ISO 12219-12	Interior air of road vehicles - Part 12: PVC- or Polyurethane form - Specification and methods for the determination of fogging characteristics of trim materials in the interior of automobiles	CD	JPN

WP29/GRPE VIAQ Roadmap



TC159/SC5 Ergonomics of the physical environment

Scope

SC5 is a committee that develops international standards in the field of ergonomics for physical environments, including environmental design of the thermal environment, lighting, noise, and accommodations for people with special requirements.

Activities

TC159 (Ergonomics) is a technical committee that handles international standardization related to ergonomics, and SC5 (Ergonomics of the physical environment) is one its subcommittees. SC5 has four working groups that handle international standardization – WG1 for thermal environments, WG4 for integrated environments including lighting and noise, WG5 for physical environments for people with special requirements, and WG7 for dynamic signs that display guidance and warnings using animation.

The Society of Automotive Engineers of Japan handles proposals and reviews of vehicle-related standards in TC159/SC5/WG1 in cooperation with the Japan Ergonomics Society, which is TC159's domestic deliberative entity.

WG activities

● WG1 Thermal environments

TC159/SC5/WG1 formulates and issues four standards on methods used to evaluate thermal environment (thermal comfort) in the vehicle cabin. ISO/TS 14505-1 covers principles and methods for assessment of thermal stress in the vehicle cabin, ISO 14505-2 presents a determination method for assessing the thermal environment in the vehicle cabin using measurement, ISO 14505-3 presents an evaluation method for assessing the thermal environment in the vehicle cabin using human subjects, and ISO 14505-4 presents an evaluation method for assessing the thermal environment in the vehicle cabin using numerical analysis (simulation).

Japan (Society of Automotive Engineers of Japan) proposed ISO 14505-4, and it was published in September 2021. The standard presents a method to calculate equivalent temperature, which is a thermal comfort index defined in ISO 14505-2, via simulation and reviews and defines information needed by the simulation. Preparations are proceeding on an update to add ISO 14505-4 information to ISO/TS 14505-1 accompanying the publication of ISO 14505-4.

Furthermore, preparatory work on ISO 14505-2 revisions is moving forward mainly in Germany. The subject revision plans to add measuring and evaluation methods for thermal comfort of the body segments in contact with the seat.

List of subordinate WGs related to road vehicles

Subordinate WGs		Name	Chair	Secretariat
SC5		Ergonomics of the physical environment	U.K.	U.K.
	WG1	Thermal environments	U.K.	U.K.

List of items related to road vehicles formulated by TC159/SC5 (December 2021)

WG	ISO No	INTERNATIONAL STANDARD
WG1	ISO/TS 14505-1:2007	Ergonomics of the thermal environment — Evaluation of thermal environments in vehicles — Part 1: Principles and methods for assessment of thermal stress
WG1	ISO 14505-2:2006	Ergonomics of the thermal environment — Evaluation of thermal environments in vehicles — Part 2: Determination of equivalent temperature
WG1	ISO 14505-3:2006	Ergonomics of the thermal environment — Evaluation of thermal environments in vehicles — Part 3: Evaluation of thermal comfort using human subjects
WG1	ISO 14505-4:2021	Ergonomics of the thermal environment — Evaluation of thermal environments in vehicles — Part 4: Determination of the equivalent temperature by means of a numerical manikin

