INTERNATIONAL STANDARD

ISO 5867-1

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Aircraft — Electromagnetic relays and contactors —

Part 1: General requirements

Aéronefs — Relais et contacteurs électromagnétiques —

Partie 1: Exigences générales

Reference number
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Contents

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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.

International Standard ISO 5867-1 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 1, *Aerospace electrical requirements*.

ISO 5867 consists of the following parts, under the general title *Aircraft — Electromagnetic relays and contactors*:

— *Part 1: General requirements*

Annexes A and B of this part of ISO 5867 are for information only.

Aircraft — Electromagnetic relays and contactors —

Part 1:
General requirements

1 Scope

This part of ISO 5867 specifies the performance requirements for electromagnetic relays and contactors for use in nominal 28 V d.c. or 115 V/200 V 3-phase, 400 Hz, a.c. systems having the characteristics specified in ISO 1540.

This part of ISO 5867 specifies the performance requirements for relays and contactors having nominal contact ratings of 5 A a.c., 5 A d.c. or greater. Auxiliary contacts, where applicable, may be rated at lower currents. Three temperature classes and three classes of sealing are specified.

This part of ISO 5867 is applicable to single-pole and multi-pole relays and contactors, electromagnetically operated and magnetically held, or electromagnetically operated and mechanically or magnetically latched, controlled by a voltage of 28 V d.c. or 115 V, 400 Hz, a.c.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 5867. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 5867 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1540:1984, *Aerospace — Characteristics of aircraft electrical systems.*

ISO 7137:1995, *Aircraft — Environmental conditions and test procedures for airborne equipment.*

IEC 50 (446):1990, *International Electrotechnical Vocabulary — Chapter 446: Electrical relays.*

IEC 68-2-17:1994, *Basic environmental testing procedures — Part 2: Tests — Test Q: Sealing.*

IEC 158-2:1982, *Low-voltage controlgear — Part 2: Semiconductor contacters (solid state contactors).*

3 Definitions

For the purposes of this part of ISO 5867, the definitions given in IEC 50 (446) and IEC 158-2 apply.

4 General requirements

4.1 Detail specification sheets

The individual item requirements shall be as specified in this part of ISO 5867 and in accordance with the detail specification sheets related to this part of ISO 5867. In the event of any conflict between requirements of this part of ISO 5867 and the detail specification sheets, the latter shall govern.

The manufacturer shall prepare an individual specification sheet for each type of device produced. The

individual specification sheet shall define the values for parameters given in annex A.

4.2 Temperature class

The temperature classes which define the maximum and minimum temperatures for use shall be as follows:

Class A: – 65 °C to + 125 °C
Class B: – 55 °C to + 85 °C
Class C: – 55 °C to + 70 °C

4.3 Sealing

Enclosure design shall be classified as follows:

Class 1: Hermetically sealed
Class 2: Environmentally sealed
Class 3: Ventilated enclosed

4.4 Altitudes

Class 1 and 2 sealed relays and contactors shall be suitable for use up to an altitude of 25 000 m.

Class 3 contactors shall be suitable for use up to an altitude of 15 000 m.

4.5 Dimensions

Relay and contactor dimensions shall be as defined in the detail specification sheet (see 4.1).

4.6 Design requirements

The relays and contactors shall operate satisfactorily when mounted in any attitude. The size and mass shall be the minimum compatible with the required performance, reliability and strength.

The relays and contactors shall be of the single-pole or multi-pole (main contacts) type, with or without auxiliary contacts.

The auxiliary contacts shall be mechanically linked to the main contacts and shall indicate the position of the main contacts.

Suitable barriers shall be placed between the terminals of the contactors in order to prevent an accidental short-circuit. These barriers shall be sufficient to prevent the short-circuiting of all the terminals through the presence of a flat conducting part.

The coil of the relay or contactor shall operate from either, but not both, a 28 V d.c. or 115 V a.c., 400 Hz system having the characteristics specified in ISO 1540.

