

Adjustable telescopic steel props — Product specifications, design and assessment by calculation and tests

The European Standard EN 1065:1998 has the status of a
British Standard

ICS 91.220

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National foreword

This British Standard is the English language version of EN 1065:1998.

The UK participation in its preparation was entrusted by Technical Committee B/514, Access and support equipment, to Subcommittee B/514/28, Props, tubes and couplers, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

This British Standard, together with BS 4074:1999 (in course preparation), will supersede BS 4074:1982, and partially supersede BS 5507-3:1982 which is currently under revision. The revised edition of BS 5507-3 will describe methods of determining the characteristic resistance of adjustable props not conforming to BS EN 1065. BS 4074:1999 covers steel trench struts.

This standard provides the user with a greatly enlarged choice of props. It is recommended, therefore, in the interests of maximizing site utilization, length compatibility with existing props, and as an aid to economic prop manufacture, that users should give preferential consideration to sizes 25, 30, 35, 40 and 50 in either B or C strength grades and to either F2 or F4 corrosion protection methods. Additionally, the use of loose forkheads is recommended.

It is recommended that, if a pin has any reduction in its nominal cross section (such as holes for cables or chains), a means should be provided to ensure that this portion of the pin is always outside the collar nut major diameter.

The principal changes from BS 4074:1982 and points of significance are as follows:

- a) Steel trench struts (previously known as trench struts) are not covered.
- b) Advice on safe working loads is not included. It is envisaged that the next amendment to BS 5975 will contain some advice.
- c) Five different strength classes of props are included. Identification is now given by marking on each prop the number of the standard, the name or trademark of the manufacturer, the year of manufacture, the classification, and the prop's compatibility with EN 74 couplers. The prop may also have the classification identified by profiling the endplates. When required (see annex E) the level of inspection and/or the sign of the independent certification system also have to be marked.
- d) Five methods of corrosion protection are given.
- e) Props are classified according to their fully extended lengths which range from 2,5 m to 5,5 m in 0,5 m intervals. Fully closed lengths of props are no longer specified but all props have at least 1,0 m of adjustment.
- f) Props having a fully closed height of less than 1,5 m are no longer included.
- g) A test to verify that the component parts of adjustable telescopic steel props do not become inadvertently disengaged in use has been added.
- h) There is a minimum linear clearance of 100 mm between the inner and outer tubes intended to form an anti-hand trapping gap when the prop is in the fully closed position.
- i) The minimum permissible end plate bearing area is reduced.
- j) A maximum clearance between threads is now specified.
- k) There is a minimum material thickness for all prop components.
- l) The use of rimming steel is no longer permitted.
- m) Geometric designed props are no longer included.
- n) Verification of the nominal characteristic resistance of an individual prop design may also be by calculation.
- o) Information about independent prototype assessment is included in annex D.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

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Summary of pages

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English version

Adjustable telescopic steel props — Product specifications, design and assessment by calculation and tests

Etais télescopiques réglables en acier —
Spécifications du produit, conception et
évaluation par calculs et essais

Baustützen aus Stahl mit Ausziehvorrichtung —
Produktfestlegungen, Bemessung und Nachweis
durch Berechnung und Versuche

This European Standard was approved by CEN on 10 June 1998.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CEN

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

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 53, Temporary works equipment, 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 March 1999, and conflicting national standards shall be withdrawn at the latest by March 1999.

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

Introduction

Whilst this European Standard deals with the more common types of adjustable telescopic steel props in use, it is not intended to prevent development of other types of props. For example, props may have hinged ends or other length adjustment devices or be made of other materials. Whilst such props cannot comply with this European Standard it is recommended that the principles of this European Standard be considered in the design and assessment of such props.

The characteristic strength values specified in this European Standard form a reference level which is unsafe for direct site use. It is a matter for a separate European Standard to relate these characteristic strengths to safe site usage by applying suitable partial safety factors γ_M and γ_F . It is also a matter for a separate European Standard to specify the required level of corrosion protection and inspection.

This European Standard is a product standard primarily for use in the field of falsework and formwork.

In cases where the prop is an integral part of a system of soffit support, other design and assessment procedures may be more appropriate or even necessary.

This European Standard gives a number of alternatives, a designation of which is given in clause 5.

1 Scope

This European Standard specifies materials, design requirements, corrosion protection alternatives together with assessment methods using both calculations and testing for open thread and covered thread adjustable telescopic steel props which are intended for use on construction sites (see Figure 1).

