

وزارة الصناعة والتكنولوجيا المتقدمة
**Ministry of Industry & Advanced Technology
(MOIAT)**

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& ADVANCED TECHNOLOGY



الإمارات العربية المتحدة
وزارة الصناعة
والتكنولوجيا المتقدمة

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المتطلبات الفنية لمركبات القيادة الذاتية

Technical requirements for Automated Driving Vehicles

ICS :

الإمارات العربية المتحدة
UNITED ARAB EMIRATES

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FOREWORD

The Ministry of Industry and advanced technology (MOIAT) has national responsibility for standardization activities; one of MOIAT's primary functions is to issue Emirates Standards/Technical Regulations through specialized technical committees.

MOIAT through the "Technical Committee for vehicles " has prepared the standard "UAE.S xxxx : 2022 : Technical requirements for Automated Driving Vehicles ."

This standard has been approved as Emirates standard by ministry Decree No. (xxxx) date xxx / xx / 2022

DRAFT

Technical requirements for Automated Driving Vehicles

Article 0

PURPOSE

- The purpose of this document is to put the safety and security-relevant aspects of developing, producing, and operating automated driving vehicles, which lead to a safe product on the public roads in the United Arab Emirates.
- This document is subject to periodic review by the National Committee, to modification in line with technological developments in the field of AD vehicles and following global trends in the relevant technical committees in the UN (WP.29).

Article 1

SCOPE

This standard applies to the fully automated vehicles designed and constructed for the carriage of passengers and/or carriage of goods or dual mode vehicles. It might operate in a predefined area or on a predefined route, that may include fixed start and end points.

It is an automobile OEMs responsibility to determine its system's automation level in conformity with automated levels defined below:

- Highly automated (L4)** means the vehicle can itself perform all driving tasks and monitor the driving environment necessarily that is to perform the Dynamic Driving Task (DDT) in the Operational Design Domain (ODD). Such ADS does not require a fallback-ready user.
- Fully automated (L5)** means that all aspects of the driving task and monitoring of the driving environment and the dynamic driving task are to be undertaken by the vehicle system. The vehicle can operate on all roads at all times.

Article 2

Terms and Definitions

For the purposes of this document, the following definitions are applied:

- a- 'Automated Driving System' (ADS) means the hardware and software of systems that are collectively capable of performing the entire DDT of the fully automated vehicle on a sustained basis in a specific design domain (ODD).
- b- 'Dynamic driving task ('DDT')' means all real time operational functions and tactical/manoeuvring functions required to operate the vehicle, excluding strategic functions such as trip scheduling and selection of destinations and waypoints and including without limitation the following subtasks:
 - i. Lateral vehicle motion control via steering (operational);
 - ii. Longitudinal vehicle motion control via acceleration and deceleration (operational);
 - iii. Monitoring the driving environment via object and event detection, recognition, classification, and response preparation (operational and tactical);
 - iv. Object and event response execution (operational and tactical);
 - v. Manoeuvre planning (tactical);
 - vi. Enhancing conspicuity via lighting, sounding the horn, signaling, gesturing, etc. (tactical).
- c- 'Operational functions' of the DDT means functions delivered over a time constant of milliseconds and which include tasks such as steering inputs to keep within a lane or braking to avoid an emerging hazard.
- d- 'tactical functions' of the DDT means functions delivered over a time constant of seconds and including tasks such as lane choice, gap acceptance and overtaking.
- e- 'Fault' means an abnormal condition that can cause a failure. This can concern hardware or software.
- f- 'Failure' means the termination of an intended behaviour of a component or a system of the ADS due to a fault manifestation.
- g- 'Minimum Risk Manoeuvre ('MRM')' means a manoeuvre aimed at minimising risks in traffic by stopping the vehicle in a safe condition (i.e. minimum risk conditions).
- h- 'Minimum Risk Condition ('MRC')' means a stable and stopped state of the vehicle that reduces the risk of a crash.
- i- 'Operational design Domain ('ODD')' means operating conditions under which a given ADS is specifically designed to function, including, but not limited to, environmental, geographical, and time-of-day restrictions, and/or the requisite presence or absence of certain traffic or roadway characteristics.
- j- 'Normal operation' means the ADS operation within specified operational limits and conditions to perform the designed activity.
- k- 'Emergency operation' means the ADS operation due to the occurrence of events requiring prompt action to mitigate adverse consequences on human health or property damage.
- l- 'Unreasonable risk' means the overall level of risk for the vehicle occupants and other road users which is increased compared to a manually driven vehicle in comparable transportation services and situations within the operational design domain.