The contacts of relays or contactors shall be capable of switching 28 V d.c. and/or 115 V/200 V a.c., 400 Hz having a system characteristic specified in ISO 1540.

4.7 Sealing enclosures

Sealing enclosures shall be of sufficient mechanical strength to withstand the normal abuse incurred in handling, transit, storage and installation without causing malfunction or distortion of parts. The case shall not be a part of the contact or coil electrical circuits.

NOTE 1 The case may be a part of the magnetic circuit.

4.7.1 Hermetically sealed enclosures

Hermetically sealed enclosures shall be constructed as a gastight enclosure that has been completely sealed by fusion of glass or ceramic to metal, or bonding of metal to metal. Hermetically sealed relays and contactors shall be purged of all air. Relays shall be filled with a suitable inert gas. The fill gas shall have a dew point of at least 5 °C below the lowest temperature rating of the device.

NOTE 2 Contactors may be filled with air or with inert gas.

4.7.2 Environmentally sealed enclosures

Environmentally sealed enclosures shall be constructed by any means other than that defined in 4.7.1 to achieve the degree of seal specified in the detail specification (see 4.1). Environmentally sealed relays and contactors shall be purged of all air. Relays shall be filled with a suitable inert gas. The fill gas shall have a dew point of at least 5 °C below the lowest temperature rating of the device.

NOTE 3 Contactors may be filled with air or with inert gas.

4.7.3 Ventilated enclosures

Ventilated contactors shall be totally enclosed for mechanical and dust protection and shall be explosion-proof. The enclosure shall be so designed that when the cover is removed, the contactor shall be capable of operating without adjustment. The enclosure design shall be such that pressure differentials cannot exist between the inside and outside to aggravate the moisture accumulation problem. The cover shall be rugged in design, constructed of high

impact materials, and securely mounted to the contactor.

4.8 Installation clearances

Adequate clearance shall be provided for installation of terminals and mounting hardware. Clearance for standard socket wrenches shall be provided. Special installation tools shall be avoided where possible.

4.9 Grounding

The mounting shall provide an effective electrical contact to ground when the relay or contactor is mounted.

4.10 Terminals

Metal covers shall be provided with a means for grounding. Relays and contactors shall have electrical terminals as specified in the detail specification (see 4.1).

No rotation or other loosening of a terminal shall occur throughout the relay or contactor life.

4.10.1 Terminal type

Power terminals of greater than 25 A rating shall be of the threaded stud type. Terminals rated at 25 A or less may be plug-in, solder hook, stud or screw terminals.

4.10.1.1 Threaded terminals and mounting studs

Stud terminals shall accept connections using crimped type lugs made of copper or aluminium, or copper bars. A flat washer having a diameter at least equal to that of the base of the terminal, and a self-locking nut or standard nut with suitable locking washer shall be used on each terminal.

No rotation or other loosening of a terminal, or any fixed portion of a terminal, shall be caused by any mechanical forces specified in table 1 involved in the connection or disconnection, throughout the life of the relay or contactor.

These are maximum values which shall not be exceeded.

NOTE 4 For installation torque values, see the detail specification (4.1).

Table 1 — Strength of threaded terminals (static value of pull and torque)

Thread size	Force		Torque	
	N	lbf	N·m	in·lbf
No. 4-40 UNC	22,2	5	0,497	4,4
No. 6-32 UNC	133	30	1,13	10
No. 8-32 UNC	156	35	2,26	20
No. 10-32 UNC	180	40	3,615	32
No. 10-24 UNC	180	40	3,954	35
1/4-28 UNC	222	50	8,474	75
5/16-24 UNF	311	70	11,298	100
3/8-24 UNF	445	100	16,948	150
7/16-20 UNF	445	100	16,948	150
1/2-20 UNF	445	100	16,948	150

Each terminal shall have a terminal seat that shall provide the normal current-conducting path. The diameter of the seat shall not be less than the area necessary to ensure that the current density does not exceed $1{,}55 \times 10^6$ A/m^2 (1 000 A/in^2).

NOTE 5 The seat does not include the cross-sectional area of the stud.