It specifies five classes of nominal characteristic strengths for adjustable telescopic steel props each having a series of maximum extended lengths. Each having differing endplate configuration.

This European Standard does not apply to adjustable props of different materials or construction, nor does it provide any information concerning the use of adjustable steel props.

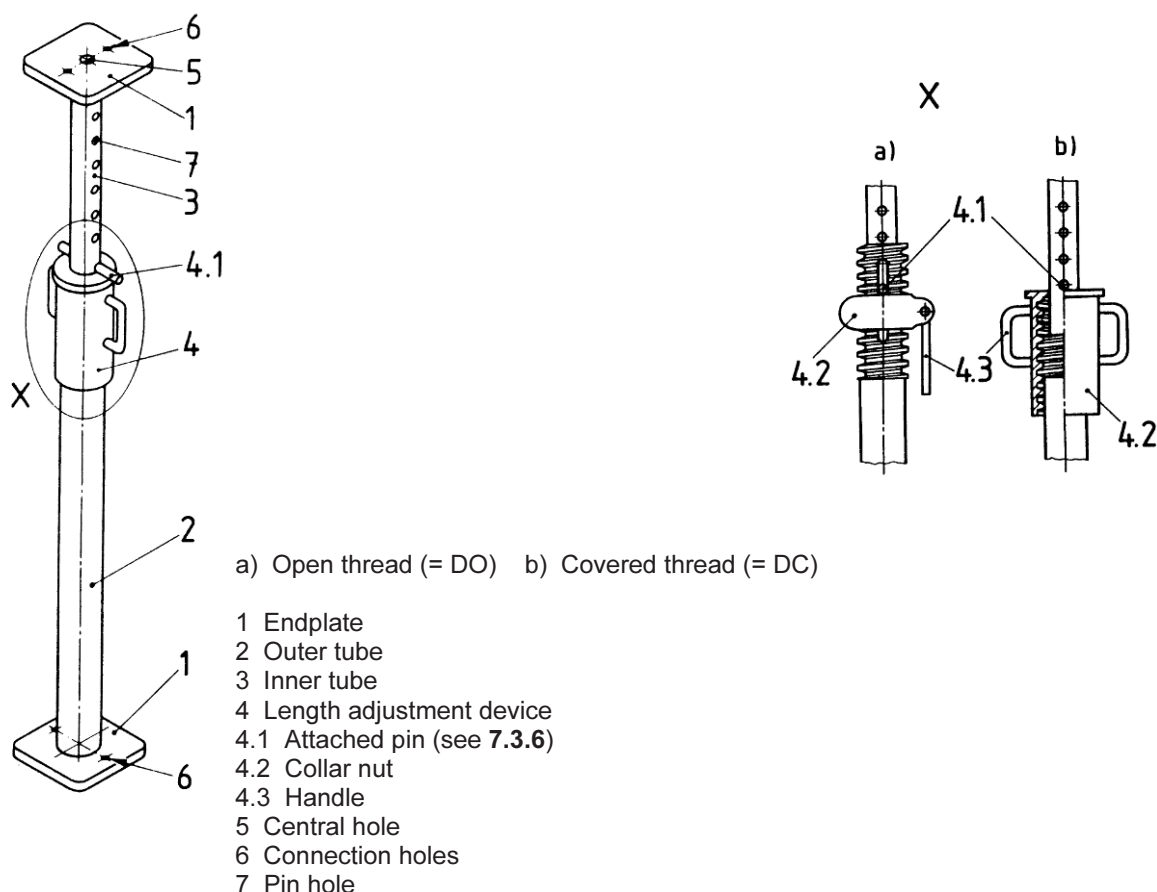


Figure 1: Adjustable telescopic steel prop

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.

