QC

AUTOMOBILE INDUSTRY STANDARD

OF THE PEOPLE'S REPUBLIC OF CHINA

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QC/T 727-2017

Replacing QC/T 727-2007

Instrument for automobile and motorcycle

汽车、摩托车用仪表

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Number, name and date of implementation of 22 automotive industry standards

No.	Standard number	Standard name	Number of standard replaced	Date of implementation
301	QC/T 727-2017	Instrument for automobile and motorcycle	QC/T 727-2007	2017-10-01
302	QC/T 803-2017	Oxygen sensor for automobile	QC/T 803.1-2008	2017-10-01
303	QC/T 1072-2017	Gear position sensor for automobiles		2017-10-01
304	QC/T 1073.1-2017	Accelerometers for automobiles - Part 1: Linear accelerometers		2017-10-01
305	QC/T 1074-2017	Technical specifications for automotive parts remanufacturing products		2017-10-01
306	QC/T 1075-2017	Technical conditions for metal honeycomb carrier of exhaust catalytic converter		2017-10-01
307	QC/T 777-2017	Technical conditions for electromagnetic fan clutch of automobile	QC/T 777-2007	2017-10-01
308	QC/T 1076-2017	Performance requirements and test methods for continuously variable transmission (CVT)		2017-10-01
309	QC/T 1077-2017	Terminology and definitions for classification of automatic control transmission for automobile		2017-10-01
310	QC/T 1078-2017	Advertising vehicle		2017-10-01
311	QC/T 1079-2017	Suction & delivery vehicle		2017-10-01
312	QC/T 1080-2017	Mobile loudspeaker for popularization of science		2017-10-01
313	QC/T 1081-2017	Electric power steering device for automobile		2017-10-01
314	QC/T 1082-2017	Motor for electric power steering device of automobile		2017-10-01
315	QC/T 1083-2017	Controller for electric power steering device of automobile		2017-10-01
316	QC/T 1084-2017	Sensor for electric power steering device of automobile		2017-10-01
317	QC/T 1085-2017	X-ray testing for light-alloy wheel of motorcycle		2017-10-01
318	QC/T 1086-2017	Technical conditions for range extenders for electric vehicles		2017-10-01

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009 “Directives for standardization - Part 1: Structure and drafting of standards”.

This standard is the revision of QC/T 727-2007 “Instruments for automobiles and motorcycles”.

As compared with QC/T 727-2007, the main changes of this standard are as follows:

- MODIFY the content of the application scope of standard, ADD the clock products;
- MODIFY the content of the normative references;
- IMPROVE the upper limit of the temperature range;
- ADD the content of the clock unit;
- ADD the content of the basic error of the clock;
- ADD the requirements that the response time of the speedometer and tachometer is to be determined through negotiation between the supplier and the purchaser;
- CHANGE the name of the temperature influence test into the temperature resistance test;
- CHANGE the technical conditions and test methods for vibration resistance, to refer to the relevant contents of GB/T 28046.3;
- CHANGE the voltage fluctuation range in the operating voltage performance, to make it consistent with the relevant content in GB/T 28046.2;
- ADD the contents of the antistatic discharge performance and conducted-interference resistance;
- DELETE the contents of voltage interference test;
- CHANGE the content of radiated-interference resistance;
- ADD the contents of the test methods of the antistatic discharge and the conducted-interference resistance;
- ADD the content of the clock’s basic error test;

Instrument for automobile and motorcycle

1 Scope

This standard specifies the classification, requirements, test methods, inspection rules, marking, packaging, storage and preservation of instruments for automobiles and motorcycles (hereinafter referred to as “instruments”).

This standard applies to speed odometers, tachometers, fuel gauges, thermometers, pressure gauges, voltmeters, ammeters and clocks (hereinafter referred to as “instruments”) for automobile and motorcycle. Other instruments for motor vehicles may also make reference to this standard.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this standard.

GB 15082 Speed meters for motor vehicle

GB/T 191 Packaging - Pictorial marking for handling of goods

GB/T 2423.17 Environmental testing for electric and electronic products - Part 2: Test method - Test Ka: Salt mist

GB/T 2423.22 Environmental testing - Part 2: Tests methods - Test N: Change of temperature

GB/T 2423. 34 Environmental testing - Part 2: Test methods - Test Z/AD: Composite temperature/humidity cyclic test

GB/T 2828.1 Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection

GB/T 8170 Rules of rounding off for numerical values & expression and judgement of limiting values

GB/T 19951 Road vehicles - Test methods for electrical disturbances from electrostatic discharge

4.2.7 The unit of the pressure gauge is generally expressed in megapascals (MPa). In principle, it is not less than two divisions: the lower limit value - the intermediate value - the upper limit value, wherein the intermediate pressure value is about one-half of the upper limit value of pressure.

4.2.8 The unit of clock is generally expressed in hours (h), minutes (min) and seconds (s).

4.3 Appearance

4.3.1 The protective layer shall be uniform, free from obvious bubbles, spots, rust, falling off, or other defects.

4.3.2 Glass or other transparent materials shall not have scratches or refractions that affect accurate readings.

4.3.3 The division lines, symbols, numbers and other markings on the dial shall be clear and complete.

4.3.4 The exposed portion of the meter indicator shall not have glare.

4.3.5 When the electrical instrument indicator is not working, its pointer shall be below the initial division, it may also touch the starting division line. When the mechanical instrument is not working, its pointer shall stop at the backstop position, it shall not leave the starting division line.

4.3.6 The speedometer is used to record the number on the digital wheel of the driving mileage, such number shall be completely arranged in the mileage count window. For the mechanical mileage counter, the color indicating the numbers of integer mileage and the decimal mileage shall be clearly distinguishable. The integer part and the decimal part of the digital-display mileage counter shall be clearly distinguishable. The cumulative mileage at the time of exit-factory shall not exceed 10 km.

4.4 Indication status

When the signal changes smoothly, the pointer movement shall be smooth and there shall be no jamming. For the digital-display instrument, when the signal changes smoothly, its display value shall change accordingly, the display is normal. At a constant angular velocity, the tachometer’s pointer is within the range of 20% ~ 80% of the upper limit of speed in the scale; the speedometer’s pointer is within a speed range of more than 20 km/h to 80% of the upper limit of scale; the amount of swing shall be within ±1% of the upper limit.

4.5 Basic error

4.5.1 Under the environmental conditions as specified in 4.1.2, the basic error of the pressure gauge is:

4.6.2 When the fuel gauge is abruptly changed from the lower limit to the upper limit, the pointer of the fuel gauge shall point to more than 90% of the full arc length of the scale within 3 min.

4.6.3 When the thermometer is abruptly changed from the lower limit value to the upper limit value, the pointer of the thermometer shall point to more than 90% of the full arc length of the scale within 2 min.

4.6.4 When the test voltage value is abruptly changed from the lower limit value to the upper limit value of voltage of the voltmeter scale, the pointer shall point to more than 90% of the full arc length of the scale within 2 min.

4.6.5 The response time of the pointer of the speedometer and tachometer is determined by negotiation between the supplier and the purchaser.

4.7 Damping of ammeter's pointer

When the ammeter's pointer moves to the upper limit of the scale, if cutting off the current, the pointer must stop swinging within 3 s.

4.8 Overload (pressure gauge, ammeter)

4.8.1 Mechanical pressure gauges shall be capable of withstanding an overload test of 1.2 times the upper limit pressure of the scale.

4.8.2 For the amperemeter whose upper limit value of current on the scale is less than 50 A, it shall be able to withstand the overload test with three times the upper limit value of current. For the amperemeter whose upper limit value of current on the scale is equal to or more than 50 A, it shall be able to withstand the overload test with two times the upper limit value of current.

4.8.3 After the test, it shall comply with the provisions of 4.4 and 4.5.

4.9 Torque of speedometer of magnetic-induction type

The torque for moving the mechanism of the speedometer of the magnetic-induction type shall not exceed 0.02 N • m.

4.10 Withstanding voltage of insulation

The electrical instrument shall be capable of withstanding a test at the voltage of 50 Hz and an actual sine wave of 550 V for 1 min. The insulation shall not be broken down.

4.11 Resistance to temperature changes

The storage temperature and working temperature range of the instrument are as shown in Table 4. The instrument shall be subjected to the test of resistance

h.

5.3.9 The clause 4.4 shall be checked in this test.

5.4 Test of pointer's response time

5.4.1 Make the pressure gauge stably indicate the upper limit of pressure of the scale, then abruptly change the signal source to the 0 position to output the nominal value. When the pointer points to 10% of the upper limit value of pressure, record the response time of the pointer.

5.4.2 Make the fuel gauge stably indicate the 0-division line of the scale, then abruptly change the signal source to the 1-division line of the scale to output the nominal value. When the pointer points to 90% of the full position value of scale, record the response time of the pointer.

5.4.3 Make the thermometer stably indicate the lower limit of temperature of the scale, then abruptly change the signal source to the upper limit of temperature of the scale to output the nominal value. When the pointer points to 90% of the upper limit of temperature of the scale, record the response time of the pointer.

5.4.4 Adjust the power supply voltage, so that the voltmeter's pointer points to the lower limit of voltage. After the indication is stable, abruptly change the voltage of power supply to the upper limit of voltage of the scale. When the pointer points to 90% of the upper limit of the scale, record the response time of the pointer.

5.5 Damping test of ammeter's pointer

Record the time elapsed when the ammeter's pointer returns from the division line of the upper limit of the scale after cut-off of power to motionless at 0 position. It shall take the average of the time which is measured in three tests.

5.6 Overload test

5.6.1 For the mechanical pressure gauge, it shall apply the pressure 1.2 times the upper limit of pressure on the scale for 1 min. After the test, the pressure gauge shall be placed at the environmental conditions as specified in 4.1.2 for not less than 4 h.

5.6.2 Connect the ammeter into a circuit where the current value is three times (or two times) the upper limit of the scale for 1 s, the test current is only applied in either direction.

5.6.3 In accordance with the method specified in 5.3, check the indication status and the basic error.

5.7 Test of magnetic-induction speedometer's torque

First check the indicated value of the instrument under the environmental conditions as specified in 4.1.2, then put the instrument into the high-temperature box, heat up to 70 °C ± 2 °C with the box, maintain the temperature for 2 h, then use the method as specified in 5.3 to check the indicated value, thereby obtain the difference between the high-temperature and the indicated value of the environmental conditions as specified in 4.1.2. Then take out the instrument, place it under the environmental conditions as specified in 4.1.2 for not less than 4 h, use the method as specified in 5.3 to check its indication status and indicated value.

5.10.3 Test of resistance to low-temperature.

First check the indicated value of the instrument under the environmental conditions as specified in 4.1.2, then put the instrument into the low-temperature box, lower the temperature to -30 °C ± 3 °C with the box, maintain the temperature for 2 h, then use the method as specified in 5.3 to check the indicated value, thereby obtain the difference between the low-temperature and the indicated value of the environmental conditions as specified in 4.1.2. Then take out the instrument, place it under the environmental conditions as specified in 4.1.2 for not less than 4 h, use the method as specified in 5.3 to check its indication status and indicated value.

5.10.4 Inspection of instrument's indicated values in high-temperature and low-temperature status.

If the conditions are not available, it may also take the instrument out of the box to carry out test immediately, it must not exceed 2 min.

5.11 Test of resistance to cyclic temperature & humidity change

Put the instrument into the test box in accordance with the normal working position, set the parameters in accordance with the test parameters as given in Figure 1. The test is carried out in the non-working state. After the test is finished, it shall be placed for not less than 4 h under the environmental conditions as specified in 4.1.2. Then use the method as specified in 5.3 to check the indication status and indicated value.