Stud terminals shall be capable of accommodating two lugs with hardware as specified. A minimum of one and a half threads shall remain above the nut with all parts tightened in place.

4.10.1.2 Solder hook or straight terminals

Solder terminals shall be tin plated. The terminal design shall allow for at least two wires of relay rating to be connected (see 4.1).

4.10.1.3 Plug-in terminals

Plug-in terminals shall conform to the arrangement and dimensions necessary for proper mating with the associated socket or connector.

For plug-in relays, the mounting arrangement of the relay and its corresponding socket shall be designed such that the entire weight of the relay shall be suspended and the stability of its mounting shall be provided by an auxiliary mounting means other than the electrical terminals of the socket. Relays with plug-in terminals shall have the electrical and environmental tests performed with the specified socket assembled to the unit. Plug-in terminals shall be gold plated.

4.10.1.4 Screw terminals

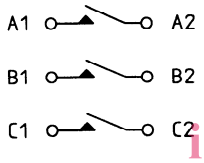
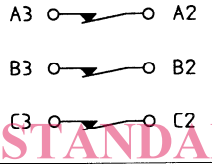
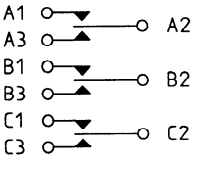
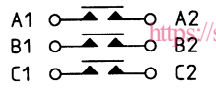
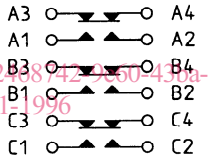
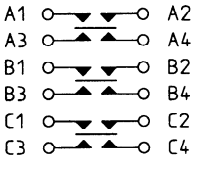
Screw terminals shall be supplied with hardware as specified in the detail specification (see 4.1). The diameter of the seat shall be equal to, or greater than, the diameter across the corresponding lug designed for the particular current. It shall not be less than the area necessary to ensure that the current density does not exceed $1{,}55 \times 10^6$ A/m^2 (1 000 A/in^2).

NOTE 6 The seat area does not include the cross-sectional area of the stud.

4.10.2 Terminal marking

Terminal identification shall be durably and legibly marked as specified in tables 2 to 4. For dual coil relays, the relationship between coil and contacts shall be as specified in table 5. The positive end of the coil (XI) shall be designated on the header by use of a contrast bead.

Table 2 — Contact arrangements, symbols and terminal marking

	Single throw		Double throw	
	Form "A"	Form "B"	Form "C"	Form "K"
	normally open	normally closed	(two position)	three position centre off
Single break				
	Form "X"	Form "Y"	Form "Z"	Form "KK"
Double break				

NOTE — Contacts are shown with coil(s) de-energized.

Table 3 — Auxiliary terminals

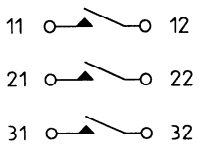
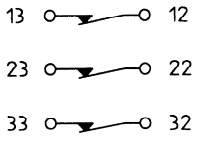
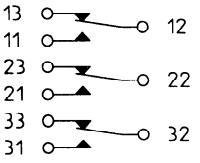
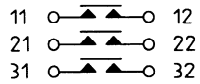
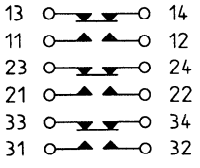
Single throw		Double throw
Normally open	Normally closed	Change over
		
		

Table 4 — Symbols and marking for terminals

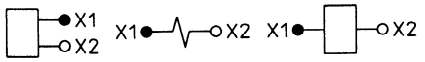
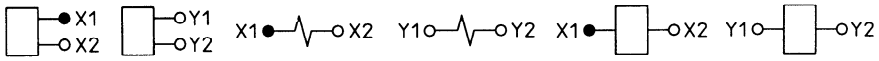
Single coil terminals	Dual coil terminals
	

Table 5 — Dual coil markings

Coil energized	Contacts closed	
	Load	Auxiliary
X1-X2	A1-A2 B1-B2 C1-C2	11-12 21-22 31-32
Y1-Y2	A3-A2 (or A3-A4) B3-B2 (or B3-B4) C3-C2 (or C3-C4)	13-12 23-22 33-32

4.10.3 Terminal covers and barriers

Relays and contactors with stud or screw terminals shall be provided with adequate covering, or separation, of terminal parts to provide protection against inadvertent shorting, grounding, or contact by personnel.

