



FORSLAG

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(IDT = identisk med/identical to - EQV = baseret på/equivalent to - MOD = modificeret/modified)

Dette forslag til Dansk Standard er/har været på offentlig høring fra: 2001-01-01 **til/to** 2001-03-01

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Proposal for English title:

Prestressing steels - Part 4: Bars

Kommentarer skal være DS i hænde senest: 2001-03-01

Comments shall be sent to DS no later than:

Der kan kun fremsendes kommentarer, såfremt forslaget er i høring som ISO/DIS, IEC/CDV eller som prEN på enquiry i CEN og CENELEC.

Tekniske kommentarer behandles ikke, hvis forslaget er til afstemning som ISO/FDIS, IEC/FDIS, CEN eller CENELEC Formal Vote.

Comments can only be submitted if the draft is subject to ISO/DIS, IEC/CDV or CEN/CENELEC Enquiry as a prEN

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Kommentarer fremsættes ved at rekvirere en elektronisk kommentarskabelon hos projektlederen. Skabelonen udfyldes og returneres til projektlederen inden høringsperiodens udløb. Modtagne kommentarer vil blive behandlet af det teknisk ansvarlige udvalg.

A template for comments must be used and can be obtained from the responsible project manager.

The comments will be dealt with in the DS Committee responsible for the area.

Standardiseringsudvalg: DS/S-389

DS committee:

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Bemærk, at forslaget skal bearbejdes yderligere, og at det derfor ikke har gyldighed som Dansk Standard.

Note that the draft will be edited further and has no validation as a Danish Standard.

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English version

Prestressing steels - Part 4: Bar

Armatures de précontrainte - Partie 4: Barres

Spannstähle - Teil 4: Stab

This draft European Standard is submitted to ECISS/COCOR before submission to CEN members for second formal vote. It has been drawn up by the Technical Committee ECISS/TC 19.

If this draft becomes a European Standard, 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.

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Contents

Page

Foreword.....	3
1 Scope	4
2 Normative references	4
3 Terms and definitions	4
4 Symbols	4
5 Designation	5
6 Manufacture.....	6
6.1 General.....	6
6.2 Processing.....	6
6.3 Ribs	6
6.4 Threaded ends	6
7 Requirements	7
7.1 General.....	7
7.2 Straightness	7
7.3 Longitudinal defects.....	7
7.4 Ductility evaluation	7
7.5 Optional bend test	7
8 Evaluation of conformity.....	11
9 Test methods.....	11
10 Delivery by the manufacturer	12

Foreword

This document (prEN 10138-4:2005) has been prepared by Technical Committee ECISS/TC 19 “Concrete reinforcing and prestressing steels - Properties, dimensions, tolerances and specific tests”, the secretariat of which is held by DIN.

This document is currently submitted to the COCOR Vote.

This European Standard consists of the following parts, under the general title *Prestressing steels*:

- *Part 1: General requirements*
- *Part 2: Wire*
- *Part 3: Strand*
- *Part 4: Bar*

1 Scope

This Part of EN 10138 gives the specific requirements for preferred sizes and technical classes of round steel bar in straight lengths, plain or ribbed and supplied in either the hot rolled or hot rolled and processed condition.

NOTE General requirements are given in prEN 10138-1.

2 Normative references

The following referenced documents are indispensable for the application 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 10027-1, *Designation system for steels — Part 1: Steel names; principal symbols*.

EN 10027-2, *Designation system for steels — Part 2: Steel numbers*.

prEN 10138-1, *Prestressing steels — Part 1: General requirements*.

CR 10260, *Designation system for steel — Additional symbols*.

EN ISO 15630-3, *Steel for the reinforcement and prestressing of concrete — Test methods — Part 3: Prestressing steels (ISO 15630-3:2002)*.

3 Terms and definitions

For the purposes of this Part of EN 10138 the terms and definitions given in prEN 10138-1 apply.

4 Symbols

The symbols used in this Part of EN 10138 and the corresponding designations are given in Table 1.

Table 1

Table 1 — Symbols and corresponding designations

Symbol	Unit	Designation
d	mm	Nominal diameter of the product
S_n	mm ²	Nominal cross-sectional area of the product
M	g/m	Nominal mass per metre of the product
F_m	kN	Specified characteristic value of maximum force
$F_{m, \max}$	kN	Specified maximum value of maximum force
$F_{p0,1}$	kN	Specified characteristic value of 0,1 % proof force
σ	-	Stress ratio i.e. Maximum force in the tensile test determined on a test piece divided by the actual 0,1 % proof force
A_{gt}	%	Specified minimum value of percentage total elongation at maximum force
L_o	mm	Original gauge length of the extensometer for the determination of A_{gt}
F_{ma}	kN	Actual maximum force, in the tensile test, determined on a test piece adjacent to the test piece submitted to special property test
F_{up}	kN	Upper force in the axial load fatigue test
F_r	kN	Force range in the axial load fatigue test
P	-	Plain (see Table 2)
R	-	Ribbed (see Table 2)

5 Designation

5.1 For the steel grades covered by this Part of EN 10138, the steel names are allocated in accordance with EN 10027-1 and CR 10260; the steel numbers shall be allocated in accordance with EN 10027-2.

