INTERNATIONAL STANDARD

ISO 19427

First edition
2019-01

Steel wire ropes — Pre-fabricated parallel wire strands for suspension bridge main cable — Specifications

Câbles en acier — Câbles à fils parallèles préfabriqués pour câble porteur de pont suspendu — Spécifications

Reference number
ISO 19427:2019(E)

© ISO 2019



COPYRIGHT PROTECTED DOCUMENT

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ... **iv**

1 Scope ... **1**

2 Normative references ... **1**

3 Terms and definitions ... **1**

4 Designation of product ... **5**

5 Requirements ... **5**
5.1 Traceability ... 5
5.2 Lengths and fabrication tolerances ... 5
5.3 Material and manufacture ... 6
5.4 Mechanical property ... 7
5.4.1 Tensile property ... 7
5.4.2 Modulus of elasticity ... 7
5.4.3 Fatigue property ... 7

6 Test methods ... **8**
6.1 Material test ... 8
6.2 Tensile test of PPWS ... 8
6.3 Modulus of elasticity ... 8
6.4 The test of socketing process ... 9
6.5 Fatigue test ... 9

7 Inspection ... **9**
7.1 Inspection and inspection documents ... 9
7.2 Acceptance unit, number of samples and test pieces ... 9
7.3 Evaluation of test results for mechanical, chemical, and coating properties ... 10
7.4 Sorting and reprocessing ... 10

8 Identification and marking ... **10**

9 Storage and handling ... **11**

10 Transportation ... **11**

Annex A (normative) **Cross-sectional layout of PPWS** ... **12**

Annex B (informative) **Sectional dimensions, nominal length mass of PPWS** ... **13**

Annex C (informative) **Nominal breaking force** ... **14**

© ISO 2019 – All rights reserved

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 105, *Steel wire ropes*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

© ISO 2019 – All rights reserved

Steel wire ropes — Pre-fabricated parallel wire strands for suspension bridge main cable — Specifications

1 Scope

This document specifies the production methods, specifications, requirements, test methods, inspection rules, marks, packing, transportation and storage for pre-fabricated parallel wire strand (PPWS), which are made of hot-dip galvanized or zinc-aluminium coated high tensile steel wires described in ISO 19203.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

ISO 4986, *Steel casting — Magnetic particle inspection*

ISO 4992-2, *Steel castings — Ultrasonic examination — Part 2: Steel castings for highly stressed components*

ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

ISO 10474:2013, *Steel and steel products — Inspection documents*

ISO 17558:2006, *Steel wire ropes — Socketing procedures — Molten metal and resin socketing*

ISO 19203, *Steel wire rod and wire products — Hot-dip galvanized and zinc-aluminium coated steel wires for bridge cables — Specifications*

EN 1774, *Zinc and zinc alloys — Alloys for foundry purposes — Ingot and liquid*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