5.12 Test of resistance to vibration

It is performed in accordance with the provisions of GB/T 28046.3. Fix the instrument on the vibration test bench and in the normal installation position, carry out the test under working condition. During the test, check whether parts are loose or damaged and whether the indication status is normal. Then place the instrument under the environmental conditions as specified in 4.1.2 for not less than 4 h, use the method as specified in 5.3 to check its indication status and indicated value.

5.17 Test of conducted immunity

The test of the electrical transient conducted immunity of the power line of the instrument shall be carried out in accordance with the relevant provisions of GB/T 21437.2 and GB/T 21437.3, or in accordance with the methods approved by both parties after consultation with the user.

5.18 Test of radiated immunity

5.18.1 Test point.

During the test, the electronic and electrical instruments shall point to the intermediate value.

5.18.2 Test of radiated immunity.

The test of radiated immunity of the instrument shall be carried out in accordance with the regulations of GB/T 17619, or in accordance with the methods approved by both parties after consultation with the user.

5.19 Test of durability

5.19.1 The pressure gauge shall be installed on the test bench in accordance with the normal working position, the pressure gauge shall be subjected to the full-scale alternating cycle, rising from the lower limit of the scale to the upper limit of the scale and then returning back to the lower limit of the scale, which forms a cycle, totally 30000 cycles are performed. During the test, it shall use the visual inspection method to check whether there is abnormal change for each part.

5.19.2 When the tachometer is installed on the test bench in accordance with the normal working position for the test, the tachometer is subjected to alternating speed cycle. For each cycle, make the indicated speed rise from 50% of the upper limit of speed value of the scale to 80%, then return back to 50% of the upper limit of the speed value, the test is lasted continuously for 340 h. During the test, it shall use the visual inspection method to check whether there is abnormal change for each part.

5.19.3 When the speedometer is installed on the test bench in accordance with the normal working position for the test, the speedometer is subjected to the alternating speed cycle. For each cycle, make the indicated speed of the speedometer rise from 50% of the upper limit of speed value of the scale to 80%, then return back to 50% of the upper limit of speed value, the cycle period is not more than 60 s, until reaching to the specified accumulative mileage. During the test, check whether the mileage counter is jammed, whether the mileage counter of digital-display type displays normally. After the test, use the visual inspection method to check whether all the numbers of the speedometer

b) Model or code of product;

c) Date of manufacture (or number) or production lot number;

d) Name of manufacturing company.

It may increase items in accordance with specific conditions, such as the implemented standard number of product, warning signs on use or Chinese warning instructions, commodity barcodes, etc. It may also increase or decrease the item in accordance with the user's request. For the small-volume products, it is allowed to mark only the items a), b), and c) of this clause. For the ultra-small parts, it is allowed to mark only the trademark, but it shall indicate the name and address of the manufacturing enterprise on its packaging or instruction manual.

7.1.2 Packaging mark

The basic contents of the packaging mark shall include:

a) Product's marking content related to delivery: name and trademark of product, model or code of product, specifications, applicable vehicle models;

b) Name, detailed address, zip code and telephone number of manufacturing enterprise;

c) Date of manufacture (or number) or production lot number;

d) Implemented standard number of product (national standards, industry standards, local standards or registered corporate standards);

e) Pictorial marking of packaging, storage and transport (in accordance with the relevant provisions of GB/T 191);

f) The text of transport operation: the outline dimension of the packaging box (length x width x height); the number of products in each box; the total mass of each box of products;

Note: It may also be marked in accordance with the user's requirements or in accordance with the specific conditions of the product.

7.2 Packaging

7.2.1 Product packaging shall consider the following:

- Requirements for moisture resistance, shock resistance and dustproof;

- Relevant requirements adapted to transport and handling;

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