INTERNATIONAL STANDARD

ISO 2020-1

First edition
1997-08-01

Aerospace — Preformed flexible steel wire rope for aircraft controls —

Part 1:
Dimensions and loads

Aéronautique et espace — Câbles en acier souples préformés pour commandes d'aéronefs —

Partie 1: Dimensions et charges

Reference number
ISO 2020-1:1997(E)

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 2020-1 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 12, *Mechanical system parts*.

This first edition of ISO 2020-1 together with ISO 2020-2 cancels and replaces ISO 2020:1984.

ISO 2020 consists of the following parts, under the general title *Aerospace — Preformed flexible steel wire rope for aircraft controls*:

— *Part 1: Dimensions and loads*

— *Part 2: Technical specification*

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Printed in Switzerland

Aerospace — Preformed flexible steel wire rope for aircraft controls —

Part 1:
Dimensions and loads

1 Scope

This part of ISO 2020 specifies the requirements which shall be satisfied by preformed flexible steel wire ropes for aircraft controls. The wire ropes shall be capable of operation within the temperature range of – 54 °C to +121 °C.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 2020. 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 2020 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 2020-2:1997, *Aerospace — Preformed flexible steel wire rope for aircraft controls — Part 2: Technical specification.*

ISO 2408:1985, *Steel wire ropes for general purposes — Characteristics.*

ISO 2532:1974, *Steel wire ropes — Vocabulary.*

ISO 3578:1980, *Steel wire ropes — Standard designations.*

3 Definitions

For the purposes of this part of ISO 2020, the definitions and designations given in ISO 2408, ISO 2532 and ISO 3578 apply.

4 Dimensions, masses, strengths of wire for ropes

4.1 Wire diameters

The nominal wire diameters necessary for the manufacture of ropes shall be specified by the ropemaker. The limit deviations given in table 1 apply to the diameters of the finished wire.

Table 1 — Limit deviations for wire diameters

Dimensions in millimetres

Nominal wire diameter	Limit deviations for wire diameters
⩾ 0,15 to < 0,40	± 0,010
⩾ 0,40 to < 1,00	± 0,015

4.2 Zinc coating (for carbon steel wire only)

The minimum values of the mass per unit area of zinc coating for carbon steel wire shall conform to the values given in table 2.

Table 2 — Minimum amounts of zinc coating for carbon steel wire

Dimensions in millimetres

Nominal wire diameter	Minimum mass per unit area of zinc coating g/m²
⩾ 0,15 to < 0,25	10
⩾ 0,25 to < 0,40	15
⩾ 0,40 to < 0,50	30
⩾ 0,50 to < 0,80	50

5 Materials

5.1 Carbon steel wire

Carbon steel wire rod shall be used for the manufacture of wire for ropes. It shall be cold drawn and zinc coated.

5.1.1 Steel analysis

The cast analysis shall be within the limits given in table 3.

Table 3 — Limits for cast analysis

Element	% (*m*/*m*)	
	min.	max.
Carbon	0,5	0,85
Silicon	—	0,35
Manganese	0,4	0,9
Phosphorus	—	0,04
Sulfur	—	0,04
Sulfur + phosphorus combined	—	0,065

5.2 Corrosion-resisting steel wire

Corrosion-resisting alloy steel wire rod shall be used for the manufacture of wire for ropes. It shall be cold drawn.

5.2.1 Steel analysis

The cast analysis shall be within the limits given in table 4.

Table 4 — Limits for cast analysis

Element	% (*m*/*m*)	
	min.	max.
Carbon	—	0,15
Silicon	—	1,0
Manganese	—	2,0
Phosphorus	—	0,045
Sulfur	—	0,03
Chromium	17,0	20,0
Nickel	8,0	12,0

6 Ropes

6.1 Construction

Wire ropes covered by this part of ISO 2020 are of the two types of construction shown in table 5.

6.1.1 7 × 7 construction

This type of wire rope shall be composed of six outer strands each of seven wires laid in a right-hand direction around a steel centre strand of seven wires.

The steel centre strand shall be composed of a layer of six wires laid in a right-hand direction around a core or king wire. It shall be of sufficient diameter to give full support to the outer strands.

The six outer strands shall be composed of a layer of six wires laid in a left-hand direction around a core or king wire.

The lengths of lay shall be as follows:

a) the six outer strands shall be laid around the steel centre strand with a length of lay between six and eight times the nominal diameter of the rope;

b) the lengths of lay of six wires of the steel centre strand and of the outer strands shall not exceed 60 % of the length of lay of the rope.

6.1.2 7 × 19 construction

This type of wire rope shall be composed of six outer strands each of 19 wires laid in a right-hand direction around a steel centre strand of 19 wires.

The steel centre strand shall be composed of a first layer of six wires laid in a right-hand direction around a core or king wire, and a second layer of 12 wires laid in a right-hand direction. It shall be of sufficient diameter to give full support to the outer strands.

The six outer strands shall be composed of a first layer of six wires and a second layer of twelve wires laid in a left-hand direction around a core or king wire.

The lengths of lay shall be as follows:

a) the six outer strands shall be closed around the steel centre strand with a length of lay between six and eight times the nominal diameter of the rope;

b) the inner layer of six wires of the steel centre strand and the outer strands shall have a length of lay of less than 60 % of the length of the outer layer;

c) the outer layer of the steel centre strand and the outer strands shall have a length of lay of less than 50 % of the length of lay of the rope.

7 Dimensions, masses, elongation and loads for ropes

7.1 Dimensions, masses and loads

Table 5 — Dimensions, masses and loads

1	2	3	4	5	6	7
Nominal diameter of wire rope mm	**Construction**	**Measured diameter** (average) mm		**Minimum breaking load** kN		**Approximate mass per 100 m** kg
		min.	max.	Carbon steel	Corrosion-resisting steel	
1,2	7 × 7	1,2	1,4	1,20	1,20	0,65
1,6		1,6	1,8	2,15	2,15	1,2
2,4		2,4	2,7	4,10	4,10	2,4
	7 × 19			4,45		2,6
3,2		3,2	3,5	8,90	7,85	4,3
4,0		4,0	4,4	12,45	10,70	6,7
4,8		4,8	5,2	18,60	16,50	9,7
5,6		5,6	6,0	24,90	22,25	12,8
6,4		6,4	6,8	31,20	28,50	16,4
7,2		7,2	7,7	35,60	34,70	20,8
8,0		8,0	8,6	43,60	40,05	25,8
9,5		9,5	10,2	64,10	53,40	36,2

7.2 Elongation

Elongation shall be tested under permanent loading on ropes of 7 × 7 and 7 × 19 constructions in accordance with the values given in table 6.