

Technical drawings

General principles of presentation

Part 21: Preparation of lines by CAD systems

(ISO 128-21:1997)

This standard has been prepared by the Technical Committee CTN 1 *General standards* the Secretariat of which is held by UNE.

UNE-EN ISO 128-21

Technical drawings
General principles of presentation
Part 21: Preparation of lines by CAD systems
(ISO 128-21:1997)

Dibujos técnicos. Principios generales de presentación. Parte 21: Preparación de líneas mediante sistemas de DAO (diseño asistido por ordenador). (ISO 128-21:1997).

Dessins techniques- Principes généraux de représentation. Partie 21: Préparation des traits par systèmes de CAO. (ISO 128-21:1997).

This standard is the official English version of EN ISO 128-21:2001, which adopts ISO 128-21:1997.

This standard was published as UNE-EN ISO 128-21:2002, which is the definitive Spanish version.

The remarks to this document must be sent to:

Asociación Española de Normalización

Génova, 6
28004 MADRID-España
Tel.: 915 294 900
info@une.org
www.une.org

© UNE 2020

Reproduction is prohibited without the express consent of UNE.
All intellectual property rights relating to this standard are owned by UNE.

English version

Technical drawings - General principles of presentation - Part
21: Preparation of lines by CAD systems (ISO 128-21:1997)

Dessins techniques - Principes généraux de représentation
- Partie 21: Préparation des traits par systèmes de CAO
(ISO 128-21:1997)

Technische Zeichnungen - Allgemeine Grundlagen der
Darstellung - Teil 21: Ausführung von Linien mit CAD-
Systemen (ISO 128-21:1997)

This European Standard was approved by CEN on 30 September 2001.

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 Management Centre or to any CEN member.

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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

CORRECTED 2002-01-02

Foreword

The text of the International Standard from Technical Committee ISO/TC 10 "Technical drawings, product definition and related documentation" of the International Organization for Standardization (ISO), the secretariat of which is held by CMC.

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 April 2002, and conflicting national standards shall be withdrawn at the latest by April 2002.

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.

Endorsement notice

The text of the International Standard ISO 128-21:1997 has been approved by CEN as a European Standard without any modification.

NOTE Normative references to International Standards are listed in annex ZA (normative).

Annex ZA
(normative)

**Normative references to international publications
with their relevant European publications**

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 (including amendments).

NOTE Where an International Publication has been modified by common modifications, indicated by (mod.), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN</u>	<u>Year</u>
ISO 128-20	1996	Technical drawings - General principles of presentation - Part 20: Basic conventions for lines	EN ISO 128-20	2001
ISO 5455	1979	Technical drawings - Scales	EN ISO 5455	1994

Introduction

Today the appearance of non-continuous lines on technical drawings prepared by computer-aided design (CAD) systems varies considerably between different systems. For that reason the standardized rules established by this International Standard, in addition to those in ISO 128-20, are intended as an aid for the consistent appearance of line elements calculated by computers and drawn by plotters.

This page intentionally left blank

Technical drawings — General principles of presentation —

Part 21:

Preparation of lines by CAD systems

1 Scope

This part of ISO 128 specifies procedures for the calculation of the most important basic types of non-continuous lines according to ISO 128-20 and their line elements.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 128. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 128 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 128-20:1996, *Technical drawings — General principles of presentation — Part 20: Basic conventions for lines.*

ISO 5455:1979, *Technical drawings — Scales.*

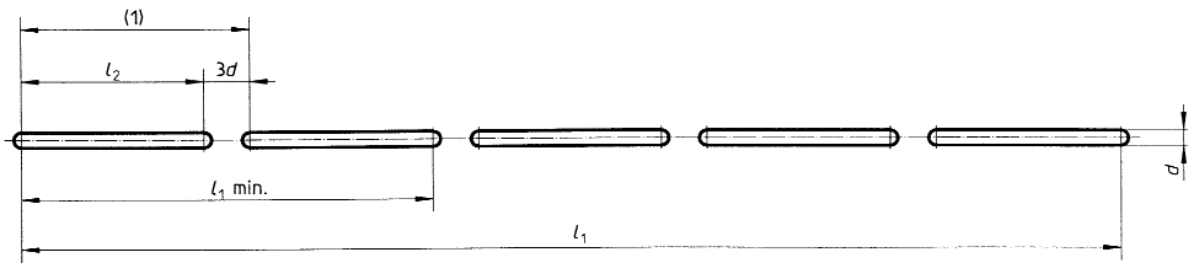
3 Definitions

For the purposes of this part of ISO 128 the definitions given in ISO 128-20 apply.

