
**INTERSTATE COUNCIL
FOR STANDARDIZATION, METROLOGY AND CERTIFICATION
(ISC)**

**I N T E R S T A T E
S T A N D A R D**

**GOST
30593-2015**

Motor vehicles

**HEATING, VENTILATION AND
CONDITIONING SYSTEMS**

Requirements for efficiency and safety

**Official Edition
English Version Approved by Interstandard**

Foreword

The purposes, main principles and basic order of work on interstate standardization are established by GOST 1.0-2015 "Interstate system for standardization. Basic principles" and GOST 1.2-2015 "Interstate System for Standardization. Interstate standards. Rules for development, taking over, renovation and cancellation"

Details

1 DEVELOPED by Federal State Unitary Enterprise 'Central Scientific and Research Institute for Automobile and Auto-Motor Transport "NAMI" (FSUE "NAMI") honoured by Red Banner of Labour'

2 2 INTRODUCED by Interstate technical committee for standardization ITC 56 "Road vehicle"

3 ADOPTED by Interstate Council for Standardization, Metrology and Certification (protocol No. 81-II, dated 27.10.2015)

Votes in favour:

| Brief name of the country according to IC (ISO 3166)004-97 | Country code according to IC (ISO 3166)004-97 | Abbreviated name of the national standards body |
|--|---|---|
| Armenia | AM | Ministry of economic of Armenia |
| Belarus | BY | Gosstandart of Republic of Belarus |
| Kazakhstan | KZ | Gosstandart of Republic of Kazakhstan |
| Kyrgyzstan | KG | Kyrgyzstandart |
| Russian Federation | RU | Rosstandart |
| Tajikistan | TJ | Tajikstandart |

4 By Order No. 708-cr dated 22.06.2016 of the Federal Agency on Technical Regulating and Metrology, the Interstate Standard GOST 30593-2015 has been introduced as a National standard of the Russian Federation since April 1, 2017.

5 IN PLACE OF GOST 30593-97

The information on the amendments to this Standard is published in the annually issued information index "National standards", and the text of the amendments and corrections is published in the monthly issued information indices "National standards". In case of revision (replacement) or cancellation of this Standard the appropriate notice will be published in the monthly issued information index "National standards". The appropriate information, notice and texts are also placed in the general-use information system — on official site of Federal Agency on Technical Regulating and Metrology in the Internet

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I N T E R S T A T E S T A N D A R D

Motor vehicles**HEATING, VENTILATION AND CONDITIONING SYSTEMS****Requirements for efficiency and safety**

Date of Introduction — 2017—04—01**1 Scope**

This Standard applies to automobile vehicles of Categories M and N¹⁾ (hereinafter referred to as "vehicles"), and sets out the requirements for efficiency and safety of heating, ventilation and conditioning systems installed in the driver's (crew) cabin (workplace) and recreation compartment and in the passenger compartment (hereinafter referred to as "manned spaces") as well as the conditions and procedure of works related to the vehicle conformity assessment against the requirements of this Standard.

For special-purpose and specialized vehicles subject to other requirements that are established in the currently enforced regulatory documents for heating, ventilation and conditioning systems, the requirements of this Standard apply in regard to the driver's workspace only.

The Standard does not apply to off-road heavy-duty vehicles.

2 Normative references

The following interstate standards are referred to in this Standard:

GOST 15150-69 Machines, instruments and other industrial products. Modifications for different climatic regions. Categories, operating, storage and transportation conditions as to environment climatic aspects influence

GOST 33557-2015 Motor vehicles. Documentary registration of test results for compliance with the technical regulations

N o t e — Users of this Standard are recommended to check validity of reference standards in the information system of general use — the official Internet site of Federal Agency on Technical Regulating and Metrology, in the annual information index "National standards" as of 1st of January of the current year, and in the monthly information indices of the current year. If the reference standard is replaced (amended), then the replaced (amended) standard shall be used. If the reference standard is cancelled without replacement, then the statement containing the reference may be used only in the part not touching this reference.

3 Terms and definitions

The following terms with their respective definitions are used for the purposes of this Standard:

¹⁾ The Categories are defined in [1].

3.1 **heating:** Controlled temperature increase and its maintenance at a given level in the manned space of a vehicle.

3.2 **heating system of vehicle:** Any device or combination thereof intended for heating of the manned space of a vehicle.

3.3 **ventilation:** Controlled air exchange in the manned space of a vehicle.

3.4 **ventilation system of vehicle:** Any device or combination thereof intended for ventilation of the manned space of a vehicle.

3.5 **conditioning:** Controlled decrease of the air temperature in the manned space of a vehicle down to the ambient temperature and below, with the provision that the temperature is maintained at a given level when the ambient temperature is equal to or greater than 17 °C.

3.6 **conditioning system of vehicle:** Set of devices intended for conditioning of the manned space of a vehicle.

3.7 **climatic unit:** Structural unit (assembly) designed to comprise devices that are intended for heating, cooling and forced displacement of air.

