



SLOVENSKI STANDARD
SIST EN 523:1999

01-oktober-1999

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Steel strip sheaths for prestressing tendons - Terminology, requirements, quality control

Hüllrohre aus Bandstahl für Spannglieder - Begriffe, Anforderungen, Güteüberwachung

Gaines en feuillard d'acier pour câbles de précontrainte - Terminologie, prescriptions,
contrôle de qualité

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ICS:

77.140.75	Jeklene cevi in cevni profili za posebne namene	Steel pipes and tubes for specific use
91.080.40	Betonske konstrukcije	Concrete structures

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en

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EUROPEAN STANDARD

EN 523

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 1997

ICS 77.140.75; 91.080.40

Descriptors: prestressed concrete, cables:ropes, sheaths : protectors, strips, steels, plastics, classifications, specifications, quality control, marking

English version

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This European Standard was approved by CEN on 1997-01-27. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 104 "Concrete (performance, production, placing and compliance criteria)", 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of an identical text or by endorsement, at the latest by September 1997, and conflicting national standards shall be withdrawn at the latest by September 1997.

This European Standard applies together with the Standards of the EN 524 series which comprises test methods for sheaths.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This Standard is applicable to uncoated cylindrical steel sheaths with a corrugated profile and with a nominal internal diameter of up to 130 mm¹⁾ and their connectors (couplers) which are assembled to form ducts for prestressing tendons in post-tensioned prestressed concrete elements. It is only applicable to sheaths and connectors made of interlocked or welded steel strip²⁾.

The seals required between sheaths and couplers are not covered by this standard⁴⁾.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- ¹⁾ For diameters greater than 130 mm requirements should be drawn up on the basis of this standard and agreed upon by the parties involved.
- ²⁾ In case of coated or galvanised steel additional provisions have to be considered, which are not covered by this standard.
- ³⁾ For plastic sheaths, see Annex A.
- ⁴⁾ The appropriate rules will be specified in a separate European Standard for concrete structures which is under preparation.



EN 524-1	Steel strip sheaths for prestressing tendons - Methods of test - Part 1: Determination of shape and dimensions
EN 524-2	Steel strip sheaths for prestressing tendons - Methods of test - Part 2: Determination of flexural behaviour
EN 524-3	Steel strip sheaths for prestressing tendons - Methods of test - Part 3: To-and-fro bending test
EN 524-4	Steel strip sheaths for prestressing tendons - Methods of test - Part 4: Determination of lateral load resistance
EN 524-5	Steel strip sheaths for prestressing tendons - Methods of test - Part 5: Determination of tensile load resistance
EN 524-6	Steel strip sheaths for prestressing tendons - Methods of test - Part 6: Determination of leak-tightness (determination of water loss)
ISO 6932	Cold-reduced carbon steel strip with a maximum carbon content of 0,25 %

3 Definitions

3.1 types of sheath

Sheaths are designated by the manufacturer according to type, each type having certain features, e.g. production procedure (welded or interlocked), shape of profile, etc.

3.2 connectors (couplers)

Connectors are specific devices to join sheath sections. They are usually made from cut ends of sheaths with the same profile type but with larger diameter (see 5.2).

3.3 stiffeners

Stiffeners are additional components whose purpose is to increase the lateral load strength of the sheaths at supporting points, e.g. semi-circular sheathing sections placed between supports and tendons.

4 Classification

Sheaths are classified by the requirements as given in table 1.

Class 1 (normal sheaths)

Class 2 (rigid sheaths)

5 Requirements

5.1 Sheaths

5.1.1 General requirements

Sheaths shall have sufficient strength to ensure that they are able to withstand varying degrees and types of mechanical loading.

Sheaths shall have a corrugated profile to provide a sufficient mechanical bond with the concrete externally and the grout internally.

The inner and outer surfaces of the sheaths shall be free of any detrimental corrosion (see clause 7).

Sheaths shall be leaktight (see 5.1.9). All joints between sheaths shall be sealed carefully (see Annex A). The sheaths and their connectors shall be designed in such a way to allow this proper sealing of the joints.

5.1.2 Steel strip

Sheaths shall be made from rolled steel strip conforming to ISO 6932 or specifies steel with similar properties. The nominal thickness of the steel strip shall be not less than the values given in table 1, lines 1a and 1b.

