BS EN 60286-2:2015

BSI Standards Publication

Packaging of components for automatic handling

Part 2: Packaging of components with unidirectional leads on continuous tapes

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National foreword

This British Standard is the UK implementation of EN 60286-2:2015. It is identical to IEC 60286-2:2015. It supersedes BS EN 60286-2:2009 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/40X, Capacitors and resistors for electronic equipment.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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EUROPEAN STANDARD

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Emballage de composants pour opérations automatisées - Partie 2: Emballage des composants à sorties unilatérales en bandes continues (IEC 60286-2:2015)

Gurtung und Magazinierung von Bauelementen für automatische Verarbeitung - Teil 2: Gurtung von Bauelementen mit einseitig herausgeführten Anschlussdrähten (IEC 60286-2:2015)

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Ref. No. EN 60286-2:2015 E

Foreword

The text of document 40/2343/FDIS, future edition 4 of IEC 60286-2, prepared by IEC/TC 40 "Capacitors and resistors for electronic equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60286-2:2015.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2016-02-27
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2018-05-27

This document supersedes EN 60286-2:2009.

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Endorsement notice

The text of the International Standard IEC 60286-2:2015 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

ISO 11469:2000	NOTE	Harmonized as EN ISO 11469:2000.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60097	1991	Grid systems for printed circuits	EN 60097	1993
IEC 60301	-	Preferred diameters of wire terminations of capacitors and resistors	EN 60301	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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PACKAGING OF COMPONENTS FOR AUTOMATIC HANDLING –

Part 2: Tape packaging of components with unidirectional leads on continuous tapes

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60286-2 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

This fourth edition cancels and replaces the third edition, published in 2008, and constitutes a technical revision.

This edition includes the following significant changes with respect to the previous edition:

– A complete revision of the structure and reworked layout.
– A two page overview containing a clear overview of all symbols and references.
– Addition of annexes of known radial tape formats.
– Improved figures.

The text of this standard is based on the following documents:

FDIS	Report on voting
40/2343/FDIS	40/2374/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60286 series, published under the general title *Packaging of components for automatic handling*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

PACKAGING OF COMPONENTS FOR AUTOMATIC HANDLING –

Part 2: Tape packaging of components with unidirectional leads on continuous tapes

1 Scope

This part of IEC 60286 applies to the tape packaging of components with two or more unidirectional leads for use in electronic equipment. In general, the tape is applied to the component leads.

It covers requirements for taping techniques used with equipment for automatic handling, pre-forming of leads, insertion and other operations and includes only those dimensions which are essential to the taping of components intended for the above-mentioned purposes.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60097:1991, *Grid systems for printed circuits*

IEC 60301, *Preferred diameters of wire terminations of capacitors and resistors*

3 Terms, definitions and symbols

For the purpose of this document, the following terms, definitions and symbols apply.

3.1 Terms and definitions

3.1.1
package
product made of any material of any nature to be used in containment, protection, structured alignment for automatic assembly, handling and delivery

3.1.2
short terminal without tape
terminal which is not held between carrier tape and cover tape

Note 1 to entry: See Figure 1.

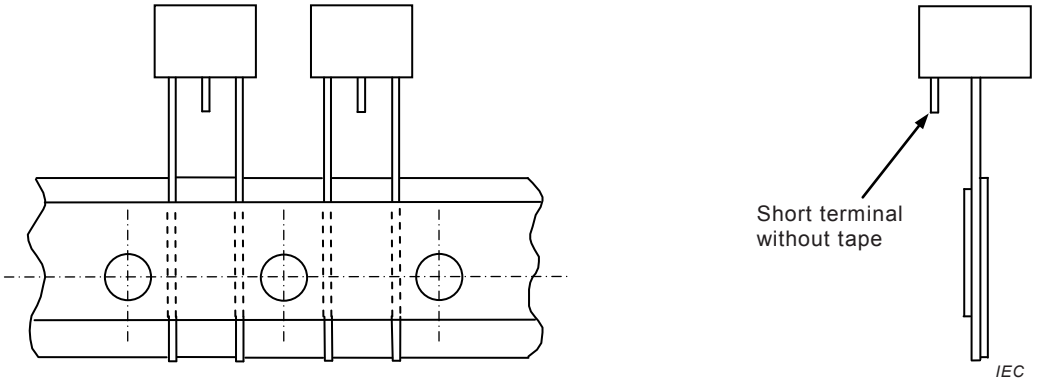

Figure 1 – Short terminal without tape

3.1.3
crimp
cinch
purposely formed angular deformation, starting at the reference plane, in such a way that the component bottom side does not touch the top surface of the printed circuit board after insertion and therefore acts as a ‘stand-off’

Note 1 to entry: The formed crimp is available in different forms, see Figure 2.

Note 2 to entry: A crimp acts as a ‘stand-off’ tool.

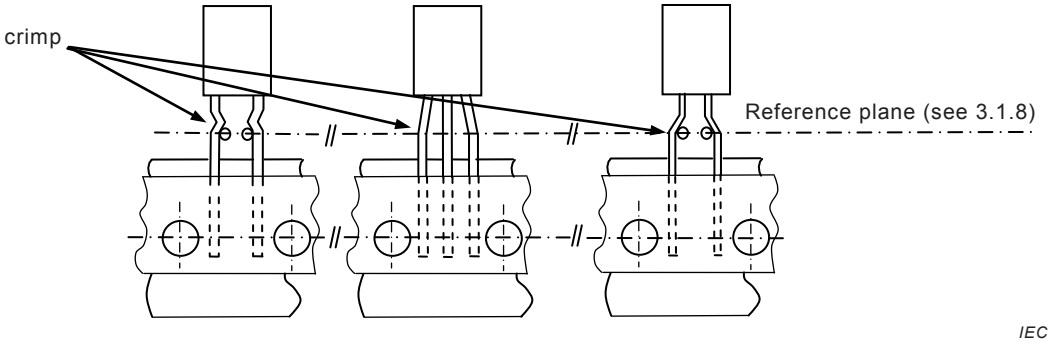

Figure 2 – Crimp

3.1.4
ordinate
straight line, perpendicular to the abscissa through the centre of the closest sprocket hole that follows the component to be checked

See Figure 3.

3.1.5
abscissa
straight line, through the centres of the sprocket holes in the direction of unreeling

See Figure 3.

3.1.6
seating plane
<components with straight leads> bottom of the component body, including any projections which support the component on the printed board

See Figure 3.

Note 1 to entry: The line goes parallel to the reference abscissa through the bottom point nearest to the tape.

Note 2 to entry: A method for determining the seating plane is given in IEC 60717.

Note 3 to entry: For definition of the reference plane, see 3.1.8, for definition of crimped leads, see 3.1.3.

3.1.7
seating plane
<components with crimped (or performed) leads> plane that changes depending on the profile of the crimp, the diameter of the leads and the hole size in the printed board

See Figure 3.

Note 1 to entry: In these components, instead of a seating plane, a reference plane is defined, for components with crimped leads only.

Note 2 to entry: A method for determining the seating plane is given in IEC 60717.

Note 3 to entry: For definition of the reference plane, see 3.1.8, for definition of crimped leads, see 3.1.3.

3.1.8
reference plane
line parallel to the abscissa through the lowest centre of the radius of curvature of the bending of the crimp

Note 1 to entry: See Figure 3.