List of ISO/TC22 international standards published in 2022 As of December 2022

Standard number	Standard title	Corresponding committee	Publication date
ISO 15118-20:2022	Road vehicles — Vehicle to grid communication interface — Part 20: 2nd generation network layer and application layer requirements	ISO/TC 22/SC 31/JWG 1	2022-04-26
ISO 14229-3:2022	Road vehicles — Unified diagnostic services (UDS) — Part 3: Unified diagnostic services on CAN implementation (UDSonCAN)	ISO/TC 22/SC 31/WG 2	2022-03-08
ISO 14229-5:2022	Road vehicles — Unified diagnostic services (UDS) — Part 5: Unified diagnostic services on Internet Protocol implementation (UDSonIP)	ISO/TC 22/SC 31/WG 2	2022-04-25
ISO 14229-7:2022	Road vehicles — Unified diagnostic services (UDS) — Part 7: UDS on local interconnect network (UDSonLIN)	ISO/TC 22/SC 31/WG 2	2022-04-25
ISO 14229-1:2020/ Amd 1:2022	Road vehicles — Unified diagnostic services (UDS) — Part 1: Application layer — Amendment 1	ISO/TC 22/SC 31/WG 2	2022-10-25
ISO 26021-1:2022	Road vehicles — End-of-life activation of in-vehicle pyrotechnic devices — Part 1: Application and communication interface	ISO/TC 22/SC 31/WG 4	2022-02-21
ISO 16844-1:2022	Road vehicles — Tachograph systems — Part 1: Electromechanical components	ISO/TC 22/SC 31/WG 4	2022-02-25
ISO 16844-4:2022	Road vehicles — Tachograph systems — Part 4: Display unit communication interface	ISO/TC 22/SC 31/WG 4	2022-02-25
ISO 16844-2:2022	Road vehicles — Tachograph systems — Part 2: Recording unit communication interface	ISO/TC 22/SC 31/WG 4	2022-04-11
ISO 16844-6:2022	Road vehicles — Tachograph systems — Part 6: Diagnostic communication interfaces	ISO/TC 22/SC 31/WG 4	2022-05-02
ISO 26021-3:2022	Road vehicles — End-of-life activation of in-vehicle pyrotechnic devices — Part 3: Data definitions	ISO/TC 22/SC 31/WG 4	2022-05-03
ISO 16844-3:2022	Road vehicles — Tachograph systems — Part 3: Motion sensor communication interface	ISO/TC 22/SC 31/WG 4	2022-05-03
ISO 16844-7:2022	Road vehicles — Tachograph systems — Part 7: Parameters	ISO/TC 22/SC 31/WG 4	2022-05-03
ISO 22900-2:2022	Road vehicles — Modular vehicle communication interface (MVCI) — Part 2: Diagnostic protocol data unit (D-PDU API)	ISO/TC 22/SC 31/WG 5	2022-06-21
ISO 13209-3:2022	Road vehicles — Open Test sequence eXchange format (OTX) — Part 3: Standard extensions and requirements	ISO/TC 22/SC 31/WG 5	2022-06-21
ISO 13209-2:2022	Road vehicles — Open Test sequence eXchange format (OTX) — Part 2: Core data model specification and requirements	ISO/TC 22/SC 31/WG 5	2022-07-26
ISO 24195:2022	Road vehicles — Vocabulary and characteristics for engineering of starting devices	ISO/TC 22/ SC 32	2022-03-29
ISO 17447-1:2022	Road Vehicles — Glow plugs with conical seating and their cylinder head housing — Part 1: Basic characteristics and dimensions for metal-sheath-type glow plugs	ISO/TC 22/SC 32/WG 1	2022-04-25
ISO/PAS 5112:2022	Road vehicles — Guidelines for auditing cybersecurity engineering	ISO/TC 22/SC 32/WG 11	2022-03-31
ISO 11451-4:2022	Road vehicles — Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 4: Harness excitation methods	ISO/TC 22/SC 32/WG 3	2022-05-31
ISO 21111-8:2022	Road vehicles — In-vehicle Ethernet — Part 8: Electrical 100-Mbit/s Ethernet transmission media, components and tests	ISO/TC 22/SC 32/WG 6	2022-08-09
ISO 21448:2022	Road vehicles — Safety of the intended functionality	ISO/TC 22/SC 32/WG 8	2022-06-30
ISO 4091:2003/Amd 1:2022	Road vehicles — Connectors for the electrical connection of towing and towed vehicles — Definitions, tests and requirements — Amendment 1	ISO/TC 22/SC 32/WG 9	2022-05-11
ISO/PAS 22596:2022	Road vehicles — Brake lining friction materials — Dynamometer metal pick-up generation procedure for disc brakes	ISO/TC 22/SC 33/WG 10	2022-05-31
ISO 11010-1:2022	Passenger cars — Simulation model classification — Part 1: Vehicle dynamics	ISO/TC 22/SC 33/WG 11	2022-04-15
ISO 15037-3:2022	Road vehicles — Vehicle dynamics test methods — Part 3: General conditions for passenger cars ride comfort tests	ISO/TC 22/SC 33/WG 2	2022-05-25
ISO 21994:2022	Passenger cars — Stopping distance at straight-line braking with ABS — Open-loop test method	ISO/TC 22/SC 33/WG 2	2022-11-01
ISO 22733-1:2022	Road vehicles — Test method to evaluate the performance of autonomous emergency braking systems — Part 1: Car-to-car	ISO/TC 22/SC 33/WG 3	2022-09-13
ISO 7141:2022	Road vehicles — Light alloy wheels — Lateral impact test	ISO/TC 22/SC 33/WG 5	2022-04-01
ISO 22139:2022	Heavy commercial vehicles and buses — Test method for steering effort measurement when manoeuvring at low speed or with stationary vehicle	ISO/TC 22/SC 33/WG 6	2022-05-11
ISO 21234:2022	Road vehicles — Heavy commercial vehicles and buses – Mass moment of inertia measurement	ISO/TC 22/SC 33/WG 6	2022-05-16