Terminal covers and barriers shall be designed to meet performance requirements applicable to the relay or contactor. The enclosure(s) shall be so designed that when the cover is removed, the relay or contactor shall be capable of operating without adjustment. The cover design shall be such that pressure differentials cannot exist between the inside and outside.

NOTE 7 Barriers may be removable, or may be integral with removable covers.

4.11 Contact symbols

Contact arrangements, symbols and terminals marking shall be in accordance with tables 2 to 4.

4.12 Materials

The materials shall conform to requirements specified in 4.12.1 and 4.12.2 as applicable. When a definite material is not specified, the selection of material shall be at the discretion of the manufacturer. Materials selected shall be such that the relays or contactors meet the performance requirements and product characteristics specified in this part of ISO 5867.

4.12.1 Metals

Metals shall be of corrosion-resistant type and shall be plated or treated to resist corrosion. Zinc plating, cadmium plating or unfused pure tin plating shall not be used on internal parts of hermetically sealed relays and contactors.

Unless otherwise specified in the detail specification (see 4.1), the use of dissimilar metals shall conform to table 6.

4.12.2 Non-metals

Non-metals, including protective finishes, shall:

a) be moisture-resistant;

b) be non-toxic;

c) be arc-resistant;

d) be flame-resistant;

e) be self-extinguishing;

f) not support fungus growth.

They shall not be adversely affected by loss of characteristics of composition in aircraft fluids at the temperatures specified in 4.2.

Materials in hermetically sealed envelopes are not required to meet the moisture- and fungus-resistance requirements.

Table 6 — Dissimilar metals

Group No.	Metallurgical category	EMF V	Anodic index 0,01 V	Compatible couples[1)]
1	Gold, solid and plated; gold-platinum alloys; wrought platinum (most cathodic)	+ 0,15	0	
2	Rhodium plated on silver-plated copper	+ 0,05	10	
3	Silver, solid or plated; high silver alloys	0	15	
4	Nickel, solid or plated; Monel metal, high nickel-copper alloys	− 0,15	30	
5	Copper, solid or plated; low brasses or bronzes; silver sider; German silver; high copper-nickel alloys; nickel-chromium alloys; austenitic corrosion-resistant steels	− 0,20	35	
6	Commercial yellow brasses and bronzes	− 0,25	40	
7	High brasses and bronzes; naval brass; Muntz metal	− 0,30	45	
8	18 % chromium type corrosion-resistant steels	− 0,35	50	
9	Chromium, plated; tin, plated; 12 % chromium type corrosion-resistant steels	− 0,45	60	
10	Tin-plate; terne-plate; tin-lead solder	− 0,50	65	
11	Lead, solid or plated; high lead alloys	− 0,55	70	
12	Aluminium, wrought alloys of the Duralumin type	− 0,60	75	
13	Iron, wrought, gray, or malleable; plain carbon and low alloy steels, armco iron	− 0,70	85	
14	Aluminium, wrought alloys other than duralumin type; aluminium, cast alloys of the silicon type	− 0,75	90	
15	Aluminium, cast alloys other than silicon type; cadmium, plated and chromated	− 0,80	95	
16	Hot-dip-zinc plate; galvanized steel	− 1,05	120	
17	Zinc, wrought; zinc-base die-casting alloys; zinc, plated	− 1,10	125	
18	Magnesium and magnesium-base alloys, cast or wrought (most anodic)	− 1,60	175	

1) Compatible couples: potential difference of 0,25 V max. between groups.