- m- 'Remote intervention operator' means, where applicable to the ADS safety concept, person(s) located outside the fully automated vehicle who may remotely achieve the tasks of the on-board operator provided it is safe to do so. The remote intervention operator shall not drive the fully automated vehicle and the ADS shall continue to perform the DDT.
- n- 'Dual mode vehicles' means fully automated vehicles with a driver seat designed and constructed:
 - i. to be driven by the driver in the 'manual driving mode' and
 - ii. to be driven by the ADS without any driver supervision in the 'fully automated driving mode'.

For dual mode vehicles, the transition between the manual driving mode and the fully automated mode, as well the transition between the fully automated mode and the manual mode may only occur when the vehicle is at standstill, not when the vehicle is moving.

Article 3

General Requirements

- It is the responsibility of the manufacturers to ensure that the Vehicles on public roads comply with applicable UAE road traffic laws.
- Vehicle manufacturers should fulfil the requirement of the relevant transport authorities for the areas in which the tests will be conducted. And agree with them for any specific infrastructure requirements.
- Manufacturers have a responsibility to ensure that highly and fully automated vehicle technologies undergo thorough testing and development before being brought to market. Using of automated vehicle technologies on public roads or in other public places should therefore be facilitated while ensuring that this testing is carried out with the minimum risk.
- If automated vehicle safety concept includes remote guidance operator(s), such service must be provided as part of automated vehicle operation
- Manufacturer should have training procedures in place for the operators, training should cover potentially hazardous situations that may be encountered and the appropriate action to take when resuming manual control.
- Automated Driving System (ADS) shall be capable of performing the entire Dynamic Driving Task (DDT). The capability of the ADS to perform the entire DDT shall be determined in the context of the Operational Design Domain (ODD) of the ADS.
- Fully automated vehicles may have some exemption from the normal requirements in the relevant UAE and GSO standers, see the exemption list in (Annex 1) .

- Individual subsystems and the full vehicles should be designed to ensure safety and functionality and with the goal of ADSs free of operational safety risks.
- The design and validation process should also consider including hazard analysis and safety risk assessment for ADSs.
- The design should demonstrate that:
 - The vehicle can operate in compliance with applicable road safety and traffic laws.
 - Entity has legal responsibility for a highly or fully automated vehicle.

Article 5

Minimum risk manoeuvre (MRM) and Minimum Risk Condition (MRC)

- During the MRM, the fully automated vehicle with the ADS shall be slowed down, with an aim of achieving a deceleration demand not greater than 4.0 m/s² under noncritical circumstances, to a full standstill in the safest possible place considering surrounding traffic and road infrastructure.
- The ADS shall signal its intention to place the vehicle in a MRC, for example, by activating hazard warning lights
- The fully automated vehicle shall only leave the MRC after confirmation that the cause(s) of the MRM is no longer present.

Article 6

Operational Design Domain (ODD)

The entities should ensure the effectiveness and safety of Automated Driving Systems (ADS) through:

- a) The ODD conditions and boundaries shall be established by the manufacturer.
- b) The ADS shall recognise its ODD conditions and boundaries of the ODD.
- c) The ADS shall be able to determine if the conditions for ADS activation are met.
- d) The ODD conditions to be recognized by the ADS shall include:
 - Road and lane markings.
 - Geographic area (city, mountain, desert, etc.);
 - Speed range.
 - Weather (rain, snow, Fog)
 - Environmental conditions (light intensity, daytime/nighttime);
- e) When the ADS reaches the ODD boundaries, it shall perform an MRM to reach a MRC and shall warn the on board operator (if applicable) /remote operator accordingly (if applicable).

- f) The scenarios and parameters, with regard to lane change, shall be applied as specified in UN Regulation No.157 . Furthermore, the relevant scenarios, with regard to pedestrian crossing, shall be also applied as specified in UN Regulation No.157.