5.1.3 Tolerances (ovality)

Deviations from the mean values of the internal diameter of any cross-section of the sheaths determined according to EN 524-1 shall not exceed $\pm 1\%$ or $\pm 0,5$ mm, whichever is the greater.

5.1.4 Relative volume of the profile

The relative volume of the profile V_{rel} determined in accordance with EN 524-1 shall be not less than $0,08 \text{ cm}^3/\text{cm}^2$. For nominal internal diameters greater than 25 mm, the height of the profile shall be not less than 2,5 mm (see EN 524-1).

5.1.5 Flexural behaviour

The relative load $F_{rel} = F_{pl}/d_1$ in N/mm and the load F_{pl} at the beginning of plastic deformation shall be determined in accordance with EN 524-2.

The relative load F_{rel} for class 2 shall not be less than the given values in table 1, line 2.

For class 1 there are no requirements but test results shall be given for information to the user in the relevant documents (see 6.2).

5.1.6 Flexibility

When tested by means of the to-and-fro bending test described in EN 524-3, flexibility is sufficient if, after the bending test, no significant deformations of the corrugation appear so that the plunger can push in the specimen in whole length. A straightening of the specimen by means of the tensile load test (see EN 524-5) is permitted.

5.1.7 Lateral load resistance

The irreversible reduction of the internal diameter shall not exceed 10 % or 5 mm whichever is the smaller when the loads given in table 1, lines 4a to 4c are applied according to EN 524-4. If any type of sheaths of class 1 withstands the load $F_1 = 1500$ N without a stiffener a test with lower forces accordance to table 1, line 4a is not required.

5.1.8 Tensile load resistance

When loaded in accordance with EN 524-5, the tensile load strength is sufficient if the sleeve coupling (comprising sheaths and the corresponding coupler) does not fail by complete separation under the test loads specified in table 1, line 5.

5.1.9 Leaktightness

When tested in accordance with EN 524-6, using a specimen tested earlier for flexibility, lateral load resistance and tensile load resistance, the water loss shall not exceed the values given in table 1, line 6.

5.2 Connectors (couplers)

5.2.1 General requirements

Couplers made from corrugated metal strip sheaths shall fulfil the requirements given in 5.1.1.

5.2.2 Minimum length

The length of the couplers shall be at least three times the nominal internal diameter of the sheaths, but not less than 150 mm.

5.2.3 Nominal internal diameter and wall thickness of the couplers

When measured in accordance with EN 524-1, the nominal internal diameter of the couplers $d_{1,c}$ shall not exceed a value of

$$d_{1,c} = d_{1,s} + 8t_s + c \quad (\text{for interlocked sheaths})$$

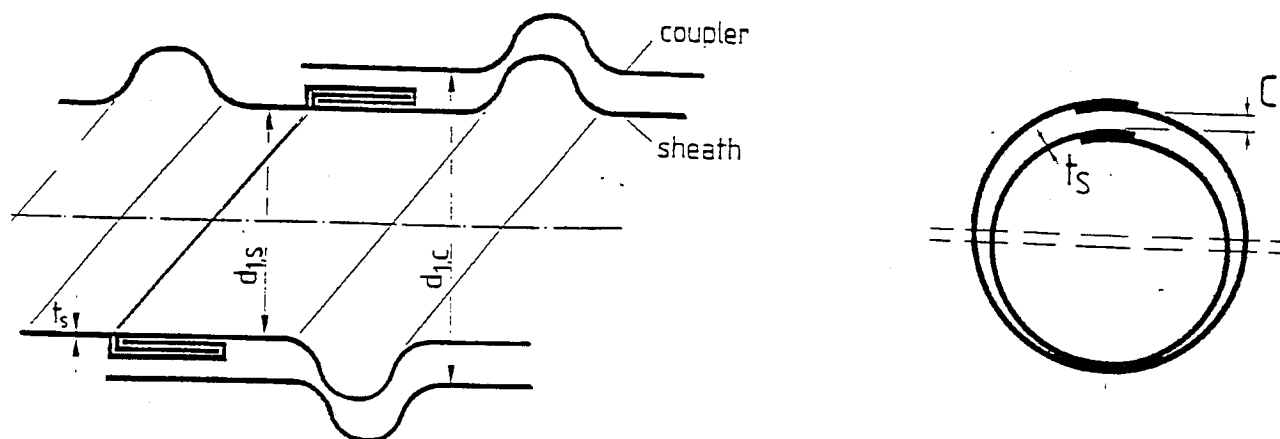
$$d_{1,c} = d_{1,s} + 3t_s + c \quad (\text{for welded sheaths})$$

where (see also figure 1)

$d_{1,s}$ is the nominal internal diameter of the sheath (in mm)

t_s is the nominal wall thickness of the sheath (in mm)

c is the clearance between the outer surface of the sheath and the inner surface of the coupler, taking into account the increase due to folds or seams (in mm),



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Figure 1: Dimensions of couplers

The clearance, c , shall not exceed 2,0 mm for sheaths with an internal diameter of up to 55 mm or 3,0 mm for larger diameters.