4.12.2.1 Plastic material

Plastic material shall conform to 4.12.2. In addition, when subjected to any of the tests in this part of ISO 5867, the plastic material shall not:

a) support combustion;

b) give off noxious gases in harmful quantities;

c) give off any gases in quantities sufficient to cause explosion of a sealed housing;

d) give off any gases in a sealed housing that will:

1) cause contamination of the contacts or other parts of the component,

2) form current-carrying tracks when subjected to arcing conditions.

4.12.2.2 Ceramic

Ceramic insulating material shall conform to the detail specification (see 4.1 and 4.12.2). External ceramic surfaces shall be glazed.

4.12.2.3 Magnet wire

Magnet wire shall conform to the detail specification (see 4.1 and 4.12.2).

4.12.2.4 Rubber

Rubber shall conform to the detail specification (see 4.1 and 4.12.2).

4.12.2.5 Semiconductors

Semiconductors shall conform to the detail specification (see 4.1).

4.13 Qualification

Relays and contactors supplied in accordance with this part of ISO 5867 shall be products that have been tested and which have satisfied the qualification inspection specified in 7.2. The qualification inspection shall be performed on units produced from parts made by production tools.

NOTE 8 Relays and contactors supplied in accordance with this part of ISO 5867 may be qualified by similarity to other relays or contactors in their generic family. The qualifying activity may require additional testing.

5 Performance detail requirements

5.1 Examination of product

When relays or contactors are examined and tested in accordance with 6.1, they shall conform to requirements for materials, design, construction, physical dimension, weight, item marking and workmanship as specified in this part of ISO 5867 and in the detail specification (see 4.1).

5.1.1 Dimensions

Dimensions shall be in accordance with 4.5.

5.1.2 Header glass of hermetically sealed enclosures

Header glass or ceramic of relays and contactors shall be visually inspected for workmanship and finish using microscopic examination with × 10 magnification. All relays shall meet the applicable seal requirements, regardless of the acceptability of the header glass.

NOTE 9 In case of dispute, the relay may be subjected to the applicable seal requirement or any test deemed appropriate in order to determine its integrity (see 6.1.2).

Header glass may have small irregularities, such as bubbles, chips, cracks, etc. The acceptability of these defects is based on the following (see figure 1):

a) broken or open blisters having sharp edges are not acceptable;

b) blisters whose diameters exceed one-third of the radial distance between the terminal and the corresponding header metal (for a cluster of blisters the combined diameters apply) are not acceptable;