ISO 23365:2022	Heavy commercial vehicles and buses — Definitions of properties for the determination of suspension kinematic and compliance characteristics	ISO/TC 22/SC 33/WG 6	2022-07-15
ISO 22138:2022	Heavy commercial vehicles — Vehicle stability during tipper body operation — Tilt-table test method	ISO/TC 22/SC 33/WG 6	2022-11-01
ISO 34501:2022	Road vehicles — Test scenarios for automated driving systems — Vocabulary	ISO/TC 22/SC 33/WG 9	2022-10-06
ISO 34502:2022	Road vehicles — Test scenarios for automated driving systems — Scenario based safety evaluation framework	ISO/TC 22/SC 33/WG 9	2022-11-02
ISO 18418-2:2022	Gasoline engines — High pressure liquid fuel supply connections — Part 2: Pipe assemblies	ISO/TC 22/SC 34/WG 2	2022-11-01
ISO 6627:2022	Internal combustion engines — Piston rings — Expander/rail oil-control rings	ISO/TC 22/SC 34/WG 4	2022-02-25
ISO 31120-1:2022	Road vehicles — Injection water — Part 1: Quality requirements	ISO/TC 22/SC 34/WG 6	2022-01-17
ISO/TS 5385:2022	Road vehicles — Anti-fog coating for exterior lighting devices — Specification	ISO/TC 22/SC 35/WG 1	2022-04-08
ISO 5685:2022	Road vehicles — Testing the abrasion resistance of automotive glazing with the windscreen wiper test	ISO/TC 22/SC 35/WG 2	2022-05-16
ISO 4513:2022	Road vehicles — Visibility — Method for establishment of eyellipses for driver's eye location	ISO/TC 22/SC 35/WG 3	2022-06-17
ISO 13215-2:2022	Road vehicles — Reduction of misuse risk of child restraint systems — Part 2: Requirements and test procedures for correct installation (panel method)	ISO/TC 22/SC 36/WG 2	2022-08-31
ISO 13215-3:2022	Road vehicles — Reduction of misuse risk of child restraint systems — Part 3: Prediction and assessment of misuse by Misuse Mode and Effect Analysis (MMEA)	ISO/TC 22/SC 36/WG 2	2022-10-05
ISO 15830-1:2022	Road vehicles — Design and performance specifications for the WorldSID 50th percentile male side-impact dummy — Part 1: Vocabulary and rationale	ISO/TC 22/SC 36/WG 5	2022-06-23
ISO 15830-4:2022	Road vehicles — Design and performance specifications for the WorldSID 50th percentile male side impact dummy — Part 4: User's manual	ISO/TC 22/SC 36/WG 5	2022-10-06
ISO 17840-1:2022	Road vehicles — Information for first and second responders — Part 1: Rescue sheet for passenger cars and light commercial vehicles	ISO/TC 22/SC 36/WG 7	2022-03-01
ISO 6469-2:2022	Electrically propelled road vehicles — Safety specifications — Part 2: Vehicle operational safety	ISO/TC 22/ SC 37	2022-05-16
ISO 23828:2022	Fuel cell road vehicles — Energy consumption measurement — Vehicles fuelled with compressed hydrogen	ISO/TC 22/SC 37/WG 2	2022-06-21
ISO 6460-1:2022	Motorcycles — Measurement method for gaseous exhaust emissions and fuel consumption — Part 1: General test requirements	ISO/TC 22/SC 38/WG 1	2022-02-10
ISO 23280:2022	Electrically propelled mopeds and motorcycles — Test method for evaluation of energy performance using motor dynamometer	ISO/TC 22/SC 38/WG 2	2022-05-11
ISO 13063-1:2022	Electrically propelled mopeds and motorcycles — Safety specifications — Part 1: On-board rechargeable energy storage system (RESS)	ISO/TC 22/SC 38/WG 2	2022-07-11
ISO 13063-2:2022	Electrically propelled mopeds and motorcycles — Safety specifications — Part 2: Vehicle operational safety	ISO/TC 22/SC 38/WG 2	2022-07-11
ISO 13063-3:2022	Electrically propelled mopeds and motorcycles — Safety specifications — Part 3: Electrical safety	ISO/TC 22/SC 38/WG 2	2022-07-11
ISO/TR 3152:2022	Road vehicles — Comparison between ISO 26262-12 and other parts of the ISO 26262 series to support motorcycle adaptation	ISO/TC 22/SC 38/WG 3	2022-02-15
ISO 20766-13:2022	Road vehicles — Liquefied petroleum gas (LPG) fuel system components — Part 13: Multivalve	ISO/TC 22/SC 41/WG 6	2022-01-04
ISO 20766-14:2022	Road vehicles — Liquefied petroleum gas (LPG) fuel system components — Part 14: Vaporizer/pressure regulator	ISO/TC 22/SC 41/WG 6	2022-01-04
ISO 20766-16:2022	Road vehicles — Liquefied petroleum gas (LPG) fuel system components — Part 16: Injectors and gas mixing device/fuel rail	ISO/TC 22/SC 41/WG 6	2022-01-04
ISO 20766-24:2022	Road vehicles — Liquefied petroleum gas (LPG) fuel system components — Part 24: Gas tubes	ISO/TC 22/SC 41/WG 6	2022-01-04
ISO 20766-25:2022	Road vehicles — Liquefied petroleum gas (LPG) fuel system components — Part 25: Gas connections	ISO/TC 22/SC 41/WG 6	2022-01-04
ISO 20766-6:2019/ Amd 1:2022	Road vehicles — Liquefied petroleum gas (LPG) fuel systems components — Part 6: Pressure relief valves (PRV) — Amendment 1	ISO/TC 22/SC 41/WG 6	2022-10-07
ISO 20766-17:2022	Road vehicles — Liquefied petroleum gas (LPG) fuel system components — Part 17: Gas dosage unit	ISO/TC 22/SC 41/WG 6	2022-10-10

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