4 Calculation of line elements

4.1 Line type No. 02 (dashed line)

See figure 1 for the configuration of this type of line.



(1): Line segment

Figure 1

EXAMPLE

See figure 2.

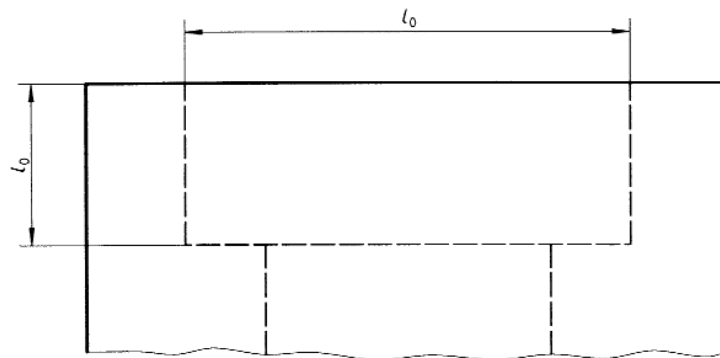


Figure 2

Formulae:

- a) Length of the line: $l_1 = l_0$
- b) Number of line segments within the line: $n = \frac{l_1 - 12d}{15d}$ (rounded)
- c) Length of the dashes: $l_2 = \frac{l_1 - 3dn}{n + 1}$
- d) Minimum length of this line: $l_{1min} = l_{0min} = 27d$
(2 dashes 12d, 1 gap 3d)

If dashed lines with a length less than $l_1 = 27d$, have to be drawn, a larger scale from ISO 5455 shall be used (i.e. the elements are drawn at a larger scale).

This line may be drawn with a constant length of dashes (12d). In this case one end of the line may be a shorter or longer dash.

EXAMPLE

$l_1 = 125$ $d = 0,35$

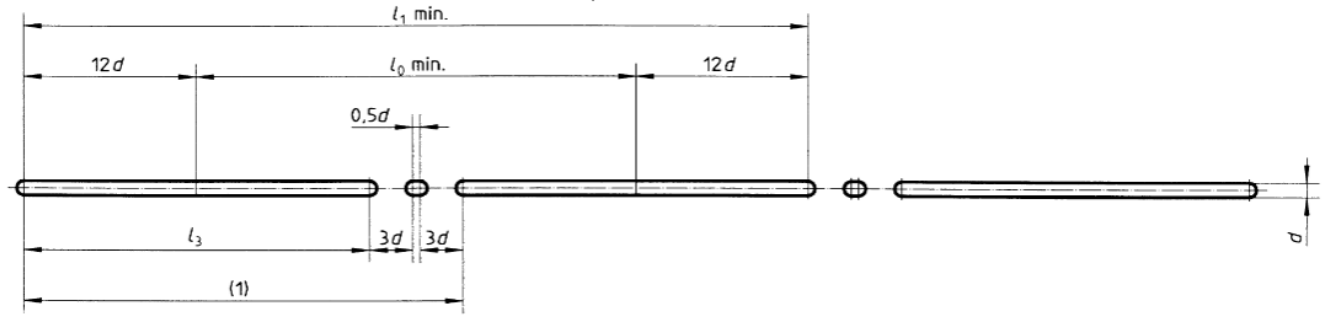
$$n = \frac{125 - 4,2}{5,25} \hat{=} 23,01 = \underline{23}$$

$$l_2 = \frac{125 - 24,15}{24} = \underline{4,202}$$

Interpretation of the result: A dashed line, of length 125 mm and line width 0,35 mm, consists of 23 line segments of length 5,252 mm (4,202 mm + 1,050 mm) and one dash of length 4,202 mm

4.2 Line type No. 04 (long dashed dotted line)

See figure 3 for the configuration of this type of line.



(1): Line segment

Figure 3

EXAMPLE

See figure 4.

