
INTERNATIONAL STANDARD



3559

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Road vehicles — Working voltages for lights fitted to motor vehicles and to their trailers

Véhicules routiers — Tensions d'alimentation des feux montés sur les automobiles et sur leurs remorques

iTeh STANDARD PREVIEW

First edition — 1976-02-01

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[ISO 3559:1976](#)

<https://standards.iteh.ai/catalog/standards/sist/9c18e258-1591-4b26-883d-1bb7f7bd25b1/iso-3559-1976>

UDC 629.113 : 629.1.066

Ref. No. ISO 3559-1976 (E)

Descriptors : road vehicles, motor vehicles, trailers, lighting equipment, signal lights, tests, measurement, voltage, electric power supply.

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up has the right to be represented on that Committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 3559 was drawn up by Technical Committee ISO/TC 22, *Road vehicles*, and circulated to the Member Bodies in November 1974.

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It has been approved by the Member Bodies of the following countries :

Austria
Belgium
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France
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Iran
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Japan
Poland
Romania
South Africa, Rep. of

ISO 3559:1976

Spain
Sweden
Switzerland
Turkey
U.S.S.R.
Yugoslavia

The Member Bodies of the following countries expressed disapproval of the document on technical grounds :

Germany
United Kingdom

Road vehicles – Working voltages for lights fitted to motor vehicles and to their trailers

1 SCOPE

This International Standard specifies a method for measuring the working voltages present at the contacts of the filament lamps in the lighting and light signalling devices fitted to motor vehicles and their trailers, and at the terminals of the trailer connector socket, if fitted¹⁾. It also specifies the voltages required to ensure proper working of these devices.

2 FIELD OF APPLICATION

This International Standard applies to vehicles propelled by internal combustion engines and equipped with lead-acid batteries, and to their trailers, as defined in 3.1 and 3.2 of ISO 3833²⁾ (motorcycles excluded).

The values given in the tables of clause 6 apply to new vehicles only.

3 DEFINITIONS

3.1 Terms relating to filament lamps

3.1.1 rated voltage : The voltage marked on the filament lamp.

3.1.2 rated wattage : The wattage marked on the filament lamp.

3.1.3 working voltage : The voltage actually present at the contacts of a filament lamp, or at the terminals of the trailer connector socket, if fitted.

3.1.4 test voltage : The voltage for which the different characteristics of a filament lamp are defined.

3.1.5 required voltage : The voltage which is required to be available at the contacts of a filament lamp under well-defined test conditions, when the filament lamp is fitted on the vehicle, in order to ensure proper working of the lighting or light signalling device in which it is fitted.

3.2 Terms relating to a vehicle's electrical system

3.2.1 nominal voltage : The characteristic voltage of a vehicle's electrical system. It is equal to the nominal voltage of the battery used (in general a vehicle has a nominal voltage of 12 or 24 V depending on the number of battery elements).

3.2.2 vehicle test voltage : The value at which the voltage of the external power supply is stabilized for the measurement of working voltages.

4 CONDITIONS OF MEASUREMENT

4.1 General conditions

4.1.1 The ambient temperature for measurements shall be 23 ± 5 °C, for tests on power-driven vehicles and 23 ± 10 °C for tests on trailers.

4.1.2 The external stabilized power supply shall be capable of delivering the output current and voltage required for the tests. Its internal resistance shall not exceed $0,003 \Omega$. Residual ripple shall not exceed 25 mV peak to peak.

4.1.3 For voltage measurements, measuring instruments of a quality category at least equal to 0,5 shall be used. Internal resistance shall be not less than $1\,000 \Omega$ per volt. With pointer instruments the measuring range shall be such that all readings are made in the upper third of the measuring scale.

With digital instruments, the uncertainty of measurement shall not exceed $\pm 0,5$ % of the value indicated.

4.2 Preparation of vehicles

4.2.1 All voltage measurements shall be made with measuring resistors or calibrated filament lamps substituted for all those filament lamps whose working voltages are to be measured. The method chosen shall be recorded in the test report. In case of dispute, the method using resistors shall be decisive.

1) This method of measurement has been written for the case in which the socket of the trailer connector is mounted on the towing vehicle. It applies equally to an articulated vehicle in which the socket is mounted on the semi-trailer, for which case, however, the words "plug" and "socket" should be interchanged wherever they refer to a trailer connector (see figure 1).

2) ISO 3833, *Motor vehicles, trailers and vehicle combinations – Designations and definitions*. (At present at the stage of draft.)

4.2.2 Each measuring resistor shall be connected to a measuring plug which matches the cap of its corresponding filament lamp. Resistance and working voltage shall be measured directly at the contacts of the plug (see figure 2).

4.2.3 The resistance of each measuring device or calibrated filament lamp shall correspond within a tolerance of $\pm 3\%$ to the resistance of the filament lamp it replaces at test voltage. The resistance values are given in table 4.

4.2.4 If a power-driven vehicle is fitted with a trailer connector socket, a plug, conforming to ISO 1185 or ISO 1724, fitted with resistors shall be coupled to it throughout the test, except during the stage specified in 5.2.3.1. These resistors shall approximately simulate the typical electrical loads of a trailer. The resistance values measured at the terminals of the plug shall correspond within a tolerance of $\pm 3\%$ to those given in table 5. Working voltages shall be measured at the terminals of the trailer connector socket (see figure 3).

4.2.5 The windscreen wipers may be replaced by an equivalent resistor, simulating the mean electrical power input of the wiper motor under the conditions of 5.1.1.

4.2.6 Where dual-intensity signalling lights are fitted using series resistors, these resistors shall be by-passed.

Flasher units for direction indicators shall also be by-passed.

Instrument panel lighting shall be set to maximum intensity, with production filament lamps.

4.2.7 The battery shall be fully charged. In case of dispute, the definition of a fully charged battery shall be that given in IEC Publication 95-1.

4.2.8 If a manual control is provided to adjust regulator output voltage according to the external temperature, this control shall be set to its mean voltage position.

5 TEST PROCEDURE

5.1 Determination of vehicle test voltage for power-driven vehicles

5.1.1 Warming up

Starting with the vehicle at ambient temperature and prepared in accordance with 4.2¹⁾, the engine shall be run as follows :

- a) for 15 min at half the speed at which maximum power is developed;

- b) for approximately 5 s at idling speed;

- c) for 5 min as in a).

Throughout this warming-up period the following electrical circuits shall be switched on :

- driving lights;
- front position lights;
- rear position lights;
- rear registration plate lights;
- instrument panel lighting;
- windscreen wipers at maximum sweep frequency with the windscreen wet, or equivalent resistance;
- heater fan at its lowest running speed.

5.1.2 Immediately after warming up, the voltage across the battery terminals shall be measured with the engine running at half the speed at which maximum power is developed and with the electrical circuits specified in 5.1.1 switched on; this measured voltage shall be recorded as the vehicle test voltage.

The engine shall then be stopped.

5.2 Measurement of working voltages on power-driven vehicles

5.2.1 With the engine stopped, and the ignition supply circuit disconnected, an external voltage stabilized power supply shall be connected to the terminals of the battery and adjusted to provide at these terminals the vehicle test voltage determined in accordance with 5.1.2.

5.2.2 The following electrical circuits shall be switched on while all working voltages are measured :

- front position lights;
- rear position lights;
- rear registration plate lights;
- instrument panel lighting;
- windscreen wipers at maximum sweep frequency with the windscreen wet, or equivalent resistance;
- heater fan at its lowest running speed.

5.2.3 Working voltages to be measured

5.2.3.1 On all vehicles, measurements shall be made in accordance with table 1. On vehicles which are fitted with a trailer connector socket, these measurements shall be made without an electrical load applied to the connector socket.

1) Suitable measures to ensure adequate engine cooling during the test shall be specified by the manufacturer, where necessary. Thermostatically controlled cooling fans driven by electric motors shall be powered from an independent supply.

5.2.3.2 On vehicles which are fitted with a trailer connector socket, additional measurements shall be made in accordance with table 2 with an electrical load as specified in 4.2.4 applied to the connector socket.

5.3 Measurement of working voltages on trailers

5.3.1 The trailer plug shall be coupled to a test socket conforming to ISO 1724 or ISO 1185. The socket shall be connected to an external voltage stabilized power supply adjusted to provide a vehicle test voltage of 13 or 27 V, which is applied simultaneously to the terminals of the test socket feeding all circuits shown in table 3.

5.3.2 The working voltages to be measured are those specified in table 3.

6 VALUES OF REQUIRED VOLTAGE (for new vehicles only)

Working voltages measured in accordance with	Required voltages
table 1	table 6
table 2	table 7
table 3	table 8

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TABLE 1

Working voltages to be measured	Circuits to be switched on in addition to those specified in 5.2.2
Driving lights	Illuminating lights other than fog lights (dip switch in main (upper) beam position)
Passing lights Front position lights Rear position lights Rear registration plate light(s)	Passing lights
Fog lights	Fog lights
Direction indicator lights Stop lights	Direction indicator lights Stop lights Passing lights
Rear fog light(s)	Rear fog light(s) Fog lights if present, otherwise passing lights

TABLE 2

Working voltages to be measured		Circuits to be switched on in addition to those specified in 5.2.2
The following vehicle lights :	Terminals of the trailer connector socket feeding the following trailer lights :	
Driving lights		Illuminating lights other than fog lights (dip switch in main (upper) beam position)
Passing lights Front position lights	Rear position lights	Passing lights
Fog lights		Fog lights
Front direction indicator lights	Rear direction indicator lights Stop lights	Direction indicator lights Stop lights Passing lights
	Rear fog light(s)	Rear fog light(s) Fog lights if present, otherwise passing lights

TABLE 3

Working voltages to be measured	Circuits to be switched on
Rear position lights Registration plate light(s) Rear direction indicator lights Stop lights Rear fog light(s)	All the lighting circuits fed through the trailer plug are energized simultaneously but the direction indicators on only one side at a time

TABLE 4

Rated values	International designation of filament lamp category	Equivalent resistance Ω
12 V 45/40 W 24 V 55/50 W	E	3,35/3,77 11,3/12,4
12 V 55 W 24 V 70 W	H ₁ , H ₂ , H ₃	2,77 10,1
12 V 60/55 W 24 V 75/70 W	H ₄	2,52/2,75 8,3/8,9
12 V 35 W 24 V 35 W	F ₂	5,21 22,4
12 V 21 W 24 V 21 W	P 25-1	7,3 28,0
12 V 21/5 W 24 V 21/5 W	P 25-2	7,3/30,4 28,0/78,4
12 V 10 W 24 V 10 W	R 19/10	18,2 62,75
12 V 5 W 24 V 5 W	R 19/5, C 11, W 10/5	36,4 112,0
12 V 4 W 24 V 4 W	T 8/4	45,5 157,0
12 V 3 W 24 V 3 W	W 10/3	60,8 196,0

TABLE 5

12 V systems		24 V systems	
Connection between terminals 3 and :	Resistance Ω	Connection between terminals 1 and :	Resistance Ω
7	12	2	40
5	12	6	40
6	3,65	4	14
1	7,3	3	28
4	7,3	5	28

NOTE – If a filament lamp of a category not included in the above table is in use, the equivalent resistance shall be determined on the basis of the mean power consumption at the test voltage.

TABLE 6

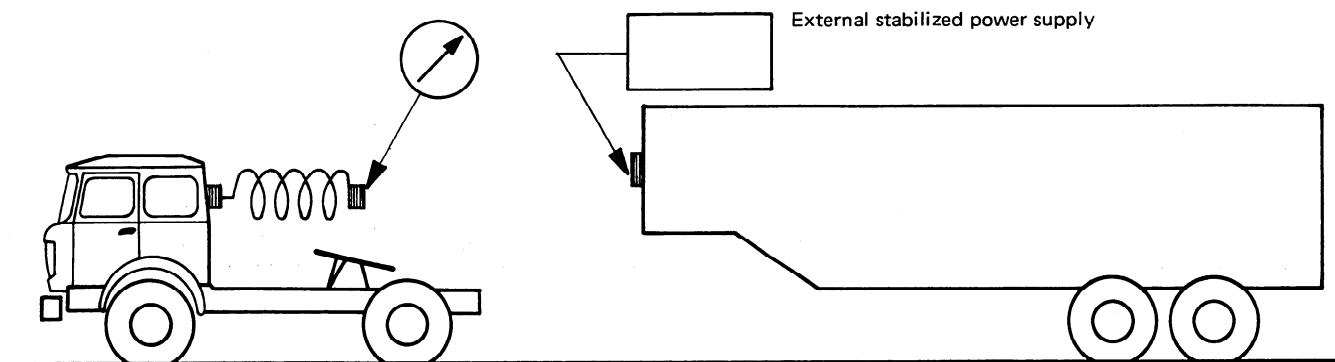
Vehicle lights	Nominal voltage 12 V		Nominal voltage 24 V	
	Minimum working voltage	Maximum working voltage	Minimum working voltage	Maximum working voltage
Driving lights	12,2	14,1	25,4	29,0
Passing lights	12,5		26,0	
Fog lights	12,2		25,4	
Front position lights	12,1	14,5	25,2	
Rear position lights				
Rear registration plate light(s)				
Direction indicator lights				
Stop lights				
Rear fog light(s)				

TABLE 7

Vehicle lights	Terminals of the trailer connector socket feeding the following trailer lights :	Nominal voltage 12 V		Nominal voltage 24 V	
		Minimum working voltage	Maximum working voltage	Minimum working voltage	Maximum working voltage
Driving lights		12,2	14,1	25,4	29,0
Passing lights		12,5		26,0	
Fog lights		12,2		25,4	
Front position lights		12,1		25,2	
Rear position lights		12,4	25,4		
		12,1	25,2		
Rear direction indicator lights		12,4	14,5	25,4	
		12,4		25,4	
Stop lights		12,4		25,4	
Rear fog light(s)		12,4		25,4	

TABLE 8

Trailer lights	Nominal voltage 12 V	Nominal voltage 24 V
	Maximum voltage drop	Maximum voltage drop
Rear position lights	1,0	1,2
Registration plate light(s)	1,0	1,2
Rear direction indicator lights	1,0	1,2
Stop lights	1,0	1,2
Rear fog light(s)	1,0	1,2



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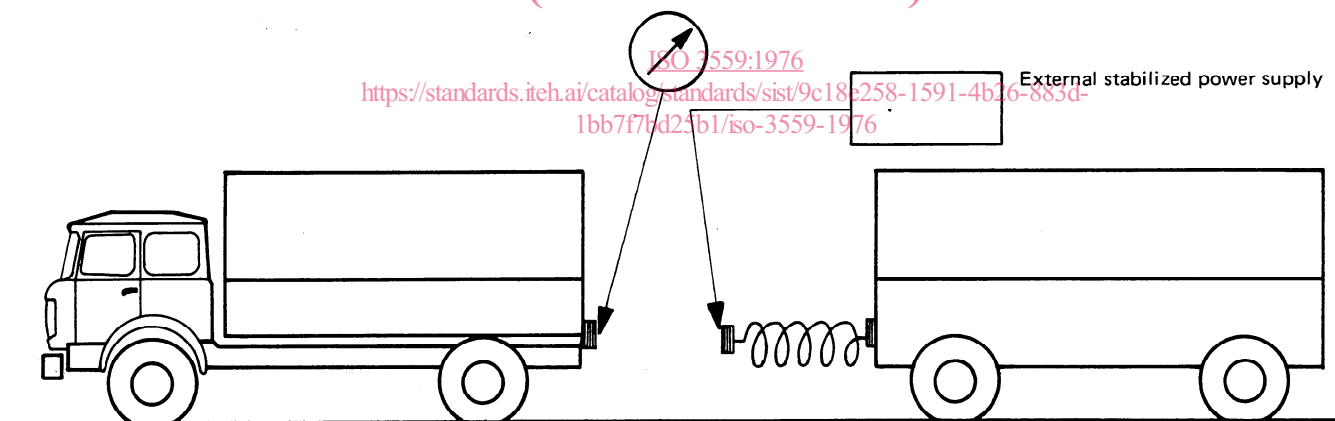


FIGURE 1

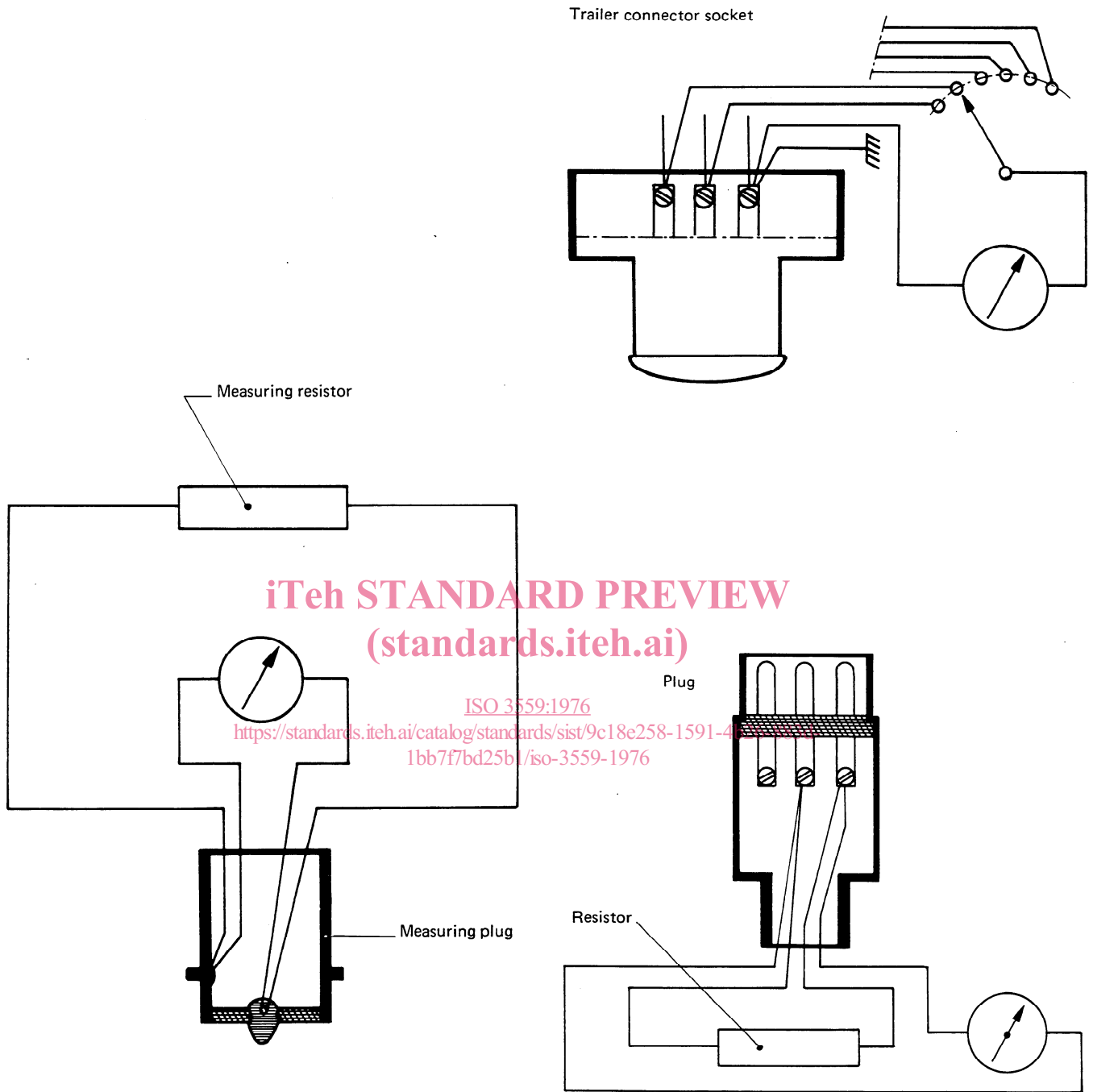


FIGURE 2 – Measuring device

FIGURE 3 – Measurement at the terminals of the trailer connector socket