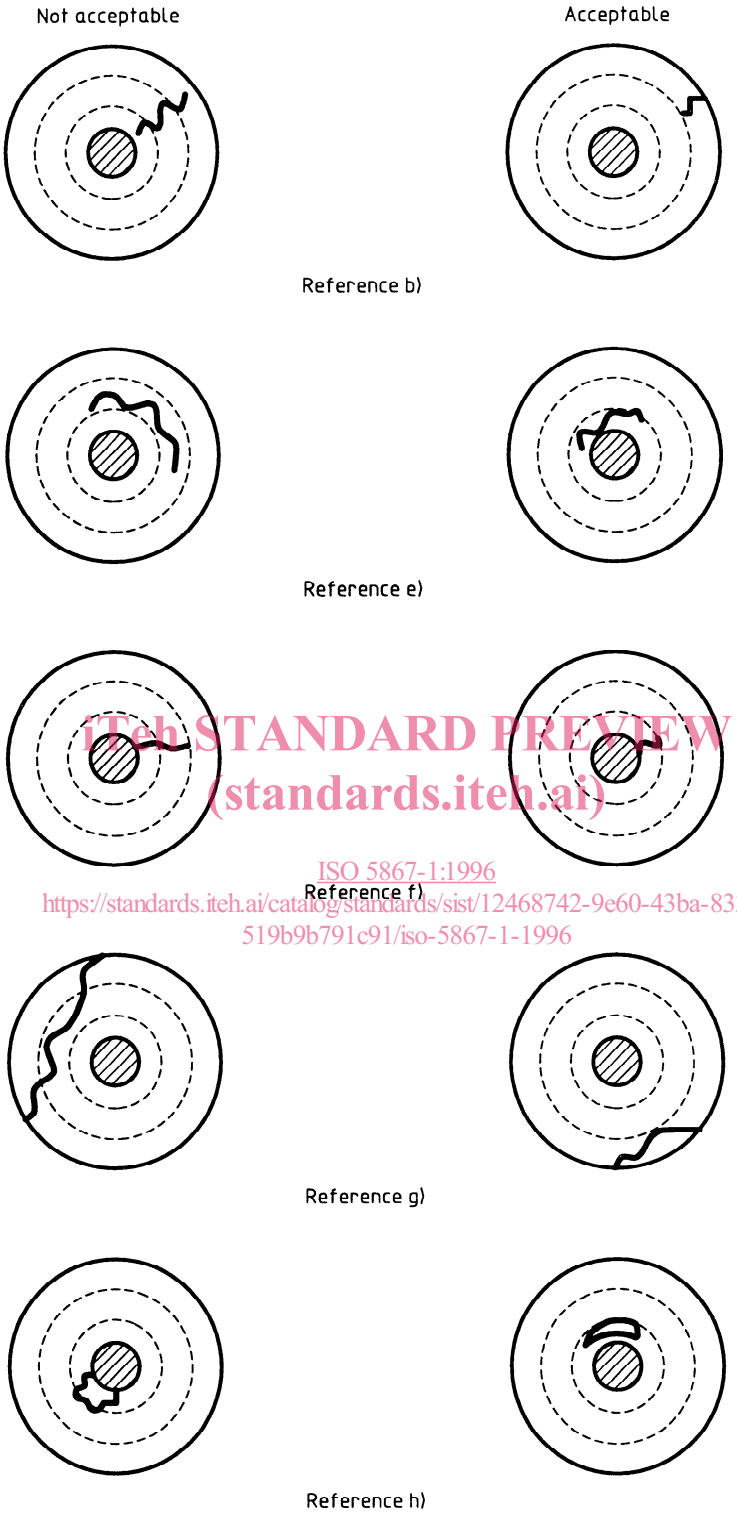
c) foreign material in or on the surface of the glass is not acceptable;

d) dark spots (pigment concentrations) whose diameters exceed one-third of the radial distance between terminal and the corresponding header metal are not acceptable;

e) circumferential cracks which extend more than 90° are not acceptable;

f) radial cracks whose lengths exceed one-third of the distance between the terminal and corresponding header metal are not acceptable;

g) tangential cracks that are not confined to a single zone are not acceptable;



NOTE — Dashed lines indicate radial distance between terminal and header metal, dividing the glass into three equal parts (zones).

Figure 1 — Inspection aid

h) surface chips whose lengths or widths exceed one-third the distance between the terminal and corresponding header metal are not acceptable;

i) chipped menisci are acceptable to the extent that they do not extend below the surface of the glass, and conform to h);

j) menisci that extend up the terminal greater than 0,51 mm (0,020 in) or one-third of the terminal diameter whichever is greater, are not acceptable;

k) peripheral cracks at the boundary of the glass and surrounding header metal are not acceptable;

l) any terminals which appear to be separated from the glass are not acceptable.

5.1.3 Operating voltage

5.1.3.1 Pickup voltage

When relays or contactors are tested in accordance with 6.1.3.1, each set of contacts shall make positive contact or open, as applicable, in the energized position when a potential voltage not in excess of the specified pickup voltage is applied to the relay or contactor coil. All normally open switching circuits shall close with positive contact and all normally closed circuits, if applicable, shall open. Once the device has picked up, the contacts shall not change state (break and remake) when the coil voltage is increased from the point of pickup to the maximum coil voltage, excluding normal contact bounce. For qualification inspection, the pickup voltage shall fall within the maximum specified when the relay or contactor is mounted in each of three mutually perpendicular planes.

5.1.3.2 Dropout voltage

This subclause is not applicable to latching relays.