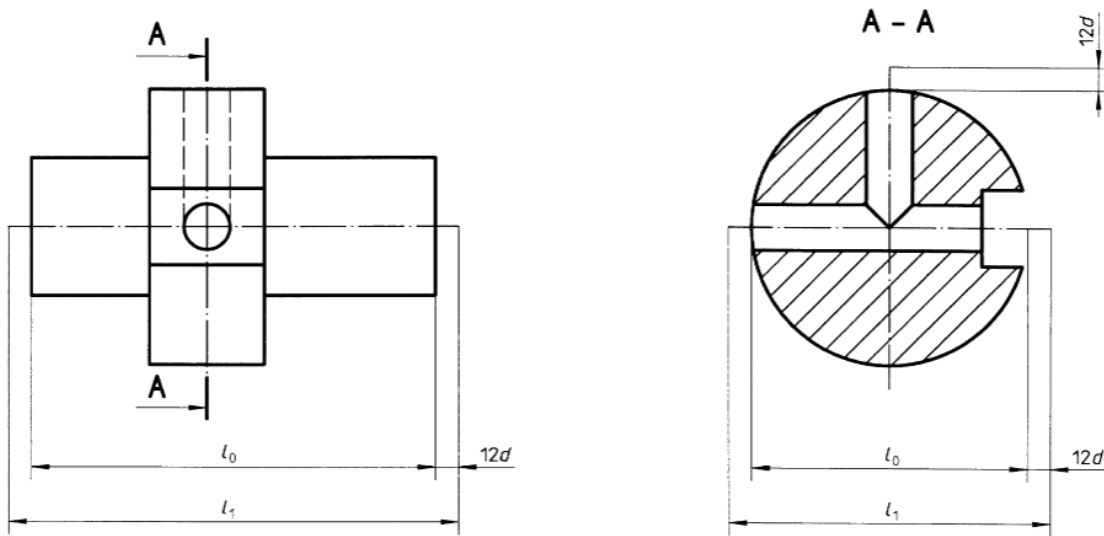


Figure 4

Formulae:

- a) Length of the line: $l_1 = l_0 + 24d$
(line extended over the outlines at both sides)
- b) Number of line segments within the line: $n = \frac{l_1 - 24d}{30,5d}$ (rounded)
- c) Length of the long dashes: $l_3 = \frac{l_1 - 6,5dn}{n + 1}$
- d) Minimum length of this line: $l_{1min} = 54,5d$

Lines shorter than $l_1 = 54,5d$ shall be drawn as continuous narrow lines. In order to comply with the requirements of ISO 128-20:1996, clause 5, the length of the long dashes of this line may be decreased or increased.

EXAMPLE

$l_0 = 125$ $d = 0,25$

$l_1 = 125 + 6 = 131$

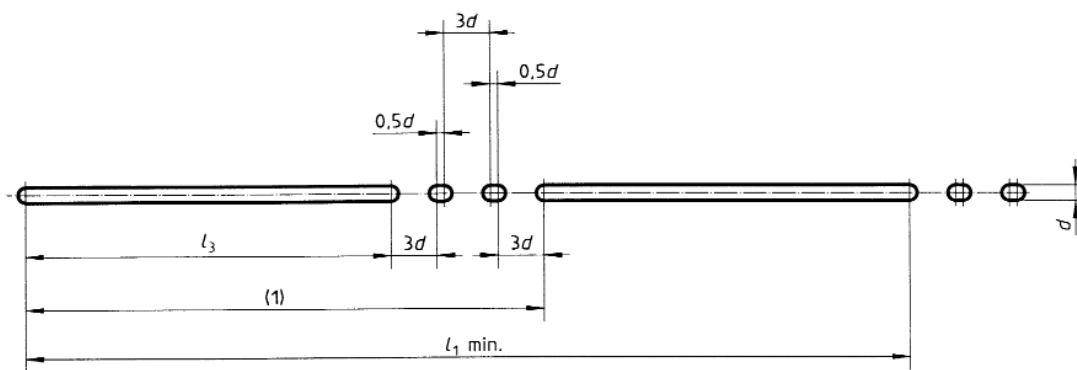
$n = \frac{131 - 6}{7,625} = 16,393 \hat{=} 16$

$l_3 = \frac{131 - 26,00}{17} = 6,176$

Interpretation of the result: A long dashed dotted line of length 131 mm and line width 0,25 mm, consists of 16 line segments of length 7,801 mm (6,176 mm + 0,750 mm + 0,125 mm + 0,750 mm) and 1 long dash of length 6,176 mm.

