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ISO 10330

Second edition
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Photography — Synchronizers, ignition circuits and connectors for cameras and photoflash units — Electrical characteristics and test methods

Photographie — Interrupteurs synchronisés, circuits d'amorçage et connecteurs pour appareils de prise de vue et sources d'éclairs — Caractéristiques électriques et méthodes d'essai

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 10330 was prepared by Technical Committee ISO/TC 42, *Photography*.

This second edition cancels and replaces the first edition (ISO 10330:1992), of which it constitutes a minor revision.

Introduction

When a camera is used in conjunction with a photoflash unit, the photoflash unit can fail to fire, depending upon the combination. The possible causes include a failure of the camera or photoflash unit, poor electrical contact at the connection between both, and the signal transferred to the photoflash unit for firing it being improper.

Photography — Synchronizers, ignition circuits and connectors for cameras and photoflash units — Electrical characteristics and test methods

1 Scope

This International Standard specifies the electrical requirements of the camera synchronizer, the ignition circuit in the photoflash unit and the cable to connect these, and the test methods to secure positive firing of the photoflash unit.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 516:1999, *Photography — Camera shutters —Timing*

ISO 518:1977, *Photography — Camera accessory shoes, with and without electrical contacts, for photoflash lamps and electronic photoflash units*

ISO 519:1992, *Photography — Hand-held cameras — Flash-connector dimensions*

ISO 8581:1994, *Photography — Electronic flash equipment — Connectors to synchro-cord*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
synchronizer
device provided in a camera or shutter unit which fire the photoflash unit in synchronization with the operation of the camera shutter and which consists of synchronizer terminals, a synchronization switch and a circuit that connects them

NOTE For details of synchronization, refer to ISO 516.

3.2
synchronizer terminals
part of the synchronizer which couples the camera or shutter unit with the photoflash unit as does the accessory shoe with electrical contacts defined in ISO 518 and the socket defined in ISO 519

3.3
ignition circuit terminals
parts of the photoflash unit which are connected to the synchronizer terminals to couple the camera or shutter unit with the photoflash unit to permit firing operation, as does the foot with electrical contacts defined in ISO 518, the plug defined in ISO 519 and the sockets defined in ISO 8581

3.4
synchronization switch
switch provided for firing the photoflash unit

NOTE It may be a mechanical or electronic switch.

3.5
synchronizer leakage current
current flowing through the synchronizer when the specified voltage is applied across the synchronizer terminals with the synchronization switch turned off

3.6
dynamic characteristics of synchronizer
variation with time of the voltage appearing across the synchronizer terminals when the camera synchronizer is operated

3.7
ignition circuit
part of the photoflash unit provided to receive the signal from the synchronizer and fire the electronic flash tube or flash bulb

4 Requirements

4.1 Polarities for synchronizer terminals and ignition circuit terminals

The polarities of the synchronizer terminals in a camera and that of the ignition circuit terminals in a photoflash unit coupled with the camera are defined in 4.1.1 and 4.1.2. The polarity of the camera synchronizer terminals shall be matched to that of the ignition circuit terminals in the coupled photoflash unit. When more than one photoflash unit is connected to a single camera in parallel by use of a device such as an adapter, it is recommended that a reverse current prevention circuit be incorporated in the adapter or the respective photoflash units to avoid an electrical interference of one photoflash unit with another.

4.1.1 For the “camera accessory shoe with electrical contacts”, defined in ISO 518, and the “foot of photoflash equipment with electrical contacts”, the contact P shown in Figure 1 shall be the positive pole, while the surface Q shall be the negative pole and, when the photoflash unit is connected to the camera, the potential for P shall be higher than that for Q.

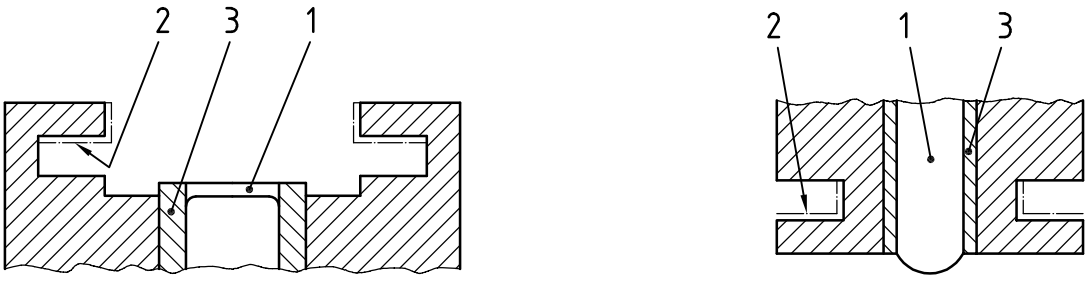
4.1.2 For the “socket and plug in small flash connections for hand-held cameras” defined in ISO 519, the part P shown in Figure 2 shall be the positive pole, while the part Q shall be the negative pole and, when the camera is connected to photoflash unit, the potential for P shall be higher than that for Q.

4.2 Voltage across and current through synchronizer terminals and ignition circuit terminals

The voltage applied across the camera synchronizer terminals and that developed across the ignition circuit terminals in the photoflash unit shall not exceed 24 V d.c.

NOTE The 24 V d.c. value is the same as the value of the “safety extra low voltage” specified in 8.1 in IEC 60335-1:2001.

The synchronization current flowing through the camera synchronizer terminals shall be 100 mA at maximum and the current flowing through the ignition circuit terminals in any one of the photoflash units shall be 30 mA at maximum.

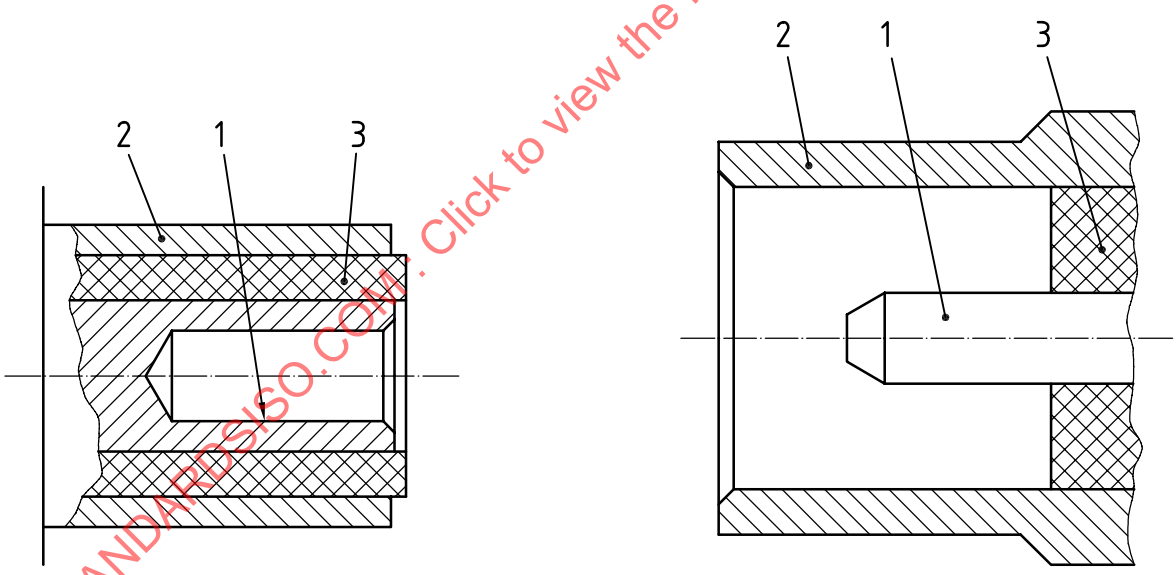


a) Shoe b) Foot

Key

1 Part P
2 Part Q
3 Insulation

Figure 1 — Polarities for camera accessory shoe with electrical contacts and foot of photoflash equipment with electrical contacts



a) Socket b) Plug

Key

1 Part P
2 Part Q
3 Insulation

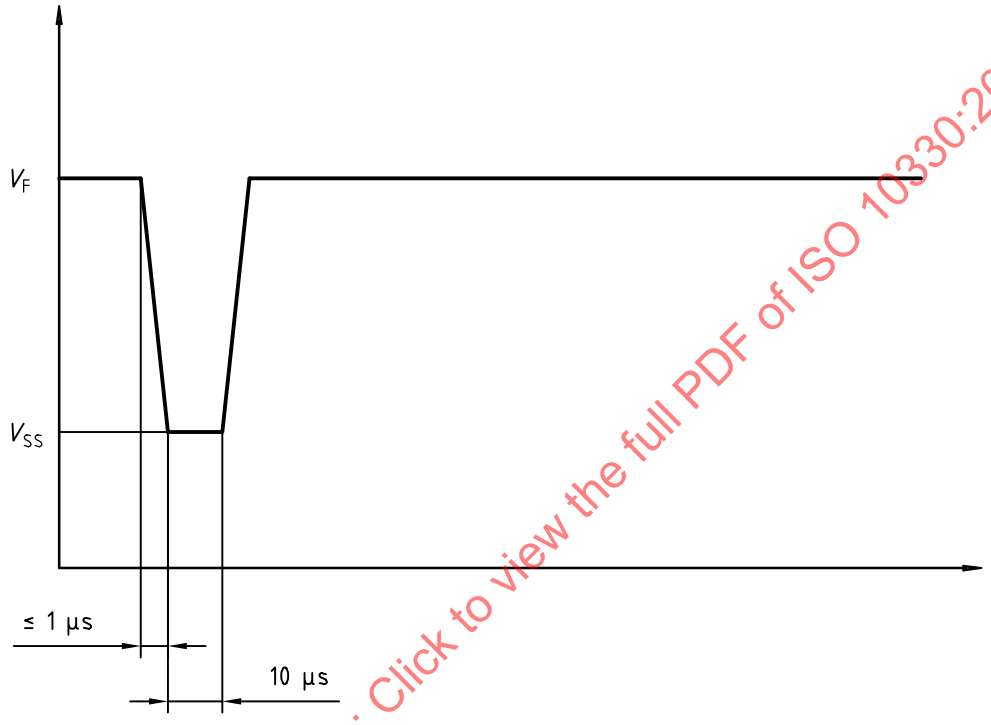
Figure 2 — Polarities of sockets and plug in small flash connection for hand-held cameras

4.3 Ignition circuit operation

When a 4,4 MΩ resistor is connected across the ignition circuit terminals and a pulse voltage as shown in Figure 3 is applied across the terminals, the photoflash unit shall be fired.

NOTE 1 The resistance value of 4,4 MΩ is specified in consideration of the synchronizer leakage current and the cable insulation resistance.

NOTE 2 See A.2 for the requirements for a photoflash unit having an ignition circuit which is equipped with precautions against accidental firing and failure to fire due to noise or chattering of the synchronization contacts.



V_F is the voltage developed across ignition circuit terminals in a photoflash unit and is equal to 24 V d.c. maximum.

V_{SS} is equal to 1,6 V.

Figure 3 — Voltage waveform across ignition circuit terminals

4.4 Dynamic characteristics of synchronizer

When the camera is operated with a 24 V d.c. power supply and 240 Ω resistor connected across the camera synchronizer terminals in series (see Figure 6) and the synchronizer has an electronic switch, then the terminal voltage for the synchronizer shall be maintained at 1,5 V or less until the synchronization switch is turned off (see the continuous thick line in Figure 4).

On the other hand, when the synchronizer has a mechanical switch, at least one of the time periods (T_1 to T_2) between the moment the synchronizer terminal voltage reaches 21 V and the moment a time of 150 µs elapses and during which the voltage across the synchronizer terminals is maintained at a value of 1,5 V or less, shall be 10 µs or more (see the broken line in Figure 4).

NOTE 1 When the synchronizer has a mechanical synchronization switch, it is desirable that after a time of 150 µs elapses, the synchronizer terminal voltage be maintained at 1,5 V or less over as long a time period as possible.

NOTE 2 It is desirable that the synchronization switch be opened after the shutter closing operation is started

4.5 Synchronizer leakage current

When a 24 V d.c. voltage is applied across the camera synchronizer terminals with the camera synchronization switch turned off, the leakage current shall be 5 µA or less.

4.6 Electrical characteristics of cable

4.6.1 Cable resistance

When the cable is short-circuited at one end, the resistance across the terminals at the other end shall be 2 Ω or less.

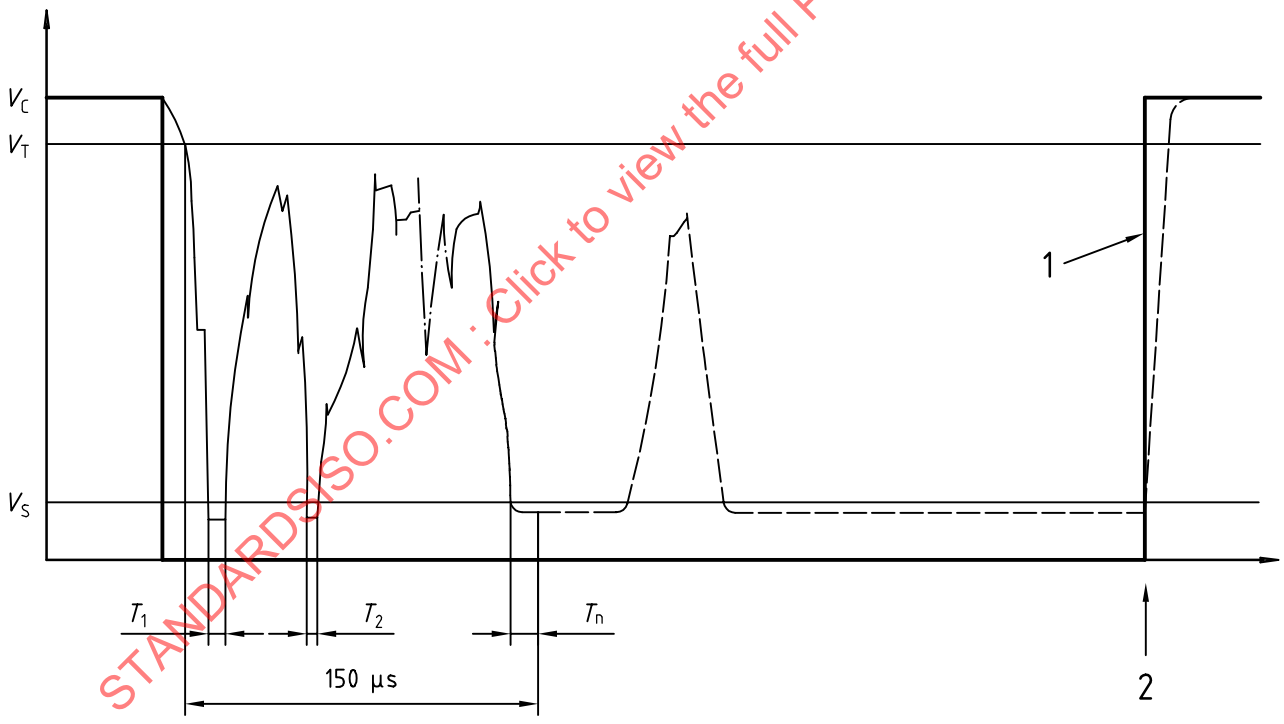
When an extremely long or special cable is used, it should be checked for inductance and capacitance.

4.6.2 Cable capacitance

The cable shall have a capacitance of 3 000 pF or less.

4.6.3 Cable insulation resistance

The insulation resistance of the cable shall be 50 MΩ or higher at 100 V d.c.



Key

1 Ideal dynamic characteristic curve
2 Shutter closing operation is started

V_C is the testing voltage and is equal to 24 V.
V_T is the defined synchronizer starting voltage and is equal to 21 V.
V_S is the upper limit of defined synchronizer on-state voltage and is equal to 1,5 V.

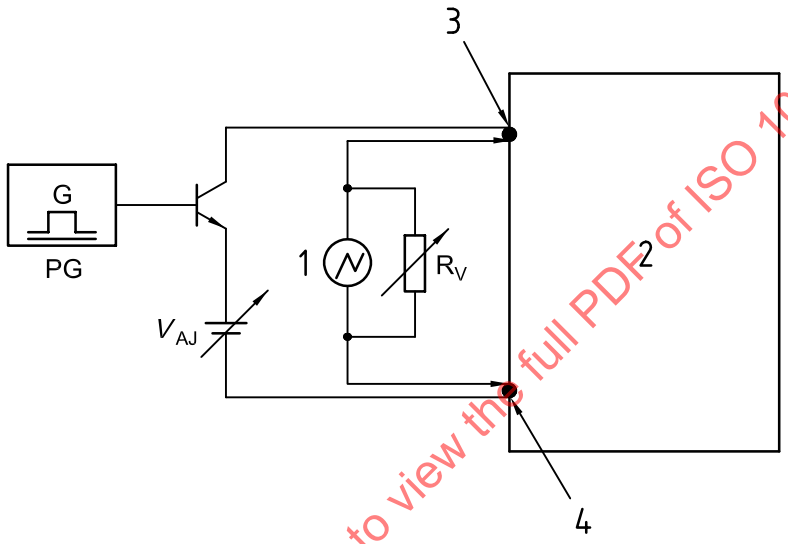
Figure 4 — Dynamic characteristics of the synchronizer

5 Test methods

5.1 Ignition circuit operation

Connect a pulse generator, a variable-voltage type d.c. voltage generator, a transistor switch, an oscilloscope and a variable resistor across the ignition circuit terminals in the photoflash unit as shown in Figure 5 a). Adjust the resistance value for the variable resistor (R_V) so that the combined resistance value of the resistance value for the variable resistor (R_V) and the input impedance across the measuring terminals in the oscilloscope connected in parallel with the variable resistor is 4,4 MΩ.

Drive the pulse generator PG with the waveform shown in Figure 5 b), adjust the variable voltage supply V_{AJ} so that the value of V_{SS} in Figure 3 is 1,6 V, and see if the voltage pulse thus provided fires the photoflash unit.



Key

1 Oscilloscope
2 Photoflash unit
3 Ignition circuit terminals, high-side
4 Ignition circuit terminals, low-side

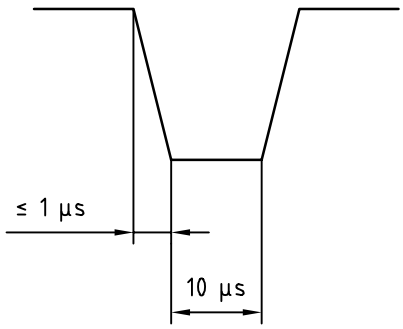
R_V is the variable resistor.

V_{AJ} is the adjustable voltage supply.

PG is the pulse generator.

The measuring terminals in the oscilloscope shall be connected directly to the ignition circuit terminals.

a) Test circuit



b) Input waveform at ignition circuit terminals

Figure 5 — Ignition circuit operation

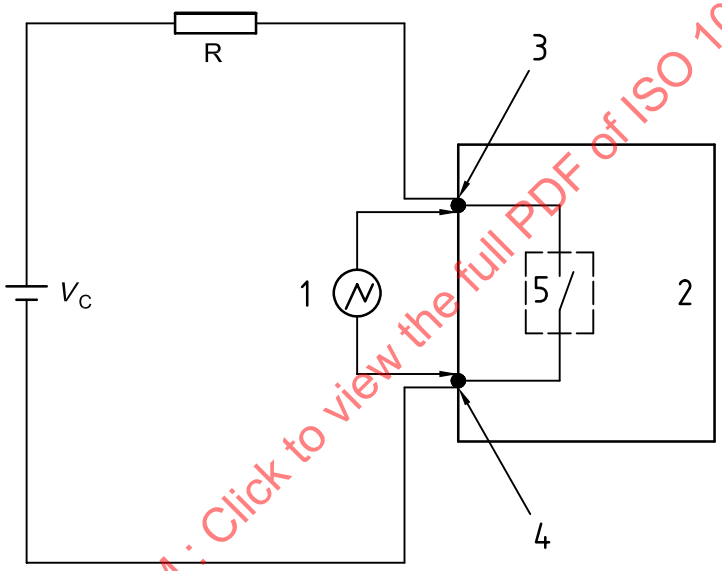
5.2 Synchronizer dynamic characteristics

Connect a 24 V d.c. power supply and a 240 Ω resistor across the camera synchronizer terminals in series and an oscilloscope in parallel with these components, as shown in Figure 6. Operate the camera shutter, and measure the time period(s) (T_1 to T_2 as shown in Figure 4) between the moment the voltage across the synchronizer terminals reaches 21 V and the moment a time of 150 µs elapses and during which the synchronizer terminal voltage is maintained at 1,5 V or less.

5.3 Synchronizer leakage current

Connect a 24 V d.c. power supply, a 10 kΩ resistor and a d.c. ammeter in series across the camera synchronizer terminals as shown in Figure 7.

Make the camera ready for functioning (complete the shutter cocking, film feed or other necessary set-up operation) and read the ammeter.



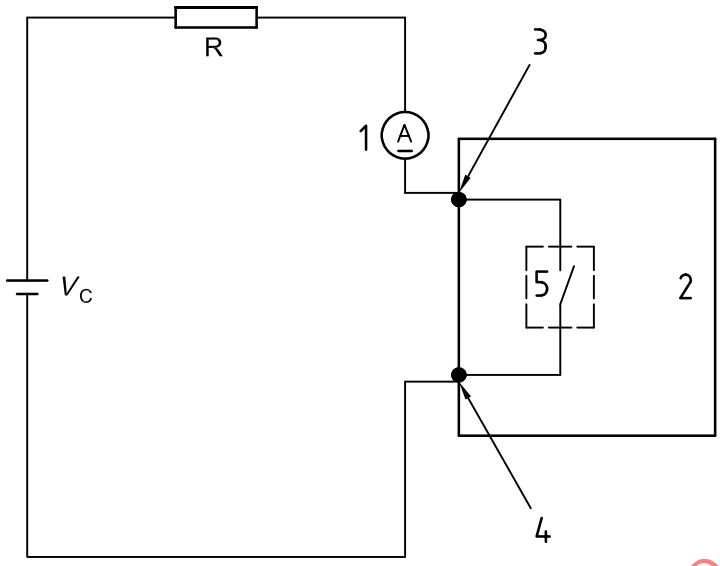
Key

1 Oscilloscope
2 Camera
3 Synchronizer terminal, high-side
4 Synchronizer terminal, low-side
5 Synchronization switch

V_C is the d.c. power supply and is equal to 24 V.
R is the resistor and is equal to 240 Ω.

The oscilloscope measuring terminals shall be connected directly to the synchronizer terminals.

Figure 6 — Synchronizer dynamic characteristic testing circuit



Key

1 d.c. ammeter
2 Camera
3 Synchronizer terminal, high-side
4 Synchronizer terminal, low-side
5 Synchronization switch

V_C is the d.c. power supply and is equal to 24 V.

R is the ammeter protection resistor and is equal to 10 kΩ.

Figure 7 — Synchronizer leakage current testing circuit

Annex A
(normative)

Requirements and test methods

A.1 Requirements and test method for synchronizers and photoflash units using thyristor type electronic switches

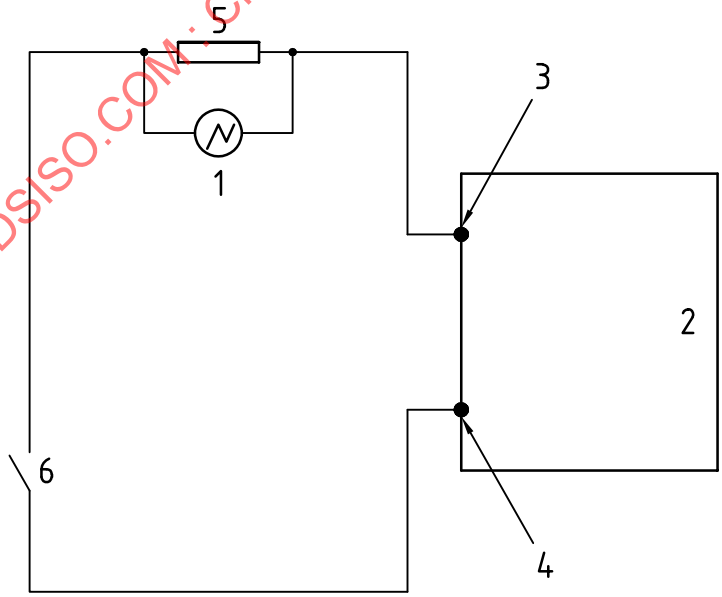
Camera synchronization switches can be divided into two broad general categories: mechanical and electronic. The mechanical synchronization switch consists of contacts made of a phosphor bronze or other spring material that is plated with gold, silver or other metal, while the electronic switch consists of a semiconductor device. The thyristor is a typical semiconductor device that is used as the electronic synchronization switch.

Having no contacts, the electronic switch is free from chattering. The thyristor has features including high overcurrent strength, thus it is widely used as the synchronization switch. However, the thyristor is a self-holding type device. Once it is turned on, it maintains the on-state as long as the current flowing through it is over a certain value and, while it is kept turned on, it cannot fire the photoflash unit again.

To eliminate this problem, any photoflash unit for connection to a thyristor type synchronizer shall be designed so that the current flowing after it is fired is 300 µA or less over a time period of 300 µs or longer. To make sure that this requirement is met, the testing circuit as shown in Figure A.1 can be used.

For photoflash units which are designed to be connected to the thyristor type synchronizer in parallel, it is desirable that the current per unit is 100 µA or less.

With a camera designed to be used with a photoflash unit with which a higher current flows after firing, the synchronization switch that is turned on by operating the shutter shall be turned off before the set-up for the subsequent shutter operation is completed.



Key

1 Oscilloscope
2 Photoflash unit
3 Synchronizer terminal, high-side
4 Synchronizer terminal, low-side
5 Current observing resistor
6 Testing switch

Figure A.1 — Photoflash unit testing circuit

A.2 Requirements and test method for ignition circuits equipped with precautions against accidental firing and failure to fire

When a long synchro-cable is used for connecting the camera to the electronic flash or the camera is subjected to vibrations or a shock, the photoflash unit can cause accidental firing or failure to fire with the shutter released, depending upon the unit.

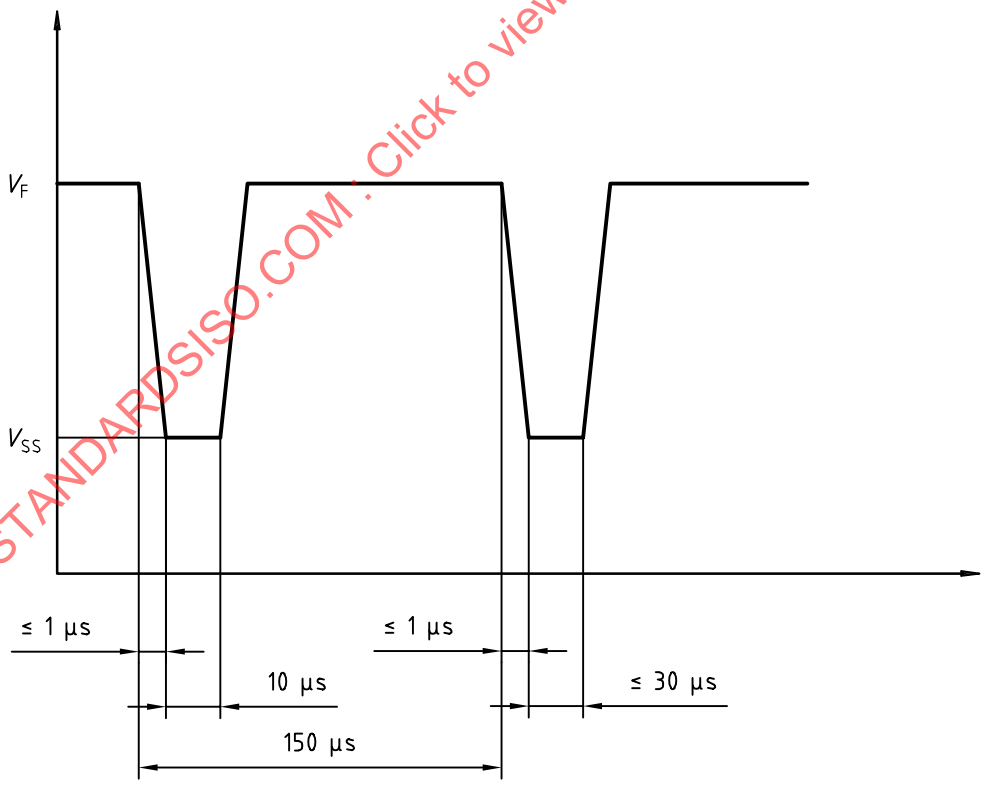
Causes of accidental firing include electrical noise interference being introduced through the long synchro-cable and the contacts of the mechanical synchronization switch incorporated in the camera being brought into contact by vibrations or a shock, which result in a signal equivalent to the firing signal to be fed into the ignition circuit in the photoflash unit.

Causes of failure to fire include contact failure of the connector, cable discontinuity and chattering of the contacts at the start of the operation, which tends to be caused by a mechanical synchronization switch, producing extremely small successive on-off signals of shorter duration than 10 µs, resulting in a lowered potential for the ignition circuit in the photoflash unit.

To solve these problems, some photoflash units are equipped with a noise filter or an undesirable-signal-cancelling circuit which functions for a time period of as long as 150 µs following the mechanical synchronization switch being turned on, during which the operation of the switch is unstable.

For a photoflash unit having such precautions against accidental firing and failure to fire, the voltage waveform specified in Figure A.2 shall be used instead of that specified in Figure 3, with the use of the test method described in 5.1 to check that the unit is fired.

For a photoflash unit equipped with an undesirable-signal-cancelling circuit, the time at which the photoflash unit is fired is delayed by the time constant for the undesirable-signal-cancelling circuit. Thus, the photoflash synchronization delay time defined in ISO 516 shall be considered.



V_F is the voltage developed across ignition circuit terminals in a photoflash unit and is equal to 24 V d.c. maximum.

V_{SS} is equal to 1,6 V.

Figure A.2 — Waveform of voltage across ignition circuit terminals in a photoflash unit with an undesirable-signal-cancelling circuit

Annex B
(informative)

Additional information

B.1 Types of ignition circuits and precautions for use

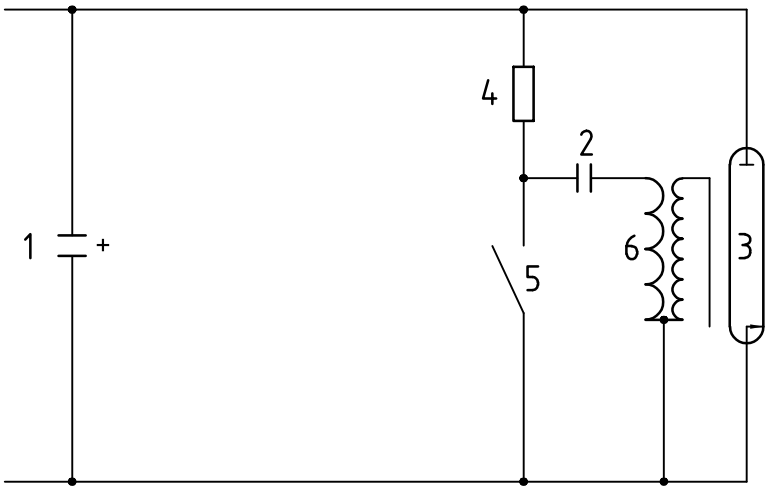
For a camera having a mechanical synchronizer switch, photoflash units providing greatly different outputs at the ignition circuit terminals (see Table B.1) should not be used one after the other.

When a photoflash gun or an electronic flash with a direct type ignition circuit is fired by means of a mechanical switch, the surfaces of the contacts can be deteriorated by the spark discharge, resulting in the contact resistance of the contacts being increased. When the synchronizer with contacts offering an increased contact resistance is used with an electronic flash having a semiconductor type ignition circuit, the synchronization current can be lower than is specified, with the result that the electronic flash cannot be fired.

Table B.1 — Types of photoflash unit and characteristics of ignition circuits

Type of photoflash unit	Ignition circuit		
	Type	Terminal voltage	Terminal current
Electronic flash	Direct type (See Figure B.1)	High voltage (200 V or over)	High current
	Semiconductor type (see Figure B.2)	Low voltage (24 V or under) [a]	Low current
Flash gun	Type B (see Figure B.3)	Low voltage (1,5 V to 6 V)	High current
	Type BC (see Figure B.4)	Low voltage (15 V to 25 V)	High current

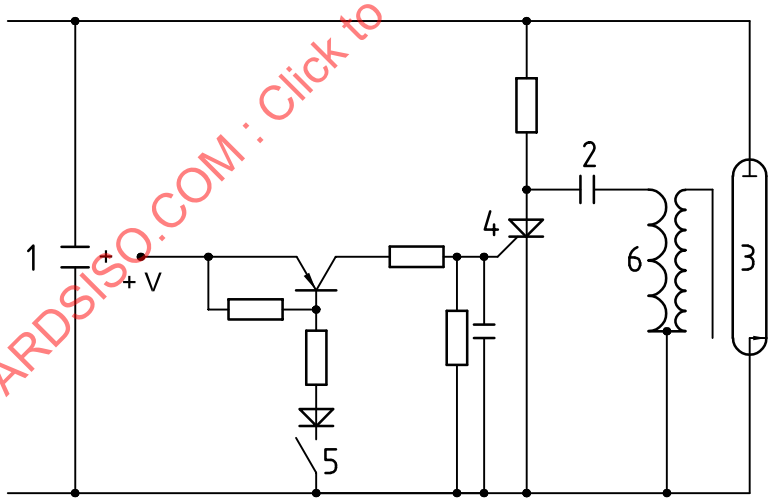
[a] Some units have a terminal voltage as high as 45 V.



Key

1 Main capacitor
2 Trigger capacitor
3 Xe discharge tube
4 Resistor
5 Synchronization switch
6 Trigger transformer

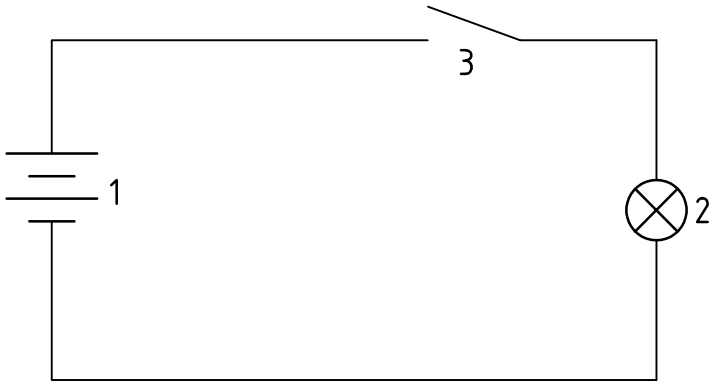
Figure B.1 — Example of direct type ignition circuit



Key

1 Main capacitor
2 Trigger capacitor
3 Xe discharge tube
4 Semiconductor
5 Synchronization switch
6 Trigger transformer

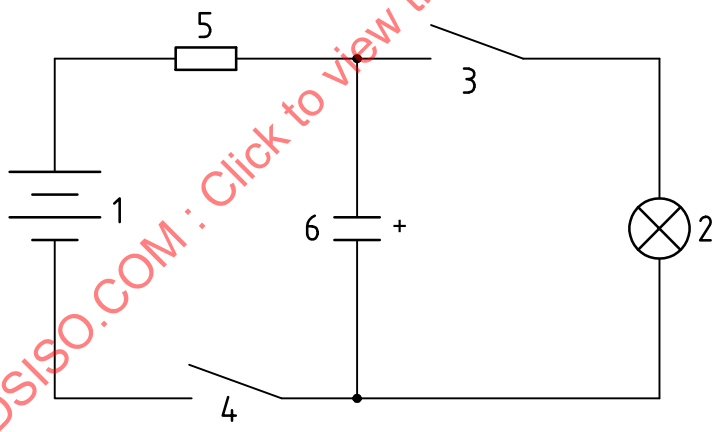
Figure B.2 — Example of semiconductor type circuit



Key

1 Battery
2 Flash lamp
3 Synchronization switch

Figure B.3 — Example of type B ignition circuit



Key

1 Battery
2 Flash lamp
3 Synchronization switch
4 Switch
5 Resistor
6 Trigger capacitor

Figure B.4 — Example of type BC ignition circuit