BRITISH STANDARD

BS EN
12899-4:2007

Fixed, vertical road traffic signs —

Part 4: Factory production control

ICS 93.080.30

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 12899-4:2007.

The UK participation in its preparation was entrusted by Technical Committee B/509, Road equipment, to Subcommittee B/509/3, Construction of road traffic signs.

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

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 March 2008

ISBN 978 0 580 57431 3

Amendments/corrigenda issued since publication

Date	Comments

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12899-4

November 2007

ICS 93.080.30

English Version

Fixed, vertical road traffic signs - Part 4: Factory production control

Signaux fixes de signalisation routière verticale - Partie 4 : Contrôle de la production en usine

Ortsfeste, vertikale Straßenverkehrszeichen - Teil 4: Werkseigene Produktionskontrolle

This European Standard was approved by CEN on 4 February 2007.

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Ref. No. EN 12899-4:2007: E

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Foreword

This document (EN 12899-4:2007) has been prepared by Technical Committee CEN/TC 226 "Road equipment" the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by May 2008, and conflicting national standards shall be withdrawn at the latest by August 2012.

No existing European Standard is superseded.

This European Standard consists of the following parts under the general title:

Fixed, vertical road traffic signs —

Part 1: *Fixed signs*

Part 2: *Transilluminated traffic bollards (TTB)*

Part 3: *Delineator posts and retroreflectors*

Part 4: (This part) *Factory production control*

Part 5: *Initial type testing*

It is based on performance requirements and test methods published in CEN, CENELEC, CIE (International Commission on Illumination) and ISO documents together with standards of the CEN member organizations.

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

Introduction

The following products are covered under Mandate M/111 Circulation Fixtures: Road Equipment. [Council Directive relating to construction products 89/106/EEC(CPD)]

Fixed vertical road traffic signs, either as products or unassembled as kits, and components of signs:

sheeting, (glass bead technology), supports, sign plates including lighting and fixings together with any combination of these components.

Also included are transilluminated traffic bollards, delineator posts and fixed retroreflectors.

This standard specifies which sorts of parameters and tests have to be taken into consideration within the FPC system, but leaves the precise test methods to be applied to be chosen depending on the manufacturer's facilities and production methods. The precise parameters and methods will be found in the manufacturer's written FPC procedures.

1 Scope

This Part of EN 12899 describes the requirements for Factory production control (FPC), for Parts 1, 2 and 3 of EN 12899.

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 12767, *Passive safety of support structures for road equipment — Requirements and test methods*

EN 12899-1:2007, *Fixed, vertical road traffic signs — Part 1: Fixed signs*

EN 12899-2:2007, *Fixed, vertical road traffic signs — Part 2: Transilluminated traffic bollards (TTB)*

EN 12899-3:2007, *Fixed, vertical road traffic signs — Part 3: Delineator posts and retroreflectors*

EN ISO 9000:2005, *Quality management systems — Fundamentals and vocabulary (ISO 9000:2005)*

EN ISO 9001:2000, *Quality management systems — Requirements (ISO 9001:2000)*

ISO 2859, *Sampling procedures for inspection by attributes*

3 Terms, definitions, symbols and abbreviations

For the purposes of this document, the terms and definitions given in EN ISO 9000:2005, EN 12899-1:2007, EN 12899-2:2007, EN 12899-3:2007 and the following apply.

3.1
factory production control (FPC)
permanent internal control of production exercised by the product manufacturer

3.2
batch
quantity of a product manufactured from one (or more, in so far as the performance of the product is not adversely affected) traceable delivery of raw material or components and for which there has been no change in the manufacturing process (in so far as the performance of the product is not adversely affected by any such change)

NOTE Production that is interrupted does not imply a new batch provided that there is no change in the raw material and component properties or in the manufacturing process.