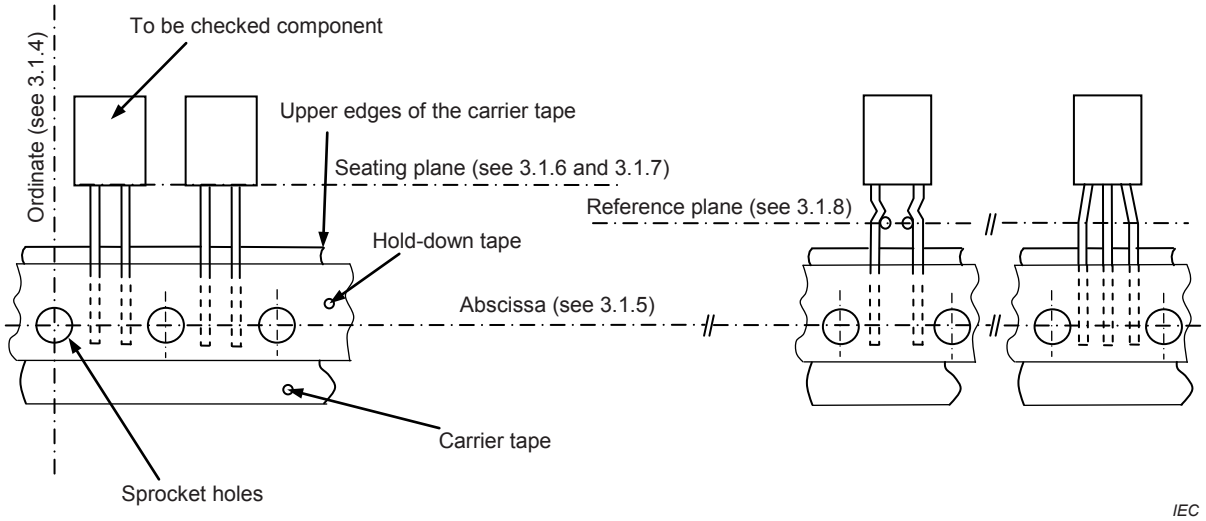

Figure 3 – Abscissa, ordinate, seating plane and reference plane

3.2 Symbols

The symbols used for tape and taped components are listed in Table 1 and Table 2. The use of these symbols is exemplified in Figure 4, Figure 5 and Figure 6.

Table 1 – List of symbols for tape and taped components

Symbols	Definition of symbols	Figure 4, sketch	Subclause
d	Lead terminal diameter	E	4.4.2
d_1	Diameter of short terminal without tape	F	4.4.2
D_0	Sprocket hole diameter	E	4.2.6
F	Lead spacing	D	4.4.1
F_1	Lead spacing between left lead and centre lead of the components with three leads	D	4.4.1
F_2	Lead spacing between right lead and centre lead of the components with three leads	D	4.4.1
H	Distance between the abscissa and the bottom plane of the component body	A, B, C, D	4.3.1
H_0	Distance between the abscissa and the reference plane of components with crimped leads (for crimped leads only)	D	4.3.2
H_1	Distance between the abscissa and the top of the body of the components	A, B, C, D	4.3.3
H_2	Distance between the abscissa and tip of short terminal without tape	E	4.3.4
H_3	Distance between the bottom of components and tip of short terminal without tape	E	4.3.5
Δh	Maximum lateral deviation of the component body vertical to the tape plane	H	4.5.1
K	Distance between the lead terminal and the short terminal without tape	F	4.4.5
L	Protrusion beyond the lower side of the carrier tape	E	4.4.4
P	Pitch of the mutual components	A, B, C	4.2.2
P_0	Pitch of the sprocket holes	A, B, C, D	4.2.3
P_1	Distance between ordinate and first lead terminal of the drawer side	A, B, C, D	4.2.4
P_2	Distance between the ordinate and the centre lead of the component on the drawer side	D	4.2.5
Δp	Maximum deviation of the component body in the tape plane	G	4.5.1
ΔP_1	Maximum deviation of the component lead in the seating plane	C	4.5.1
T	Thickness of the carrier tape and the hold-down tape	I	4.4.3
T_1	Total thickness of the carrier tape, the hold-down tape and diameter of the lead	I	4.4.3
W	Carrier tape width	D	4.1.1
W_0	Hold-down tape width	D	4.1.2
W_1	Distance between the upper edges of the carrier tape and the abscissa (centre of the sprocket hole)	D	4.1.3
W_2	Distance between the upper edges of the carrier tape and the hold-down tape	D	4.1.4

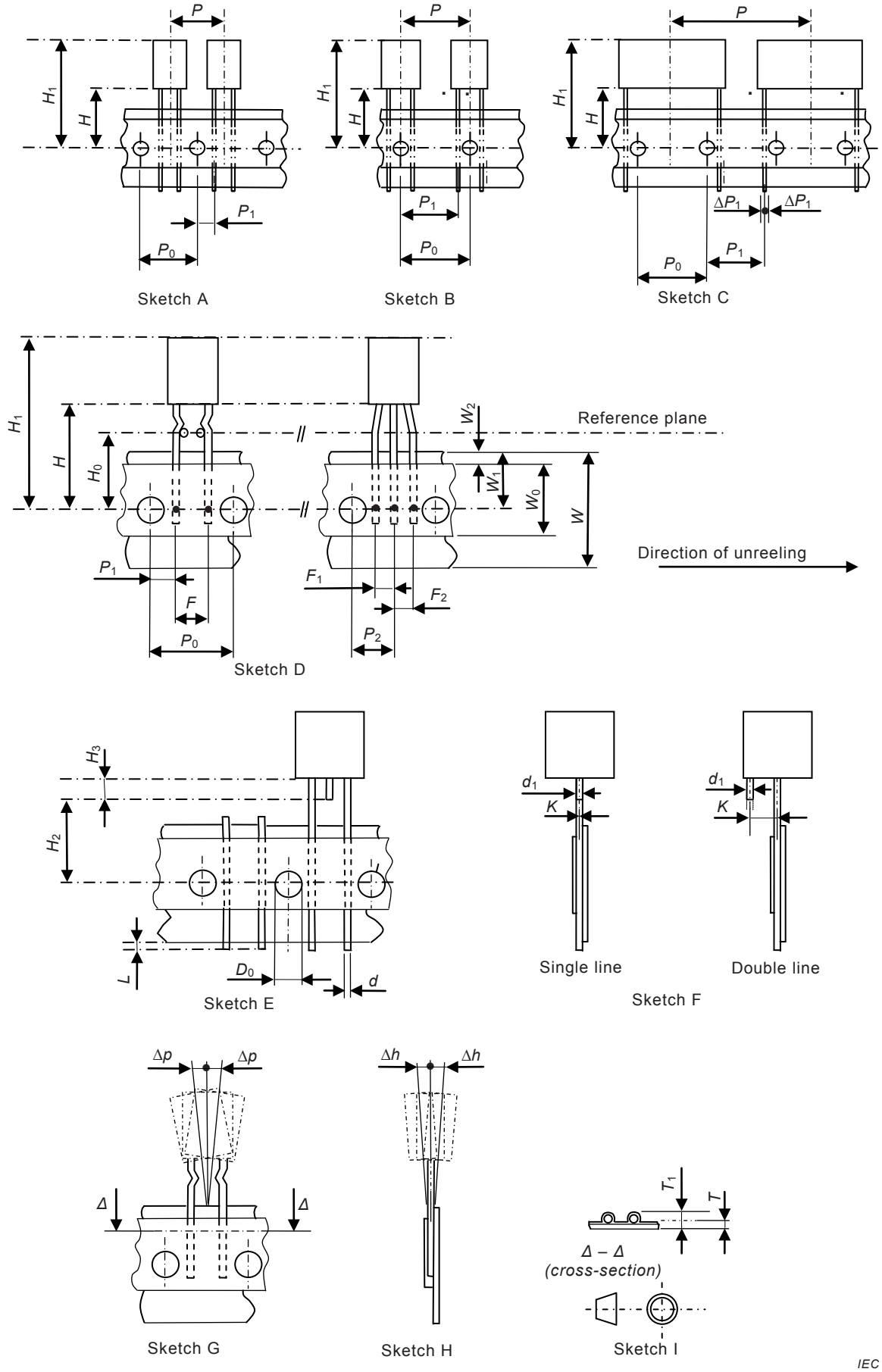

Figure 4 – Symbol references of tape and taped components dimensions

Table 2 – List of symbols used for packing taped components

Symbols	Definition of symbols	Figure reference	Subclause
A	Reel diameter	Figure 5	7.2
C	Arbour hole diameter	Figure 5	7.2
N	Hub diameter	Figure 5	7.2
W_3	Width between flanges, measured at hub	Figure 5	7.2
W_4	Total reel width, measured at hub	Figure 5	7.2
X	Width of fan-fold container	Figure 6	7.3
Y	Length of fan-fold container	Figure 6	7.3
Z	Height of fan-fold container	Figure 6	7.3