4.3 Line type No. 05 (long dashed double-dotted line)

See figure 5 for the configuration of this type of line.



(1): Line segment

Figure 5

EXAMPLE

See figure 6.

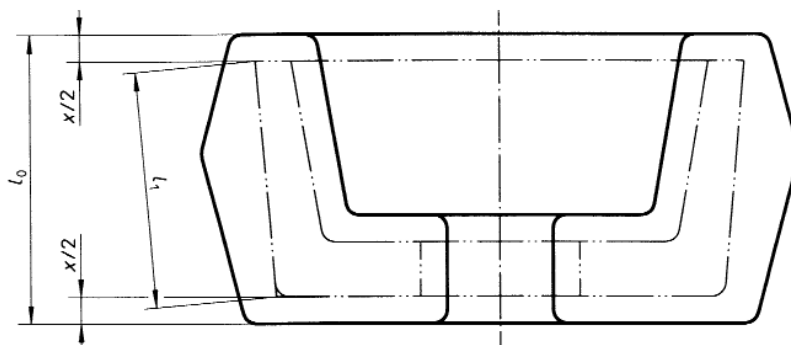


Figure 6

Formulae:

- a) Length of the line: $l_1 = l_0 - x$
- b) Number of line segments within the line: $n = \frac{l_1 - 24d}{34d}$ (rounded)
- c) Length of the long dashes: $l_3 = \frac{l_1 - 10dn}{n + 1}$
- d) Minimum length of this line: $l_{1\min} = 58d$

Lines shorter than $l_1 = 58d$ shall be drawn at a larger scale, in accordance with ISO 5455.

It is permissible to draw the long dashes with a change in direction, see figure 7.



Figure 7

In order to comply with the requirements of ISO 128-20:1996, clause 5, the length of the long dashes of this line may be increased or decreased.

EXAMPLE

$$l_0 = 128 \quad d = 0,35 \quad \frac{x}{2} = 1,5$$

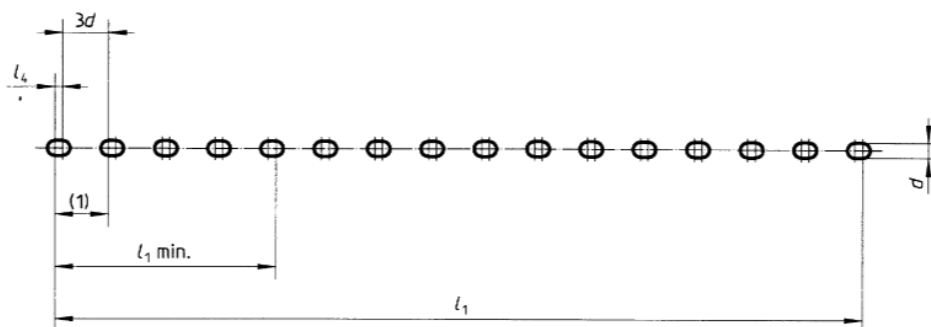
$$l_1 = 128 - 3 = 125$$

$$n = \frac{125 - 8,4}{11,9} = 9,798 \hat{=} 10$$

$$l_3 = \frac{125 - 35,00}{11} = 8,182$$

4.4 Line type No. 07 (dotted line)

See figure 8 for the configuration of this type of line.



(1): Line segment

Figure 8

EXAMPLE

See figure 9.

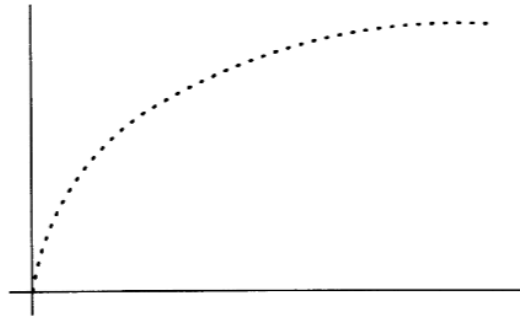


Figure 9

Formulae:

- a) Length of the line: $l_1 = l_0$
- b) Number of line segments within the line: $n = \frac{l_1 - 0,5d}{3,5d}$ (rounded)
- c) Length of the dots: $l_4 = \frac{l_1 - 3dn}{n + 1}$
- d) Minimum length of this line: $l_{1\min} = 7,5d$

EXAMPLE

$$l_1 = 125 \quad d = 0,5$$

$$n = \frac{125 - 0,25}{1,75} = 71,286 \hat{=} 71$$

$$l_4 = \frac{125 - 106,5}{72} = 0,257$$

4.5 Line type No. 08 (long dashed short dashed line)

The conditions for this line type are the same as those for type No. 04 but the formulae are slightly modified as follows.