Article 7

ADS behavior

- a- The ADS shall be able to:
- operate at safe speeds and respect speed limitations applicable to the vehicle.
 - maintain appropriate distances from other road users by controlling the longitudinal and lateral motion of the vehicle.
 - adapt its behavior to the surrounding traffic conditions (e.g., by avoiding disruption to the flow of traffic) in an appropriate safety-oriented way.
 - adapt its behavior in line with safety risks and give the highest priority to the protection of human life)
- b- The ADS shall detect and respond appropriately to objects and events relevant for the DDT within the ODD. which might include:
- motor vehicles and road user such as motorcycles, bicycles, and pedestrians.
 - road accidents
 - traffic congestions
 - road works
 - emergency vehicles.
 - traffic signs, road markings
 - trains and light rail
 - environmental conditions (e.g. lower speed).
- c- In cases of fully automated vehicles, the ADS must be able to fall back into a minimal risk condition without the need of remote operator intervention.
- d- In the case the pedestrian crosses with parameter values outside the boundaries specified in UN Regulation 157 and the ADS can no longer avoid collision, the control strategy of the ADS may change between collision avoidance and mitigation only if the manufacturer can declare or provide technical evidence that this increases the safety of the vehicle occupants and the other road users (e.g. by prioritizing braking over an alternative manoeuvre).
The operating manual shall include the functional description of the ADS.
- The operating manual shall include the technical measures (e.g. checks and maintenance works of vehicle and off-board infrastructure, transport and physical infrastructure

requirements such as localization marker and perception sensors), operational restrictions (e.g. speed limit, dedicated lane, physical separation with oncoming traffic), environmental conditions (e.g. no snow) and operational measures (e.g. on-board operator or remote intervention operator needed) necessary to ensure safety during the fully automated vehicle operation.

- The operating manual shall describe the instructions for vehicle occupants, transport service operator, on board operator (where applicable) and remote intervention operator (where applicable) and public authorities in case of failures and ADS request.
- The operating manual shall set out rules to ensure proper performance of maintenance, overall tests and further examinations.

Article 8

Human Machine Interface

- Where a remote operator or dispatcher is part of the ADS safety concept, the remote dispatcher, should be able to know the status of the ADS at all times. The ADS shall be able to anticipate exits from the ODD. When the ADS reaches the ODD boundaries, it shall perform a MRM to reach a MRC and shall warn the on board operator (if applicable) /remote operator accordingly (if applicable).
- The ADS shall activate the relevant vehicle systems when necessary and applicable (e.g. opening doors, activate wipers in case of rain, heating or cooling system, etc.)
- If a remote intervention operator is part of the ADS safety concept, the fully automated vehicle shall provide the vehicle occupants with a facility to call the operator through an audio-visual interface.
- If a remote intervention operator is part of the ADS safety concept, the fully automated vehicle shall provide means to allow the remote intervention operator to assess the situation inside and outside of the vehicle. it shall be possible for him to open the power operated service door remotely.

Article 9

Vehicle Cybersecurity & Software Update

- a- The ADS shall be protected from unauthorized access in accordance with UNECE R 155.
- b- The ADS shall support software updates. The effectiveness of the software update procedures and processes concerning the ADS shall be demonstrated by compliance with UN ECE R 156.
- c- Automobile OEMs Cyber Security Management System (CSMS) shall consider:
 - How they manage CS used within Automobile OEM's organization.

- Risk assessment system used to identify the risks to vehicle types, categorization, and treatment of the risks.
 - The testing and verification methods for CS of a vehicle type.
 - The processes used for ensuring that the risk assessment is kept latest level.
 - The ability to monitor/detect/respond to cyber-attacks/threats/vulnerabilities on vehicle types/the effectiveness of the processes itself.
- d- The Automobile OEMs using “Over the Air Software Update (OTASU)” shall:
- Be able to restore systems to their previous version to place the vehicle into a safe state if the software update is failed or interrupted.
 - Be sure that the software update will be executed safely when OTASU may affect the safety of the vehicle.
 - Notify the vehicle users about the update before the execution of OTASU and the result of the update.

Article 10

The occupant protection system

- The manufacturer shall demonstrate that an acceptable degree of consideration has been given to the functional and operational safety for the ADS during its design and development processes. The measures put in place by the manufacturer shall ensure that the fully automated vehicle is free of unreasonable safety risks to vehicle occupants and other road users during the vehicle lifetime. and the manufacturer shall define the acceptance criteria from which the validation targets of the ADS are derived to evaluate the residual risk for the ODD.

