



BSI Standards Publication

Prestressing steels — Waxed and sheathed strands for construction applications

National foreword

This British Standard is the UK implementation of EN 18035:2025.

The UK participation in its preparation was entrusted to Technical Committee ISE/104, Concrete Reinforcing and Pre-Stressing Steels.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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English Version

Prestressing steels - Waxed and sheathed strands for construction applications

Aciers de précontrainte - Torons gainés cirés pour applications dans la construction

Spannstähle - Gewachste und gehüllte Litze für Bauanwendungen

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European foreword

This document (EN 18035:2025) has been prepared by Technical Committee CEN/TC 459/SC 4 “Concrete reinforcing and prestressing steels”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2026, and conflicting national standards shall be withdrawn at the latest by May 2026.

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1 Scope

This document specifies the requirements for uncoated high strength steel strands of zinc or zinc alloy coated high strength steel strands, encapsulated with wax and a sheath for construction applications.

The document applies only to products as supplied by the manufacturer.

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.

EN 1179:2003, *Zinc and zinc alloys — Primary zinc*

EN 10020, *Definition and classification of grades of steel*

EN 10204, *Metallic products — Types of inspection documents*

EN 10244-1, *Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 1: General principles*

EN 10244-2, *Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 2: Zinc or zinc alloy coatings*

EN ISO 175, *Plastics — Methods of test for the determination of the effects of immersion in liquid chemicals (ISO 175)*

EN ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles (ISO 527-1)*

EN ISO 527-2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics (ISO 527-2)*

EN ISO 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps (ISO 4892-2)*

EN ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests (ISO 9227)*

EN ISO 10304-1, *Water quality — Determination of dissolved anions by liquid chromatography of ions — Part 1: Determination of bromide, chloride, fluoride, nitrate, nitrite, phosphate and sulfate (ISO 10304-1)*

EN ISO 10304-4, *Water quality — Determination of dissolved anions by liquid chromatography of ions — Part 4: Determination of chlorate, chloride and chlorite in water with low contamination (ISO 10304-4)*

EN ISO 15630-3, *Steel for the reinforcement and prestressing of concrete — Test methods — Part 3: Prestressing steel (ISO 15630-3)*

EN ISO 16120-1, *Non-alloy steel wire rod for conversion to wire — Part 1: General requirements (ISO 16120-1)*

EN ISO 16120-2, *Non-alloy steel wire rod for conversion to wire — Part 2: Specific requirements for general purpose wire rod (ISO 16120-2)*

EN ISO 16120-4, *Non-alloy steel wire rod for conversion to wire — Part 4: Specific requirements for wire rod for special applications (ISO 16120-4)*

ISO 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method*

ISO 1817, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 2137, *Petroleum products and lubricants — Determination of cone penetration of lubricating greases and petrolatum*

ISO 2176, *Petroleum products — Lubricating grease — Determination of dropping point*

ISO 2207, *Petroleum waxes — Determination of congealing point*

ISO 6964, *Polyolefin pipes and fittings — Determination of carbon black content by calcination and pyrolysis — Test method*

ISO 11357-6, *Plastics — Differential scanning calorimetry (DSC) — Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT)*

ISO 18553, *Method for the assessment of the degree of pigment or carbon black dispersion in polyolefin pipes, fittings and compounds*

ISO 22285, *Petroleum products and lubricants — Determination of oil separation from grease — Pressure filtration method*

NF M 07-023, *Liquid fuels — Determination of chlorides in crude petroleum and petroleum products*

ASTM D942, *Standard Test Method for Oxidation Stability of Lubricating Greases by the Oxygen Pressure Vessel Method*

ASTM B997, *Standard Specification for Zinc-Aluminum Alloys in Ingot Form for Hot-Dip Coatings*

ASTM D1693, *Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics*

3 Terms and definitions

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

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

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

uncoated strand

strand consisting of seven uncoated plain cold drawn high strength steel wires

3.2

zinc or zinc alloy coated strand

strand consisting of seven zinc or zinc alloy continuous hot-dip coated cold drawn high strength steel wires