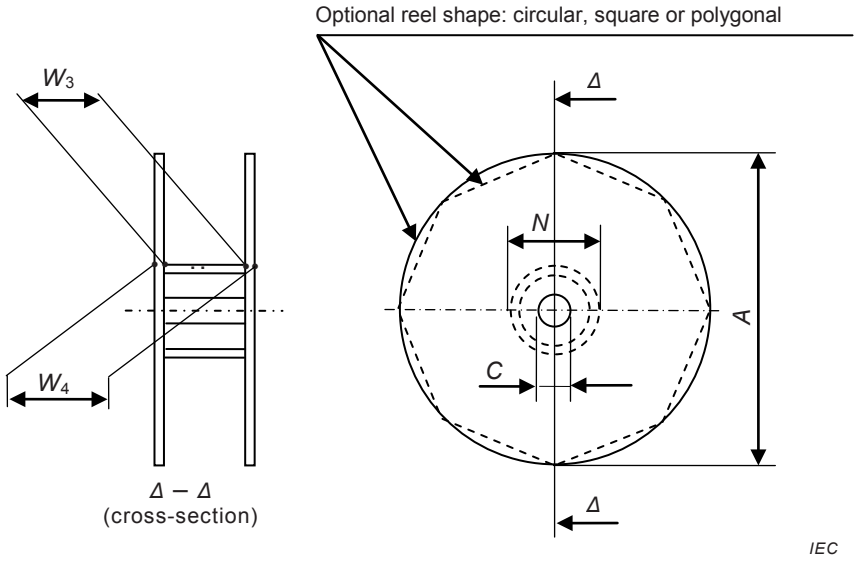

Figure 5 – Symbol references of reel dimensions

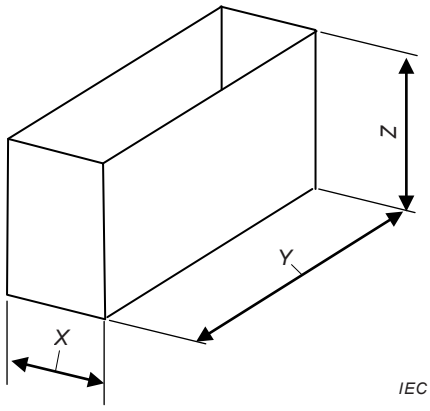

Figure 6 – Symbol references of fan-fold container dimensions

4 Dimensions

For references, see Figure 4 and Table 1.

4.1 Tape width dimensions (*W*, W_0, W_1, W_2)

The following clauses describe the dimensions related to tape width.

4.1.1 Tape width (*W*)

See Figure 4, sketch D

– Carrier tape width *W* $W = 18 \,^{+1,0}_{-0,5}$ mm

4.1.2 Hold-down tape width (W_0)

See Figure 4, sketch D

This dimension is governed by the retention of the components in the tape. The hold-down tape shall not protrude beyond the carrier tape.

– Hold-down tape width W_0 (see Annex A and Annex B)

4.1.3 Distance between the upper edges of the carrier tape and the abscissa (W_1)

See Figure 4, sketch D

– Position of sprocket hole W_1 $W_1 = 9,0 \,^{+0,75}_{-0,5}$ mm

4.1.4 Distance between the upper edges of the carrier tape and the hold-down tape (W_2)

See Figure 4, sketch D

– Distance W_2 W_2 = 3,0 mm max.

4.2 Components and sprocket hole pitches (*P*, P_0, P_1, P_2, D_0)

4.2.1 General

The following subclauses describe the dimensions common to the taped component in relation to its location in the tape and the mutual distance between components.

The grid is defined as lead spacing *e* = 2,5 mm shall be used (see IEC 60097).

NOTE 1 Components with a lead spacing of $F = 3 \times e$ may be delivered with the sprocket holes arranged between the leads of the component (see Figure 4, sketch B).

NOTE 2 Components with a lead spacing of $F = 8 \times e$ to $11 \times e$ may be delivered with one or two sprocket holes arranged between the leads of the component (see Figure 4, sketch B and C).

4.2.2 Pitch between two consecutive mutual components (*P*)

See Figure 4, sketch A, B, and C

– Pitch *P* (see Annex A and Annex B)

4.2.3 Pitch between two consecutive sprocket holes (P_0)

See Figure 4, sketch A, B, C and D

– Pitch P_0 (see Annex A and Annex B)

4.2.4 Distance between the ordinate and the first lead of the component on the drawer side (for components with two leads) (P_1)

See Figure 4, sketch A, B, C and D

– Pitch P_1 (see Annex A)

4.2.5 Distance between the ordinate and the center lead of the component on the drawer side (for components with three leads) (P_2)

See Figure 4, sketch D

– Pitch P_2 (see Annex B)

4.2.6 Sprocket hole diameter (D_0)

See Figure 4, sketch E. The maximum tolerance over any 20 sprocket hole pitches is ±1 mm.

– Sprocket hole diameter D_0 D_0 = (4,0 ± 0,2) mm

4.3 Dimensions for component position relative to the abscissa (H, H_0, H_1, H_2, H_3)

The following subclauses describe the dimensions of the position of the components related to the abscissa.

4.3.1 Distance between the abscissa and the bottom plane of the component body (H)

See Figure 4, sketch A, B, C and D

– Distance H $H = 18{,}0\ ^{+2{,}0}_{0}$ mm

4.3.2 Distance between the abscissa and the reference plane of components with crimped leads (H_0)

See Figure 4, sketch D

– Distance H_0 (for crimped leads only) H_0 = (16,0 ± 0,5) mm

4.3.3 Distance between the abscissa and the top of the body of the components (H_1)

See Figure 4, sketch A, B, C and D

– Distance H_1 (see Annex A and Annex B)

4.3.4 Distance between the abscissa and the tip of the short terminal without tape (H_2)

See Figure 4, sketch E

– Distance H_2 $H_2 = 17{,}0\ ^{+2{,}0}_{0}$ mm

4.3.5 Distance between the bottom of the component and the tip of the short terminal without tape (H_3)

See Figure 4, sketch E

– Distance H_3 H_3 = [terminal length] mm ± 0,5 mm

Total dimension of H_3 is the length of the terminal that protrudes through the printed circuit board including the length of the terminal that sticks out from the bottom of the printed circuit board after inserting components to it. Sufficient lead terminal should stick out underneath the PCB surface for the purpose of clinching. Tolerance shall only be specified for soldering purposes.

4.4 Lead terminal dimensions (*d, d_1, F, F_1, F_2, L, K*) and tape thickness (*T, T_1*)

The following subclauses describe the dimensions and tolerances that belong to the lead terminals of the packaged components.

4.4.1 Dimensions and tolerances of lead spacing for two leaded components (*F*) and for three leaded components (F_1, F_2)

See Figure 4, sketch D and Annex A and Annex B.

Tolerance of lead pitch *F* $^{+0,5}_{-0,2}$ mm

Tolerance of lead pitch F_1 and F_2 $^{+0,4}_{-0,1}$ mm

Components shall be taped and handled so that lead spacing can easily be maintained within tolerances after separation or removal from the tape.

4.4.2 Lead terminal diameter (*d, d_1*)

See Figure 4, sketch E and F

Diameter *d* and d_1 of lead terminal select in accordance with IEC 60301.

Market trend for automatic insertion, where lead spacing is *F* = 5 mm, the recommended lead diameters are 0,6 mm maximum, and where lead spacing is *F* = 7,5 mm, the recommended lead diameters are 0,8 mm maximum.

NOTE When the lead type is not a circle, a circle going through the corners of the non-circular cross-section is considered to be the equivalent circular cross-section.

4.4.3 Tape thickness (*T, T_1*)

See Figure 4, sketch I.

Unless otherwise specified by agreement between the manufacturer and the customer, the thickness of the tape shall be as follows:

Total thickness *T* of the combined carrier and hold-down tape T = 0,9 mm max.

Total thickness T_1 of the combined carrier and hold-down tape including the leads $T_1 = T + d$

4.4.4 Maximum permissible protrusion of the ends of the leads (*L*)

See Figure 4, sketch E

Protrusion *L* beyond the lower side of the carrier tape L = 0,5 mm max.

NOTE Market trend tends towards smaller values.

4.4.5 Distance between the lead terminal and the short terminal without tape (*K*)

See Figure 4, sketch F.

Tolerance of distance *K* for a single line ±0,3 mm

Dimension and tolerance of distance *K* for a double line K = 2,5 $^{+0,3}_{-0,3}$ mm

The recommended positions and shape for the short terminal without tape are shown in Figure 7. For easier guidance through the hole in the PCB it is recommended to form the lead tip of the short terminal in a V-shape.