Article 11

ADS data requirements and specific data elements for event data recorder for fully automated vehicles

- In case of an On-board data storage, the device(s) shall be mounted in the vehicle cab/passenger compartment or in a position of sufficient structural integrity to protect against physical damage that would prevent the retrieval of data. This or an alternative system, such as off-board data storage system, shall be covered with appropriate documentation (e.g. calculations or simulations); it should record:

- Activation/ re-initialisation and Deactivation of the ADS .
 - Request sent by the ADS to the remote intervention operator.
 - Request/Input send by the remote intervention operator
 - Start and End of emergency operation
 - Involved in a detected collision
 - Event data recorder (EDR) trigger input
 - Minimum risk manoeuvre engagement by the ADS
 - Minimum risk condition reached by the fully automated vehicle
 - Description the ADS failure
- The ADS data shall be available subject to requirements specified in the local or national laws.
 - Once the storage capacity reaches its limit, existing data shall only be overwritten following a first in first out procedure.
 - Documented evidence on the storage capacity shall be provided by the manufacturer.
 - the data shall be recorded in a clearly identifiable way.
 - the software versions for each recorded occurrence, indicate to the software that was present when the event occurred, shall be clearly identifiable.
 - The manufacturer shall provide instructions on how to access the data.
 - An adequate protection against manipulation (e.g. data erasure) of stored data shall be ensured for example by way of an anti-tampering design
 - Data stored shall be easily readable in a standardised way via the use of an electronic communication interface, at least through the standard interface (OBD port).
 - the 'Event Data Recorder (EDR) should be accordance UNECE R 160

Article 12

Validation Methods

- The reaction of the ADS under the influence of a faults which shall correspond with the documented summary of the hazard analysis, to a level that the safety concept and execution are confirmed as being adequate and in compliance with the requirements of this standard.
- Simulation tool and mathematical models to verify of the safety concept may be used for scenarios that are difficult on a test track or in real driving conditions.

- Evidence must be provided to ensure the safety of motorized vehicles and cybersecurity. Tests should demonstrate the behavioral competencies an ADS would be expected to perform:
 - During Normal operation.
 - During crash avoidance situations.
- To demonstrate the expected performance of an ADS for deployment on public roads, test approaches may include a combination of:
 - simulation ;
 - test track ;
 - on-road testing.
- Testing may be performed by the entities themselves but could also be performed by an independent third party.

ANNEXE (1)

Exemptions from the GSO vehicles requirements

Appendix 1

Exemptions for Automated vehicles

GSO	clause	Requirement	Fully automated vehicles of categories N1, N2 and N3 without driver seat and without occupants	Fully automated vehicles of categories N1, N2, N3, M1, M2, M3 without driver seat, with occupants	Dual mode vehicles: vehicles with a driver seat designed and constructed to be driven by the driver in the “manual driving mode” and to be driven by the automated driving system (ADS) without any driver supervision in the “fully automated driving mode”	Specific provisions to be applied if letter A is used (i.e. the approval is not possible under the regulatory act because it does not yet include specific requirements for fully automated vehicles) No provision shall apply if the vehicle category is not in the scope of the base regulatory act.
38	Part 3A	Motor Vehicles - Methods of Test for Impact Strength - Part 3A: Side Impact	n/a	A n/a for vehicles below 30 km/h	X	The collision test will be carried out on the side or sides as agreed between the manufacturer and type approval authority.
42		<i>Motor Vehicles: General Requirements</i>	See table below	See table below	See table below	See table below
48	3.1 and 3.6	Motor Vehicles: Conformity Certificates	X	X	X	
51		Passenger Car Tyres - Part 1: Nomenclature, Designation, Dimensions, Load Capacities and Inflation Pressures	n/a	A	X	Vehicles which have limit top speed less than 130 Kph allow to use “Q” speed rated tires and meet the temperature rating of A or B.

GSO	clause	Requirement	Fully automated vehicles of categories N1, N2 and N3 without driver seat and without occupants	Fully automated vehicles of categories N1, N2, N3, M1, M2, M3 without driver seat, with occupants	Dual mode vehicles: vehicles with a driver seat designed and constructed to be driven by the driver in the “manual driving mode” and to be driven by the automated driving system (ADS) without any driver supervision in the “fully automated driving mode”	Specific provisions to be applied if letter A is used (i.e. the approval is not possible under the regulatory act because it does not yet include specific requirements for fully automated vehicles) No provision shall apply if the vehicle category is not in the scope of the base regulatory act.
52	4.10.2	Passenger Car Tyres - Part 2: General Requirements	n/a	A	X	Vehicles which have limit top speed less than 130 Kph allow to use “Q” speed rated tires and meet the temperature rating of A or B.
53		Passenger Car Tyres - Part 3: Methods of Test	n/a	A	X	Vehicles which have limit top speed less than 130 Kph allow to use “Q” speed rated tires and meet the temperature rating of A or B.
290		Instruction Manual for Appliances Instruments and Equipment	A	A	A	Arabic-language owner’s manual is a voluntary requirement in this stage.
422	Req. 3	Requirements for rear-view and external mirrors	A	A	X (for manual driving mode) A (for fully automated driving mode)	Functionality shall be covered by the ADS to maintain constant 360-degree visibility outside and

GSO	clause	Requirement	Fully automated vehicles of categories N1, N2 and N3 without driver seat and without occupants	Fully automated vehicles of categories N1, N2, N3, M1, M2, M3 without driver seat, with occupants	Dual mode vehicles: vehicles with a driver seat designed and constructed to be driven by the driver in the “manual driving mode” and to be driven by the automated driving system (ADS) without any driver supervision in the “fully automated driving mode”	Specific provisions to be applied if letter A is used (i.e. the approval is not possible under the regulatory act because it does not yet include specific requirements for fully automated vehicles) No provision shall apply if the vehicle category is not in the scope of the base regulatory act.
						around the vehicle through sensors, cameras, LiDARs, and radars.
UAE.S 5021		The UAE Terrestrial Radio Receiver Specifications for AM/FM/T-DAB+	n/a	n/a	X (for manual driving mode) A (for fully automated driving mode)	
UAE.S 5019		eCall Technical Requirements	n/a	A	X (for manual driving mode) A (for fully automated driving mode)	For fully automated driving mode, the ADS takes care of the functionality.

Appendix 2
Exemptions from GSO 42 General Requirements

GSO	clause	Requirement	Fully automated vehicles of categories N1, N2 and N3 without driver seat and without occupants	Fully automated vehicles of categories N1, N2, N3, M1, M2, M3 without driver seat, with occupants	Dual mode vehicles: vehicles with a driver seat designed and constructed to be driven by the driver in the “manual driving mode” and to be driven by the automated driving system (ADS) without any driver supervision in the “fully automated driving mode”	Specific provisions to be applied if letter A is used (i.e. the approval is not possible under the regulatory act because it does not yet include specific requirements for fully automated vehicles) No provision shall apply if the vehicle category is not in the scope of the base regulatory act.
42	13.7	The service brake shall be constructed as to be operated by the driver's right foot.	Not required to equip with a human-operated service brake pedal.	Not required to equip with a human-operated service brake pedal.	Need to equip with a human-operated service brake pedal.	
	15.1	The steering system shall be such as to be easily and securely handled by the driver in his normal driving position.	Not required to equip with a human-operated steering system.	Not required to equip with a human-operated steering system.	Need to equip with a human-operated steering system.	
	15.2	The steering wheel shall be on the left side.	Not applicable	Not applicable	Need to comply	
	16.2	The controls shall be located to the left and right of the center of the	Not applicable	Not applicable	Need to comply	

GSO	clause	Requirement	Fully automated vehicles of categories N1, N2 and N3 without driver seat and without occupants	Fully automated vehicles of categories N1, N2, N3, M1, M2, M3 without driver seat, with occupants	Dual mode vehicles: vehicles with a driver seat designed and constructed to be driven by the driver in the “manual driving mode” and to be driven by the automated driving system (ADS) without any driver supervision in the “fully automated driving mode”	Specific provisions to be applied if letter A is used (i.e. the approval is not possible under the regulatory act because it does not yet include specific requirements for fully automated vehicles) No provision shall apply if the vehicle category is not in the scope of the base regulatory act.
		steering wheel and so as to be easily identified and operated by the driver in a normal driving position.				
	16.3	The controls to be used by a driver while driving the vehicle shall be located so that they are operable by the driver restrained by the crash protection system...	Not applicable	Not applicable	Need to comply	
	16.4	The tell-tales and indicators, shall be located so that they are visible and recognizable to a driver during night and day when activated.	The vehicle shall display the warning messages and telltales to passengers on in-cabin display screens.	The vehicle shall display the warning messages and telltales to passengers on in-cabin display screens.	Need to comply	
	16.7	The location, identification, colour and illumination of the controls, telltales and indicators shall be in accordance with the relevant GSO	The telltales shall be provided to passengers visible on display screens.	The telltales shall be provided to passengers visible on display screens.	Need to comply	