3.3
manufacturer
person or organization with legal responsibility for placing the product on the market

3.4
supplier
producer of raw materials and components (e.g. sign faces, fixing devices etc.) of the product

4 System requirements

4.1 General

The manufacturer shall establish, document and maintain a FPC system to ensure that the products placed on the market conform to the declared performance characteristics. The FPC system shall consist of written procedures (works manual), regular inspections and tests and/or assessments and the use of the results to control raw and other incoming materials or components, equipment, the production process and the product. Records shall remain legible, readily identifiable and retrievable and reviewed for effectiveness at least once per year which shall be recorded. This shall include testing of samples in accordance with a prescribed test plan defined in this European Standard.

A FPC system conforming to the requirements of EN ISO 9001, and made specific to the requirements of this standard, is considered to satisfy the above requirements.

In each factory, the manufacturer may delegate action to a person having the necessary authority to:

a) monitor procedures to demonstrate conformity of the product at appropriate stages;

b) identify and record any instance of nonconformity;

c) monitor procedures to correct instances of nonconformity.

All FPC systems shall achieve and maintain an adequate level of confidence that the product is in conformity with the requirements of this European Standard.

The results of inspections, tests or assessments requiring action shall be recorded, as shall any action taken. The action to be taken when control values or criteria are not met shall be recorded and retained for the period specified in the manufacturer's FPC procedures.

Components having the necessary performance levels already demonstrated (e.g. by conformity to an appropriate European Standard or by CE marking in accordance with an appropriate ETA) may be considered to have the declared performance levels and do not require any further testing for the purposes of conformity with this European Standard, providing the component's performance is not detrimentally affected by the manufacturing process when it is incorporated into the product.

In the case of new factories, new production lines or units, if the FPC system is temporarily unable to meet requirements that apply for normal production, as specified in this standard, the provisions of Table 1 shall apply to final quality testing. This shall continue until the FPC system is capable of meeting the other requirements of this standard.

4.2 Production control system

4.2.1 The manufacturer shall establish procedures to ensure that the production tolerances allow the product performances to conform to the declared values, demonstrated by initial type testing.

The production control ~~s~~system shall at least include the necessary procedures for the:

a) relevant constituents;

b) controls and tests to be carried out during manufacture;

c) verifications and tests carried out on finished products in accordance with the test regime specified in Clause 5;

d) control of the necessary installations, equipment and trained personnel to execute the tests on the raw materials, the tests during production and the final quality control tests as specified in Clause 5;

e) operation maintenance and calibration of appropriate testing and manufacturing equipment by qualified personnel.

NOTE 1 This does not preclude the manufacturer from concluding a sub-contracting agreement with one or more organizations or persons having the necessary skills and equipment in order to perform the above tasks.

The test methods to be applied and the tolerances for the results of all the tests used shall be documented in the FPC system.

The minimum frequency of testing shall be in accordance with the test plan of the manufacturer, or as specified in Table 1, whichever is the more rigorous.

NOTE 2 These methods would normally be direct methods. In the case of certain characteristics, indirect test methods could be appropriate if a relationship can be established between the specific characteristic (the one to be verified) and another characteristic which is more practicable to measure such that conformity to this standard is demonstrated.

Samples that have been subjected to destructive testing cannot be used. Other samples may be returned to the production line.

Table 1a — Minimum frequency of testing during production for product testing and evaluation as part of FPC for fixed signs and components (complete sign assemblies, signs, sign plates, supports and retroreflective sheeting materials)