3.8 **climatic modification of vehicle:** Vehicle classification as regards the exposure to environmental climatic factors as per GOST 15150.

3.9 **microclimate maintenance system; MMS:** Aggregation of heating, ventilation and conditioning systems (if provided for in the vehicle design).

3.10 **climate control system:** MMS equipped with devices for automatic maintenance of the specified thermal conditions in the manned space of a vehicle.

3.11 **driver (passenger) head (breathing) zone:** Hemisphere from the face side of the driver (passenger) head limited by distances of up to 150 mm from the face.

3.12 **steady-state temperature:** Mean temperature in the case of temperature changes not exceeding ± 2 °C for 15 min.

3.13 **manned space of vehicle:** Interior vehicle part allocated for the driver (crew, persons escorting the cargo, etc.) and passengers.

4 Requirements for efficiency and safety

4.1 General

4.1.1 Each vehicle shall be equipped with heating and ventilation systems for its manned space.

Conditioning systems are mandatory for vehicles of Category M₃ and Class III, and driver's workplaces (cabins) of vehicles of Category M₃, Class I¹⁾, and recommended for other vehicles.

For modifications VYJI and XJI of Categories N₂, N₃, M₂ and M₃ and Classes II and III, vehicles are additionally equipped with a redundant (emergency) heating system conforming to 4.2.9. This requirement is optional for other vehicles.

4.1.2 Heating, ventilation and conditioning systems shall be supplied with devices controlling their duty, air flowrate, direction of airflow from the outlets, and distribution of airflows over the driver's workplace areas (head zone, feet zone and waist zone).

For vehicles of Categories M₁ and N₁ equipped with a climate control system, switching a temperature control for the manned space to adjacent positions (if they are discrete) shall not lead to temperature changes in the manned space in excess of 3 °C.

4.1.3 Control devices of ventilation, heating and conditioning systems shall be designed to disable such systems completely when required. Individual components of these systems operating automatically from the air flow associated with the vehicle movement (e.g., exhaust valves on the body) may still continue functioning in this case.

4.1.4 If a conditioning system is installed, the vehicle need not be equipped with ventilation system components that duplicate the functions of the conditioning system.

4.1.5 Devices intended to perform individual functions of heating, ventilation and conditioning systems may be combined in a common unit or separate units, as selected by the design.

¹⁾ The Categories are defined in [1].

4.2 Requirements for heating system

4.2.1 The heating system shall either operate with an open air inflow, or support the selection of such operation mode. The flowrate of open air through the heating system shall ensure that the requirements of 4.3.1 are met.

4.2.2 The duty of the heating system and the heat-protection efficiency of the body shall be sufficient to maintain the thermal conditions in the manned space that are specified in Table 1 for different vehicle modifications.

4.2.3 The thermal conditions of Table 1 shall be ensured at an ambient temperature of minus 25 °C (for vehicle modification Y) or minus 50 °C (for vehicle modifications YXJI and XJI), and shall be achieved at an air velocity (mobility) not exceeding 0.6 m/s in the head and waist zones of the driver (crew) and passengers. The air velocity (mobility) in these zones may increase to 1 m/s during the first 10 min (for vehicle modification Y) or 15 min (for vehicle modifications YXJI and XJI) after the start of driving.

The air temperature in the driver's feet zone in steady-state driving conditions shall be by (3 – 10) °C higher than the one in the driver's head zone.

4.2.4 The heating system and the vehicle body shall be designed to avoid any ingress of non-controlled open air flows into the manned space, for example, through the body seals (of windows, doors or hatches), service holes, or interfaces between the structural members.

For vehicles of Category M₃ and Class I, non-tightness in the adjoining areas of the hinges or top/bottom edges of passenger doors and the body or floor (footboard) is permitted upon the condition that the open air flows penetrating due to such non-tightness do not reach the breathing zone of the passengers occupying the seats behind the respective doors.

Table 1 — Requirements for parameters of thermal environment in manned space of vehicle with switched-on heating system

| Manned space zone of concern | Vehicle category | | | | | | | |
|---|--------------------------|-----------------|---|------------------|---|------------------|--|------------------|
| | M ₁ , N | | M ₃ , Class I | | M ₂ , M ₃ , Classes A and II; specialized passenger vehicles | | M ₂ , M ₃ , Classes B and III | |
| | Vehicle modification | | | | | | | |
| | y | YXJI and XJI | y | YXJI and XJI | y | YXJI and XJI | y | YXJI and XJI |
| Temperature values, °C, not less than: | | | | | | | | |
| Feet zone of driver | 18 | 16 | 18 | 16 | 18 | 16 | 18 | 16 |
| Waist zone of driver ¹⁾ | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 |
| Head zone of driver | 12 | 10 | 12 | 10 | 12 | 10 | 12 | 10 |
| Time to achieve temperature from start of driving, min | 15 | 20 | 20 | 30 | 20 | 30 | 20 | 30 |
| Steady-state temperature values, °C, not less than: | | | | | | | | |
| Feet zone of passenger (crew member) | 20 | 18 | — | 0 | — | — | 22 ⁵⁾ | 20 |
| | at first row of seats | | | | | | | |
| Waist zone of passenger (crew member) | 20 | 18 | 15 ²⁾ (seated); 12 ³⁾ (standing) | 10 ³⁾ | 20 ⁴⁾ | 18 ⁴⁾ | 22 ⁵⁾ | 20 ⁵⁾ |
| | | | | | | | for sleeping berth (if available) | |
| Head zone of sitting passenger (crew member) | — | — | — | — | 22 | 20 | 22 ⁵⁾ | 20 ⁵⁾ |
| 1) Does not apply to places equipped with electric heating or with seat cushion heating equivalent in its effect. | | | | | | | | |