GSO	clause	Requirement	Fully automated vehicles of categories N1, N2 and N3 without driver seat and without occupants	Fully automated vehicles of categories N1, N2, N3, M1, M2, M3 without driver seat, with occupants	Dual mode vehicles: vehicles with a driver seat designed and constructed to be driven by the driver in the “manual driving mode” and to be driven by the automated driving system (ADS) without any driver supervision in the “fully automated driving mode”	Specific provisions to be applied if letter A is used (i.e. the approval is not possible under the regulatory act because it does not yet include specific requirements for fully automated vehicles) No provision shall apply if the vehicle category is not in the scope of the base regulatory act.
		regulation.				
	19.3	Multi-purpose passenger vehicles equipped with passenger car tyres, shall have tyres of "A" or "B" temperature rating and provided with speed symbol "S" (180km/h) and higher rating tyres.	It will be accepted Q rated tires and meet the Temperature rating of A or B if the maximum limit speed is less than 130Kph	It will be accepted Q rated tires and meet the Temperature rating of A or B if the maximum limit speed is less than 130Kph	Need to comply	
	19.7	The vehicles shall be provided with a spare tyre. The vehicles provided with a run flat tyre may be exempted from this requirement.	Not applicable, because any risk of issues with the tires is significantly mitigated /reduced.	Not applicable, because any risk of issues with the tires is significantly mitigated /reduced.	Need to comply	
	20.9	Driver's seat. The driver's seat on a motor vehicle in the left side...	Not applicable	Not applicable	Need to comply	
	21.8	When a belt assembly of the driver's	Not applicable	For vehicles without driver seat,	Need to comply	

GSO	clause	Requirement	Fully automated vehicles of categories N1, N2 and N3 without driver seat and without occupants	Fully automated vehicles of categories N1, N2, N3, M1, M2, M3 without driver seat, with occupants	Dual mode vehicles: vehicles with a driver seat designed and constructed to be driven by the driver in the “manual driving mode” and to be driven by the automated driving system (ADS) without any driver supervision in the “fully automated driving mode”	Specific provisions to be applied if letter A is used (i.e. the approval is not possible under the regulatory act because it does not yet include specific requirements for fully automated vehicles) No provision shall apply if the vehicle category is not in the scope of the base regulatory act.
		seat is not fastened and the ignition switch is in the "start" position, a warning system shall be activated for a period of four seconds at least.		any seat in the first seat row shall be considered to be a front passenger seat.		
	22.1	The airbag shall be located in a suitable position to assist in preventing the driver's head and chest from impacting the steering wheel or windshield.	Not applicable	For vehicles without driver seat, any seat in the first seat row shall be considered to be a front passenger seat.	Need to comply	
	22.3	Passenger cars, Multipurpose passenger vehicles...with GVWR less than 3500kg shall be provided with air bags to the driver and front passenger outboard seat.	Not applicable	For vehicles without driver seat, any seat in the first seat row shall be considered to be a front passenger seat.	Need to comply	

GSO	clause	Requirement	Fully automated vehicles of categories N1, N2 and N3 without driver seat and without occupants	Fully automated vehicles of categories N1, N2, N3, M1, M2, M3 without driver seat, with occupants	Dual mode vehicles: vehicles with a driver seat designed and constructed to be driven by the driver in the “manual driving mode” and to be driven by the automated driving system (ADS) without any driver supervision in the “fully automated driving mode”	Specific provisions to be applied if letter A is used (i.e. the approval is not possible under the regulatory act because it does not yet include specific requirements for fully automated vehicles) No provision shall apply if the vehicle category is not in the scope of the base regulatory act.
	25.1 and related	The vehicles shall be provided with devices for indirect vision to observe the traffic area adjacent to the vehicle which cannot be observed by direct vision. These can be conventional mirrors, camera-monitors or other devices able to present information about the indirect field of vision to the driver.	A	A	Need to comply for manual driving mode A (for fully automated driving mode)	Functionality shall be covered by the ADS to maintain constant 360-degree visibility outside and around the vehicle through sensors, cameras, LiDARs, and radars.
	30.14	All motor vehicles shall be provided with a minimum of one rear fog lamp.	Need to comply	Need to comply	Need to comply	
	31.5	The driver's door lock shall be locked from outside by the help of a key or by the help of a remote system for light duty vehicles.	the ADS system shall be automatically locked and secured when closed and in operation.	the ADS system shall be automatically locked and secured when closed and in operation.	Need to comply	