Characteristics	Minimum number of samples	Frequency and documentation
Fixed signs and components		
Resistance to horizontal loads – standard design	One	Verify conformity to raw material specification and design per batch
Resistance to horizontal loads – non standard design	One	Verify conformity to raw material specification per batch and design per unit
Resistance to impact of sign face material	One	Per batch of sign face material
Resistance to impact of supports (EN 12767)	One (if not NPD)	Verify conformity to raw material specification and design per batch of supports
Chromaticity co-ordinates and luminance factors –retroreflective sheeting materials	Five per colour and type	All samples in each batch shall meet the requirements of EN 12899-1
Coefficient of retroreflection – retroreflective sheeting materials	Five per colour and type	All samples in each batch shall meet the requirements of EN 12899-1
Chromaticity co-ordinates and luminance factors – signs	In accordance with Table 2	All samples in each batch shall pass the test in the manufacturer's FPC procedures
Coefficient of retroreflection – signs	In accordance with Table 2	All samples in each batch shall pass the test in the manufacturer's FPC procedures. The following geometry shall be used: α = 20' and β_1 = +5° (β_2 = 0° and ε = 0°)
Mean luminance, uniformity of luminance and luminance contrast – transilluminated signs	In accordance with Table 2	All samples in each batch shall pass the test in the manufacturer's FPC procedures
Resistance to weathering – retroreflective sheeting materials	One per colour and type	Continuous by reference to validation of other performance characteristics, plus the weathering test specified in the manufacturer's FPC procedures
Resistance to weathering – screen–printed, retroreflective sheeting materials	One per colour and type	Continuous by reference to validation of other performance characteristics, plus the weathering test specified in the manufacturer's FPC procedures
Tests for the purpose of FPC may not necessarily be the same as those for ITT. The above testing may not be necessary for any raw material or component which bears CE marking, but see EN 12899-5:2007, 4.1. Characteristics shall be selected and applied as appropriate to the product or component. For sampling purposes, the batch size referred to in Table 2 shall not exceed one year's production.		

Table 1b — Minimum frequency of testing during production for product testing and evaluation as part of FPC for transilluminated traffic bollards (TTB)

Characteristics	Minimum number of samples	Frequency and documentation
Transilluminated bollards		
Resistance to horizontal loads	One	Verify conformity to raw material specification and design per batch
Resistance to impact	One	Per substrate material and design per year
Chromaticity coordinates – retroreflective sheeting materials	Five per colour and type	All values shall lie within the limits specified in EN 12899-1, per batch of sheeting material
Chromaticity coordinates – screen-printed materials	In accordance with Table 2	All values shall lie within the limits specified in EN 12899-1, per batch of signs
Mean luminance, uniformity of luminance	In accordance with Table 2	All values shall lie within the limits specified in EN 12899-1, per batch of signs
Resistance to corrosion (metallic parts only)	In accordance with Table 2	Measurement of protective coating thickness or verify conformity to raw material specification and design per batch
Resistance to natural weathering – retroreflective sheeting materials	One per colour and type	Every 3 years
Resistance to natural weathering – retroreflective, screen-printed materials	One per colour and type	Every 3 years
Tests for the purpose of FPC may not necessarily be the same as those for ITT. The above testing may not be necessary for any raw material or component which bears CE marking, but see EN 12899-5:2007, 4.1. Characteristics shall be selected and applied as appropriate to the product or component. For sampling purposes, the batch size referred to in Table 2 shall not exceed one year's production.		

Table 1c — Minimum frequency of testing during production for product testing and evaluation as part of FPC for delineator posts

Characteristics	Minimum number of samples	Frequency and documentation
Delineator posts		
Resistance to horizontal loads	One	Verify conformity to raw material specification and design per batch
Resistance to impact	One	Per substrate material and design per year
Chromaticity coordinates – retroreflective sheeting materials	Five per colour and type	All values shall lie within the limits specified in EN 12899-1, per batch of sheeting material
Coefficient of retroreflection – retroreflective sheeting materials	Five per colour and type	All values shall lie within the limits specified in EN 12899-1, per batch of sheeting material
Resistance to corrosion (metallic parts only)	In accordance with Table 2	Measurement of protective coating thickness or verify conformity to raw material specification and design per batch
Resistance to natural weathering – retroreflective sheeting materials	One per colour and type	Every 3 years
Tests for the purpose of FPC may not necessarily be the same as those for ITT. The above testing may not be necessary for any raw material or component which bears CE marking, but see EN 12899-5:2007, 4.1. Characteristics shall be selected and applied as appropriate to the product or component. For sampling purposes, the batch size referred to in Table 2 shall not exceed one year's production.		

Table 1d — Minimum frequency of testing during production for product testing and evaluation as part of FPC for retroreflectors

Characteristics	Minimum number of samples	Frequency and documentation
Retroreflectors		
Resistance to impact	In accordance with Table 2	Test per batch
Chromaticity co-ordinates (type R1 only)	In accordance with Table 2	All values shall lie within the limits specified in EN 12899-1, per batch
Coefficient of retroreflection	In accordance with Table 2	All values shall lie within the limits specified in EN 12899-1, per batch
Resistance to corrosion (metallized retroreflectors only)	In accordance with Table 2	Per batch
Resistance to natural weathering	One per colour and type	Every 3 years
Tests for the purpose of FPC may not necessarily be the same as those for ITT. The above testing may not be necessary for any raw material or component which bears CE marking, but see EN 12899-5:2007, 4.1. Characteristics shall be selected and applied as appropriate to the product or component. For sampling purposes, the batch size referred to in Table 2 shall not exceed one year's production.		

The manufacturer shall record the results of the tests specified above. These records shall at least include the following information:

— identification of the fixed vertical sign tested;

— date of sampling and testing;

— test methods performed;

— test results.

The testing regime for FPC shall be at the discretion of the manufacturer in so far as it shall provide adequate assurance that the product conforms to the characteristics of the product specification as demonstrated by the initial type testing.

Table 2 — Control sample related to batch size

Number of articles in the batch	Minimum number of articles in the control sample
1 to 3	All
4 to 500	3
501 to 1 200	5
1 201 to 3 200	8
3 201 to 10 000	13
>10 000	20

4.2.2 Statistical conformity control

If a manufacturer wishes to use statistical conformity control, the following shall apply.

The numbers in Table 2 shall be taken as a basis and the recommended starting point. The use of analytical quality assurance techniques such as statistical process control is recommended to reassess sample size and sample frequency on an ongoing basis using historical test results. Statistical conformity control shall be applied in accordance with methodology described in ISO 2859.

4.3 Records

Records shall include everything that is necessary to demonstrate control of the raw materials and components, the production process and the final product. Records shall be kept for at least the manufacturer's warranty period of the product, the period specified in the FPC or 5 years from the date on which the product was placed upon the market, whichever is the greater.

The identification of the product tested, the date of sampling and testing, the test methods performed, the test results, date of manufacture and acceptance criteria shall be entered in a register under the signature of the person responsible for the control and who carried out the verification.

The results of inspections, tests or assessments requiring action shall be recorded, as shall any action taken. In case of nonconformity, the corrective actions taken to rectify the situation shall be recorded in the register.

4.4 Treatment of nonconforming products

If control or test results show that the product does not meet the requirements, the necessary corrective action shall be taken in sufficient time to prevent defective products being released into the market. Products (or batches) not conforming shall be quarantined and properly identified. Once the nonconformity has been corrected the product shall be re-tested. If it is not practicable to correct the fault the product shall be rejected unless the customer accepts it in a repaired or uncorrected form. The customer's acceptance shall be verified in writing.

For any product delivered before the test results are available, a procedure and record shall be maintained for notifying customers. A recall procedure shall be provided for any product which is found not to be in conformity with the harmonized part of the respective European Standard.

4.5 Traceability and marking

The manufacturer shall establish and maintain documented procedures for identifying the product or the constituent by suitable means during all stages of production. The manufacturer shall establish documented procedures for unique identification of individual product or batches. This identification shall be recorded. The manufacturer shall have procedures ensuring that processes related to

affixing traceability codes and/or markings are inspected regularly. Conformity to EN ISO 9001:2000, 7.5.3 shall be deemed to satisfy the requirements of this subclause.

4.6 Personnel

The responsibility, authority and the relationship between personnel that manages, performs or verifies work affecting product conformity, shall be defined. This applies in particular to personnel that need to initiate actions preventing product nonconformity from occurring, actions in the case of nonconformity and to identify and register product conformity problems. Personnel performing work affecting product conformity shall be competent based on appropriate education, training, skills and experience for which records shall be maintained.

This subclause shall also apply when certain tasks are subcontracted.

4.7 Equipment

All weighing, measuring and testing equipment necessary to achieve, or produce evidence of, conformity shall be calibrated or verified and regularly inspected according to documented procedures, frequencies and criteria. Control of monitoring and measuring devices shall conform to the appropriate clause of EN ISO 9001.

NOTE The manufacturer may arrange sub-contracting agreements with one or more organizations or persons having the necessary skills and equipment in order to perform the necessary tasks, provided the above subclause is followed.

All equipment used in the manufacturing process shall be regularly inspected and maintained to ensure use, wear or failure does not cause inconsistency in the manufacturing process.

Inspections and maintenance shall be carried out and recorded in accordance with the manufacturer’s written procedures and the records retained for the period defined in the manufacturer's FPC procedures.

4.8 Design process

The factory production control system shall document the various stages in the design of the products, identify the checking procedure and those individuals responsible for all stages of design.

During the design process itself, a record shall be kept of all checks, their results, and any corrective actions taken. This record shall be sufficiently detailed and accurate to demonstrate that all stages of the design phase, and all checks, have been carried out satisfactorily. Conformity to EN ISO 9001:2000, 7.3 shall be deemed to satisfy the requirements of this subclause.

4.9 Raw materials and components

The specifications of all incoming raw materials and components shall be documented, as well as the inspection scheme for ensuring their conformity. The verification of conformity of the raw material with the specification shall be in accordance with EN ISO 9001:2000, 7.4.3.

Raw materials and components shall have the same performance characteristics as those used for initial type testing. In the FPC system, the manufacturer shall define procedures for the verification of raw materials and components from suppliers with a less rigorous FPC system. If this is not the case, the inspection scheme should be raised to obtain that level. In the event that supplied kit components are used, the attestation of conformity level for components should at least coincide with that of the kit. If this is not the case, the inspection scheme should be raised to obtain that level.

4.10 Controls and tests during manufacturing

The manufacturer shall have defined, documented and implemented a production control system conforming to this European Standard in order to plan and carry out production under controlled conditions. Conformity to EN ISO 9001:2000, 7.5.1 and 7.5.2 shall be deemed to satisfy the requirements of this subclause.

4.11 Handling, storage and packaging

Whilst the product is on the manufacturer's premises, the manufacturer shall ensure that packaging prevents damage during handling and storage and that the product remains in accordance with the applicable technical specification.

5 Final quality testing

The FPC system shall provide for final quality control testing.

NOTE It is suggested that the annual production be used for the batch size in Table 2 to determine the sampling rate.

Annex A
(informative)

Examples of test forms for registering the results of a conformity review

Conformity review	Fixed traffic sign *(Name of test subject)*	

Relevant EN		
Product identification		
Drawing no.		
Supplier	[1)]	
Lot no.	[1)]	
Supplier's document no.	[1)]	
Date of supply	[1)]	

[1)] If raw material is tested

Form for test results: actual values and specified values

Note: Use a new record sheet for each fresh sample.

Storage sample	**Yes/no**
Stock identification code	

Corrective and preventive action necessary	**Yes/no**
2nd test necessary	**Yes/no**
Nature of defect	
Action needed	
Signature of responsible person	
Deadline for action	

Bibliography

List of references used in the text and of useful test methods.

1. Construction Products Directive of 22 December 1988 (89/106/EEC), published in the O.J. of the E.C. No. L40 of 11 February 1989, modified by the Directive of 22 July 1993 (93/68/EEC) published in the O.J. of the E.C. No. L220 of 30 August 1993.

2. Guide for the definition of Factory Production Control in technical specifications relating to Construction Products. Construct 95/135 Rev.1, European Commission DG-III, Brussels, 6.7.1995.

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