INTERNATIONAL STANDARD

ISO 9763

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Aerospace — Aircraft control wire rope assemblies — Technical specification

Aéronautique et espace — Câbles de commandes d'aéronefs, équipés — Spécification technique

Reference number
ISO 9763:1999(E)

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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 3.

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 9763 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 12, *Mechanical system parts*.

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Aerospace — Aircraft control wire rope assemblies — Technical specification

1 Scope

This International Standard specifies the characteristics, inspections and test methods as well as the quality assurance requirements for aircraft control wire rope assemblies equipped with swaged end fittings. This International Standard is applicable to control wire rope assemblies as defined in ISO 9762.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 2020-1*, Aerospace — Preformed flexible steel wire rope for aircraft controls — Part 1: Dimensions and loads.*

ISO 9001:1994, *Quality systems — Model for quality assurance in design, development, production, installation and servicing.*

ISO 9002:1994, *Quality systems — Model for quality assurance in production, installation and servicing.*

ISO 9003:1994, *Quality systems — Model for quality assurance in final inspection and test.*

ISO 9737:—[1)], *Aerospace — Eye-ends, in corrosion-resistant steel, swaged on aircraft control wire rope — Dimensions and loads.*

ISO 9747:—[1)], *Aerospace — Double-shank ball-ends, in corrosion-resistant steel, swaged on aircraft control wire rope — Dimensions and loads.*

ISO 9748:—[1)], *Aerospace — Ball-ends, in corrosion-resistant steel, swaged on aircraft control wire rope — Dimensions and loads.*

ISO 9749:—[1)], *Aerospace — Stud-ends, in corrosion-resistant steel, swaged on aircraft control wire rope — Dimensions and loads.*

ISO 9759:—[1)], *Aerospace — Fork ends, in corrosion-resistant steel, swaged on aircraft control wire rope — Dimensions and loads.*

ISO 9760:—[1)], *Aerospace — Fork ends, in corrosion-resistant steel, swaged on aircraft control wire rope for rolling bearings, — Dimensions and loads.*

ISO 9762:—[1)], *Aerospace — Aircraft control wire rope assemblies — Combinations and dimensions.*

[1)] To be published.

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3 Terms and definitions

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

3.1
manufacturing batch
quantity of control wire rope assemblies making up the same manufacturing series and of the same composition:

— with wire ropes from the same spool (identical material and diameter);

— with the same definitions for the extremities

3.2
test piece
control wire rope assembly taken at random from a given batch

4 Requirements

4.1 General

The requirements specified by this International Standard are given in Table 1 and, apart from where otherwise specified, they also apply to control wire rope assemblies ready for use. The test temperature shall be, apart from where otherwise specified, ambient temperature. These requirements are to be taken into account along with the conditions which figure in all the other standards or specifications cited in the product or the definition documents for control wire rope assemblies.

Table 1 — Technical requirements and inspections and test methods

No.	Characteristics	Technical requirements	Inspections and test methods	Q [a]	A [b]
4.2	Composition of the control wire rope assembly	In conformity with the code designation specified in ISO 9762.	Visual examination.	×	
4.3	External aspect	No cracks, distortion or burrs shall be allowed. A slight round-edged punch mark shall be allowed on the end fitting. This stamp shall be applied before swaging for the purpose of holding the wire rope in the fitting.	Visual examination.	×	×
4.4	Dimensions of the swaged part	In accordance with Table 2 and Figures 1, 2 and 3.	Usual measuring instruments.	×	×
4.5	Length "L_1" of the wire rope inserted into the end fitting	In accordance with Figure 1. After swaging, no trace of the naked wire rope shall appear between the identification mark and the end fitting.	Inspection: — by x-ray examination; or — by applying a reference mark to the wire rope before swaging. The choice of the mark (paint, self-adhesive band or other) is left to the manufacturer.	×	×

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Table 1 *(continued)*

No.	Characteristics	Technical requirements	Inspections and test methods	Q [a]	A [b]
4.6	Internal faults on the swaged part	In accordance with Figure 4. After swaging: — no cracks or folds visible to the naked eye; — no cracks deeper than 150 μm; — no more than six cracks having a depth between 40 μm and 150 μm.	On the cross section for the swaged part, carry out: — a visual examination; — a micrographic examination at a magnifying power of at least 100.	×	×
4.7	Length of the control wire rope assembly	In accordance with ISO 9762.	Unless specified otherwise, the measurement shall be taken with the wire rope held flat along its whole length under a 50 N load.	×	×
4.8	Performance under a load equal to 60 % of the minimum breaking load of the wire rope	Subjected to a load equal at least to 60 % of the minimum breaking load of the wire rope concerned given in ISO 2020-1, the wire rope shall not slip in the end fitting and no wire shall be found to be broken upon visual or tactile inspection.	The test shall be carried out with the wire rope in a straight line. — Apply the load continuously and progressively (within a minimum of 3 s). — Maintain it for 5 s. — Then bring it gradually back to zero. Any sudden variation in the load recorded during the test shall be considered the sign of possible slippage of the wire rope in the end fittings and shall call for a very thorough inspection of the wire rope assembly and of its length. After this test, the control wire rope assembly shall be carefully examined.	×	×
4.9	Performance under the minimum breaking load of the wire rope	No slippage of the wire rope in the end fittings shall be allowed under the minimum breaking load of the wire rope concerned given in ISO 2020-1. Any eventual fracture shall only occur under a load equal or superior to the minimum breaking load and then never in or at the limit of the end fitting.	The load shall be applied continuously and progressively until a load equal to 80 % of the minimum breaking load is obtained. The remaining load shall be applied at a rate of about 10 N/s. A visual check shall be carried out to see whether the wire rope has slipped.	×	×

[a] Q = conditions for executing qualification inspections and tests (in accordance with 5.2)

[b] A = conditions for executing acceptance inspections and tests (in accordance with 5.3)

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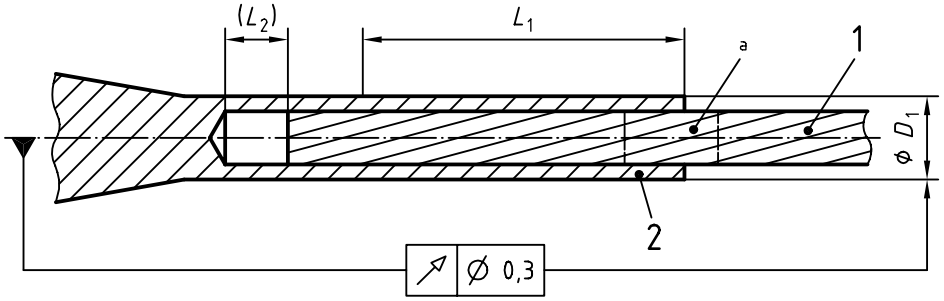
Table 2 — Dimensions of the swaged part

Dimensions in millimetres

Nominal diameter of wire rope [a]	D_1 [b] ± 0,12	D_2 [c]		D_3 $^{0}_{-0,12}$	L_1 min.	L_2	L_3 max.	L_4 max.
1,6	3,5	2,84		4,83	18	4,5	10	4
2,4	4,83	3,63		6,43	21	5	15,5	6
3,2	5,56	4,83	$^{0}_{-0,12}$	8	27	6,4	20	8
4	6,35	5,64		9,63	33	8	26	10
4,8	7,95	6,48		11,23	34	7,3	30	12
5,6	9,52	7,67	$^{0}_{-0,17}$	12,83	39	8,4	35	14
6,4	11,12	8,84		14,4	43		41	16

[a] In accordance with ISO 2020-1.
[b] Executable along the whole length L_1 (see Figure 1).
[c] Executable along the whole length L_4 (see Figure 3).

Dimensions in millimetres

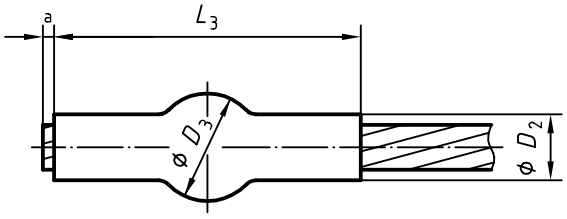


Key

1 Wire rope
2 End fitting

[a] Reference mark

Figure 1 — Swaging of end fittings ISO 9737, ISO 9749, ISO 9759 and ISO 9760



[a] 1 mm to 1,5 mm

Figure 2 — Swaging of ISO 9747 end fitting

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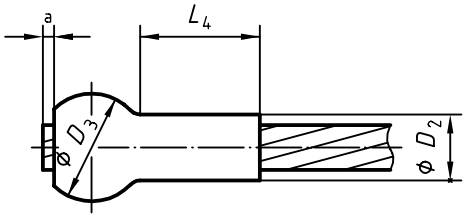
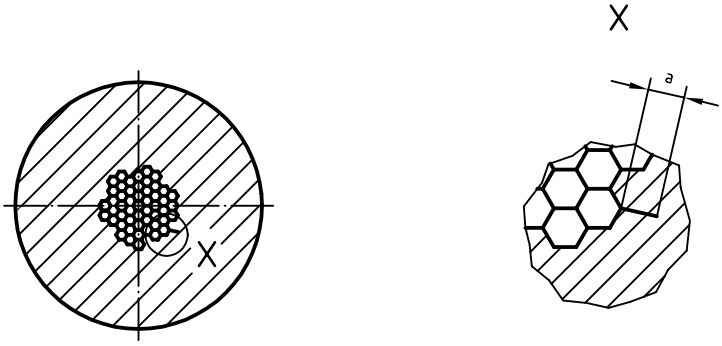


a 1 mm to 1,5 mm

Figure 3 — Swaging of ISO 9748 end fitting



a 40 µm to 150 µm

Figure 4 — Cross-section of the swaged part of the end fitting

5 Quality assurance

5.1 General

5.1.1 Approval of the manufacturer

The manufacturer shall satisfy the quality assurance and approval procedures as defined by ISO 9001, ISO 9002 or ISO 9003. The aim of these procedures is to ensure that the manufacturer has a quality system and is capable of manufacturing, on a regular basis, control wire rope assemblies which fulfil the specified quality conditions.

The manufacturer shall be approved by the certification authorities or their delegated representative, who may be the first supervisor.

5.1.2 Qualification of control wire rope assemblies

The purpose of qualification inspections and tests of control wire rope assemblies is to verify that the conception and the manufacturing conditions of a control wire rope assembly and shall be such that the conditions of this International Standard are satisfied.

The qualification of control wire rope assemblies shall be granted by the certification authorities in the buyer's country, or their delegated representative, who may be the first supervisor.

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5.1.3 Acceptance of control wire rope assemblies

The purpose of acceptance inspections and tests for control wire rope assemblies is to verify as simply and cheaply as possible and with the inherent uncertainty of a statistical test, that the conditions of this International Standard can be satisfied.

Acceptance tests shall be carried out by the manufacturer, or under his responsibility. The manufacturer shall be responsible for the quality of the manufactured products.

5.2 Conditions for the execution of qualification tests

The qualification tests are given in Table 1. They shall be carried out for each nominal diameter of the control wire rope assembly to the following combinations:

a) an ISO 9737 or ISO 9749 or ISO 9759 or ISO 9760 end fitting at the two extremities,

b) an ISO 9737 or ISO 9749 or ISO 9759 or ISO 9760 end fitting at one extremity and an ISO 9747 or ISO 9748 end fitting at the other.

For a control wire rope assembly, of a given nominal diameter, perform the checks and inspections given in Table 3 on six control wire rope assemblies (two in each of the above combinations).