Table 1 (continued)

| |
|--|
| ²⁾ The temperature drop to 12 °C is permitted on seats located immediately behind the entrance door. ³⁾ The temperature drop to 10 °C (for vehicle modification Y) or 8 °C (for vehicle modifications YXJI and XJI) is permitted on a standing site closer than 1 m to the entrance door. ⁴⁾ The temperature drop to 18 °C (for vehicle modification Y) or 15 °C (for vehicle modifications YXJI and XJI) is permitted on seats located immediately behind the entrance door. ⁵⁾ The spread of steady-state temperatures in the reference zones (feet, waist and head zones of passengers (crew members)) within the compartment shall not exceed 5 °C not taking into account the temperature rise in local areas adjacent to external surfaces of heaters and their air pipes, and in areas where the heated air flow is immediately directed to. |
|--|

4.2.5 The temperature of those heating system parts that may possibly be touched by the driver (crew) or the passengers in the normal driving conditions shall rise above 70 °C for metallic surfaces or 80 °C for surfaces made of other materials or provided with a non-metallic coating.

4.2.6 The temperature of the heated air supplied to the manned space and measured at the centre of the outlet shall not exceed 150 °C.

4.2.7 Vehicles verified against the requirements of [2] and vehicles with heating systems taking the heat from engine coolant (or analogous liquid if the loops of the heating system and the engine cooling system are separated from each other) are deemed to be compliant with the requirements of 4.2.5 and 4.2.6.

4.2.8 When the heating system is switched off, the heating temperature of any component or any surface section inside the manned space shall not rise above 30 °C due to residual effects of the coolant, or due to heat releases of the engine or other vehicle assemblies and systems.

4.2.9 Any redundant (emergency) heating system of the vehicle shall be either separated from the engine cooling system, or shall enable disconnection from it.

The redundant (emergency) heating system shall be designed to maintain air temperatures not less than 18 °C in the areas of the driver's workplace and the berth (if any) for 8 h at an ambient temperature of minus 50 °C without the need for recharging the batteries or for refuelling.

4.3 Requirements for ventilation system

4.3.1 A system of forced ventilation, operating either separately or in part of heating systems conforming to 4.2.1, and a conditioning system conforming to 4.4.1 and 4.4.2 shall provide the following inflow of free (open) air to the manned space:

- not less than 30 m³/h per each person for vehicles of Categories M and N with up to and including five seats (with the driver's workplace among them), and 7 m³/h per each next passenger in addition;
- not less than 120 m³/h supplied to the driver's workplace (taking into account the flowrate for blow-off of the glazing if required by the design) and not less than 7 m³/h per each person for vehicles of Categories M₂ and M₃ (Classes II and III);
- not less than 180 m³/h supplied to the driver's workplace (taking into account the flowrate for off of the glazing if required by the design) and not less than 7 m³/h per each person for vehicles of Category M₃ and Class I.

4.3.2 The ventilation system shall ensure that 15 min after the start of motion, the temperature in the manned space will drop from an initial temperature at least 1.5 times greater than the ambient one to a temperature at most 3 °C higher than the ambient temperature, if the ambient temperature is (30 ± 3) °C and the total solar intensity is 1000 W/m².

4.3.3 The ventilation system shall be suitable for maintaining the air velocity (mobility) in the head and waist zones of the driver (crew) and passengers within the range of (0.5 – 1.5) m/s.

4.3.4 If the ambient temperature is above 17 °C, the air supplied (pumped) to the cabin and the manned space shall not be heated by more than 3 °C as compared to the ambient temperature.

This requirement shall not apply if the driver's workplace is equipped with a conditioning system or a separate fan, and complying with the requirements of 4.3.2 is achieved by the use of natural ventilation while meeting the requirements of 4.2.8.

4.4 Requirements for conditioning system (if available)

4.4.1 The conditioning system shall either operate with an open air inflow, or support the selection of such operation mode. The flowrate of open air through the conditioning system shall ensure that the requirements of 4.3.1 are met.

4.4.2 The conditioning system shall provide the means for controlling generation and direction of air flows. The overall switch-on/switch-off of the conditioning system is done from the driver's workplace.