- a) Length of the line: $l_1 = l_0$
- b) Number of line segments within the line: $n = \frac{l_1 - 24d}{32d}$ (rounded)
- c) Length of the long dashes: $l_3 = \frac{l_1 - 12dn}{n + 1}$
- Lengths of the short dashes: $6d$ (see table 3 of ISO 128-20:1996)
- d) Minimum length of this line: $l_{1\min} = 60d$

EXAMPLE

$$l_1 = 125 \quad d = 0,5$$

$$n = \frac{125 - 12}{16} = 7,063 \hat{=} 7$$

$$l_3 = \frac{125 - 42}{8} = 10,375$$

4.6 Line type No. 09 (long dashed double-short dashed line)

The conditions for this line type are similar to those for type No. 05 and the formulae b), c) and d) are slightly modified as follows:

- a) Length of the line: $l_1 = l_0$
- b) Number of line segments within the line: $n = \frac{l_1 - 24d}{45d}$ (rounded)
- c) Length of the long dashes: $l_3 = \frac{l_1 - 21dn}{n + 1}$
- Length of the short dashes: $6d$ (see table 3 of ISO 128-20:1996)
- d) Minimum length of this line: $l_{1\min} = 69d$

EXAMPLE

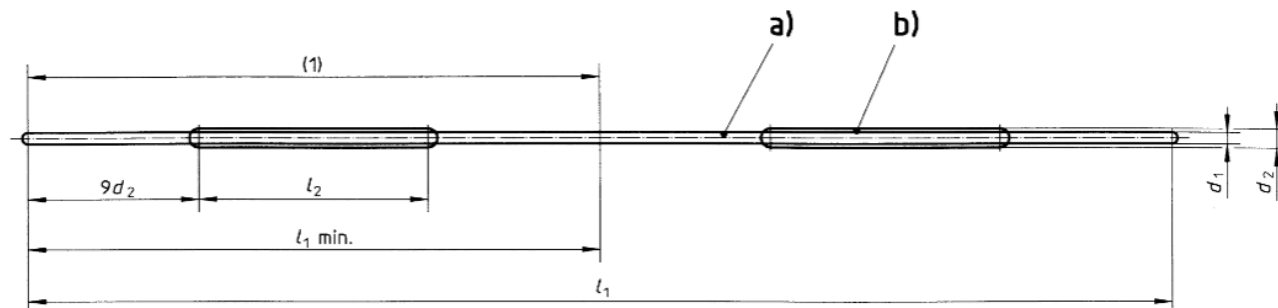
$$l_1 = 125 \quad d = 0,25$$

$$n = \frac{125 - 6}{11,25} = 10,578 \hat{=} 11$$

$$l_3 = \frac{125 - 57,75}{12} = 5,604$$

4.7 Examples of combinations of basic types of line**4.7.1 Two types of lines superimposed**

See figure 10 for the configuration of this type of line.



- (1): Line segment
 a): Continuous line No. 01: line width, e.g. 0,25 mm
 b): Dashed spaced line No. 03: line width, e.g. 0,5 mm

Figure 10

EXAMPLE

See figure 11.

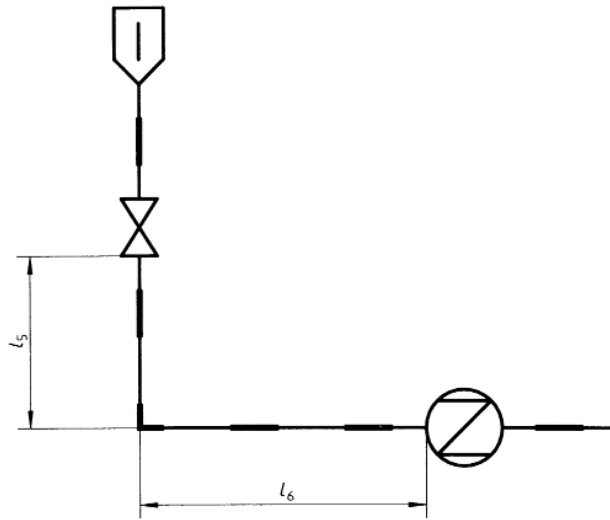


Figure 11

Formulae:

- a) Length of the line: $l_1 = l_5 + l_6$
- b) Number of line segments within the line: $n = \frac{l_1}{30d_2}$ (rounded)
- c) Length of the dashes: $l_2 = \frac{l_1 - 18d_2n}{n}$
- d) Minimum length of this line: $l_{1min} = 30d_2$

EXAMPLE

$l_1 = 125$ $d_1 = 0,25$ $d_2 = 0,5$

$n = \frac{125}{15} = 8,333 \hat{=} 8$

$l_2 = \frac{125 - 72}{8} = 6,625$

Interpretation of the result: This line consists of a continuous line 125 mm long and 0,25 mm wide as well as a dashed spaced line of width 0,5 mm and 8 dashes of length 6,625 mm, spaced 9 mm apart ($18d_2$, see table 3 of ISO 128-20:1996). The ends are 4,5 mm in length ($9d_2$).

4.7.2 Line with zigzags

See figure 12 for the configuration of this type of line.

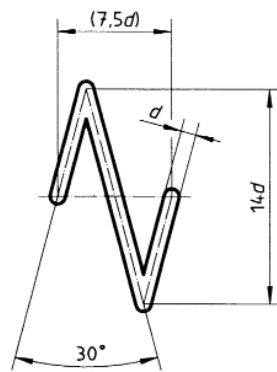


Figure 12

EXAMPLES

See figures 13 and 14.

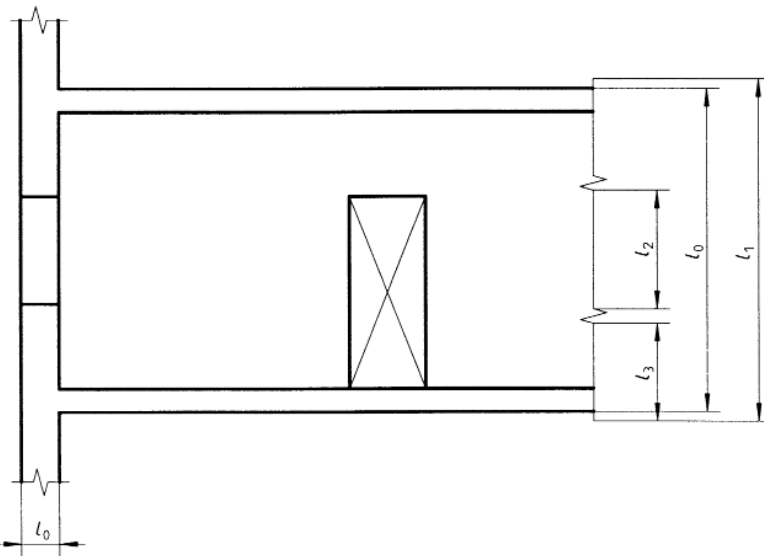


Figure 13

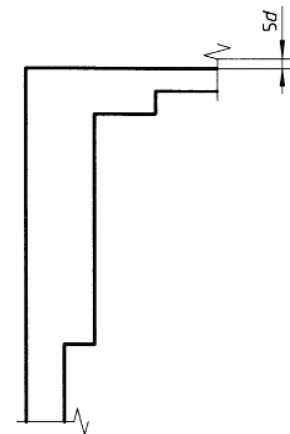


Figure 14

Formulae:

- a) Length of the line: $l_1 = l_0 + 10d$
- b) Number of zigzags within the line: $n = \frac{l_1}{80} + 1$ (rounded, $l_1 < 40$ makes $n = 1$)
- c) Length of the dashes between zigzags: $l_2 = \frac{l_1}{n} - 7,5d$
- d) Length of the dashes at the ends of the line:
- if two or more zigzags: $l_3 = \frac{l_2}{2}$
 - if one zigzag: $l_3 = \frac{l_1 - 7,5d}{2}$

If $l_0 \leq 10d$, the zigzag shall be arranged as shown in figure 14.