When relays or contactors are tested in accordance with 6.1.3.2, each set of normally open contacts shall open, and each set of normally closed contacts shall close, as applicable, when the applied coil voltage is in the specified dropout voltage range. Excluding normal contact bounce, once the relay has dropped out, the contacts shall not change state when the voltage is reduced from the point of dropout to 0 V. For qualification inspection, the dropout voltage shall be measured with the device in each of three mutually perpendicular planes.

5.1.4 Hold voltage

When relays or contactors are tested in accordance with 6.1.4, there shall be no change in contact state (neither an opening of contacts that are closed, nor closure of contacts that are opened) until the coil voltage is less than the hold voltage specified in the detail specification (see 4.1).

5.1.5 Coil resistance

When relays or contactors are tested in accordance with 6.1.5, the d.c. coil resistance (or the maximum coil current) shall be as specified in the detail specification (see 4.1). If protective circuitry is involved d.c. coil resistance shall be substituted by coil current (see 5.1.6).

5.1.6 Maximum coil current

When relays or contactors are tested in accordance with 6.1.6, the maximum coil current shall not exceed the value specified in the detail specification (see 4.1).

5.1.7 Contact circuit voltage drop and contact resistance

When relays or contactors are tested in accordance with 6.1.7, the voltage drop values measured at the appropriate terminal with rated resistive current shall not exceed the values given in table 7.

For relays or contactors with auxiliary contacts rated 2 A or less, the contact resistance value shall be not greater than 0,05 Ω prior to the load endurance (life) cycling test and 0,15 Ω after the load endurance (life) cycling test.

5.1.8 Contact bounce, operating and release time

Release time is not applicable to latching relays.

Photographic records of contact operating and release times, and contact bounce at nominal coil voltage shall be taken for qualification test approval.

When relays or contactors are tested in accordance with 6.1.8, the contact bounce, operating and release times shall be within limits specified in the detail specification (see 4.1). The operating and release times shall not include the contact bounce time. The operating time and release time of each pole of a multipole relay shall be within 1 ms of each other pole of that relay for relays with contact ratings of 15 A or less, and within 2 ms for relays and contactors with contact ratings greater than 15 A. Synchronized switching control parameters for auxiliary contacts

relative to main and each other shall be specified in the detail specification (see 4.1). Unless make-before-break action is specified in the detail specification (see 4.1), double-throw relays or contactors shall show no evidence of any normally open contacts closing before all normally closed contacts open; any normally closed contacts shall not make before all normally open contacts break. Contact break bounce on release of normally open contacts when specified in the detail specification (see 4.1) shall be less than 100 µs.

5.1.9 Dielectric strength and leakage current

When relays or contactors are tested in accordance with 6.1.9, the insulation of the relays and contactors shall be capable of withstanding, without damage, the values specified in table 8, or in the relevant detail specification (see 4.1).

All a.c. voltages stated are r.m.s. voltages. The testing shall be carried out under standard sea level conditions.

Leakage current shall not exceed 1 mA and the rate of applied test voltage shall not exceed 250 V/s.

The 1 min test is mandatory for qualification test only. The 5 s to 10 s test may be used for production acceptance testing.

5.1.10 Insulation resistance

When relays or contactors are tested in accordance with 6.1.10, the insulation resistance shall be measured at a potential of (500 ± 25) V d.c. between all mutually insulated terminals and between terminals and case. The required value shall be reached within 2 min after applying the test potential.

Insulation resistance shall be a minimum value of 100 MΩ except after climatic tests when it shall be a minimum value of 50 MΩ.

5.1.11 Low level run-in

Relays and auxiliary contacts shall be tested in accordance with 6.1.11 or 6.2.15.6 as appropriate. One operation exceeding 100 Ω dynamic contact circuit resistance shall constitute failure.

5.1.12 Sealing test

5.1.12.1 Class 1 relays and contactors

When class 1 relays and contactors are tested in accordance with 6.1.12, the leakage rate shall not exceed $6,2 \times 10^{-3}$ Pa·cm^3/s per cubic centimetre (1×10^{-6} atm·cm^3/s per cubic inch) of net sealed volume, except for relays of 32,8 cm^3 (2 in^3) net sealed volume or less, in which case the leakage rate shall not exceed $6,2 \times 10^{-5}$ Pa·cm^3/s per cubic centimetre (1×10^{-8} atm·cm^3/s per cubic inch) of net sealed volume.