5.2 The designation shall consist of:

- a) the number of this Part of EN 10138;
- b) the steel name consisting of:
 - 1) the letter Y for prestressing steel;
 - 2) the nominal tensile strength in MPa;
 - 3) the letter H for hot-rolled bar ;
- c) the nominal diameter of the bar in mm;

prEN 10138-4:2005 (E)

- d) where necessary R for ribbed;
- e) Stress corrosion class (C1 or C2).

EXAMPLE

EN 10138-4	Y	1030	H	26,5	R	C1
Number of this Part of EN 10138						
Prestressing steel						
Nominal tensile strength (MPa)						
Hot rolled bar						
Nominal diameter (mm)						
Ribbed						
Stress corrosion class						

i.e. EN 10138-4-Y1030H-26,5-R-C1

NOTE The steel number may be used instead of the steel name i.e. EN 10138-4-1.1380-26,5-R-C1.

6 Manufacture

6.1 General

The bar shall be manufactured from steel in accordance with prEN 10138-1.

6.2 Processing

The steel shall be hot rolled into bar. Where subsequent processing is required to achieve the specified mechanical properties, such processing shall take the following forms either singly or in combination:

- a) accelerated cooling;
- b) cold stretching;
- c) additional tempering.

6.3 Ribs

Ribs shall be designed as a single start right hand thread. The design of the thread shall be according to defined characteristics. The threads shall have a generally uniform spacing of not more than $0,8 d$ where d is the nominal bar diameter.

6.4 Threaded ends

Where bar is supplied with threaded end, the threads shall be agreed between purchaser and supplier.

7 Requirements

7.1 General

Nominal and specified properties shall be in accordance with Tables 2 and 3.

7.2 Straightness

The deviation from straightness for any length of bar shall not exceed 4 mm/m length.

7.3 Longitudinal defects

Longitudinal surface defects shall not exceed 0,3 mm in depth.

7.4 Ductility evaluation

The tensile test fracture shall be visually examined to verify that it has been of a ductile type. The percentage of reduction in area shall be recorded.

7.5 Optional bend test

As an alternative to the ductility evaluation in 7.4, a bend test may be carried out over a mandrel of $10 d$, through an angle of 180° , see EN ISO 15630-3.

Table 2 — Dimensions and properties of hot rolled and processed bars

Steel designation		Surface configuration	Nominal ^a				Specified			
Steel name	Steel number		Diameter d mm	Tensile strength R_m MPa	Cross-sectional area ^d S_n mm ²	Mass ^{b c} per metre M g/m	Permitted deviation on nominal mass per metre	Characteristic value of maximum force F_m kN	Characteristic value of 0,1 % proof force $F_{p0,1}^e$ kN	Maximum value of maximum force $F_{m, max}$ kN
Y1230H	1.1382	P	26,0	1 230	531	4 168	-2% to + 6%	653	573	730
		R	26,5		552	4 480		678	596	760
		P	32,0		804	6 313		989	869	1 110
		R	32,0		804	6 530		989	869	1 110
		P	36,0		1 018	7 990		1 252	1 099	1 400
		R	36,0		1 018	8 270		1 252	1 099	1 400
		P	40,0		1 257	9 865		1 546	1 357	1 730
		R	40,0		1 257	10 205		1 546	1 357	1 730
Y1100H	1.1381	R	15,0	1 100	177	1 440	-2% to + 6%	194	159	224
			20,0		314	2 560		346	283	397
Y1050H	1.1383	R	17,5		241	1 960		255	230	295
		P	26,0		531	4 168		558	505	640

Table 2 — Dimensions and properties of hot rolled and processed bars

Steel designation		Surface configuration	Nominal ^a				Specified			
Steel name	Steel number		Diameter <i>d</i>	Tensile strength <i>R_m</i>	Cross-sectional area ^d <i>S_n</i>	Mass per metre <i>M</i>	Permitted deviation on nominal mass per metre	Characteristic value of maximum force <i>F_m</i>	Characteristic value of 0,1 % proof force <i>F_{p0,1}</i> ^e	Maximum value of maximum force <i>F_{m, max}</i>
			mm	MPa	mm ²	g/m		kN	kN	kN
Y1050H (cont.)	1.1383	R	26,5	1 050	552	4 480	-2% to + 6%	580	525	665
		P	32,0		804	6 313		845	760	975
		R	32,0		804	6 530		845	760	975
		P	36,0		1 018	7 990		1 070	960	1 230
		R	36,0		1 018	8 270		1 070	960	1 230
		P	40,0		1 257	9 865		1 320	1 190	1 520
		R	40,0		1 257	10 205		1 320	1 190	1 520
		R	47,0		1 735	14 100		1 820	1 650	2 090
Y1030H	1.1380	P	25,5		511	4 009	-2% to + 6%	526	426	605
		P	26,0		531	4 168		547	443	629
		R	26,5		552	4 480		568	461	653
		P	27,0		573	4 495		590	478	678
		P	32,0		804	6 313		828	672	953

prEN 10138-4:2005 (E)