EN 74

Couplers, loose spigots and base-plates for use in working scaffolds and falsework made of steel tubes – Requirements and test procedures

EN 729-2

Quality requirements for welding – Fusion welding of metallic materials – Part 2: Comprehensive quality requirements

EN 1562

Founding – Malleable cast irons

EN 1563

Founding – Spheroidal graphite cast irons

EN 10002-1

Tensile testing of metallic materials – Method of test at ambient temperature

EN 10025

Hot rolled products of non-alloy structural steels – Technical delivery conditions

- EN 10083-1
Quenched and tempered steels – Part 1: Technical delivery conditions for special steels
- EN 10083-2
Quenched and tempered steels – Part 2: Technical delivery conditions for unalloyed quality steels
- EN 10083-3
Quenched and tempered steels – Part 3: Technical delivery conditions for boron steels
- EN 10113-1
Hot-rolled products in weldable fine grain structural steels – Part 1: General delivery conditions
- EN 10113-2
Hot-rolled products in weldable fine grain structural steels – Part 2: Delivery conditions for normalized/normalized rolled steels
- EN 10113-3
Hot-rolled products in weldable fine grain structural steels – Part 3: Delivery conditions for thermomechanical rolled steels
- EN 10155
Structural steels with improved atmospheric corrosion resistance – Technical delivery conditions
- EN 10204 : 1991
Metallic products – Types of inspection documents
- EN 10210-1
Hot finished structural hollow sections of non-alloy and fine grain structural steels – Part 1: Technical delivery requirements
- EN 10210-2
Hot finished structural hollow sections of non-alloy and fine grain structural steels – Part 2: Tolerances, dimensions and sectional properties
- EN 10219-1
Cold formed structural hollow sections of non-alloy and fine grain structural steels – Part 1: Technical delivery requirements
- EN 10219-2
Cold formed structural hollow sections of non-alloy and fine grain structural steels – Part 2: Tolerances, dimensions and sectional properties
- prEN 39
Steel tubes for tube and coupler scaffold structures – Technical delivery conditions
- ENV 1993-1-1
Eurocode 3: Design of steel structures – Part 1-1: General rules and rules for buildings
- EN ISO 9001
Quality systems – Model for quality assurance in design, development, production, installation and servicing (ISO 9001)
- EN ISO 9002
Quality systems – Model for quality assurance in production, installation and servicing (ISO 9002)
- ISO 2937
Plain end seamless steel tubes for mechanical application
- ISO 3304
Plain end seamless precision steel tubes – Technical conditions for delivery
- ISO 3305
Plain end welded precision steel tubes – Technical conditions for delivery
- ISO 3306
Plain end as-welded and sized precision steel tubes – Technical conditions for delivery

3 Definitions and symbols

For the purposes of this European Standard the following definitions and symbols apply.

3.1 adjustable telescopic steel prop: Compression member normally used as temporary vertical support in construction works. A prop consists of two tubes which are telescopically displaceable within each other. A prop has a coarse adjustment with a pin inserted into holes in the inner tube and a means of fine adjustment using a threaded collar (see Figure 1).

3.2 endplate: Plate which is fixed at right angles to one end of inner or outer tube.

3.3 forkhead: Endplate with lateral projections to locate a beam.

3.4 collar nut: Nut which incorporates at least one handle and has one face which supports the pin and is internally threaded to provide fine length adjustment to the prop.

3.5 inner tube: The smaller diameter tube provided with holes for the coarse adjustment of the prop.

3.6 outer tube: The larger diameter tube one end of which is threaded externally.

3.7 length adjustment device: Device consisting of a pin, collar nut, holes in the inner tube and a threaded outer tube.

NOTE: The forces from the endplate are transferred to the pin inserted in the inner tube holes and to the collar nut which transfers the forces to the outer tube thread. In some prop designs an additional loose washer is used between the pin and the collar nut.

3.8 pin: The part of the length adjustment device which is inserted through the inner tube holes and is secured to the prop.

3.9 length at maximum extension: The distance measured between the outside faces of the endplates when the prop is in the fully extended position.

NOTE: The prop extension is called "fully open" if the pin is in the hole farthest away from the inner tube endplate and the collar nut is in the uppermost position. The prop extension is called "fully closed" if the pin is in the hole nearest the inner tube endplate and the collar nut is in the lowest position.

3.10 main symbols: Symbols are given in Table 1.