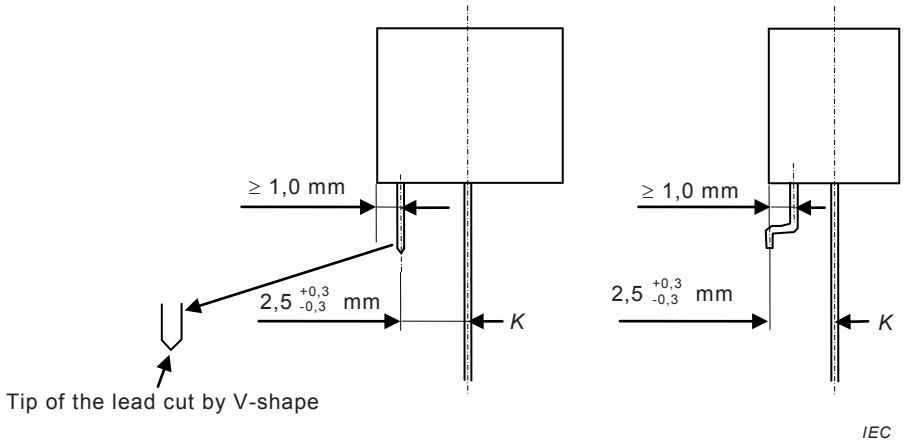

Figure 7 – Position of short terminal without tape

4.5 Maximum permissible deviation of taped component dimensions

The following subclause describes the maximum permissible deviations.

4.5.1 Maximum permissible deviation of taped component dimensions (Δh, Δp, ΔP_1)

See Figure 4, sketch A, B, C, G and H.

From the nominal position: Maximum lateral deviation Δh $|\Delta h| = 2$ mm max.
of the component body vertical to the tape plane

Maximum deviation of the component body in the tape plane Δp $|\Delta p| = 1{,}3$ mm max.

Maximum deviation of the component leads in the seating plane (valid from the upper edge of the tape for all values of P_1 to the seating plane or reference plane respectively) ΔP_1 $|\Delta P_1| = 0{,}7$ mm max.

The following instructions apply:

a) for new design e = 2,5 mm shall be used (see IEC 60097);

b) when taping components with sprocket holes between its leads, care shall be taken that the leads do not interfere with the sprocket holes;

c) for cases where inter-changeability cannot be guaranteed (see NOTE 1 and NOTE 2 in 4.2.1).

5 Taping

5.1 Taping dimensions

Taping dimensions shall be in accordance with Annex A. When the lead terminal is formed, the type and dimensions of the forming shall be by agreement between the manufacturer and customer.

5.2 Splices

Splices shall be at least as strong as the original tape and shall not hamper the transport and the cutting of the tape. When splicing is applied, the misalignment of the holes on each side of

the splice shall not be more than ±0,3 mm in any direction. Splices shall not interfere with sprocket feed holes nor shall the overall thickness exceed 1,5 mm. When used, staples shall not interfere with the transport and cutting operations.

NOTE This includes deformation of lead ends due to shearing operations.

5.3 Tape leader and trailer

When a leader and/or trailer tape is required for tape handling, the leader and/or trailer shall have a minimum length equivalent to the distance of at least three sprocket holes (see Figure 8).

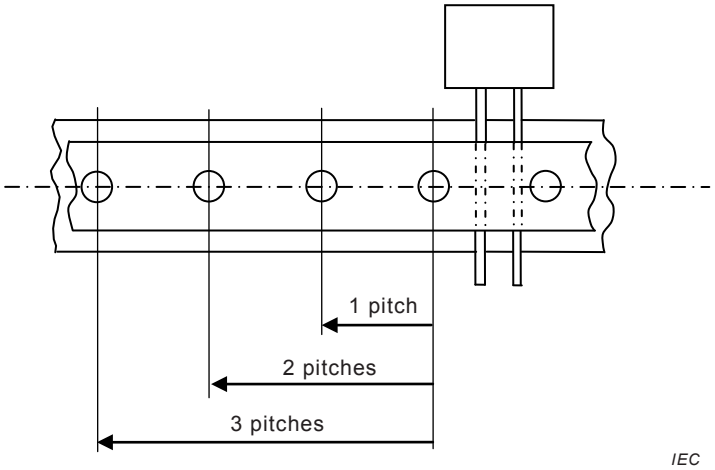

Figure 8 – Leader and trailer of tape

6 Tape

6.1 Polarization direction on tape

All polarized components shall be oriented in one direction. The cathode lead and, for transistors (except for TO-92 packages), the emitter lead shall be the last one to leave the package, unless otherwise specified in the detail specification. For TO-92 packages the flat side shall be on the upper side of the tape.

6.2 Kinks or bends on tape

The wire terminations of the taped components shall be free from kinks or bends between the seating or reference plane and the carrier tape.

6.3 Adhesion to tape and extraction force

The components shall be held sufficiently in the tape, so that their position remains, during storage and transportation, within the permitted tolerances.

The extraction force for components in the tape plane, vertical to the direction of unreeling shall be minimum 5 N (see Figure 9).

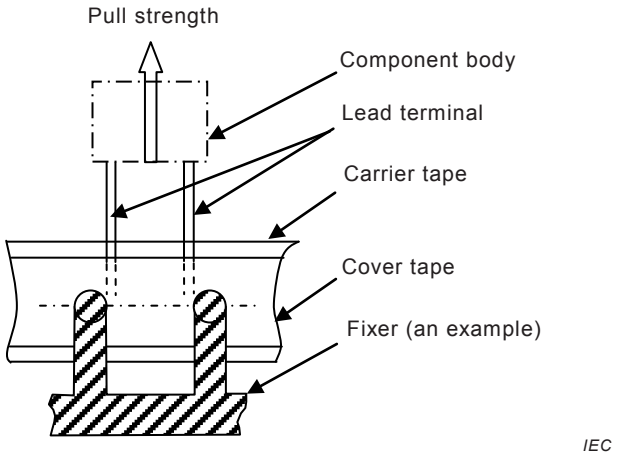

Figure 9 – Pull strength from taping

6.4 Tape breaking force

The minimum breaking force of the tape shall be 15 N.

6.5 Tape material

The tapes shall be suitable to withstand storage of the taped components. The tape material shall not migrate along the leads or give off vapours which may affect solderability or affect the mechanical or electrical characteristics of component and leads by chemical action (e.g. corrosion).

In addition, the hold-down tape shall not become detached so that the components do not remain in position after storage. Any degradation of the carrier tape occurring during storage shall not cause the tape to break or prevent the demounting of components during normal use.

Tapes in adjacent layers shall not stick together in the packing, e.g. because of exposed adhesive.

The sprocket holes shall be free from burrs and traces of adhesive from the hold-down tape.

6.6 Hold-down tape

For tapes in fan-fold arrangement the hold-down tape shall preferably not become separated from the carrier tape in the region of the fold. If this cannot be avoided, the value of the maximum tape thickness shall not be exceeded.

6.7 Missing components

For automatic insertion, the number of empty places in the tape per reel or fan-fold arrangement shall not exceed:

– three (3) missing components, when the component pitch is equivalent to one sprocket hole pitch (see Figure 10);
– one (1) missing component, when the component pitch is equivalent to two sprocket hole pitches or more (see Figure 10).

Empty places, for example programmed empty places at the bend or fan-fold packing, or for other reasons, shall be by agreement between the supplier and the customer.

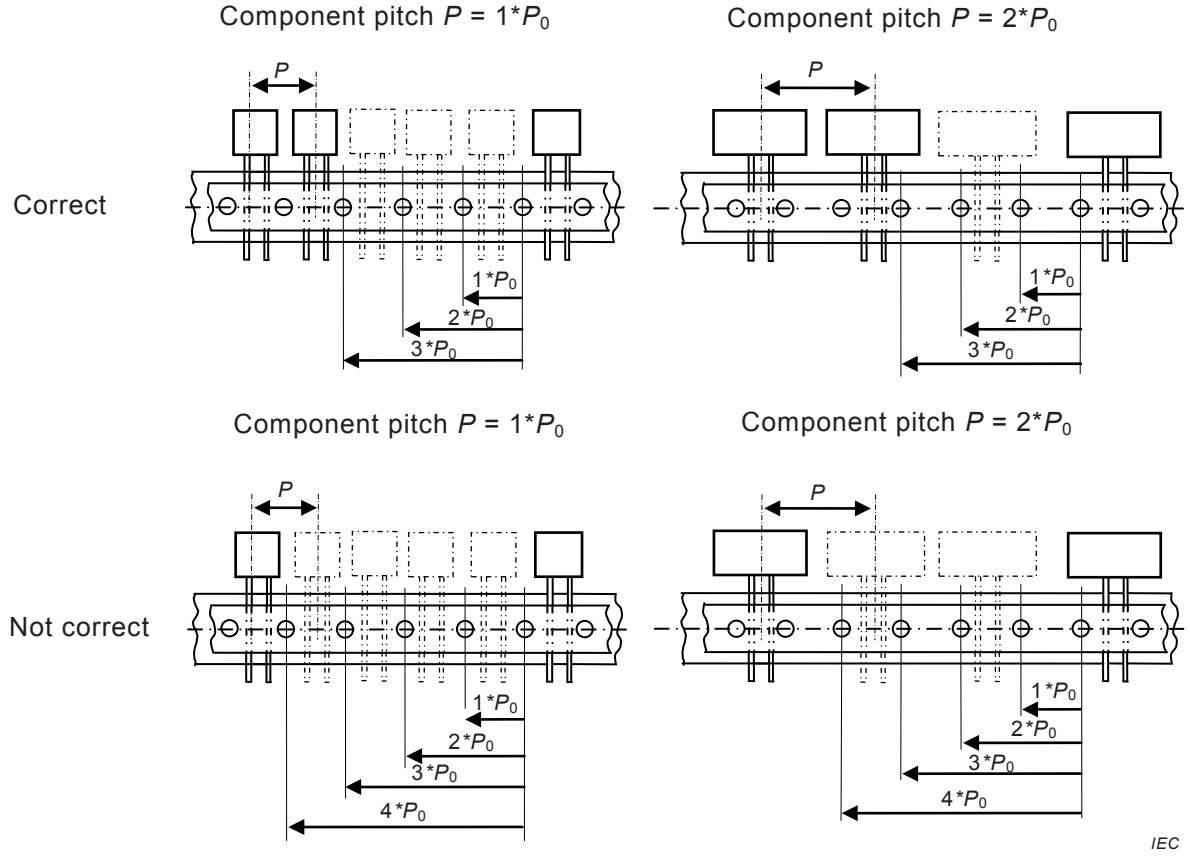

Figure 10 – Missing components

7 Packing

7.1 General

For lead spacing dimension *F*, see 4.4.1.

The tapes of components may either be wound on reels or folded (for example in a fan-fold arrangement).

When winding the tape on the reel, the carrier tape shall be closest to the centre of the reel.

7.2 Reel dimensions

For a list of symbols, see Table 2. References to the preferred reel dimensions are shown in Figure 5 and Table 3.

Table 3 – Reel dimensions

Dimensions in millimetres

Total reel width, measured at hub	**Width between flanges, measured at hub**	**Reel diameter**	**Hub diameter**	**Arbour hole diameter**
W_4 maximum	W_3	*A* maximum	*N*	*C*
65	[a]	320	80 min.	14 to 38
		370		
		400		
90		500	125 max.	
		609		

[a] The distance W_3 between the flanges shall be governed by the overall dimensions of the taped component and shall allow proper reeling and unreeling.

7.2.1 Component tape reeling

Reeling of the tape with taped components shall be performed according Figure 11.

NOTE The upper side could be a hold-down tape.

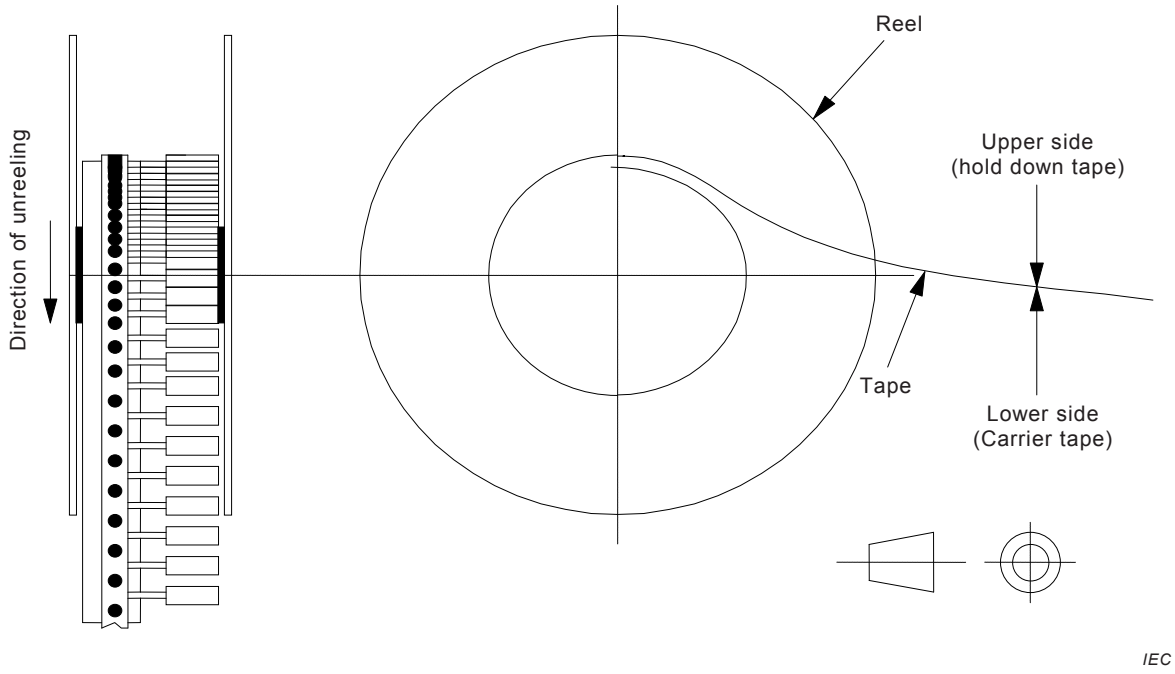

Figure 11 – Reeling

7.2.2 Components protection

In order to prevent component damage and lead distortion, protection between layers of components and over the last layer may be necessary.

In this case protection materials shall not cause deterioration of the components or of lead solderability.

7.2.3 Reel filling

The total number of components on the reel shall be such that the components and the final cover shall not extend beyond the smallest dimension of the flange in the radial direction.

7.3 Maximum dimensions of the fan-fold container

Table 4 shows the maximum outer dimensions for the fan fold container, whose symbols are listed in Table 2 and are shown in Figure 6.

Table 4 – Maximum outer dimensions for a fan-fold arrangement

Dimensions in millimetres

Dimension	Standard	Exceptions
X – Width	65	78
Y – Length	372	510
Z – Height	372	450

NOTE 1 The depth of the box fan-fold arrangement is about 3 mm.

NOTE 2 *X*-width: 65 mm maximum = Dimension 46,5 mm + Half of width of tape 9 mm + Protrusion L_1 beyond the lower side of the carrier tape 0,5 mm + Clearance in box fan-hold arrangement 1,5 mm × 2 + Depth of box fan-fold arrangement 3 mm × 2.

NOTE 3 Normal dimensions of *X*-width suggested as a design limit value from a machine maker is 65 mm maximum.

NOTE 4 The fan-fold arrangement has outer dimensions for each component. The dimensions are designed in such a way that components do not collapse in a fan-fold container and are designed for maximum values.

7.4 Recycling

Reels as defined in Figure 5 shall preferably be made of recyclable material. When such material is used the reel shall be permanently marked with the recycling symbol.

Preferably ISO 11469 should be used.

7.5 Marking

Marking on the packaging box shall include the following items. Where space is limited, the abbreviated designation may be substituted for the manufacturer’s name.

a) Manufacturer’s type designation
b) Quantity
c) Production date: month/year or week/year
d) Lot number
e) Manufacturer’s name or trademark

Annex A
(informative)

Dimensions for two leads

A.1 Dimensions for two formed leads, sprocket hole between parts

This clause describes details of the dimensions for two formed leads, see Figure A.1 and Table A.1.

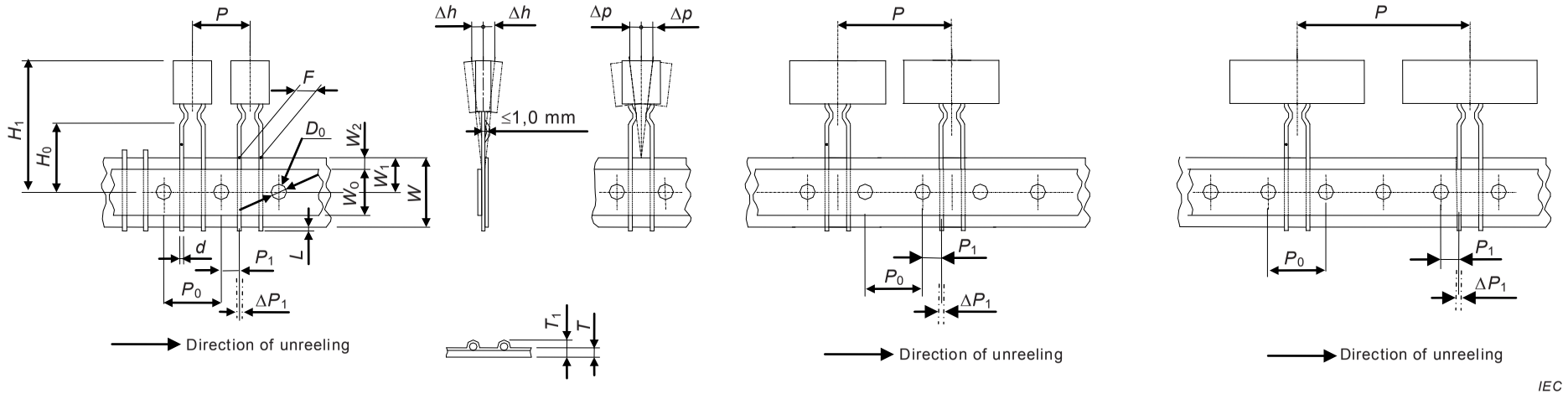

Figure A.1 – Symbol references for two formed leads, sprocket hole between parts

Table A.1 – Dimensions for two formed leads, sprocket hole between parts

Dimensions in millimetres

P	P_0	P_1	F	H_0	H_1	d	T	$T_1 = d + T$	W	W_0	W_1	W_2	D_0	L	Δh	Δp	ΔP_1
±1,0	±0,3	±0,7	+0,5 -0,2	±0,5	max.	max.	max.	max.	+1,0 -0,5	min.	+0,75 -0,5	max.	±0,2	max.	max.	max.	max.
12,7	12,7	5,10	2,5	16,0	32,2	0,6	0,9	1,5									
12,7	12,7	3,85	5,0	16,0	32,2	0,6	0,9	1,5									
12,7	12,7	3,85	5,0	16,0	46,5	0,6	0,9	1,5									
15,0	15,0	5,00	5,0	16,0	46,5	0,8	0,9	1,7									
15,0	15,0	3,75	7,5	16,0	46,5	0,8	0,9	1,7									
15,0	15,0	3,75	7,5	16,0	58,0	1,0	0,9	1,9									
15,0	15,0	3,75	7,5	16,0	62,0	1,0	0,9	1,9									
25,4	12,7	3,85	5,0	16,0	46,5	0,8	0,9	1,7									
30,0	15,0	5,00	5,0	16,0	46,5	0,8	0,9	1,7	18,0	5,0	9,0	3,0	4,0	0,5	2,0	1,3	0,7
30,0	15,0	3,75	7,5	16,0	46,5	0,8	0,9	1,7									
30,0	15,0	3,75	7,5	16,0	58,0	1,2	0,9	2,1									
30,0	15,0	3,75	7,5	16,0	62,0	1,2	0,9	2,1									
38,1	12,7	5,10	2,5	16,0	46,5	0,8	0,9	1,7									
38,1	12,7	3,85	5,0	16,0	46,5	0,8	0,9	1,7									
45,0	15,0	5,00	5,0	16,0	58,0	1,2	0,9	2,1									
45,0	15,0	3,75	7,5	16,0	58,0	1,2	0,9	2,1									
45,0	15,0	3,75	7,5	16,0	62,0	1,2	0,9	2,1									

A.2 Dimensions for two formed leads, sprocket hole between leads

This clause describes details of the dimensions for two formed leads, see Figure A.2 and Table A.2.

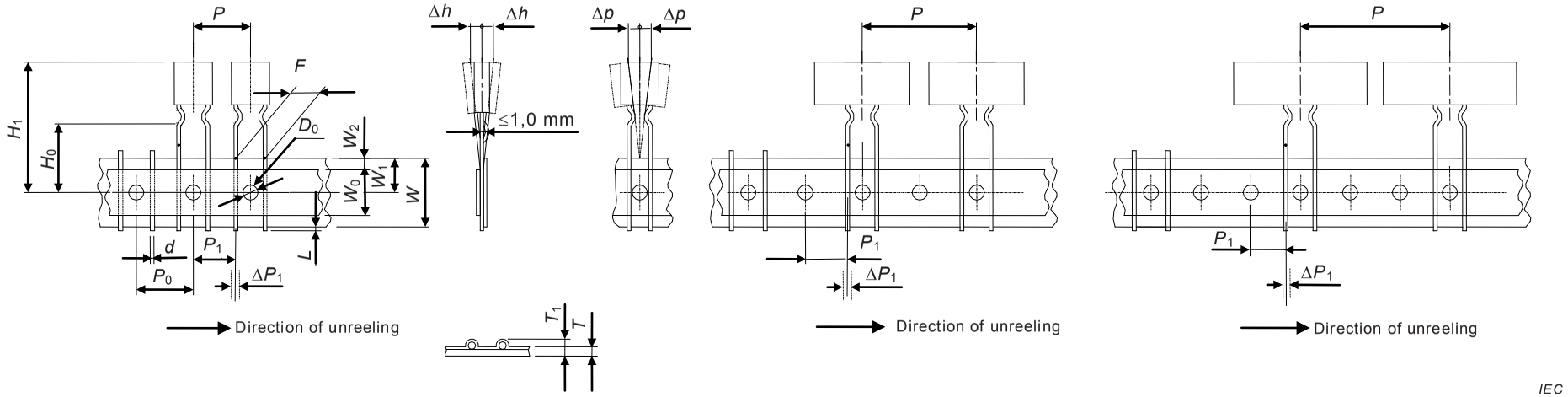

Figure A.2 – Symbol references for two formed leads, sprocket hole between leads

Table A.2 – Dimensions for two formed leads, sprocket hole between leads

Dimensions in millimetres

P	P_0	P_1	F	H_0	H_1	d	T	$T_1 = d + T$	W	W_0	W_1	W_2	D_0	L	Δh	Δp	ΔP_1
±1,0	±0,3	±0,7	+0,5 -0,2	±0,5	max.	max.	max.	max.	+1,0 -0,5	min.	+0,75 -0,5	max.	±0,2	max.	max.	max.	max.
12,7	12,7	8,95	7,5	16,0	46,5	0,8	0,9	1,7									
15,0	15,0	10,0	10,0	16,0	46,5	0,8	0,9	1,7									
25,4	12,7	8,95	7,5	16,0	46,5	0,8	0,9	1,7									
25,4	12,7	7,70	10,0	16,0	46,5	0,8	0,9	1,7									
25,4	12,7	6,45	12,5	16,0	46,5	0,8	0,9	1,7									
25,4	12,7	5,20	15,0	16,0	46,5	0,8	0,9	1,7									
30,0	15,0	11,25	7,5	16,0	46,5	0,8	0,9	1,7									
30,0	15,0	10,0	10,0	16,0	46,5	0,8	0,9	1,7	18,0	5,0	9,0	3,0	4,0	0,5	2,0	1,3	0,7
30,0	15,0	8,75	12,5	16,0	46,5	0,8	0,9	1,7									
30,0	15,0	7,50	15,0	16,0	46,5	0,8	0,9	1,7									
30,0	15,0	5,00	20,0	16,0	46,5	0,8	0,9	1,7									
38,1	12,7	8,95	7,5	16,0	46,5	0,8	0,9	1,7									
38,1	12,7	7,70	10,0	16,0	46,5	0,8	0,9	1,7									
38,1	12,7	6,45	12,5	16,0	46,5	0,8	0,9	1,7									
38,1	12,7	5,20	15,0	16,0	46,5	0,8	0,9	1,7									

A.3 Dimensions for two straight leads, sprocket hole between parts

This clause describes details of the dimensions for two straight leads, see Figure A.3 and Table A.3.

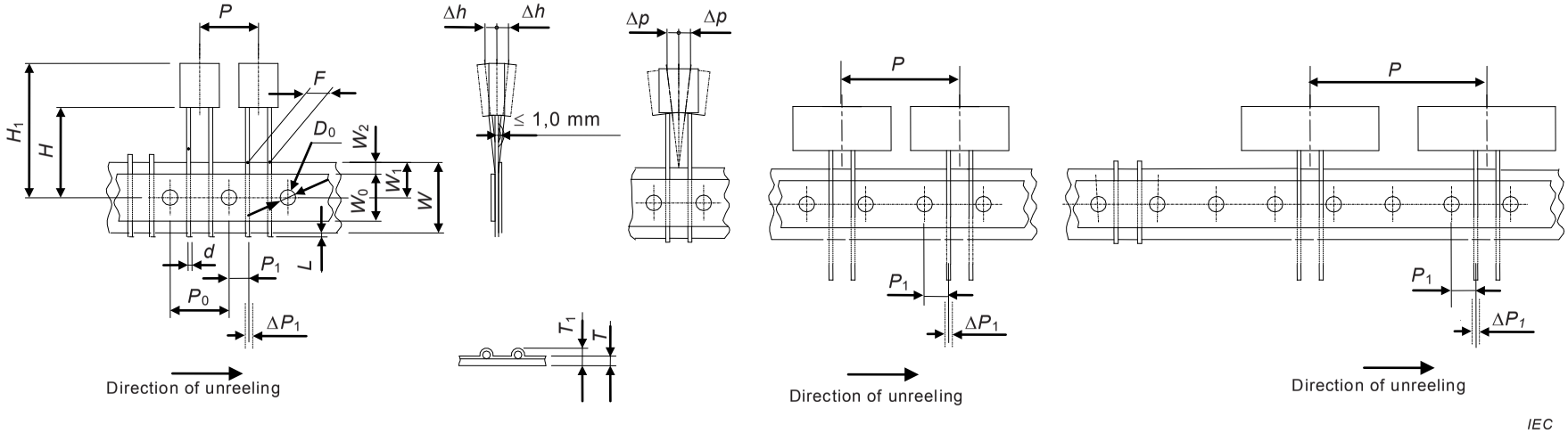

Figure A.3 – Symbol references for two straight leads, sprocket hole between parts

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IEC 60286-2:2015 © IEC 2015

Table A.3 – Dimensions for two straight leads, sprocket hole between parts

Dimensions in millimetres

P	P_0	P_1	F	H	H_1	d	T	$T_1 = d + T$	W	W_0	W_1	W_2	D_0	L	Δh	Δp	ΔP_1
±1,0	±0,3	±0,7	+0,5 -0,2	+2,0 0	max.	max.	max.	max.	+1,0 -0,5	min.	+0,75 -0,5	max.	±0,2	max.	max.	max.	max.
12,7	12,7	5,10	2,5	18,0	32,2	0,6	0,9	1,5									
12,7	12,7	3,85	5,0	18,0	46,5	0,6	0,9	1,5									
15,0	15,0	5,00	5,0	18,0	46,5	0,8	0,9	1,7									
15,0	15,0	3,75	7,5	18,0	46,5	0,8	0,9	1,7									
15,0	15,0	3,75	7,5	18,0	58,0	1,2	0,9	2,1									
15,0	15,0	3,75	7,5	18,0	62,0	1,2	0,9	2,1									
25,4	12,7	3,85	5,0	18,0	46,5	0,8	0,9	1,7	18,0	5,0	9,0	3,0	4,0	0,5	2,0	1,3	0,7
30,0	15,0	5,00	5,0	18,0	46,5	0,8	0,9	1,7									
30,0	15,0	3,75	7,5	18,0	46,5	0,8	0,9	1,7									
30,0	15,0	3,75	7,5	18,0	58,0	1,2	0,9	2,1									
30,0	15,0	3,75	7,5	18,0	62,0	1,2	0,9	2,1									
38,1	12,7	3,85	5,0	18,0	46,5	0,8	0,9	1,7									

A.4 Dimensions for two straight leads, sprocket hole between leads

This clause describes details of the dimensions for two straight leads, see Figure A.4 and Table A.4.

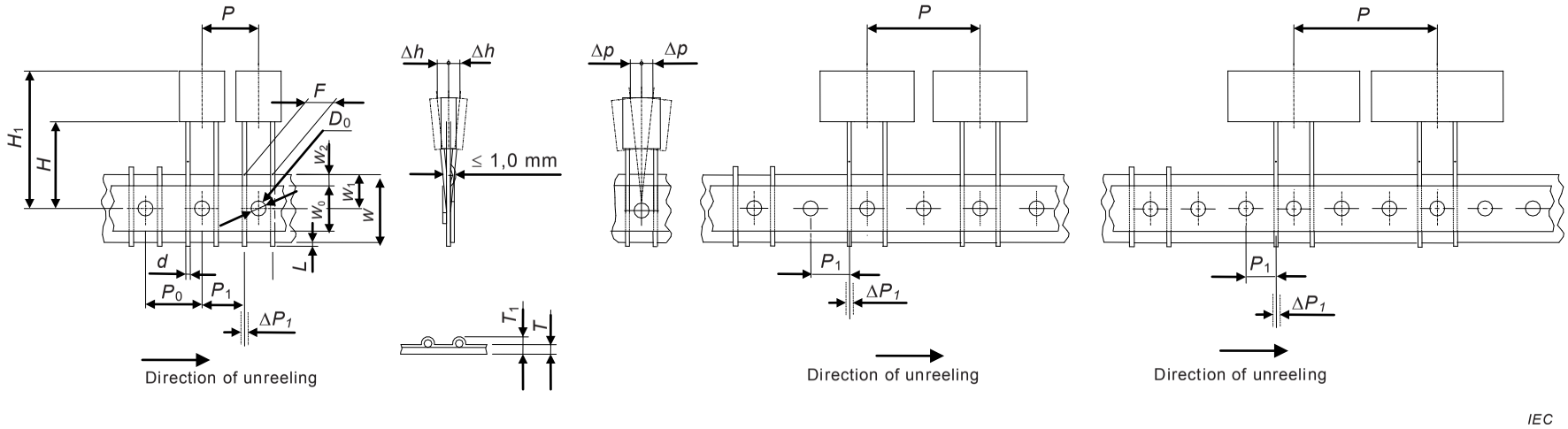

Figure A.4 – Symbol references for two straight leads, sprocket hole between leads

Table A.4 – Dimensions for two straight leads, sprocket hole between leads

Dimensions in millimetres

P	P_0	P_1	F	H	H_1	d	T	$T_1 = d + T$	W	W_0	W_1	W_2	D_0	L	Δh	Δp	ΔP_1
±1,0	±0,3	±0,7	+0,5 -0,2	+2,0 0	max.	max.	max.	max.	+1,0 -0,5	min.	+0,75 -0,5	max.	±0,2	max.	max.	max.	max.
12,7	12,7	8,95	7,5	18,0	46,5	0,8	0,9	1,7									
15,0	15,0	10,00	10,0	18,0	46,5	0,8	0,9	1,7									
25,4	12,7	8,95	7,5	18,0	46,5	0,8	0,9	1,7									
25,4	12,7	7,70	10,0	18,0	46,5	0,8	0,9	1,7									
25,4	12,7	6,45	12,5	18,0	46,5	0,8	0,9	1,7									
25,4	12,7	5,20	15,0	18,0	46,5	0,8	0,9	1,7									
30,0	15,0	11,25	7,5	18,0	46,5	0,8	0,9	1,7									
30,0	15,0	10,00	10,0	18,0	46,5	0,8	0,9	1,7	18,0	5,0	9,0	3,0	4,0	0,5	2,0	1,3	0,7
30,0	15,0	8,75	12,5	18,0	46,5	0,8	0,9	1,7									
30,0	15,0	7,50	15,0	18,0	46,5	0,8	0,9	1,7									
30,0	15,0	5,00	20,0	18,0	46,5	0,8	0,9	1,7									
38,1	12,7	8,95	7,5	18,0	46,5	0,8	0,9	1,7									
38,1	12,7	7,70	10,0	18,0	46,5	0,8	0,9	1,7									
38,1	12,7	6,45	12,5	18,0	46,5	0,8	0,9	1,7									
38,1	12,7	5,20	15,0	18,0	46,5	0,8	0,9	1,7									

Annex B
(informative)

Dimensions for three leads

B.1 Dimensions for three formed leads, sprocket hole between parts

This clause describes details of the dimensions for three formed leads, see Figure B.1 and Table B.1.

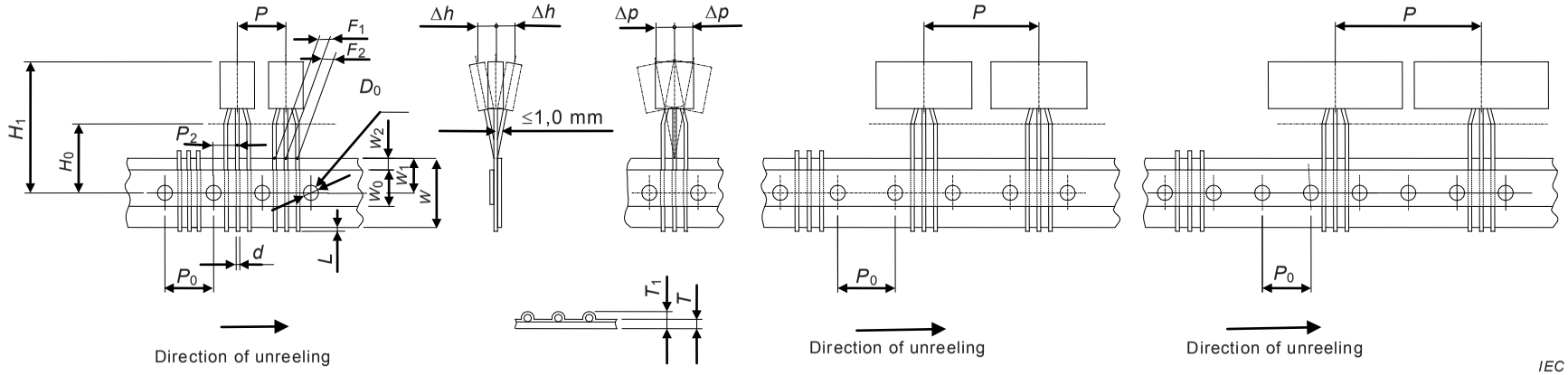

Figure B.1 – Symbol references for three formed leads, sprocket hole between parts

Table B.1 – Dimensions for three formed leads, sprocket hole between parts

Dimensions in millimetres

P	P_0	P_2	F_1, F_2	H_0	H_1	d	T	$T_1 = d + T$	W	W_0	W_1	W_2	D_0	L	Δh	Δp	ΔP_1
±1,0	±0,3	±0,7	+0,4 -0,1	±0,5	max.	max.	max.	max.	+1,0 -0,5	min.	+0,75 -0,5	max.	±0,2	max.	max.	max.	max.
12,7	12,7	6,35	2,5	16,0	32,2	0,6	0,9	1,5	18,0	5,0	9,0	3,0	4,0	0,5	2,0	1,3	0,7
12,7	12,7	6,35	5,0	16,0	46,5	0,6	0,9	1,5									
15,0	15,0	7,50	5,0	16,0	46,5	0,8	0,9	1,7									
15,0	15,0	7,50	7,5	16,0	46,5	0,8	0,9	1,7									
15,0	15,0	7,50	7,5	16,0	58,0	1,2	0,9	2,1									
15,0	15,0	7,50	7,5	16,0	62,0	1,2	0,9	2,1									
25,4	12,7	6,35	5,0	16,0	46,5	0,8	0,9	1,7									
30,0	15,0	7,50	5,0	16,0	46,5	0,8	0,9	1,7									
30,0	15,0	7,50	7,5	16,0	46,5	0,8	0,9	1,7									
30,0	15,0	7,50	7,5	16,0	58,0	1,2	0,9	2,1									
30,0	15,0	7,50	7,5	16,0	62,0	1,2	0,9	2,1									
38,1	12,7	6,35	5,0	16,0	46,5	0,8	0,9	1,7									

B.2 Dimensions for three formed leads, sprocket hole between leads

This clause describes details of the dimensions for three formed leads, see Figure B.2 and Table B.2.

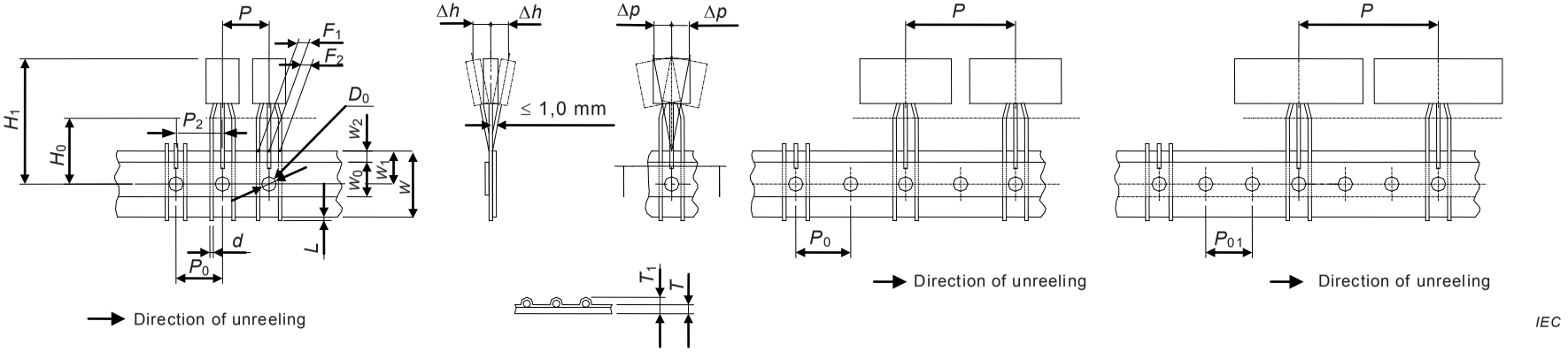

Figure B.2 – Symbol references for three formed leads, sprocket hole between leads

Table B.2 – Dimensions for three formed leads, sprocket hole between leads

Dimensions in millimetres

P	P_0	P_2	F_1, F_2	H_0	H_1	d	T	$T_1 = d + T$	W	W_0	W_1	W_2	D_0	L	Δh	Δp	ΔP_1
±1,0	±0,3	±0,7	+0,4 -0,1	±0,5	max.	max.	max.	max.	+1,0 -0,5	min.	+0,75 -0,5	max.	±0,2	max.	max.	max.	max.
12,7	12,7	12,7	7,5	16,0	46,5	0,8	0,9	1,7									
15,0	15,0	15,0	10,0	16,0	46,5	0,8	0,9	1,7									
25,4	12,7	12,7	7,5	16,0	46,5	0,8	0,9	1,7									
25,4	12,7	12,7	10,0	16,0	46,5	0,8	0,9	1,7									
25,4	12,7	12,7	12,5	16,0	46,5	0,8	0,9	1,7									
25,4	12,7	12,7	15,0	16,0	46,5	0,8	0,9	1,7									
30,0	15,0	15,0	7,5	16,0	46,5	0,8	0,9	1,7									
30,0	15,0	15,0	10,0	16,0	46,5	0,8	0,9	1,7	18,0	5,0	9,0	3,0	4,0	0,5	2,0	1,3	0,7
30,0	15,0	15,0	12,5	16,0	46,5	0,8	0,9	1,7									
30,0	15,0	15,0	15,0	16,0	46,5	0,8	0,9	1,7									
30,0	15,0	15,0	20,0	16,0	46,5	0,8	0,9	1,7									
38,1	12,7	12,7	7,5	16,0	46,5	0,8	0,9	1,7									
38,1	12,7	12,7	10,0	16,0	46,5	0,8	0,9	1,7									
38,1	12,7	12,7	12,5	16,0	46,5	0,8	0,9	1,7									
38,1	12,7	12,7	15,0	16,0	46,5	0,8	0,9	1,7									

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