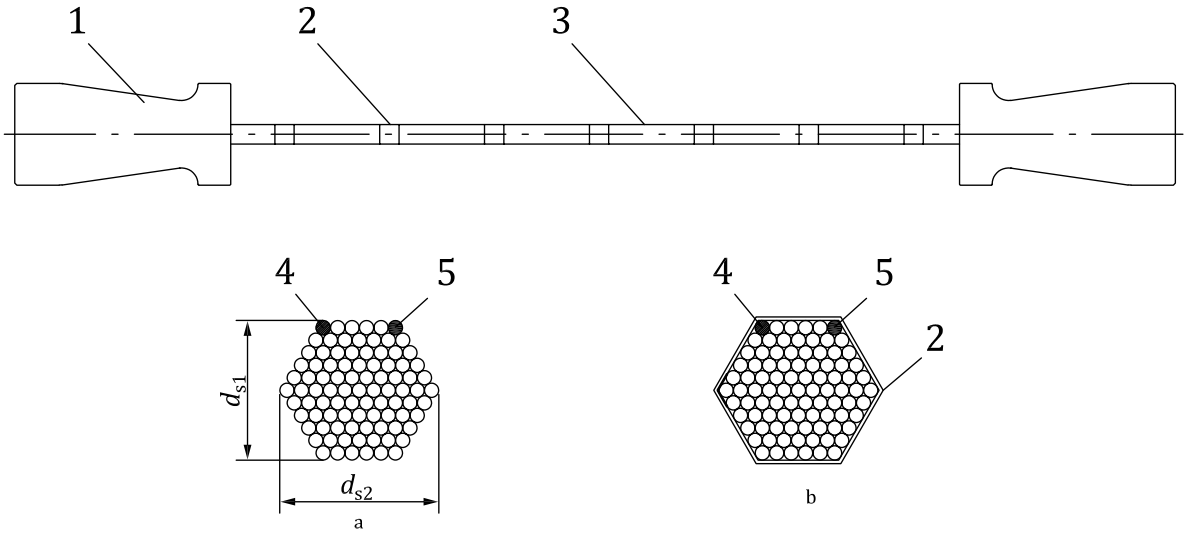
— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
pre-fabricated parallel wire strand
PPWS
strand factory pre-fabricated by assembling a group of wires laid parallel in a hexagonal (regular or irregular) shape, bound together at intervals by binding tape, and fitted with *sockets* (3.3) at each end

Note 1 to entry: The section and the structure of PPWS is shown in Figure 1.

© ISO 2019 – All rights reserved



Key

1 socket
2 binding tape
3 PPWS
4 gauge wire
5 coloured wire (red)

d_{s1} hexagon diagonal distance (across corners), in mm
d_{s2} hexagon width distance (across flats), in mm
a Cross-section of strand (without binding tape).
b Cross-section of strand (with binding tape).

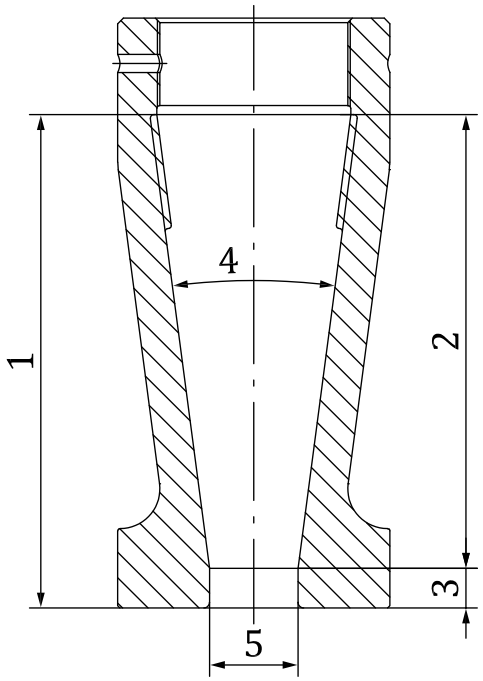
Figure 1 — Diagram of structure of PPWS

3.2
binding tape
plastic tape reinforced by plastic fibres

Note 1 to entry: The tapes are bound at intervals to keep the shape of strand tight and can permit the wires to open or spread sufficiently to adjust the stresses in the strand during reeling and unreeling.

3.3
socket
PPWS (3.1) termination incorporating a *socket basket* (3.5), see Figure 2

© ISO 2019 – All rights reserved



Key

1 overall basket length [tapered portion plus parallel portion(s), if applicable, plus radius at rope entry]
2 tapered portion of socket basket
3 parallel portion of socket basket and any radius at strand entry
4 angle of tapered basket
5 diameter at strand entry

Figure 2 — Typical socket basket

Note 1 to entry: Length adjusting system shall be provided at connection between PPWS socket and anchorage structure.

3.4
socketing medium
molten metal alloy or resin

3.5
socket basket
tapered portion of a *socket* (3.3) within which the evenly splayed out wires are secured

3.6
PPWS grade
R_m
level of requirement of nominal tensile strength grade which is designated by a number

EXAMPLE 1 770, 1 960.