GSO	clause	Requirement	Fully automated vehicles of categories N1, N2 and N3 without driver seat and without occupants	Fully automated vehicles of categories N1, N2, N3, M1, M2, M3 without driver seat, with occupants	Dual mode vehicles: vehicles with a driver seat designed and constructed to be driven by the driver in the “manual driving mode” and to be driven by the automated driving system (ADS) without any driver supervision in the “fully automated driving mode”	Specific provisions to be applied if letter A is used (i.e. the approval is not possible under the regulatory act because it does not yet include specific requirements for fully automated vehicles) No provision shall apply if the vehicle category is not in the scope of the base regulatory act.
	31.7	In passenger cars and multipurpose vehicles, when the locking mechanism of the doors are not engaged, a telltale indicator lamp shall function to indicate to the driver that one of the doors is not fully latched.	Not applicable	A	Need to comply for manual driving mode A (for fully automated driving mode)	If the passenger doors are not properly latched and locked, ADS shall ensure that the vehicle can only move if doors are closed.
	32 and related	Every motor vehicle shall be equipped with a speedometer located in the driver's direct field of vision and is clearly legible by night and by day.	A	A	Need to comply for manual driving mode A (for fully automated driving mode)	The speed shall be electronically always transmitted to the ADS.
	33 and related	The odometer should be located in front of the driver's direct field of vision and to the clearly legible.	A	A	Need to comply for manual driving mode A (for fully automated driving mode)	The Odometer information shall be transmitted electronically to the ADS.

GSO	clause	Requirement	Fully automated vehicles of categories N1, N2 and N3 without driver seat and without occupants	Fully automated vehicles of categories N1, N2, N3, M1, M2, M3 without driver seat, with occupants	Dual mode vehicles: vehicles with a driver seat designed and constructed to be driven by the driver in the “manual driving mode” and to be driven by the automated driving system (ADS) without any driver supervision in the “fully automated driving mode”	Specific provisions to be applied if letter A is used (i.e. the approval is not possible under the regulatory act because it does not yet include specific requirements for fully automated vehicles) No provision shall apply if the vehicle category is not in the scope of the base regulatory act.
	34 and related	The speed warning device shall alert the driver... The speed limitation device shall be fitted to the vehicle...	Not applicable	Not applicable	Need to comply for manual driving mode Not applicable (for fully automated driving mode)	
	35 and related	Every motor vehicle shall have a power-driven windshield wiping system...	Not applicable	Not applicable	Need to comply for manual driving mode Not applicable (for fully automated driving mode)	
	39.1	...limit of the rearward displacement of the steering to reduce the likelihood of chest, neck, or head injuries.	Not applicable	Not applicable	Need to comply for manual driving mode Not applicable (for fully automated driving mode)	
	39.3.1 and related	Static side Impact	Not applicable	Not applicable	Need to comply for manual driving mode Not applicable (for fully automated driving mode)	

GSO	clause	Requirement	Fully automated vehicles of categories N1, N2 and N3 without driver seat and without occupants	Fully automated vehicles of categories N1, N2, N3, M1, M2, M3 without driver seat, with occupants	Dual mode vehicles: vehicles with a driver seat designed and constructed to be driven by the driver in the “manual driving mode” and to be driven by the automated driving system (ADS) without any driver supervision in the “fully automated driving mode”	Specific provisions to be applied if letter A is used (i.e. the approval is not possible under the regulatory act because it does not yet include specific requirements for fully automated vehicles) No provision shall apply if the vehicle category is not in the scope of the base regulatory act.
	44.1	Every motor vehicle shall be provided with suitable changing wheel tools...	Not applicable	Not applicable	Need to comply for manual driving mode Not applicable (for fully automated driving mode)	
	44.2	It shall be provided with a dry powder fire extinguisher	The automated driving system must be able to deal safely in the event of a fire in the vehicle	The automated driving system must be able to deal safely in the event of a fire in the vehicle	Need to comply for manual driving mode The automated driving system must be able to deal safely in the event of a fire in the vehicle (for fully automated driving mode)	
	44.3	It shall be provided with emergency equipment such as a reflector triangle and special tools...	Not applicable	Not applicable	Need to comply for manual driving mode Not applicable (for fully automated driving mode)	
	44.4	Every motor vehicle shall be provided with a first aid box...	Not applicable	Not applicable	Need to comply for manual driving mode	