Outlets of each conditioning system for passenger compartments shall be designed to supply the cooled air into areas that are free of passengers (crew) in normal operating conditions (upper zone of the compartment, passages, sites at the doors, etc.). For vehicle Categories M₁, N, M₂ and M₃, Classes A, I and II, and for specialized vehicles, this requirement is considered satisfied if the outlets are equipped with devices (headers, shutters, blinds, or similar) capable of changing the direction and intensity of air flows from at least one passenger place.

Vehicles of Categories M₂ and M₃ and Classes B and III, shall be designed to provide an additional supply of the cooled air through individual channels to each passenger place, with possible control of the air flow intensity and direction, and with complete disabling the air flow if necessary.

Providing individual channels is not required if the automatic control of the conditioning system ensures that the specified temperature is maintained, and the spread of steady-state air temperatures along the length of the passenger compartment is at most 3 °C at the passenger and crew seats. Upon that, the cooled air flow shall not be directed immediately to human breathing zones.

4.4.3 The conditioning system shall ensure that the air temperature in head zones of the driver (crew) and passengers in the manned space will decrease within 10 min for vehicles of Categories M₁ and N or 20 min for vehicles of Categories M₂ and M₃ after the conditioner start-up time (immediately after the engine start-up) from an initial temperature at least 1.5 times greater than the ambient one to a temperature at most 3 °C higher than the ambient temperature, if the ambient temperature is (30 ± 3) °C and the total solar intensity is 1000 W/m².

The above temperatures shall be achieved at an air velocity (mobility) not exceeding 0.3 m/s in head zones of the driver (passengers). The air velocity (mobility) in these zones may increase to 0.5 m/s within the first 5 min for vehicles of Categories M₁ and N or 10 min for vehicles of Categories M₂ and M₃ after the conditioning system is started.

4.4.4 The conditioning system shall not decrease the relative humidity in the manned space below 30 % in steady-state driving conditions.

4.4.5 The temperature of those conditioning system parts (excluding the outlets for the cooled air) that may possibly be touched by the driver (crew) or the passengers in normal driving conditions shall not decrease below 15 °C.

4.4.6 The air temperature at the output of the conditioning system shall not be less than 0 °C.

4.4.7 A coolant used in the conditioning system shall not belong to substances depleting the ozone layer, in accordance with [3].

4.4.8 Vehicles equipped with a conditioning system that meets the requirements 4.4 are deemed conforming to clauses 4.3.2-4.3.4 of this Standard.

5 Conditions of works for vehicle conformity assessment against requirements of this Standard

5.1 The recommended conditions and procedure of activities pertaining to the vehicle conformity assessment against the requirements of this Standard are presented in Appendix A.

5.2 For the purposes of conformity assessment, a vehicle submitted to the testing laboratory shall be provided with the technical description containing the data specified in Appendix B. For the purposes of other tests, supplying the data within the scope necessary to prepare of a reporting document (test report) is considered sufficient.

5.3 The test report shall comply with the requirements of GOST 33557.

Appendix A (recommended)

Conditions and procedure of works for vehicle conformity assessment against requirements of this Standard

A.1 General conditions of tests

A.1.1 Test item

A.1.1.1 The test item shall be in a good condition. The settings of assemblies, mechanisms and systems shall correspond to those indicated in the operation manual (OM). The fuel, lubricants and working fluids to be used shall meet the manufacturer's prescriptions. For electric accumulator vehicles (abbreviated as "EAV" below), the charge of accumulator batteries prior to the tests shall be from 75 to 90 % of their nominal capacity (to be measured using a standard instrument).

A.1.1.2 The loading of the test item shall be partial (driver, operator and instrumentation).

A.1.1.3 During the tests, all microclimate maintenance systems (i.e., heating, ventilation and conditioning ones) shall operate with an open air inflow at the maximum efficiency (for heating, the driver's workplace shall be viewable through the area cleaned with a window wiper and through the indirect viewing tools) and air mobility as per 4.2.3, 4.3.3 and 4.4.3, unless otherwise specified in Table A.1. The recommended positions of controls are defined by the manufacturer or otherwise determined by expert examination. An automatic control mode of the microclimate maintenance system, if available, is considered as the recommended one, unless otherwise specified by the manufacturer.

Changing the positions of controls by the operator is always permitted during the tests if it ensures a more efficient operation of the microclimate maintenance system.

A.1.1.4 Driving mode

A.1.1.4.1 Motion shall be steady, at a speed of (60 ± 10) km/h for vehicles Categories M₁ and N₁, (50 ± 10) km/h for other vehicles (excluding trolleybuses), and (40 ± 10) km/h for trolleybuses.

A.1.1.4.2 The gearbox (GB) shall be set to automatic mode (for vehicles with automatic GB control), or to the highest gear possible for the given mode as per the OM (for vehicles with manual GB control).

A.1.2 Test site

The test site shall be a road with solid paving, with gradients and turn radii not affecting the stated driving modes, or an aero-climatic chamber with treadmills. In the latter case, the load on drive wheels shall correspond to driving along the road with solid paving.

A.1.3 Atmospheric (climatic) conditions

A.1.3.1 The ambient temperature during the tests shall be among the ones used to set the rated values of estimated performance indicators of the respective MMS systems, within a ± 3 °C tolerance.

A.1.3.2 The wind speed shall not exceed 3 m/s.

A.1.3.3 The relative humidity shall be (30–60) % in the tests of ventilation and conditioning systems, and is not specified for the tests of heating systems.

A.1.3.4 The (total) solar intensity shall be within $(1000 \pm 100)^{1)}$ W/m² in the tests of ventilation and conditioning systems, and shall not cause any additional air temperature rise in the manned space in the tests of heating systems.

A.2 Metrological support of tests

A.2.1 All instruments and equipment shall be in a good condition, and duly calibrated.

A.2.2 The maximum admissible error of measuring instruments shall be:

- | | |
|---|-------------------------------------|
| - temperature | $\pm 0.5\text{ }^{\circ}\text{C}$; |
| - time | $\pm 10\text{ s}$; |
| - air velocity (mobility) v : up to 1 m/s (inclusive) | $\pm (0.05 \pm 0.05v)\text{ m/s}$; |
| above 1 m/s: | $\pm (0.1 \pm 0.05v)\text{ m/s}$; |
| - solar intensity | $\pm 2\text{ }\%$; |
| - humidity | $\pm 5\text{ }\%$; |
| - linear dimensions | $\pm 5\text{ mm}$. |

¹⁾ Upon agreement with the manufacturer, tests at a solar intensity exceeding the specified upper limit are permitted.

A.2.3 Places selected for measurements of temperatures and air velocities (mobility) specified for reference zones or used to estimate parameters

A.2.3.1 Head zone of the driver (seated passenger): at (700 ± 25) mm from point R¹⁾ up along the line parallel to the seat back plane in the design position specified by the manufacturer — for passenger seats²⁾ not occupied during the tests; or from the left and right at (200 ± 10) mm from the vertical symmetry plane of the seat — for seats of the driver and seat of the passenger next to him³⁾ if occupied by the operator.

A.2.3.2 Waist zone of the driver (seated passenger): at (100 ± 10) mm from point R up along the line parallel to the seat back plane in the design position specified by the manufacturer — for passenger seats not occupied during the tests; or from the left and right in vertical planes parallel to the symmetry plane of the seat and tangent to seat sides, but not closer than 50 mm to elements enclosing the manned space in this zone — for seats of the driver seat and seat of the passenger next to him, if occupied by the operator.

A.2.3.3 Feet zone of the driver (seated passenger): at (50 ± 10) mm from the floor surface in the area enclosed by two planes parallel to the vertical symmetry plane of the seat and located at 220 mm from the left and right from that plane. The places of measurements shall not be closer than 50 mm to structural elements enclosing this zone (if any), and shall be located in the area of direct exposure to the air flow leaving the outlet of the heater.

The number of places for measurements and transmitter (sensor) locations is selected by the operator depending on the design and size of this zone.

A.2.3.4 Feet, waist and head zones of a standing passenger: at (50 ± 10) mm, (1000 ± 100) mm and (1600 ± 100) mm above the floor surface, respectively.

A.2.3.5 Place for rest (berth): along the longitudinal centreline, at (100 ± 10) mm above the surface and at (100 ± 10) mm from vertical planes enclosing the berth zone by its length.

A.2.3.6 At the MMS input: at the outlet centre outside the vehicle.

A.2.3.7 At the MMS output: at the outlet centres inside the vehicle, at (10 ± 5) mm from the plane perpendicular to the flow and tangent to the structural components of the outlet.

A.2.3.8 The parameters in the zones specified in A.2.3.1—A.2.3.4 are measured in the following locations of the driver (passenger) along the vehicle length:

- at the driver's workplace and passenger (crew) seat next to the driver's one (if present): for all vehicle Categories. If several passenger (crew) seats are in the same row with the driver's seat, the measurements shall be carried out for the extreme right seat;

- at the extreme left and right seats in each row: for vehicle Categories M₁ and N;

- at the extreme left and right seats of the first row after the driver's workplace, and if the number of such seats exceeds four, also at the extreme seats of the middle row in the passenger compartment: for vehicle Categories M₂ and M₃;

- at seats located directly behind the entrance doors;

- standing site: at the centre and at (1000 ± 100) mm from the entrance door: for vehicle Categories M₂ of Classes B and M₃ and Classes I and II;

- at the centre of the manned space, at (1600 ± 100) mm: in the passenger compartment of vehicle Categories M₂ and Classes B and M₃ or Classes I and II.

In certain cases, the places for measurements may be adjusted by the operator depending on the design features of the manned space of the vehicle.

A.2.4 Places selected for measurements of surface temperatures

A.2.4.1 Places of possible contacts of MMS components with humans (driver, crew, passengers).

A.2.4.2 Places of heating from the engine and other vehicle assemblies and systems (specified by the expert responsible for the tests).

A.2.5 Places selected for measurements of humidity in manned space

A.2.5.1 At the geometric centre of the horizontal section of each manned space, at a height of the driver (passenger) head zone: for all vehicle Categories, excluding the passenger compartment of vehicles Category M₂, of Classes B and M₃ and Classes I and II, and at a height of (1600 ± 100) mm in the passenger compartment of vehicles Category M₂, of Classes B and M₃ and Classes I and II.

¹⁾ Point R (the reference seat point) is a design point specified by the manufacturer and bound to the 3D coordinate system of the vehicle. Measurements are also permitted from point H determined using a volumetric device (three-dimensional manikin) that is arranged on the seat.

²⁾ Here and in A.2.3.2—A.2.3.3: including the seat of a crew member (second driver, conductor, guide, etc.).

³⁾ For vehicle Categories M₂ and M₃, a tip-up seat of a crew member (guide) in the front part of the compartment is considered to be in the same row with the driver's seat.

A.3 The specifics, conditions and recommended sequence of activities for the vehicle conformity assessment against the requirements of separate clauses of this Standard are detailed in Table A.1.

Table A.1 — Recommended sequence of activities for vehicle conformity assessment against requirements of this Standard

| Clause containing object of assessment | State of object; test conditions | Designation of work stages and recommended sequence of their completion during conformity assessment |
|---|--|---|
| Conformity assessment against requirements of 4.1 ("General") | | |
| 4.1.1; 4.1.2 (first paragraph); 4.1.3—4.1.5 | Parked vehicle | Expert examination |
| Conformity assessment against requirements of 4.2 ("Requirements for heating system") | | |
| 4.2.1 | Parked vehicle | Expert examination; see also the conformity assessment against the requirements of 4.3.1 (for heating mode) |
| 4.2.2 — 4.2.6 | Expert examination or preliminary runs (conditions are not specified) ¹⁾ | 1. Determine the position of controls that corresponds to A.1.1.3 and internal surfaces (zones) of the manned space (MS) subject to heating from the engine and other assemblies and systems. Complete an expert examination against 4.2.4 |
| | Motionless vehicle. Engine is off (for EAV, AB is not powered/charged from external supply), heating system is off, windows and/or doors are closed. Driver and operator are outside vehicle | 2. Cool the MS at the parking in conditions of A.1.3.1 until the reference zone temperatures close to the ambient temperature are achieved (within the tolerances of 5 °C for vehicles of Category M ₃ and 3 °C for vehicles of other Categories), but for at least 1 h |
| | Driver is in vehicle. Heating system is on, windows and/or doors are opened. Standard engine heating devices (if any) are in use | 3. Start the engine, warm up for 15 min for vehicle Categories M ₁ and N ₁ or 20 min for vehicle Categories N ₂ , N ₃ and M ₂ , M ₃ (excluding trolleybuses and EAV) |
| | Driver and operator are in vehicle. Heating system mode is as in A.1.1.3. Driving mode is as in A.1.1.4. Heating duty of heating system may be decreased after air temperature reaches 24 °C in "coldest" reference zone of MS | 4. Close the windows, doors and air holes ²⁾ . Switch on the heating system. Wait for 2 min for vehicle Categories M ₁ and N (excluding EAV), 5 min for EAV ³⁾ and vehicles of other Categories (excluding trolleybuses) and 10 for trolleybuses; then start moving and counting the reference time |
| | | 5. After the expiration of the reference time, record the temperatures in the reference zones (head, waist and feet zones of the driver). Check the results against 4.2.2 and 4.2.3 (in regard to expiration of the rated reference time from the start of movement) |
| | Driver and operator are in vehicle. Heating system mode is as in A.1.1.3. Driving mode is as in A.1.1.4. Heating duty of heating system may be decreased after air temperature reaches 24 °C in "coldest" reference zone of MS | 6. Continue moving until the steady-state temperatures are reached in the MS, but not longer than 60 min for vehicle modification "Y" or 90 min for vehicle modification "YXJI" ("XJI"). Record the steady-state temperatures in the reference zones (head, waist and feet zones of the passenger, berth) and at the heater(s) output(s), and surface temperatures. Check the results against 4.2.2 and 4.2.3 (in regard to the steady-state mode ratings), 4.2.5 and 4.2.6 |
| | | 7. Record the air flowrate at the output from one of the heater outlets in the MS (for its later assessment as per 4.3.1) |

Table A.1 (continued)

| Clause containing object of assessment | State of object; test conditions | Designation of work stages and recommended sequence of their completion during conformity assessment |
|---|---|---|
| 4.1.2 (second paragraph) | Movement continues in mode corresponding to A.1.1.4 | 8. For climate control systems with discrete regulation of the MS temperature, successively set the control governing this temperature to adjacent positions. After 10 min of driving with each control position, measure the temperature in the MS reference points. Check the conformity to 4.1.2 (second paragraph) |
| 4.2.9 | Parked vehicle. Engine is off. Using remote monitoring and control of heater operation (with no operator inside vehicle) is recommended | 9. Stop the vehicle, shutdown the engine, switch on the redundant (emergency) heating system, set the control governing the heat duty to the position where an air temperature not less than 18 °C is maintained in the driver's workplace areas. Start counting the reference time. Check the result against 4.2 |
| Conformity assessment against requirements of 4.3 ("Requirements for ventilation system") | | |
| 4.3.1 ⁴⁾ | Motionless vehicle. Windows, doors and air holes are closed. Controls of air flow distribution are in position set when steady-state temperatures for respective test mode were determined (conditions are not specified) | <p>1. Change the rotary speed of discharge unit fans to set the air flow from the outlet to the value corresponding to the one recorded in the tests of the respective system (heating as per 4.2.1—4.2.6 (step 7 for the check of conformity to 4.2), ventilation (as per requirements of A.1.1.3) or conditioning system as per 4.4.3—4.4.5 (step 9 for the check of conformity to 4.4))</p> <p>2. For the air flow from the MMS outlet set as above, measure the inflow volume of the fresh air through the inlet to the system of forced ventilation. Check the conformity to 4.3.1</p> |
| 4.2.8; 4.3.2—4.3.4 | Expert examination or preliminary runs | 1. Determine the position of controls corresponding to A.1.1.3 and the internal MS surfaces (zones) subject to heating from the engine and other assemblies and systems. Check the vehicle conformity to the requirements of 4.3.3 |
| 4.2.8; 4.3.2—4.3.4 | Motionless vehicle. Engine is off, MMS is off, windows and/or doors are closed. Driver and operator are not in vehicle | 2. Keep the vehicle in the conditions specified in A.1.3 for at least 1 h, or until the temperatures in the MS reference zones become 1.5 times greater than the ambient temperature |
| | Driver and operator are in vehicle. System is on, its mode is as in A.1.1.3 | 3. Start the engine. Switch on the ventilation system. Wait for 1 min for vehicle Categories M ₁ and N or 2 min for other vehicle Categories, then close the doors, and start moving and counting the reference time |
| | Vehicle is moving | 4. After the expiration of the reference time from the time of movement, record the temperatures in the reference zones (head zones of the driver and passengers). Check the conformity to 4.3.2 |
| | | 5. Continue moving until the steady-state temperatures in the MS are reached, but at most for 60 min |
| | | 6. Record the steady-state air temperatures at the input and output of the system of forced ventilation. Check the conformity to 4.3.4 |

Table A.1 (continued)

| Clause containing object of assessment | State of object; test conditions | Designation of work stages and recommended sequence of their completion during conformity assessment |
|--|---|--|
| 4.2.8; 4.3.2—4.3.4 | Vehicle is moving | 7. Record the temperatures of MS surfaces (zones) heated from the engine and other assemblies and systems. Check the conformity to 4.2.8 |
| Conformity assessment against requirements of 4.4 ("Requirements for conditioning system") | | |
| 4.4.1 | See conformity assessment as per 4.3.1 (for ventilation mode) | See the conformity assessment against 4.3.1 (for ventilation mode) |
| 4.4.2 (excluding last paragraph) | Parked vehicle | Expert examination |
| 4.4.2 (last paragraph), 4.4.3—4.4.6 | Expert examination or preliminary runs | 1. Determine the position of controls corresponding to A.1.1.3 and internal MS surfaces (zones) subject to cooling when the conditioning system operates |
| | Motionless vehicle. Engine is off, MMS is off, windows and/or doors are closed. Driver and operator are not in vehicle | 2. Keep the vehicle in conditions of A.1.3 for at least 1 h or until the temperatures in the MS reference zones become 1.5 times greater than the ambient temperature |
| | Driver and operator are in vehicle. System is on, its mode is as in A.1.1.3 | 3. Start the engine. Switch on the conditioning system. Wait for 1 min for vehicle Categories M ₁ and N or 2 min for other vehicle Categories, then close the windows, doors and air holes, and start counting the reference time |
| | Vehicle is moving. Duty of conditioning system may be reduced after air temperature reaches 22 °C in "hottest" reference zone of MS | 4. After the expiration of the reference time, record the temperatures in the reference zones (head zones of the driver and passengers). Check the conformity to 4.4.3 |
| | | 5. Continue moving until the steady-state temperatures in the MS are reached, but at most for 60 min Check the conformity to 4.4.2 (last paragraph) for vehicle Categories M ₂ and M ₃ , Classes B and III |
| | | 6. Record the air humidity in the MS. Check the conformity to 4.4.4 |
| | | 7. Record the temperatures of MS surfaces (zones) subject to cooling when the conditioning system operates. Check the conformity to 4.4.5 |
| | | 8. Record the steady-state air temperature at the input and output of the conditioning system. Check the conformity to 4.4.6 |
| | | 9. Record the air flow rate at one of the outlets of the conditioning system in the MS (for the assessment of conformity to 4.3.1 in the conditioning mode) |
| 4.4.7 | Expert examination of technical documents (manufacturer's declaration, technical description, vehicle marking, etc.) | Determine if the coolant type in use belongs to substances not depleting the ozone layer as stated in [3] |
| ¹⁾ The actual atmospheric (climatic) conditions may deviate from the ones indicated in A.1.3. Whether the work in the actual conditions is possible is decided by an expert. ²⁾ Here in below, the specified requirement does not apply to natural ventilation devices opening and closing automatically. | | |

Table A.1 (continued)

³⁾ If the heating system design and the OM provide for a pre-heating of the manned space prior to EAV movement. If such mode is not supported, the heating system is switched on in accordance with the OM, and counting of the reference time is started 2 min after the start of movement.

⁴⁾ The special remarks regarding the assessment of conformity to this requirement are given in A.4.

A.4 Special remarks regarding conformity assessment against 4.3.1

A.4.1 When the conformity to 4.3.1 is assessed using the method specified in Table A.1, the ratio between the flowrates at the input of the forced ventilation system and the output from the respective outlet in the manned space may be evaluated in advance (in the tabular or analytic form) for a number of characteristic rotary speeds (minimum, maximum, and 1—2 intermediate) of fans included in the heating unit. The sought-for open air flowrate is determined using the well-known methods of mathematical statistics (interpolation or extrapolation of the obtained dependence).

A.4.2 The tests with the forced ventilation system operating independently are only carried out when the vehicle design includes no means for natural ventilation of the manned space.

A.4.3 The tests for conformity assessment against 4.3.1 in the conditioning mode may be omitted if the open air flowrate in the heating mode exceeds the normative value by 20 % or above.

A.4.4 The use of other methods including computational ones and those based on expert examination of technical documents is permitted provided that they ensure the required accuracy of the results.

Appendix B (mandatory)

Technical description of vehicle for conformity assessment application

B.1 The technical description shall include the following information.

B.1.1 General information:

- vehicle model;
- vehicle type;
- vehicle modification(s);
- trade name of vehicle;
- vehicle Category;
- VIN code;
- applicant and their address;
- manufacturer and their address;
- manufacturer's representative and their address;
- assembly plant/plants and its/their address/addresses (if any);
- supplier of packages for assembly (if any);
- list of models, modifications and versions this technical description applies (if any).

B.1.2 General specifications of vehicle:

- type of body;
- engine layout/arrangement diagram;
- number of seats, passenger capacity;
- engine mark/type, brief specifications;
- transmission type;
- description of vehicle marking;
- general view drawing of vehicle with indication of overall dimensions and body layout (cabin, compartment, passenger rooms).

B.1.3 Ventilation system of vehicle:

- type of ventilation system (natural, forced, combined);
- mark/type of discharge unit (fan) of forced ventilation system;
- number of fans included in forced ventilation system (provide a drawing (diagram) indicating the locations of system fans);
- performance of fans included in forced ventilation system (m^3/h);
- number of hatches and opening windows for natural ventilation of vehicle (provide a drawing (diagram) indicating the locations of windows and hatches for natural ventilation of the vehicle);
- locations of open air intake into forced ventilation system and locations of air venting to vehicle (provide a drawing (diagram) indicating these locations);
- ventilation system controls (provide a drawing (diagram) of ventilation system controls, indicate their operating/non-operating positions and describe the permitted/recommended operating modes);
- additional information (if any).

B.1.4 Heating system of vehicle:

- operating principle of heating system (by the heat source in use);
- diagram of heating system with indication of heater(s) location(s) on vehicle (provide a drawing (diagram) of such locations);
- mark/type of heater(s);
- identification of heaters (heating duty, marking, drawing, etc.);
- discharge unit (fan) productivity of heaters (m^3/h) as regards open air supply to manned space of vehicle;
- heating system controls (provide a diagram of such controls, indicate their operating/non-operating positions and describe the permitted/recommended operating modes);

- additional information (available documents attesting the conformity to [2]).
- B.1.5 Conditioning system of vehicle:
- mark/type of conditioning system (with indication of its productivity and coolant type);
 - conditioner location on vehicle (provide a drawing (diagram) of the conditioning system);
 - identification of main components of conditioning system (marking, diagram/drawing, photograph, etc.);
- regards open air supply to compartment (m^3/h);
- mark/type of discharge unit (fan) of forced ventilation system with indication of air productivity as regards open air supply to compartment (m^3/h);
 - conditioner controls (provide a diagram of such controls, indicate their operating/non-operating positions and describe the permitted and/or recommended operating modes);
 - additional information (if any).

Bibliography

- [1] ECE/TRANS/WP.29/78/ Consolidated resolution on the construction of vehicles (R.E.3) of the Inland Transport Committee of the UNECE
- [2] UNECE Regulation No. 122 Uniform technical prescriptions concerning the approval of vehicles of Categories M, N and O with regard to their heating systems
- [3] Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal, September 16, 1987) (Bulletin of International Agreements No. 7 as of the year 2006, "Legal Literature" publishing house of the RF Presidential Administration)

UDC 629.114.00117.5.001.4:006.354

ICS 43.060.40

Keywords: automobile vehicles, manned space, heating, ventilation, conditioning, temperature, climatic modification, technical requirements, efficiency, safety

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