Note 1 to entry: *PPWS* (3.1) strength grade correspond to the strength grades of the wires in the PPWS. It is expressed in MPa.

3.7
nominal wire diameter
d
nominal diameter of the perpendicular cross-section of the steel wire after coating

Note 1 to entry: It is expressed in millimetres.

© ISO 2019 – All rights reserved

3.8
nominal metallic cross-sectional area
A
design value obtained from the sum of the metallic cross-sectional areas of the wires in the *PPWS* (3.1) based on their nominal diameters:

$$A = \frac{\pi}{4} d^2 \times n$$

where n is the number of steel wires composing PPWS

Note 1 to entry: It is expressed in mm^2.

3.9
nominal breaking force
F_n
value of minimum breaking force based on the nominal wire sizes, wire tensile strength grades for the *PPWS* (3.1) class or construction as given in the manufacturer's design, which is obtained as follows:

$$F_n = R_m \times A \,/1\,000$$

Note 1 to entry: It is expressed in kN.

3.10
measured breaking force
F_m
breaking force obtained using a prescribed method

Note 1 to entry: It is expressed in kN.

3.11
nominal PPWS length mass
m
mass of unit length of *PPWS* (3.1) obtained from the product of the *nominal metallic cross-sectional area* (3.8) and density of steel wires after coating and calculated as follows:

$$m = A \times \gamma_w$$

where γ_w is the density of coated steel wire

Note 1 to entry: It is expressed in kg/m.

Note 2 to entry: γ_w is expressed in kg/m^3 (see ISO 19203:2018, Annex C).

3.12
unstressed length
length which corresponds to the actual length without load supplied using a prescribed method

3.13
free length
L_0
cable length excluding *socket* (3.3) lengths, which is the length between the front faces of sockets

Note 1 to entry: It is expressed in m.

3.14
gauge wire
wire used to control the length of the *PPWS* (3.1) during manufacturing, which is measured and marked under specific marking load while temperature is uniform

© ISO 2019 – All rights reserved

3.15
coloured wire
wire used to check twist condition of *PPWS* (3.1) during construction, which is painted with distinct colour on its total length

3.16
unit of product
set of 20 pieces of *PPWSs* (3.1) subsequently produced

4 Designation of product

The PPWS shall be ordered in accordance with this document and be designated as follows:

a) ISO 19427;

b) PPWS;

c) nominal diameter of steel wire, in millimetres;

d) number of steel wires composing PPWS;

e) PPWS grade;

f) coating type:

EXAMPLE 1 A PPWS made up of 91 pieces of zinc coated steel wires with diameter of 5 mm and grade of 1770, is designated:

ISO 19427-PPWS-5,00-91-1770-Zn

where Zn is hot-dip zinc coated.

EXAMPLE 2 A PPWS made up of 127 pieces of zinc-aluminium alloy coated steel wires with diameter of 7 mm and grade of 1860, is designated:

ISO 19427-PPWS-7,00-127-1860-ZnAl

where ZnAl is zinc-aluminium alloy coated.

5 Requirements

5.1 Traceability

The traceability shall be done from the beginning to the end of manufacturing. The manufacturer shall use suitable means to ensure the conformity of products and identify the status of products with respect to monitoring and measurement requirements throughout production and delivery.

The manufacturer shall control the unique identification of the products, and shall retain the documented information necessary to enable traceability.

5.2 Lengths and fabrication tolerances

5.2.1 The gauge wire shall be in the outside of the PPWS. The total length of the PPWS and all measuring points for the sockets, saddles and the key point such as main span middle point and side span middle point shall be marked on the gauge wire under specific marking load while temperature is uniform. The length of gauge wire shall take into account elongation, sag correction and temperature correction based on unstressed length of the cable.

The tension load shall be varied according to the wire diameter. For 5 mm diameter wires, the load shall be more than 50 kg. For 7 mm diameter wires, the load shall be more than 100 kg.

© ISO 2019 – All rights reserved