Table 3 — Inspections and tests for the qualification of control wire rope assemblies

Order No.	Type of inspection	Sub-clause	Number of the test piece [a]					
			1	2	3	4	5	6
1	Composition of the control wire rope assembly	4.2	×	×	×	×	×	×
2	External aspect	4.3	×	×	×	×	×	×
3	Length of the control wire rope assembly	4.7	×	×	×	×	×	×
4	Dimensions of the swaged part	4.4	×	×	×	×	×	×
5	Length "L_1" of the wire rope inserted in the end fitting	4.5	×	×	×	×	×	×
6	Performance under a load equal to 60 % of the wire rope's minimum breaking load	4.8	×	×	×	×	×	×
7	Performance under the wire rope's minimum breaking load	4.9	×	×	×			
8	Internal faults of the swaged part	4.6				×	×	×

[a] Composition of the test pieces (see 5.2):
— Test pieces No. 1 and 4: an ISO 9737 or ISO 9749 or ISO 9759 or ISO 9760 end fitting at each extremity.
— Test pieces No. 2 and 5:
  — an ISO 9737 or ISO 9749 or ISO 9759 or ISO 9760 end fittings at one extremity;
  — an ISO 9747 or ISO 9748 end fitting at the other extremity.
— Test pieces No. 3 and 6:
  — an ISO 9747 end fitting at one extremity;
  — an ISO 9748 end fitting at the other extremity.

The test specimen shall consist of

— a 500 mm length wire rope, with the same characteristics as the naked wire rope used on the control wire rope assembly and from the same spool;

— end fittings identical to those used on the control cable assembly, swaged on the wire rope sample under the same swaging conditions as for the control wire rope assemblies from the batch. These swagings shall be carried out during the manufacture of the batch in question and under the same execution conditions as this batch.

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If a control wire rope assembly is made up of two end fittings and an intermediary fitting (ISO 9747), each sample shall made up of two specimens on which the following are swaged at the ends:

— one of the end fittings;

— an intermediary fitting (ISO 9747).

5.3 Conditions for the execution of acceptance inspections and tests

The acceptance inspections and tests are given in Table 1. They shall be carried out on each identity batch in accordance with Table 4.

6 Marking

In addition to the manufacturer's own marking, each control wire rope assembly shall be marked using the identity block specified in ISO 9762.

It shall be:

— either stamped onto a tab which is slipped onto the wire rope before swaging the last end fitting; or

— engraved on a sleeve fixed to the swaged part of the end fitting; or

— printed indelibly (ink, chemical engraving or other means) on one of the two end fittings without this affecting the performance or reducing the service life of the control wire rope assembly.

The inspection stamp shall also figure along with the marking.

Table 4 — Acceptance inspections and tests for control wire rope assemblies

Order No.	Type of inspection and test	Sub-clause	Number of inspections or tests per batch	Sanction
1	Composition of the control wire rope assembly	4.2	100 %	Any control wire rope assembly which does not satisfy the requirements shall, alone, be eliminated and shall not lead to the rejection of the batch.
2	External aspect	4.3		
3	Length of the control wire rope assembly	4.7		
4	Dimensions of the swaged part	4.4		
5	Length "L_1" of the wire rope inserted in the end fitting	4.5		
6	Performance under a load equal to 60 % of the wire rope's minimum breaking load	4.8		
7	Performance under the wire rope's minimum breaking load	4.9	See Table 5. Carry out these two tests on the same test piece	Any control wire rope assembly which shall not satisfy the requirements causes rejection of the batch.
8	Internal faults of the swaged part	4.6		

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Table 5

Number in the delivery batch	Number of test pieces
1 to 90	2
91 to 150	3
151 to 280	5
281 to 500	8

7 Packing

Control wire rope assemblies shall be packed individually in paper packaging free from grease and carefully closed:

— in a rectilinear position; or

— rolled so that the diameter is at least 150 times the diameter of the wire rope.

The manner in which the assemblies are packed depends on whether the objects can be folded or not, but shall be such that there is no deterioration during transportation.

The following indications shall figure on each package at least:

— name and address of the producer;

— number of the deal or order;

— quantity;

— identity block defined by the product standard or the definition document;

— packing date.

Special packing may be stipulated in which case it shall be specified in the order.

8 Certificate of conformity

All control wire rope assemblies supplied in conformity with this International Standard shall be accompanied by a conformity certificate supplied by the manufacturer.

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