EXAMPLE

$$l_0 = 125 \qquad d = 0,25$$

$$l_1 = 125 + 2,5 = \underline{127,5}$$

$$n = \frac{127,5}{80} + 1 = 2,594 \hat{=} 3$$

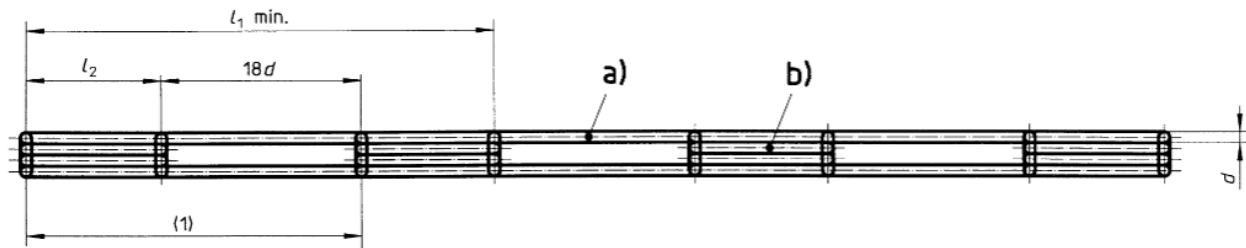
$$l_2 = \frac{127,5}{3} - (7,5 \times 0,25) = \underline{40,625}$$

$$l_3 = \frac{40,625}{2} = \underline{20,313}$$

Interpretation of the result: A line with zigzags of a length of 127,5 mm and a line width of 0,25 mm is drawn with 3 zigzags. The distance between the zigzags is 40,625 mm and the length of the dashes at the ends is 20,313 mm.

4.7.3 "Railway" line

See figure 15 for the configuration of this type of line.



- (1): Line segment
- a): Continuous line No. 01
- b): Dashed spaced line No. 03

Figure 15

EXAMPLE

See figure 16.

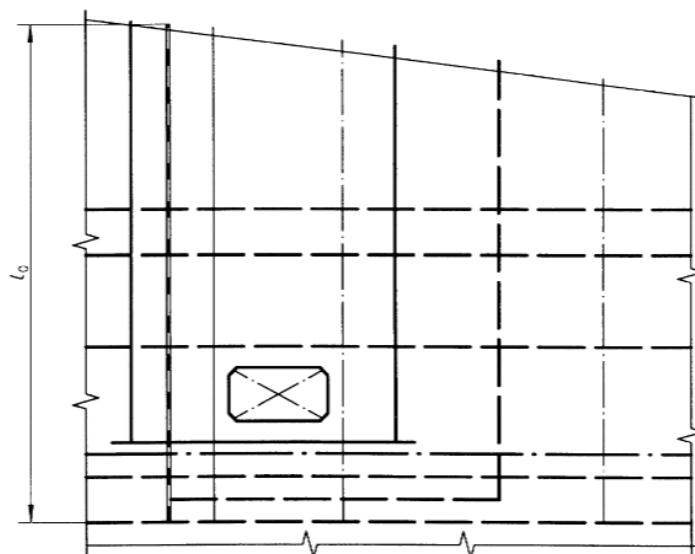


Figure 16

Formulae:

- a) Length of the line: $l_1 = l_0$
- b) Number of line segments within the line: $n = \frac{l_1 - 12d}{30d}$ (rounded)
- c) Length of the dashes: $l_2 = \frac{l_1 - 18dn}{n + 1}$
- d) Minimum length of this line: $l_{1\min} = 42d$

EXAMPLE

$$l_1 = 125 \quad d = 0,35$$

$$n = \frac{125 - 4,2}{10,5} = 11,505 \hat{=} 12$$

$$l_2 = \frac{125 - 75,60}{12 + 1} = 3,800$$

Interpretation of the results: A "railway" line of length 125 mm and line width 1,4 mm ($4 \times 0,35$ mm) consists of 12 complete line segments of length 10,100 mm (3,800 mm + 6,300 mm) and one dash of length 3,800 mm.

Annex A
(informative)

Bibliography

- [1] ISO 6428:1982, *Technical drawings — Requirements for microcopying*.

This page intentionally left blank

This page intentionally left blank

This page intentionally left blank

For information regarding the development of standards contact:

Asociación Española de Normalización
Génova, 6
28004 MADRID-España
Tel.: 915 294 900
info@une.org
www.une.org

For information regarding the sale and distribution:

AENOR INTERNACIONAL S.A.U.
Tel.: 914 326 160
normas@aenor.com
www.aenor.com



Spanish standardization body in:

