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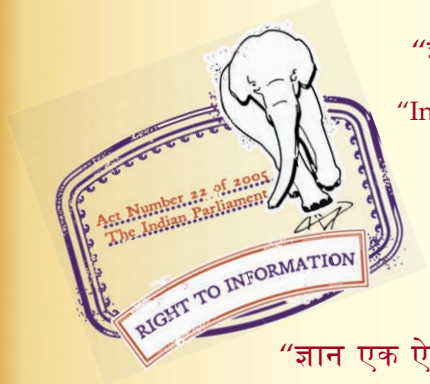

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IS 10714 (Part 21) : 2001
ISO 128-21 : 1997

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भाग 21 सी ए डी पद्धति द्वारा लाइनें तैयार करना

Indian Standard

TECHNICAL DRAWINGS — GENERAL PRINCIPLES OF PRESENTATION

PART 21 PREPARATION OF LINES BY CAD SYSTEMS

ICS 01.100.27; 35.240.10

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December 2001

Price Group 6

NATIONAL FOREWORD

This Indian Standard (Part 21) which is identical with ISO 128-21 : 1997 'Technical drawings — General principles of presentation — Part 21: Preparation of lines by CAD systems' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of Drawings Sectional Committee and approval of the Basic and Production Engineering Division Council.

ISO 128 was published in 1982 and was accordingly adopted as IS 10714 : 1983. Now ISO has published ISO 128-21 : 1997. In view of the above, the committee decided to adopt ISO 128-21 : 1997. This standard (Part 21) specifies procedures for the calculation of the most important basic types of non-continuous lines according to ISO 128-20 and their line elements. Other part of this series is given as follows:

IS 10714 (Part 20) : 2001 Technical drawings — General principles of presentation — Part 20 : Basic conventions

The text of ISO Standard has been approved as suitable for publication as Indian Standard without deviations. In this adopted standard, certain terminology and conventions are not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a full point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the editions indicated :

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 128-20 : 1996	IS 10714 (Part 20) : 2001 Technical drawings — General principles of presentation: Part 20 Basic conventions for lines	Identical
ISO 5455 : 1979	IS 10713 : 1983 Scales for use in technical drawings	do

This adopted standard also gives Bibliography in Annex A which is informative. The corresponding Indian Standard against the ISO Standard is given below along with its degree of equivalence for the edition indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 6428 : 1982	IS 10164 : 1985 Requirement to execute technical drawings for microcopying	Identical

Indian Standard

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.*

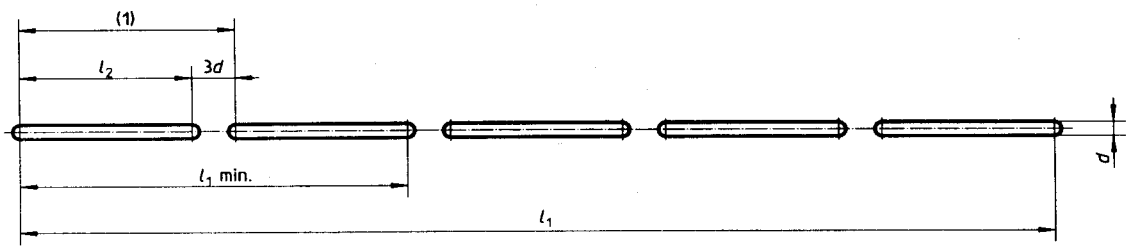
3 Definitions

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.

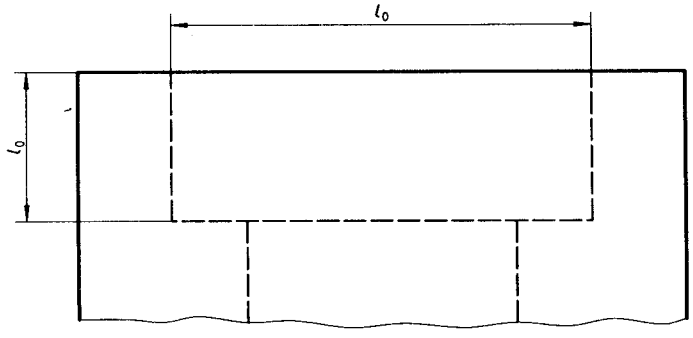


Figure 2

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: $l_{1\min} = l_{0\min} = 27d$
(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

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

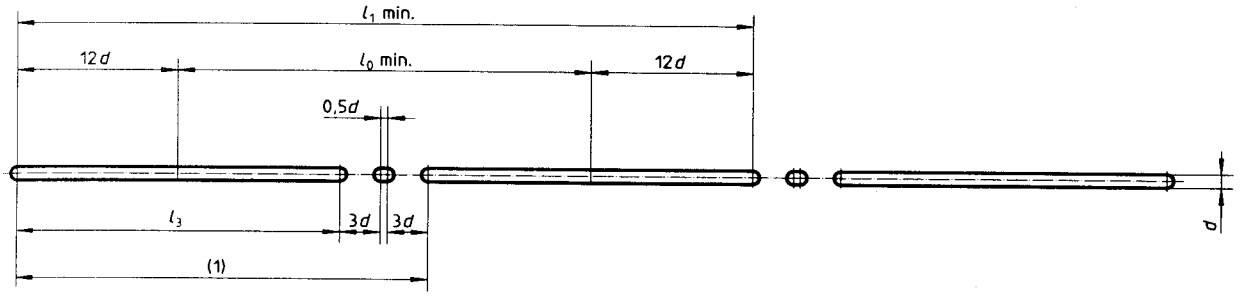
$$n = \frac{125 - 4{,}2}{5{,}25} \widehat{=} \underline{23{,}01} = \underline{23}$$

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

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.

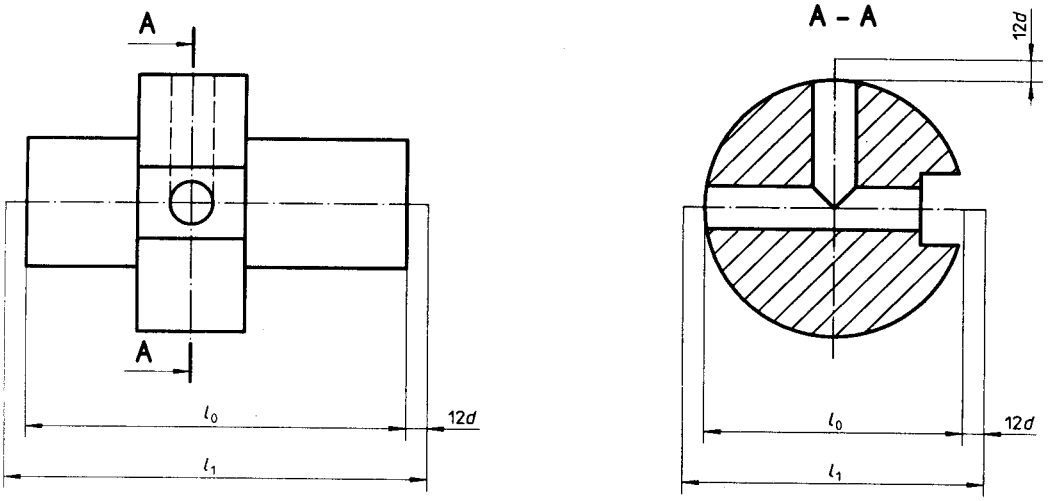


Figure 4

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: $l_{1\min} = 54{,}5d$

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

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

$l_1 = 125 + 6 = \underline{131}$

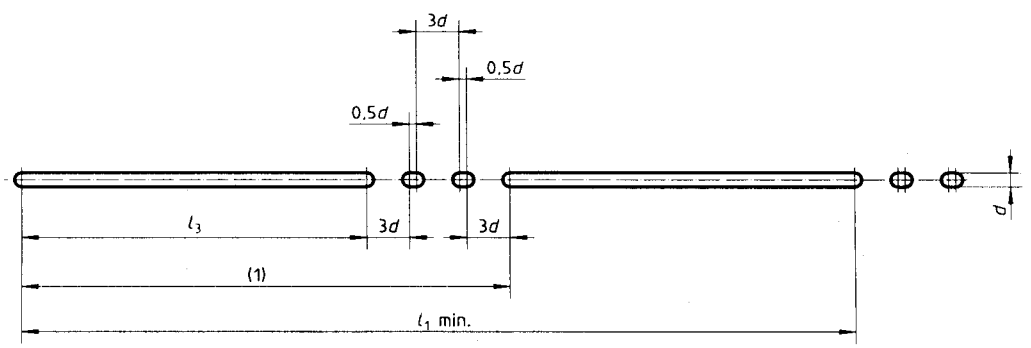
$$n = \frac{131 - 6}{7{,}625} = \underline{16{,}393} \mathrel{\hat{=}} \underline{16}$$

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

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.

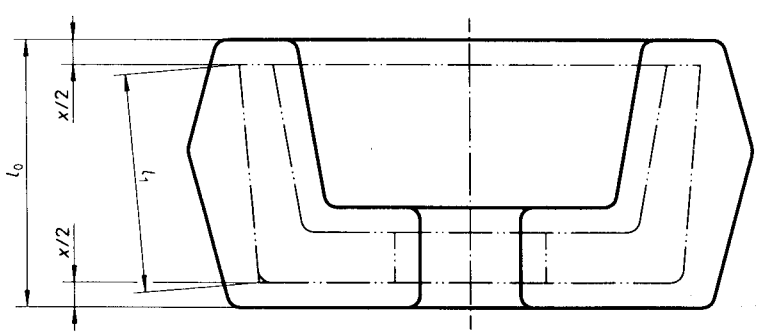


Figure 6

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

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

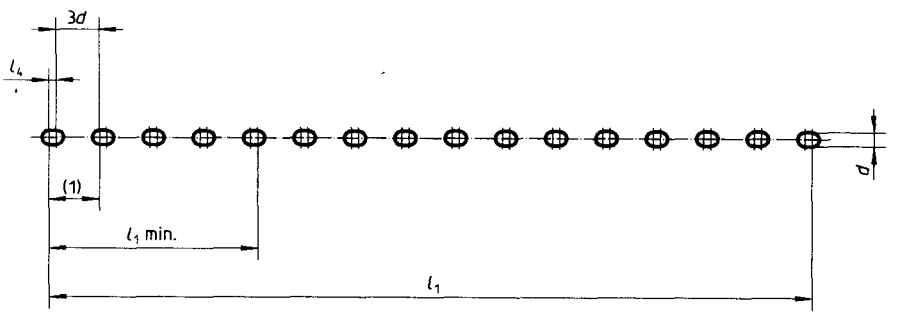
$l_1 = 128 - 3 = \underline{125}$

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

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

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.

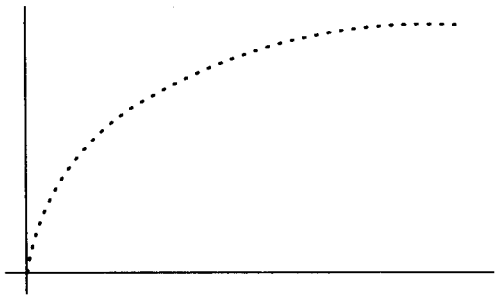


Figure 9

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

$l_1 = 125$ $d = 0{,}5$

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

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

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

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

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

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

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

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

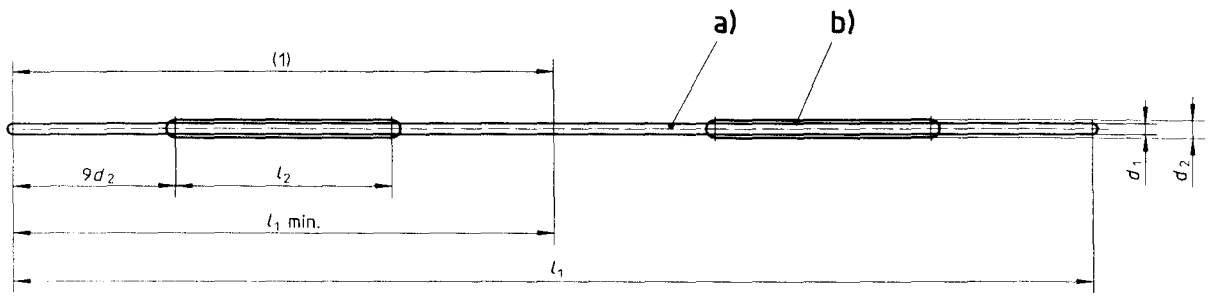
$$n = \frac{125 - 6}{11,25} = \underline{10,578} \,\hat{=}\, \underline{11}$$

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

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.

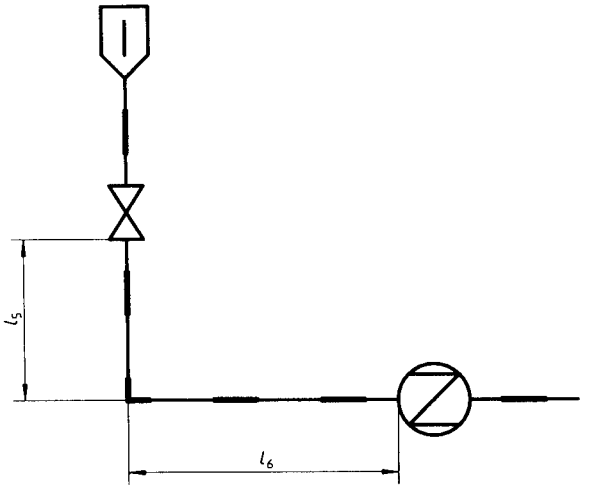


Figure 11

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: $l_2 = \frac{l_1 - 18d_2 n}{n}$

d) Minimum length of this line: $l_{1\min} = 30d_2$

EXAMPLE

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

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

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

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.

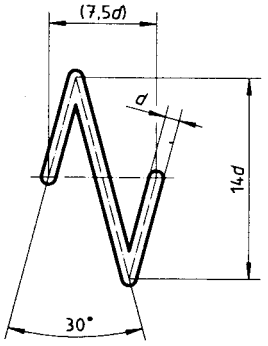


Figure 12

EXAMPLES

See figures 13 and 14.

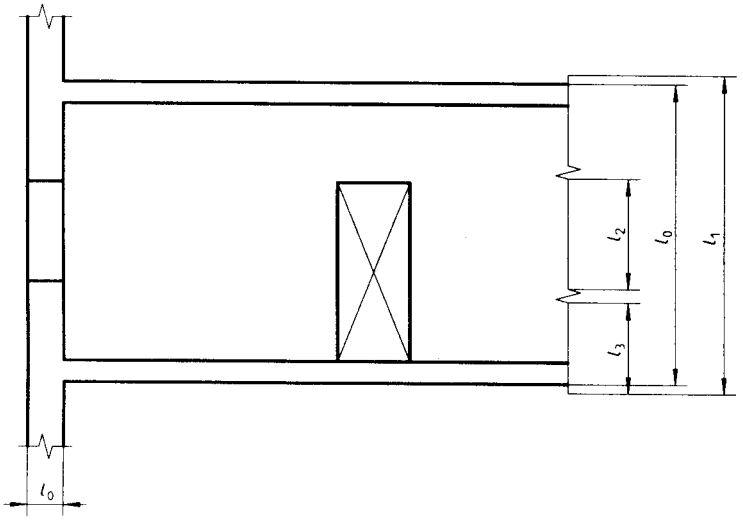


Figure 13

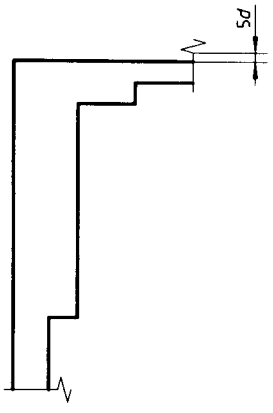


Figure 14

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

EXAMPLE

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

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

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

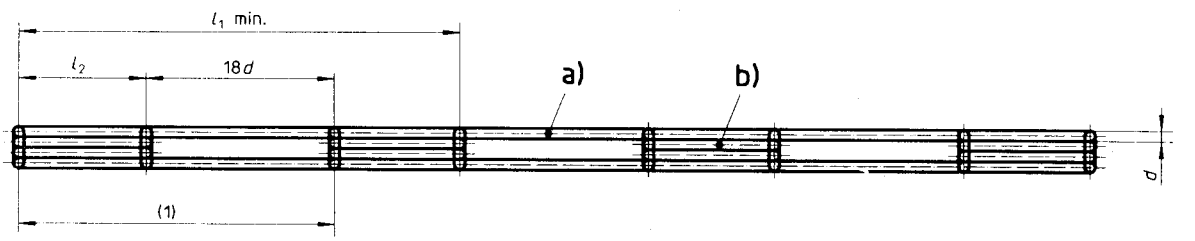
$$l_2 = \frac{127,5}{3} - (7,5 \times 0,25) = \underline{40,625}$$

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

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.

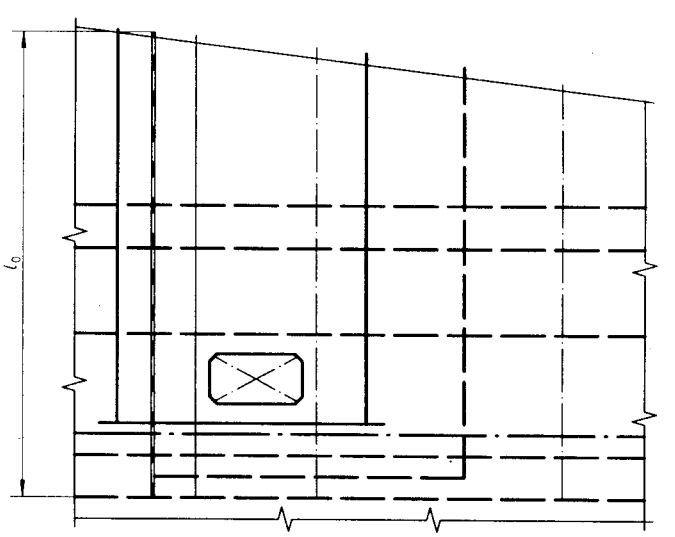


Figure 16

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

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

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

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

Interpretation of the results: A "railway" line of length 125 mm and line width 1,4 mm (4 x 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.*

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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