Table 1 — Main symbols

Number	Symbol	Denomination	Unit
1	D_i	Outer diameter of the inner tube	mm
2	D_m	Collar nut major thread diameter	mm
3	d_p	Diameter of the pin	mm
4	$e_{b,core}$	Eccentricity at the base at which the spring becomes effective	mm
5	$e_{b,limit}$	Limit eccentricity at the base	mm
6	$e_{b,0}$	Initial eccentricity at the base	mm
7	e_t	Eccentricity at the top	mm
8	f_y	Yield strength	N/mm ²
9	$f_{y,act}$	Actual yield strength	N/mm ²
10	$f_{y,nom}$	Nominal yield strength	N/mm ²
11	l	Actual extension length of the prop	m
12	l_{max}	Length of a prop at maximum extension	m
13	l_0	Overlapping length	mm
14	M_{pl}	Plastic moment resistance of the cross section	kN × m
15	$M_{pl,N}$	Reduced plastic moment resistance of the cross section	kN × m
16	N	Normal (axial) force	kN
17	$N_{c,i}$	Ideal buckling force	kN
18	N_{pl}	Plastic compression resistance of the cross section	kN
19	$N_{pl,nom}$	Nominal plastic compression resistance of the cross section	kN
20	N_t	Normal (axial) force of the tube	kN
21	R	Strength of a prop	kN
22	$R_{b,t}$	Bearing resistance of the tube	kN
23	$R_{s,p}$	Shear resistance of the pin	kN
24	R_u	Failure load of a test	kN
25	$R_{y,act}$	Actual characteristic strength of the prop class y where y corresponds to classes A, B, C, D or E	kN
26	$R_{y,k}$	Nominal characteristic strength of the prop class y where y corresponds to classes A, B, C, D or E	kN
27	V	Vertical load	kN
28	$\Delta\varphi_0$	Angle of inclination between the inner and outer tube	rad
29	γ_M	Partial safety factor for the resistance	1
30	γ_{M1}, γ_{M2}	Splitted partial safety factors for the material	1
31	γ_F	Partial safety factor for the action	1

4 Classification

An adjustable telescopic steel prop shall be classified according to its nominal characteristic strength $R_{y,k}$ and its maximum length $l_{\max}$ given in Table 2.

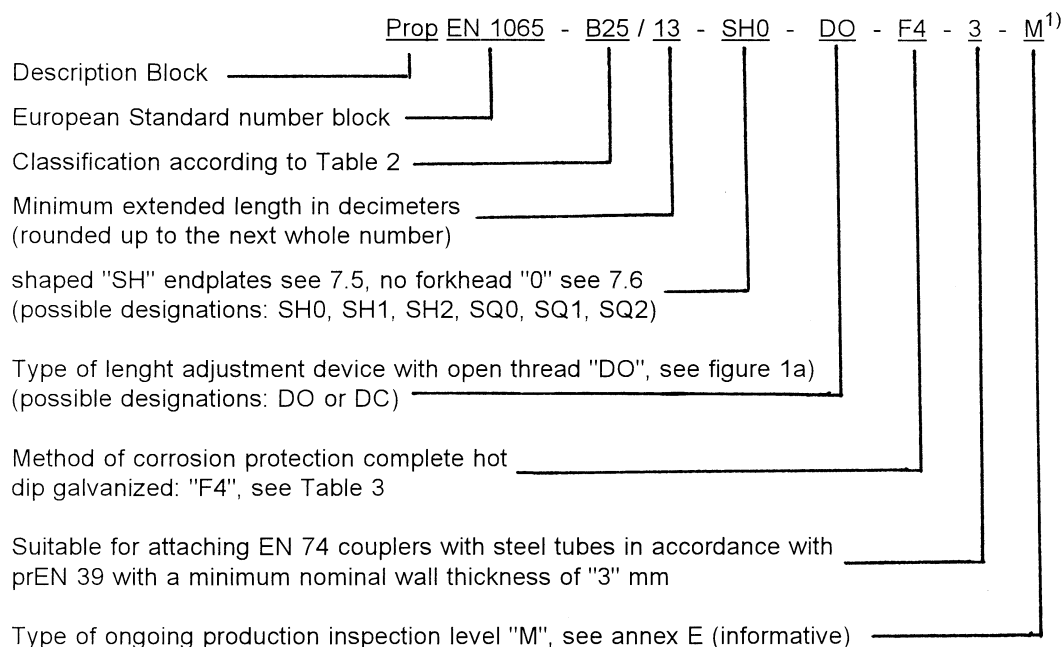
For classes A, B and C props the nominal characteristic strength given in Table 2 shall apply to the maximum extension length. For classes D and E props the nominal characteristic strength given in Table 2 shall apply to all possible extension lengths.

Table 2 — Classification

Class	Length at maximum extension	Nominal characteristic strength (see clause 8)
	$l_{\max}$ m	$R_{y,k}$ kN
A 25	2,50	20,4
A 30	3,00	17,0
A 35	3,50	14,6
A 40	4,00	12,8
B 25	2,50	27,2
B 30	3,00	22,7
B 35	3,50	19,4
B 40	4,00	17,0
B 45	4,50	15,1
B 50	5,00	13,6
B 55	5,50	12,4
C 25	2,50	40,8
C 30	3,00	34,0
C 35	3,50	29,1
C 40	4,00	25,5
C 45	4,50	22,7
C 50	5,00	20,4
C 55	5,50	18,6
D 25	2,50	34,0
D 30	3,00	
D 35	3,50	
D 40	4,00	
D 45	4,50	
D 50	5,00	
D 55	5,50	
E 25	2,50	51,0
E 30	3,00	
E 35	3,50	
E 40	4,00	
E 45	4,50	
E 50	5,00	
E 55	5,50	

5 Designation

Designation of a prop in accordance with EN 1065, class: "B 25", with a minimum extended length: "13" dm, with shaped: "SH" and plain: "O" endplates and a length adjustment device with open thread: "DO", completely hot-dip galvanized with a corrosion protection: "F4" and suitable for attaching EN 74 couplers with steel tubes in accordance with prEN 39 with nominal wall thickness greater than "3" mm and with an ongoing production inspection level "M":



6 Materials

6.1 General

Materials shall have a good resistance to, and/or be protected against atmospheric corrosion and shall be free of any impurities and defects which might affect their satisfactory use. Steels of deoxidation type FU (rimming steels) are not permitted.

Materials should be selected from the relevant existing European and International Standards and, whenever applicable, shall be in accordance with the following standards:

Material standards:	EN 10025, EN 10113-1, EN 10113-2, EN 10113-3, EN 10155
Tube standards:	EN 10210-1, EN 10219-1, prEN 39
Bar standards:	EN 10083-1, EN 10083-2, EN 10083-3
Casting standards:	EN 1562, EN 1563

6.2 Modification by cold working

Steel for tubes conforming basically to EN 10025 and modified by cold working may be used provided that

- the modified yield strength conforms to one of the yield strengths given in EN 10025 or
- the yield strength amounts to 315 N/mm² or 395 N/mm² and
- the elongation of the modified steel is not less than 18 %
- the process used can be shown to guarantee these values.

NOTE: Cold working modifies the structural properties by strain hardening.

6.3 Corrosion protection

Props shall be protected against corrosion by one of the methods given in Table 3.

Table 3 — Methods of corrosion protection

Finish grade	Prop components	Corrosion protection
F1	Tubes with endplates Collar nut Handle	Painted on the outside with no quality control
	Thread Pin and attachment	Self-colour or protected with no quality control
F2	Tubes with endplates Collar nut Handle Thread	Painted on the outside in accordance with prEN 39
	Pin and attachment	Painted with no quality control
F3 ¹⁾	Tubes Endplates Thread	Zinc coated 15 µm minimum before fabrication
	Tube, thread and endplate welds	Zinc coated 15 µm minimum after fabrication
	Collar nut Handle Pin and attachment	Zinc coated 15 µm minimum
F4	Tubes with endplates Collar nut Handle Thread ²⁾	Hot-dip galvanized after fabrication in accordance with prEN 39
	Pin and attachment	Zinc coated 15 µm minimum
F5	All prop components	Special arrangement
¹⁾ Edges of holes and slots do not need to be protected. ²⁾ It is not necessary to measure the thickness of zinc in threaded zones.		

7 Configuration

7.1 Tubes

The cross-sections of the tubes should be selected from the relevant existing European or International Standards and, whenever applicable, shall be in accordance with the following standards:

EN 10210-1, EN 10210-2, EN 10219-1, EN 10219-2, prEN 39
ISO 2937, ISO 3304, ISO 3305, ISO 3306

For classes B, C, D and E props the nominal wall thickness of any tube used shall be at least 2,6 mm. For class A props the minimum wall thickness shall be not less than 2,3 mm after taking tolerances into account.

For the purposes of assessment, the method of making holes shall be stated on the drawings.

NOTE: The preferred method of forming holes is by drilling (see 9.2.4.1).

It is permissible to either, locally expand the diameter of the tube adjacent and welded to endplate or, add an additional larger diameter tube adjacent and welded to endplate to increase the stiffness of the connection (see also 9.2.3.1).