Table 2 — Dimensions and properties of hot rolled and processed bars

Steel designation		Surface configuration	Nominal ^a				Specified			
Steel name	Steel number		Diameter <i>d</i>	Tensile strength <i>R_m</i>	Cross-sectional area ^d <i>S_n</i>	Mass per metre ^{b c} <i>M</i>	Permitted deviation on nominal mass per metre	Characteristic value of maximum force <i>F_m</i>	Characteristic value of 0,1 % proof force <i>F_{p0,1}</i> ^e	Maximum value of maximum force <i>F_{m, max}</i>
			mm	MPa	mm ²	g/m		kN	kN	kN
Y1030H (cont.)	1.1380	R	32,0	1 030	804	6 530	-2% to + 6%	828	672	953
		P	36,0		1 018	7 990		1 048	850	1 206
		R	36,0		1 018	8 270		1 048	850	1 206
		P	40,0		1 257	9 865		1 294	1 049	1 488
		R	40,0		1 257	10 250		1 294	1 049	1 488
		P	50,0		1 964	15 386		2 022	1 640	2 326

^a The nominal modulus of elasticity may be taken by convention as 205 GPa (kN/mm²) for as rolled and as rolled stretched and tempered bars and the secant modulus between 5 % and 70 % of the specified characteristic maximum force may be taken by convention as 170 GPa (kN/mm²) for as rolled and stretched bars.

^b For plain bars the nominal mass per metre is calculated from the nominal cross-sectional area and a density value of 7,85 kg/dm³.

^c For ribbed bars the nominal mass per metre includes the ribs and may vary according to the rib profile.

^d For ribbed bars the nominal cross-sectional area does not include the non-bearing portion of the ribs.

^e The specified characteristic value of 0,1 % proof force, *F_{p0,1}*, is approximately 81 % of the specified characteristic value of the maximum force, *F_m*, for 1 100 MPa and 1 030 MPa nominal tensile strength bar and approximately 88 % of the specified characteristic value of maximum force, *F_m*, for 1 230 MPa nominal strength bar and approximately 90% of the specified characteristic value of maximum force, *F_m*, for 1 050 MPa nominal tensile strength bar.

Table 3 — Additional requirements for bars

Property		Product under test		Specification	
Minimum total percentage elongation at maximum force, A_{gt} , with $L_o \geq 200$ mm				3,5 %	
Maximum stress relaxation at 1 000 h for initial force corresponding to 70 % actual maximum force		≤ 15 mm		6 %	
		> 15 mm		4 %	
Constriction at break		All bar diameters		Ductile break visible to the unaided eye	
Fatigue			Fatigue force range, F_r , where the upper limit, F_{up} , is 70 % of F_m N	Number of cycles without fracture	
		Plain bars	$d \leq 40$: $200 \times S_n$	$\geq 2 \times 10^6$	
			$40 < d$: $150 \times S_n$		
		Ribbed bars	$d \leq 40$: $180 \times S_n$		
			$40 < d$: $120 \times S_n$		
Stress corrosion resistance	Class C1 ^a	Test solution A	Bar diameter d mm	Minimum lifetime to fracture in hours	
				Individual test minimum (h)	Median minimum of all tests (h)
			$d = 15$	20	50
			$15 < d \leq 25$	60	250
	Class C2 ^a	Test solution A	$25 < d \leq 32$	100	400
			$d = 15$	20	50
			$15 < d \leq 25$	60	250
		Test solution B	$25 < d \leq 32$	100	400
			$15 < d \leq 32$	2 000	-
^a Test solution A defined in EN ISO 15630-3. When other regulatory requirements for stress corrosion exist the additional test solution B for initial type testing defined in EN ISO 15630-3 shall be used.					

8 Evaluation of conformity

The requirements in prEN 10138-1 shall be met.

9 Test methods

The test methods shall be in accordance with EN ISO 15630-3.

10 Delivery by the manufacturer

Delivery conditions shall be in accordance with prEN 10138-1 and the following requirements:

- a) bars shall be supplied in straight lengths;
- b) until delivered to the purchaser, the manufacturer shall protect the threaded ends against damage.