3.3

waxed and sheathed strand

uncoated or zinc alloy coated strand encapsulated with wax and a sheath

3.4**sheath**

continuous envelope surrounding the strand

3.5**batch of wax**

quantity of wax produced in one manufacturing operation

4 Symbols and abbreviated terms

For the purposes of this document, the following symbols and abbreviations apply:

A_{gt}	(%)	Percentage total extension at maximum force
D	(%)	Average coefficient of reduction of the maximum force in the deflected tensile test
D_i	(mm)	Minimum diameter of the coil of waxed and sheathed strand
E	(MPa)	Modulus of elasticity of the strand
F_0	(kN)	Initial force in the isothermal stress relaxation test and the stress corrosion test
F_m	(kN)	Maximum force
$F_{m,a}$	(kN)	Mean maximum force of the two test pieces adjacent to the test piece submitted to the relaxation test, fatigue test or corrosion test
$F_{p0,1}$	(kN)	0,1 % proof force
F_r	(N)	Force range in the axial force fatigue test
ΔF_{rt}	(N)	Force loss in the test piece at time t in the isothermal stress relaxation test
F_{up}	(N)	Upper force in the axial force fatigue test
L	(mm)	Length of the test piece
M	(g)	Nominal mass per meter of the strand
M_t	(g)	Total mass of the test piece
M_s	(g)	Mass of the sheath
M_w	(g)	Total mass of wires
M_{wl}	(g/m)	Mass of wax per unit length
N		Number of force cycles in the axial force fatigue test
S_n	(mm ²)	Nominal cross-sectional area of the strand
t_a	(h)	Minimum lifetime to fracture in the stress corrosion test
$t_{f,m}$	(h)	Median lifetime to fracture in the stress corrosion test
t_n	(mm)	Minimum thickness of the sheath
Δm	(%)	Deviation from the nominal mass per meter

5 Classification and designation**5.1 Classification**

The steels of the constituent strands of waxed and sheathed strands covered by this document shall be classified as special steels according to EN 10020.

5.2 Designation

The designation of the products covered by this document comprises in the order:

- description of the product (i.e. waxed and sheathed strand);
- designation of the strand from which the waxed and sheathed strand is produced in square brackets;
- symbol + W for wax;
- thickness class;
- colour of the sheath when other than black, when applicable.

EXAMPLE

Waxed and sheathed strand [Y1860S7+ZA-15,7-R1-F3-D2]+W-T_n2 white designates a waxed and sheathed strand with a thickness class T_n2, made from a strand coated with a zinc-aluminium alloy of nominal diameter 15,7 mm, strength class 1 860 MPa, relaxation class R1, fatigue class F3 and class D2 of deflected tensile properties, of white colour.

NOTE The strength class is only used for designation purposes (see EN 10027-1). The strength class corresponds to the tensile strength obtained by dividing the maximum force (F_m) by the nominal cross-sectional area (S_n).

6 Information to be obtained by the manufacturer

The following information shall be obtained at the time of enquiry and order:

- a) designation of the product in accordance with 5.2;
- b) packaging and protection requirements;
- c) requirements concerning information to accompany the delivery (e.g. date of manufacture, delivery note, type of inspection document (see EN 10204), copies of force/extension diagrams);
- d) special requirements for labelling.

7 Requirements

7.1 Manufacturing process

The manufacturing method of the waxed and sheathed strands is at the discretion of the manufacturer and shall be in accordance with the following:

- The base strands are manufactured from wire produced with wire rod in accordance with EN ISO 16120-1 and EN ISO 16120-2 or EN ISO 16120-1 and EN ISO 16120-4. Strands with normal production lengths may contain welds made in the individual wires before cold working but shall not contain welds made during or after cold working.
- In the case of zinc or zinc alloy coated strands, the coating of the constituent wires of the strand shall be completed before stranding.
- The sheath shall be applied to the waxed strand by direct extrusion.