Table 7 — Contact circuit voltage drop

Readings in volts

Class	Before load cycling		After load cycling	
	Average reading	Maximum individual reading	Average reading	Maximum individual reading
1	0,125	0,150	0,150	0,175
2 and 3	0,150	0,175	0,175	0,200

Table 8 — Minimum values for high voltage tests

Rated voltage	Test voltage	Duration
28 V d.c.	500 V, 50 Hz to 60 Hz	1 min
115/200 V a.c.	1 250 V, 50 Hz to 60 Hz	1 min
28 V a.c.	600 V, 50 Hz to 60 Hz	5 s to 10 s
115/200 V a.c.	1 500 V, 50 Hz to 60 Hz	5 s to 10 s

5.1.12.2 Class 2 relays and contactors

When class 2 relays and contactors are tested in accordance with 6.1.12, the leakage rate shall be as specified in the detail specification (see 4.1).

5.1.13 Marking

In addition to the reference marking of the terminals (see 4.10.2), each relay or contactor shall be clearly and indelibly marked with the following information:

a) a reference to this part of ISO 5867;

b) manufacturer's name or identification;

c) manufacturer's type number;

d) the nominal operating coil voltage;

e) the rated voltage and resistive current;

f) circuit diagram (de-energized);

g) date code (year/week).

5.2 Environmental electrical and mechanical requirements

5.2.1 High temperature operation

When relays or contactors are tested in accordance with 6.2.1, the requirements for pickup voltage and dropout voltage shall conform to the detail specifications (see 4.1).

5.2.2 Low temperature operation

When relays or contactors are tested in accordance with 6.2.2, there shall be no damage such as loosening of terminals, cracking or flaking of glass insulation (other than crazing or chipping of the glass meniscus) or of the hermetic seal. Following the test and at the specified low temperature, the pickup voltage, dropout voltage, and contact voltage drop shall conform to the detail specification (see 4.1). Devices which contain permanent magnets in the magnetic circuit shall, in addition to the above test, be subjected to the demagnetizing effect of a sudden application of maximum coil voltage for one operation at the beginning of the second 24 h period when the high temperature pickup voltage shall conform to detail specification (see 4.1).

5.2.3 Electromagnetic interference

5.2.3.1 Exported spikes

If applicable, when tested in accordance with 6.1.14.1, the relays and contactors shall not generate exported spikes (back EMF) in excess of the figures specified in the detailed specification (see 4.1).

5.2.3.2 Imported spikes

When tested in accordance with 6.1.14.2, the relays and contactors shall accept imported spikes of ± 600 V peak over sine wave width of 5 µs without any damage to the relay or contactor coil or coil suppression device.

Following this test, the relays or contactors shall conform to 5.1.3.1, 5.1.3.2, 5.1.5 and 5.2.3.1.

5.2.3.3 Compass-safe distance

When relays or contactors are tested in accordance with 6.2.3, they shall satisfy the compass-safe distance as specified in the detail specification (see 4.1). There shall be not more than 1° deflection of the compass when either the relay or contactor is tested in both energized and de-energized condition.

5.2.4 Strength of terminals

When relay or contactor terminals are tested in accordance with 6.2.4, they shall conform to 4.10 and table 1.

5.2.5 Thermal shock

When relays or contactors are tested in accordance with 6.2.5, there shall be no damage to the relay, loosening of terminals, or cracking or flaking of the glass insulation (other than cracking or chipping of the glass meniscus).

5.2.6 Sand and dust

This subclause is only applicable to class 3 relays or contactors.

When relays or contactors are tested in accordance with 6.2.6, there shall be no evidence of damage sufficient to impair the operation of the device.

5.2.7 Continuous current

When relays or contactors are tested in accordance with 6.2.7, there shall be no damage such as loosening of terminals or loss of seal, or any deterioration of performance beyond the limits specified in the de-