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The steel strips from which couplers are made shall at least fulfil the minimum requirements concerning the wall thickness as the sheaths which are to be connected (see table 1, lines 1a to 1b).

5.3 Stiffeners

It shall be possible to strengthen locally those sheaths which do not possess the increased lateral load resistance specified in table 1, line 4b. The size of the stiffeners shall not exceed half the circumference of the sheath and shall be designed such that, after concreting, no cavities remain between the sheath and the stiffener which could have detrimental effects. This requirement can be met for instance by using the same profile and at least the same wall thickness for stiffener and sheath.

The length of the stiffeners shall not exceed 1,5 times the nominal internal diameter of the sheaths or 10 cm, whichever is the greater.

6 Marking, technical documents, delivery note

6.1 Marking

The producer's mark or trademark, the reference "EN 523", classification, nominal internal diameter and, where necessary, the type of sheath shall be displayed either on each packing unit or transport bundle or on the sheaths themselves.

6.2 Technical documents

Technical documents shall be prepared by the producer in which the following information shall be given for both sheaths and the corresponding couplers:

- marking;
- dimensions and tolerances;
- nominal thickness of the steel strip;
- sketch of the shape of the profile;
- relative volume of the profile;
- load F_{pi} ;
- nominal weight;
- chosen radius for the bending test;
- lateral load;
- type, shape and dimensions of stiffeners required for the sheaths to fulfil the requirements given in table 1, line 4 (if relevant).

6.3 Delivery note

The following information shall be given on the delivery note and shall correspond to that given in the technical documents:

- name of producer; iTeh STANDARD PREVIEW
- marking; (standards.iteh.ai)
- number of this European Standard, EN 523;
- nominal internal diameter, classification, type, SIST EN 523:1999
- approved certification body (where appropriate), <https://standards.iteh.ai/catalog/standards/sist/e44fb94b-54ed-4860-a0de-c1b01b876540/sist-en-523-1999>

In the case of couplers and stiffeners, reference shall be made to the sheaths with which they are to be used.

7 Storage

Sheaths shall be stored in such a way that any damage or corrosion is avoided and no water or other substances harmful to the prestressing steel are able to penetrate into them.

8 Quality control procedures

8.1 General

The production of steel strip sheaths shall be subject to the following quality control procedures.

Quality control is defined as a combination of actions and decisions with the aim of ensuring that the sheaths comply with the requirements specified in clause 5.

Table 1: Minimum requirements

1		2	3	4	5	6	7	8	9	10	11
Characteristic		Class	Nominal internal diameter d_i in mm								
			≤ 25	over 25 to 35	over 35 to 45	over 45 to 55	over 55 to 65	over 65 to 75	over 75 to 85	over 85 to 100	over 100 to 130
1a	Nominal thickness of steel strip in mm	1	0,20	0,25	0,25	0,30	0,30	0,35	0,35	0,40	≥ 0,40
1b		2	-	-	0,40	0,45	0,45	0,50	0,50	0,60	≥ 0,60
2	Relative load F_p/d_i in N/mm	2	3,0	3,5	4,0	4,0	4,5	5,0	5,5	6,0	6,5
3a	Radius r for the flexibility test, in mm (maximum values)	1	750	750	750	750	750	750	750	900	1000
3b		2	1500	1500	1500	1500	1500	1500	1500	1800	1800
4a	Lateral load F_l in N	1	500	600	750	750	950	950	950	1050	1050
4b		1	1500	1500	1500	1500	1500	1500	1500	1500	1500
4c		2	1500	1500	1500	1500	1500	1500	1500	1500	1500
5	Tensile load F_2 in N	1 and 2	250	400	600	900	1100	1400	1600	1900	2200
6	Tightness	1 and 2	Water loss ≤ 1,5 % by volume								