GSO	clause	Requirement	Fully automated vehicles of categories N1, N2 and N3 without driver seat and without occupants	Fully automated vehicles of categories N1, N2, N3, M1, M2, M3 without driver seat, with occupants	Dual mode vehicles: vehicles with a driver seat designed and constructed to be driven by the driver in the “manual driving mode” and to be driven by the automated driving system (ADS) without any driver supervision in the “fully automated driving mode”	Specific provisions to be applied if letter A is used (i.e. the approval is not possible under the regulatory act because it does not yet include specific requirements for fully automated vehicles) No provision shall apply if the vehicle category is not in the scope of the base regulatory act.
					Not applicable (for fully automated driving mode)	
44.5		Tyre pressure gauge	A	A	Need to comply for manual driving mode A (for fully automated mode)	The vehicle shall equipped with a tire pressure monitoring system. The warning signal shall be sent to the ADS and the remote intervention operator (if applicable).
44.7		Any safety warning or statement provided with any vehicle parts shall be translated into Arabic	translating the labels, warning or statement to Arabic are voluntary in this stage	translating the labels, warning or statement to Arabic are voluntary in this stage	translating the labels, warning or statement to Arabic are voluntary in this stage	
44.8		The information given in the navigation system shall as a minimum be available in Arabic or Arabic and English.	translating navigation system statement to Arabic are voluntary in this stage	translating the labels, warning or statement to Arabic are voluntary in this stage	translating navigation system statement to Arabic are voluntary in this stage	

GSO	clause	Requirement	Fully automated vehicles of categories N1, N2 and N3 without driver seat and without occupants	Fully automated vehicles of categories N1, N2, N3, M1, M2, M3 without driver seat, with occupants	Dual mode vehicles: vehicles with a driver seat designed and constructed to be driven by the driver in the “manual driving mode” and to be driven by the automated driving system (ADS) without any driver supervision in the “fully automated driving mode”	Specific provisions to be applied if letter A is used (i.e. the approval is not possible under the regulatory act because it does not yet include specific requirements for fully automated vehicles) No provision shall apply if the vehicle category is not in the scope of the base regulatory act.
	44.9	All instructions indicated on the driver's monitor/display shall be available in Arabic and English	translating instructions indicated on the driver's monitor/display to Arabic are voluntary in this stage	translating instructions indicated on the driver's monitor/display to Arabic are voluntary in this stage	translating instructions indicated on the driver's monitor/display to Arabic are voluntary in this stage	
	45.1	Arabic certification label	translating label to Arabic are voluntary in this stage	translating label to Arabic are voluntary in this stage	translating label to Arabic are voluntary in this stage	
46 and related		Owner's manual in Arabic and English	translating Owner's manual to Arabic are voluntary in this stage	translating Owner's manual to Arabic are voluntary in this stage	translating Owner's manual to Arabic are voluntary in this stage	

Appendix 3

Mandatory Standards for Automated Driving Vehicles

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No.	Standard Number	Standard Title
1	UN Regulation No. 155	Cyber security and cyber security management system
2	UN Regulation No. 156	Software update and software update management system
3	UN Regulation No. 158	Devices for means of rear visibility or detection (To be complied for dual mode vehicles driven in manual mode)
4	UN Regulation No. 160	Event Data Recorder (EDR)

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Annex 2

Referenced Standards

- These documents and specifications are considered as references and guides that can be used by manufacturers to demonstrate compliance with safety and performance requirements.
- Manufacturers can use any methods that comply with international best practices and worldwide references to verify the completion of these requirements.

No.	Standard Number	Standard Title
1	ISO/PAS 21448:2019	Road Vehicles – Safety of the intended functionality (SOTIF)
2	ISO 26262:2018	Road Vehicles – Functional safety
3	ISO/SAE CD 21434	Road Vehicles – Cybersecurity engineering
4	ISO 19157:2013	Geographic information – Data quality
5	ISO/TS 19158:2012	Geographic information – Quality assurance of data supply
6	ISO/TS 16949:2009	Quality management systems – Particular requirements for the application of ISO 9001:2008 for automotive production and relevant service part organizations
7	ISO/IEC 2382-1:1993	Information technology – Vocabulary – Part 1: Fundamental terms
8	ISO/IEC/IEEE 15288:2015	Systems and software engineering – System life cycle processes
9	IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 1: General requirements
10	IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 2: Requirements for electrical/ electronic / programmable electronic safety-related systems
11	IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 3: Software requirements
12	IEC TS 61508-3-1:2016	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 3-1: Software requirements - Reuse of pre-existing software elements to implement all or part of a safety function
13	IEC 61508-4:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 4: Definitions and abbreviations
14	IEC 61508-5:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 5: Examples of methods for the determination of safety integrity levels
15	SAE J3016	Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles.