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Prestressing steels - Part 1: General requirements

Armatures de précontrainte - Partie 1: Prescriptions générales

Spannstähle - Teil 1: Allgemeine Anforderungen

This draft European Standard is submitted to CEN members for enquiry. 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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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This Part of this European Standard has been prepared by SC2 'Prestressing steels' of the Technical Committee ECISS/TC 19 'Concrete reinforcing and prestressing steels — Properties, dimensions, tolerances and specific tests' of which the Secretariat is held by BSI.

This European Standard has been prepared under mandate M115 given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of the EU Construction Products Directive (89/106/EEC).

For relationship with the EU Construction Products Directive, see informative Annex ZA, which is an integral part of this Part of this European Standard and by which it becomes a harmonized European Standard.

EN 10138 is published in four parts, the other parts being :

EN 10138-2, *Prestressing steels – Part 2: Wire*

EN 10138-3, *Prestressing steels - Part 3: Strand*

EN 10138-4, *Prestressing steels – Part 4: Bars*

All products placed on the market within the European Union and EFTA must be certificated in accordance with Annex ZA of this Part of this European Standard.

In accordance with the common rules of CEN/CENELEC the following member countries are obliged to adopt this standard : Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom

1 Scope

This Part of this European Standard specifies general requirements for high tensile strength steel products, which are used widely for the prestressing of concrete and are also used for other tensile applications in the construction field such as ground anchors, force lifting, suspension and stay cables of bridges. The standard applies only to products in the condition as supplied by the producer.

The specific requirements for each type of prestressing steel are given in Parts 2 to 4 of this European Standard.

NOTE The hereabove-mentioned tensile applications other than the prestressing of concrete, may be the subject of complementary requirements to those in Parts 2 to 4 of this European Standard, by agreement between the purchaser and the producer.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this European Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this European Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest editions of the normative document referred to applies. Members of CEN/CENELEC maintain registers of currently valid European Standards.

ENV 1992-1-1, *Eurocode 2 - Design of concrete structures — Part 1 : General rules and rules for buildings*

ENV 1992-1-2, *Eurocode 2- Design of concrete structures — Part 1-2 : General rules — Structural fire design*

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

prEN 10138-2, *Prestressing steels — Part 2: Wire*

prEN 10138-3, *Prestressing steels — Part 3: Strand*

prEN 10138-4, *Prestressing steels — Part 4: Bars*

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

EN ISO 377, *Steel and steel products - Location and preparation of samples and test pieces for mechanical testing.*

prEN ISO 15630-3, *Steel for the reinforcement and prestressing of concrete — Test methods — Part 3: Prestressing steels*

EN ISO 9001, *Quality systems - Model for quality assurance in design/development, production, installation and servicing.*

EN ISO 9002, *Quality systems - Model for quality assurance in production, installation and servicing.*

3 Terms and definitions

For the purposes of this European Standard the terms and definitions given in Parts 2 to 4 of this European Standard and the following apply.

3.1
wire rod
hot rolled steel delivered in coils, used for wire drawing

3.2
wire
product manufactured by cold working wire rod that is in a suitable metallurgical condition for wire drawing and which is given a final thermo-mechanical treatment

NOTE The surface of the wire is plain or indented. Both have a smooth surface and may be covered by a residue of drawing lubricant. The wire is wound into large diameter coils. Indented wire has indentations at regular intervals introduced by a process carried out before the final thermo-mechanical treatment.

3.3
strand
product consisting of a number of wires spun together in the same direction and with the same lay length which is given a final thermo-mechanical treatment and is then wound into large diameter coils

NOTE A strand may be described by the number of wires as follows:

a) 3-wire strand: Three wires spun together over a theoretical common axis;

b) 7-wire strand: A straight core wire around which are spun six wires in one layer;

c) 7-wire compacted strand: 7-wire strand that has been drawn through a die, or compressed by other means, before the final thermo-mechanical treatment;

d) Indented 3-wire strand or 7-wire strand is produced from indented wires. The central wire may be plain with no indentations.

3.4
bar
product manufactured in straight lengths in a hot rolling mill

3.5
processed bar
bar treated after production by accelerated cooling, cold stretching or additional tempering, either singly or in combination

3.6
characteristic value
value having a prescribed probability of not being attained in a hypothetical unlimited test series

NOTE In the context of this European Standard the characteristic value is (unless otherwise indicated) the lower limit of the statistical tolerance interval at which there is a 95 % probability ($1 - \alpha = 0{,}95$) that 95 % of the values are at or above this lower limit. This definition refers to the long-term quality level of production.

3.7
inspection
activities such as measuring, examining or gauging one or more properties of a product or service and comparing these with specified requirements to determine conformity

3.8
batch
any quantity of bars of one size and one cast produced by one manufacturer and presented for examination at any one time

3.9
consignment
total amount of product in the same delivery to a customer which may consist of several batches

3.10
product family
group of related products e.g. same tensile strength grades plain or indented (see Annex A)

3.11
factory production control
permanent internal production control exercised by the manufacturer

3.12
standard properties
properties prescribed in this European Standard as part of the factory production control requirements for every test unit

3.13
special properties
properties prescribed in this European Standard which are not determined as part of the factory production control requirements for every test unit

3.14
maximum value
the value which no test result shall exceed

3.15
minimum value
the value below which no test result shall fall

4 Classification

All steels covered by this European Standard are classified as special steels according to EN 10020.

5 Information to be supplied by the purchaser

The following information shall be supplied by the purchaser at the time of enquiry and order:

a) designation of the product in accordance with Parts 2 to 4 of this European Standard;

b) the packaging and protection requirements;

c) requirements for copies of force/extension diagrams;

d) special requirements for labelling;

e) nominal depth of indentations for indented wire.

6 Requirements

6.1 Steel making process

The steel may be made by any process except that air or mixed air-oxygen bottom blown processes shall not be used. If requested by the purchaser, the cast analysis of the steel shall be given for the elements C, Si, Mn, P and S.

6.2 Technological properties

The finished product shall be free from defects that would impair the performance of a prestressing tendon made of it.

Rusted steels shall not be supplied unless the rust is a thin film. The underlying steel surface shall appear to be smooth to the unaided eye.

NOTE 1 Coatings or surface treatments for specific purposes may be applied to the surface of the steel only if previously agreed between purchaser and manufacturer. Such coatings are outside the scope of this European Standard.

NOTE 2 Limitations on the presence of welds are given in Parts 2 – 4 of this European Standard.

6.3 Geometrical properties

The geometrical properties shall be defined by a nominal cross-sectional area (S_n) with tolerances and a nominal diameter. Where this is insufficient or not appropriate, details of the configuration of the product as given in the relevant Part of this European Standard shall also be provided.

6.4 Mechanical properties

6.4.1 The relevant properties and specified values shall be as specified in Parts 2 – 4 of this European Standard.

Tensile properties shall be recorded as force in force units. Where stress is used for designation purposes, calculation of stress shall be based on the specified cross-sectional area of the product.

6.4.2 The specified maximum force is the specified characteristic value of maximum force (F_m).

The maximum value of maximum force ($F_{m,max}$) shall be as specified in Parts 2 – 4 of this European Standard.

6.4.3 The specified proof force value is the specified characteristic 0,1 % proof force ($F_{p0,1}$).

6.4.4 The minimum value of percentage total elongation at maximum force (A_{gt}) shall be as specified in Parts 2 – 4 of this European Standard.

6.4.5 The prestressing steel shall be proved to have suitable ductility by means of bending, reverse bending and/or constriction, according to the case as specified in Parts 2 to 4 of this European Standard.

6.5 Special properties

6.5.1 General

Isothermal relaxation, fatigue behaviour, deflected tensile and stress corrosion properties shall be the subject of periodic testing.

6.5.2 Isothermal stress relaxation

Curves for relaxation of force shall be established, at a nominal temperature of 20 °C, for a period of 1000 h from an initial force of 70 % of the actual maximum force, in the tensile test, determined on an adjacent test piece.

NOTE If verification of established values is required, tests of 120 h from an initial force of 70 % of actual maximum force extrapolated to 1000 h may be accepted, provided the manufacturer can give proof of a satisfactory correlation between 1000 h tests and extrapolation of 120 h tests.

6.5.3 Fatigue behaviour

The products shall withstand without failure two million load cycles under conditions of stable upper (F_{up}) and frequency (f) where the stable upper force is defined by 70% of the actual maximum breaking force (F_m) determined in a tensile test on an adjacent test piece. The fluctuating force range (F_r) which is twice the force amplitude (F_a) shall be as specified in Parts 2 – 4 of this European Standard.

6.5.4 Deflected tensile behaviour

The maximum permitted D value for strands with nominal diameter $\geq$ 12.5 mm shall be in accordance with Part 3 of this European Standard.

6.5.5 Stress corrosion resistance

The minimum individual and median value of life-time to failure shall be as specified in Parts 2 to 4 of this European Standard.

7 Evaluation of conformity

NOTE In conjunction with this clause, Annex ZA has to be taken into account on attestation of conformity.

7.1 Factory production control

7.1.1 General

Prestressing steels according to this standard shall be produced under a permanent system of factory production control which shall ensure the same level of confidence in the conformity of the finished product, whatever the manufacturing process.

The system of factory production control shall include evaluation of property requirements given in 7.1.2.

This system, which may include the purchase and further processing of incoming material (e.g. billets, wire rods, wire) shall address the requirements of this European Standard and ensure that the finished products consistently conform to its requirements.

NOTE Manufacturers which have a factory production control system which meets the requirements of EN ISO 9001 / EN ISO 9002 and which addresses the requirements of this Standard are recognised as satisfying the factory production control requirements of this Standard.

Semi-finished material purchased for further processing from a manufacturer whose factory production control system has been certificated to the relevant requirements of this European Standard should be considered satisfactory with no further work.

Manufacturers purchasing semi-finished materials from suppliers whose factory production control system is not certificated to the relevant requirements of this European Standard should ensure confidence in the resulting finished product by the following:

a) inspection of the incoming material appropriate to the form of this material;

b) inspection of the finished product at a frequency greater than three times that described in 7.1.2. This frequency may be reduced if the factory production control procedures of the manufacturer result in the level of confidence described in the earlier paragraphs of this clause.

7.1.2 Sampling and testing

7.1.2.1 Testing of geometrical and mechanical properties

For the verification of the geometrical and mechanical properties by the manufacturer, sampling and testing on finished products shall be as specified in Parts 2 – 4 of this European Standard.

The test results shall satisfy the relevant requirements as specified in Parts 2 – 4 of this European Standard.

7.1.2.2 Assessment of the long term quality level

The results of tests on all test units of the continuous production shall be collated product per product and statistically evaluated for maximum force (F_m) and 0,1 % proof force ($F_{p0,1}$) using data based on a 6 months operation (or a 12 months operation if the production quantity is limited).

The following requirement shall be satisfied for F_m and $F_{p0,1}$: $m - ks \geq C_v$

where

m is the average value ;

s is the estimate of the standard deviation of the population ;

k is the coefficient listed in Table 1 ;

C_v is the specified characteristic value.

Table 1 — Coefficient k as a function of a number (n) of the test results for a reliable failure rate of 5 % (p = 0,95) at a probability of 95 %

n	k	n	k
5	4,21	30	2,22
6	3,71	40	2,13
7	3,40	50	2,07
8	3,19	60	2,02
9	3,03	70	1,99
10	2,91	80	1,97
11	2,82	90	1,94
12	2,74	100	1,93
13	2,67	150	1,87
14	2,61	200	1,84
15	2,57	250	1,81
16	2,52	300	1,80
17	2,49	400	1,78
18	2,45	500	1,76
19	2,42	1 000	1,73
20	2,40		

The foregoing is based on the assumption that the distribution of a large number of results is normal. However, it is not a requirement of this standard that the distribution is normal.

7.2 Initial type testing

For each product family, one size shall be tested.

NOTE Annex A gives examples of product families.

For each product family, the products from which the samples are taken shall come from two different heats. The samples to be taken per heat shall permit the determination of the special properties and for geometrical and mechanical properties, witness testing in the manufacturer's testing laboratory and testing by an independent testing laboratory, with retest on any results where necessary.

The samples shall be taken as random samples from the production material presented for testing. Care should be taken to ensure that the samples genuinely reflect the properties of the products to be tested. Two samples shall be taken from each of four units of products from each of the two heats, i.e. a total of sixteen samples. Any sample preparation shall be in accordance with EN ISO 377.

For a product family, the type and number of tests to be carried out shall be in acordance with Table 2.

Table 2 — Type and number of tests for the initial type testing and for the continuous surveillance

Stage	Frequency and product concerned	Type and number of tests				
		Geometrical and mechanical properties	Special properties			
			Stress-relaxation	Fatigue resistance	Deflective tensile behaviour [a]	Stress-corrosion resistance
Initial type testing	Once, for each product family	16 tests (2x4 per heat)	2 tests (1 per heat)	6 tests (3 per heat)	2 tests series (1 per heat)	1 test series
Continuous Surveillance	Yearly for each product type (wire, 3-wire strand, 7-wire strand, 7-wire compacted strand, bar)	8 tests	1 test	1 test	1 test series	1 test series
[a] Only for 7-wire strand and 7-wire compacted strand with a nominal diameter $\geq$ 12,5 mm.						

7.3 Continuous surveillance

7.3.1 General

The purpose of continuous surveillance is to:

a) confirm that the system of factory production control continues to comply with the requirements of 7.1;

b) select samples for audit testing according to 7.3.2.

7.3.2 Audit testing

All properties (geometrical, mechanical and special) shall be tested by taking samples of the products at the factory as indicated in Table 2.

These tests are carried out on one product family taken at random per product type. Where several product families of a product type are produced, the sampling shall be done in such a way to cover the greatest number of product families in a certain period of time.

7.3.3 Evaluation, reporting and action

The results of the manufacturer long term quality level assessment shall be evaluated every six months.

The result of continuous surveillance shall be recorded in a supervision report which shall be produced within a period of 6 weeks.

If the results show that the production does not conform to the requirements, appropriate measures shall be taken. The measures will depend on the type and significance of the deficiencies noted but shall include:

a) intensification of supervision (increase the frequency of testing),

b) suggestion to change the conditions of production.

8 Test methods

Test methods for specified tests shall be in accordance with prEN ISO 15630-3 .

NOTE Where the actual cross-sectional area is required, this may be obtained by taking a test piece of suitable length, measured to an accuracy of 3 significant figures. The mass (m) of the test piece should be determined to the nearest 1 g for $m \geq 500$ g and to the nearest 0,1 g for $m < 500$ g.

Using the equation:

$$\text{area}\ (\text{mm}^2) = \frac{\text{mass}\ (\text{g})}{\text{length}\ (\text{m})\ \text{x}\ \text{density}\ (\text{kg/dm}^3)}$$

9 Delivery conditions

9.1 Identification

Each coil of wire or strand or quantity of bars shall carry a label giving:

a) the designation of the product given in Parts 2 – 4 of this European Standard;

b) the coil number or bar batch number;

c) the manufacturer's name and plant;

d) specific requirements according to 5.2 d) and e).

9.2 Delivery documentation

Each consignment shall be accompanied by documentation containing:

a) all the information necessary to identify the units of product within the consignment;

b) an inspection certificate in accordance with EN 10204 :1994, Clause 3.1B;

c) force/extension diagrams when agreed with the purchaser.

9.3 Dimensions of unit of product

9.3.1 Wire and strand

Where the product is supplied in coil form then the diameter of the coil shall be sufficiently large to ensure that the permanent straightness of the product after decoiling is unaffected.

9.3.2 Bar

The dimensions of a product supplied in straight lengths shall be agreed at the time of ordering with the purchaser.

9.4 Packaging and handling

Where the product is supplied in a coil form then coils shall be formed in such a way that the material is held firmly by restraining bands or ties. In case of reopening the coils special caution shall be taken to contain the energy contained and avoid personal injuries.

9.5 Transport and storage

Prestressing steels in transport and storage shall be protected against damage and contamination, particularly from substances or liquids which are likely to produce or encourage corrosion.

Annexe A
(informative)

Product families

Table A.1 gives examples of product families for products defined in Parts 2 — 4 of this European Standard.

Table A.1 — Examples of product families

Types of Prestressing steel	Number of the product family	Products in the product family		Surface configuration
		Steel name	Nominal diameter (mm)	
Cold drawn wire	1	Y1860 C	3,0-4,0-5,0	Plain or indented
	2	Y1770C	3,2-5,0-6,0	Plain or indented
	3	Y1670C	6,9-7,0-7,5-8,0	Plain or indented
	4	Y1570C	9,4-9,5-10,0	Plain or indented
3-wire strand Class A	5	Y1960S3 Y1860S3	5,2 6,5-6,8-7,5	Plain or indented
3-wire strand Class B	6	Y2160S3 Y206053 Y1960S3	5,2 5,2 6,5	Plain or indented
7-wire strand Class A	7	Y1860S7 Y1770S7	7,0-9,0-11,0-12,5-13,0-15,2 -16,0 15,2-16,0-18,0	Plain or indented
7-wire strand Class B	8	Y2160S7 Y2060S7 Y1860S7	6,85 7,0 9,0	Plain or indented
7-wire strand Compacted Class A	9	Y1860S7G Y1820S7G Y1700S7G	12,7-15,2 15,2 18,0	Plain
Bars	10	Y1100H Y1030H	15 and 20 25,5 to 50	Ribbed or plain
	11	Y1230H	26 to 40	Ribbed or plain

Annex ZA
(informative)

Clauses of this European Standard addressing the provisions of EU Construction Products Directive.

ZA.1 General

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

The clauses of this Part of this European Standard, shown in Table ZA.1, meet the requirements of the mandate given under the EU Construction Products Directive (89/106).

Compliance with these clauses confers a presumption of fitness of the construction products covered by the European Standard for its intended use(s).

Construction product(s) : Prestressing steel in wire, strand, bar.

Intended uses: Concrete structures

Table ZA.1 — Clauses of this European Standard addressing the provisions of EU Construction Products Directive

Requirement/Characteristic from the mandate	Requirement clause(s) in this or other European Standard(s)
Stress ratio (ultimate tensile strength/tensile yield strength)	6.4.2 (maximum force)
Tensile yield strength	6.4.3 (0,1 % proof force)
Elongation at maximum force	6.4.4
Relaxation	6.5.2
Sections and tolerances on sizes	6.3
Surface geometry	6.3
Fatigue	6.5.3
Durability	6.5.5 (stress corrosion resistance)

ZA.2 Procedure(s) for the attestation of conformity of products

ZA.2.1 For the products and intended uses listed below, the system of attestation of conformity shall be in accordance with Table ZA.2.

Table ZA.2 — Products, intended uses and attestation of conformity system

Products	Intended use(s)	Attestation of conformity system(s)
Prestressing steel products **-**wires (stress relieved cold drawn wires, smooth wires, indented wire) -strands(multi-wire strands, multi-wire compacted strands, indented and high bond strand) -bars (hot rolled and processed bar threaded bars, ribbed or plain or smooth bars)	used for the prestressing of concrete	1+[a]
[a] System 1+ : See CPD Annex III.2.(i) with audit testing of samples taken at the factory		

ZA.2.2 For products under system 1, regarding the initial type testing of the product (see Annex III.1.a of the CPD), the task for the approved laboratory will be limited to the assessment of the following characteristics:

— maximum force;

— 0,1% proof force;

— deflected tensile strength (for strands);

— elongation at maximum force;

— relaxation;

— sections and tolerances on sizes;

— surface geometry;

— modulus of elasticity;

— fatigue.

ZA.2.3 For products under systems 1, for the continuous surveillance, assessment and approval of the factory production control [see Annex III.1.g of the CPD], only parameters related to the following characteristics shall be of the interest of the approved body [1)]:

— maximum force;

— 0,1 % proof force;

— deflected tensile strength (for strands);

— elongation at maximum force;

— relaxation;

— sections and tolerances on sizes;

— surface geometry;

— modulus of elasticity;

— fatigue.

ZA.2.4 For the initial inspection of the factory and of the factory production control (see Annex III.1.f of the CPD), parameters related to all the relevant characteristics shall be of interest to the approved body.

ZA.3 Procedure for conformity

ZA.3.1 General

The procedure for conformity of the product(s) covered by this European Standard shall be addressed according to the certification procedure described in ZA.3.2.

ZA.3.2 Certification procedure

Assessment of the producer's system of factory production control and the resultant product produced in accordance with this European Standard, which includes external supervision and testing, shall be carried out by the notified certification body acting either with its own resources or with inspection bodies or testing laboratories authorised by it. Certification for production of product meeting the requirements of this European Standard shall be given for a product family with defined diameters after the steps described in ZA.3.3 and ZA.3.4 and Figure ZA.1 have been taken.

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1) In this case the notified body.

ZA.3.3 Application

An application for approval shall be made by the manufacturer to the notified body which shall be accompanied by a technical file, setting out the manufacturing processes and methods and a quality manual, setting out the general policies, procedures and practices of the manufacturer.

ZA.3.4 Initial assessment

The initial assessment shall be performed by the notified body. This shall consist of initial type testing of the products described in this European Standard and an assessment of the manufacturer's system for factory production control. This shall include sampling and testing of the product as described in clause 7. The samples shall be taken in the presence of the notified body. Geometrical and mechanical properties shall be assessed by both the manufacturer and an independent testing laboratory. Special properties shall be assessed by an independent laboratory.

NOTE When agreed with the notified body independent testing for special properties may be carried out in the manufacturer's laboratory under the supervision of the notified body.

Successful performance in the initial assessment shall result in certification of the product of the manufacturer.

ZA.3.5 Continuous surveillance and audit testing

Continuous surveillance inspections and audit testing shall be performed by the notified body which shall act to ensure on-going compliance of the system of factory production control and of the product in accordance with this European Standard. These inspections shall include sampling and testing of the product as described in 7.3.2. The provisions given in ZA.3.4 apply to these tests. Maintenance of approval shall be subject to :

a) Continued satisfactory operation of the system of factory production control as verified by the notified body at the initial assessment;

b) Continued production of the product(s) described in this European Standard in the product families covered by the certification.

Continuous Surveillance inspections shall be performed twice a year. This frequency may be increased if necessary in accordance with 7.1 (see also Parts 2 – 4 of this European Standard).

ZA.3.6 Re-assessment and renewal of certification

The duration of certification, based on satisfactory maintenance of approval as described in ZA.3 shall be for a period of 5 years from the issue of the certificate. After this period the manufacturer's system of factory production control shall be subject to a re-assessment which shall include all elements of the system at this stage. Sampling and testing of the product at this stage shall be at the continuous surveillance level described in 7.3. Renewal of certification will be subject to compliance with the requirements of ZA.3.

ZA.4 CE marking and labelling

The CE marking and the accompanying information shall be placed on a label firmly attached to each coil of wire, strand and each bundle of bars.

The CE marking shall include the identification number of the notified body.

The information which accompanies the CE marking shall consist of:

a) the name and address of the producer;

b) the last two digits of the year in which the marking was affixed;

c) the number of the EC certificate of conformity;

d) the reference to this European Standard i.e. EN 10138-1 and:

either

— the designation of the product in accordance with the relevant Part of this European Standard, when the product complies with the requirements of one of the classes of convenience defined in Parts 2 – 4 of this European Standard (see example 1);

or

— the description of the product form and the nominal dimensions of the product followed by, for all the relevant performance characteristics in table ZA.1, successively the symbols of the property, the test result obtained on the relevant test unit and the corresponding specified value, when it is not referred to classes of convenience (see example 2).

NOTE If more than one value is obtained for the test unit, the mean value shall be indicated.

EXAMPLE 1:

CE 0123
Any Co. Ltd. PO Box 23 B-1070 99 0123-CPD-0001
EN 10138-1 Strand -EN 10138-3 – Y1860S7-16,0

EXAMPLE 2:

CE 0123
Any Co. Ltd. PO Box 23 B-1070 99 0123-CPD-0001
EN 10138-4 Plain Bar -25 x 14000 F_m : 550 kN(500 kN) $F_{p0,1}$: 430 kN(400 kN) A_{gt} : 5,2% (3,5%) Ductile Break Mass deviation : +2,3% (-2% ; +6%) Relaxation : 3,2% (4%) Fatigue : Pass Stress Corrosion : min 80h(60h) median 300h (250h)

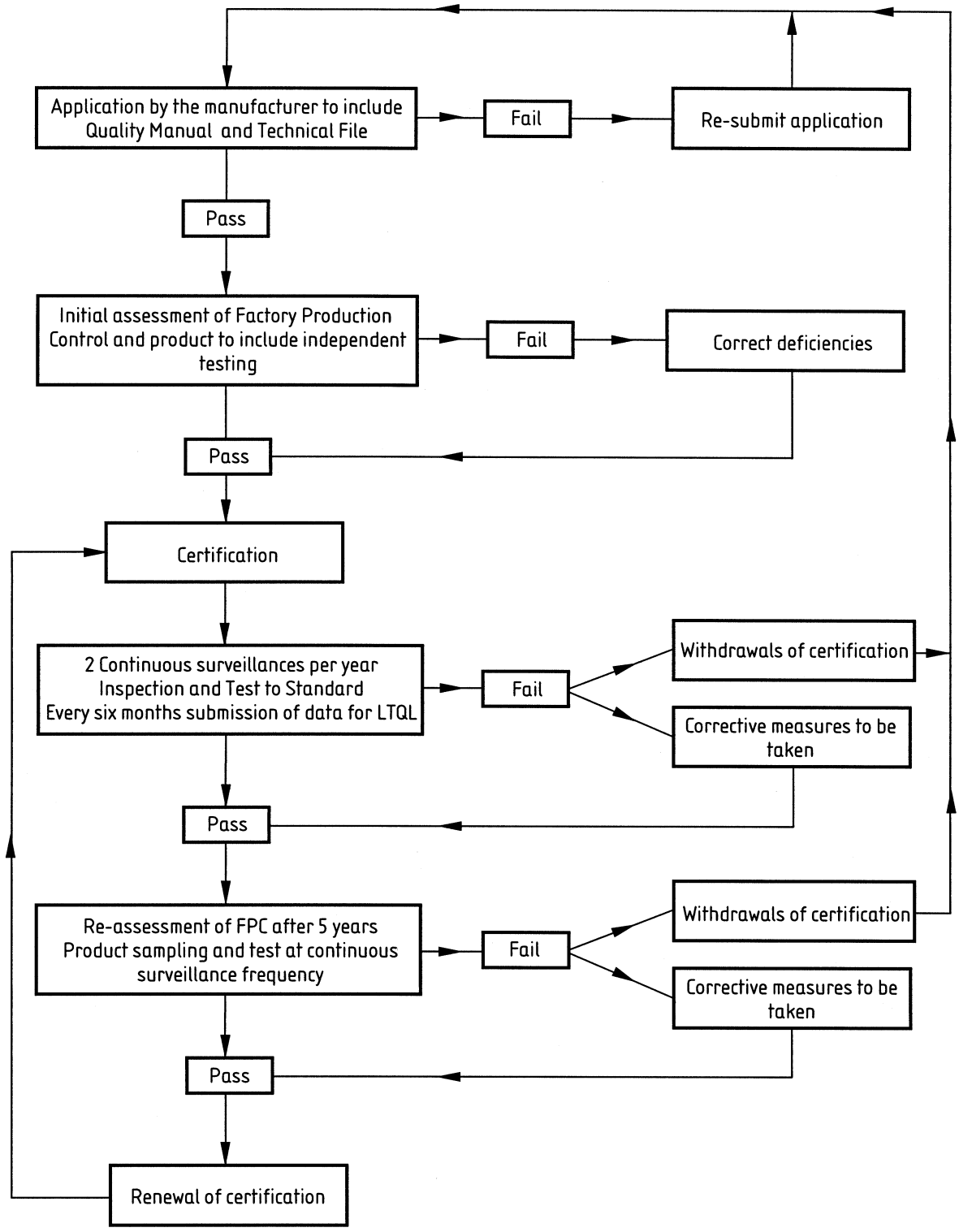

Figure ZA.1 — Certification procedure