

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Packaging of components for automatic handling –  
Part 3: Packaging of surface mount components on continuous tapes**

<https://standards.iteh.ai>

**Emballage de composants pour opérations automatisées –  
Partie 3: Emballage des composants pour montage en surface en bandes  
continues**

[IEC 60286-3:2022](https://standards.iteh.ai/catalog/standards/iec/5ea62c84-e0fe-480b-b972-a67cb87ce5e1/iec-60286-3-2022)

<https://standards.iteh.ai/catalog/standards/iec/5ea62c84-e0fe-480b-b972-a67cb87ce5e1/iec-60286-3-2022>



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2022 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

#### IEC publications search - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [sales@iec.ch](mailto:sales@iec.ch).

#### IEC Products & Services Portal - [products.iec.ch](http://products.iec.ch)

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

### A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

### A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Recherche de publications IEC -

##### [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

#### Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [sales@iec.ch](mailto:sales@iec.ch).

#### IEC Products & Services Portal - [products.iec.ch](http://products.iec.ch)

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



---

**Packaging of components for automatic handling –  
Part 3: Packaging of surface mount components on continuous tapes**

**Emballage de composants pour opérations automatisées –  
Partie 3: Emballage des composants pour montage en surface en bandes  
continues**

[IEC 60286-3:2022](https://standards.iteh.ai/catalog/standards/iec/5ea62c84-e0fe-480b-b972-a67cb87ce5e1/iec-60286-3-2022)

<https://standards.iteh.ai/catalog/standards/iec/5ea62c84-e0fe-480b-b972-a67cb87ce5e1/iec-60286-3-2022>

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

---

ICS 31.020; 31.240

ISBN 978-2-8322-5899-6

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD .....	6
INTRODUCTION .....	8
1 Scope .....	9
2 Normative references .....	9
3 Terms, definitions and symbols .....	9
3.1 Terms and definitions .....	9
3.2 Symbols .....	11
4 Structure of the specification .....	13
5 Dimensional requirements for taping .....	13
5.1 Component cavity positioning requirements .....	13
5.1.1 Requirements for type 1a, type 1b, type 2a, type 2b and type 3 .....	13
5.1.2 Requirements for type 4 .....	13
5.2 Component cavity dimension requirements (type 1a, type 1b, type 2a, type 2b and type 3) .....	14
5.3 Type 1a – Punched carrier tape, with top and bottom cover tape (tape widths: 8 mm and 12 mm) .....	14
5.4 Type 1b – Pressed carrier tape, with top cover tape (tape width: 8 mm) .....	17
5.5 Type 2a – Blister carrier tape, with single round sprocket holes and tape pitches down to 2 mm (tape widths: 8 mm, 12 mm, 16 mm and 24 mm) .....	19
5.6 Type 2b – Blister carrier tape, with single round sprocket holes and with 1mm tape pitch (tape widths: 4 mm) .....	21
5.7 Type 3 – Blister carrier tape, with double sprocket holes (32 mm to 200 mm) .....	23
5.8 Type 4 – Adhesive-backed punched plastic carrier tape for singled bare die and other surface mount components (8 mm, 12 mm, 16 mm and 24 mm) .....	26
6 Polarity and orientation requirements of components in the tape .....	28
6.1 Requirements for all types .....	28
6.2 Specific requirements for type 1a .....	29
6.3 Specific requirements for type 4 .....	29
7 Carrier tape requirements .....	29
7.1 Taping materials .....	29
7.2 Minimum bending radius (for all types) .....	29
7.3 Camber .....	30
8 Cover tape requirements (for type 1a, type 1b, type 2a, type 2b and type 3) .....	31
9 Component taping and additional tape requirements .....	33
9.1 All types .....	33
9.2 Specific requirements for type 1b .....	33
9.3 Specific tape requirements for type 2b .....	33
9.4 Specific requirement for type 4 .....	34
9.4.1 General .....	34
9.4.2 Coordinate system .....	34
9.4.3 Component positioning and lateral displacement .....	35
9.5 Specific requirements for tapes containing die products .....	36
9.5.1 General .....	36
9.5.2 Tape design for tapes containing die products .....	36
9.5.3 Cleanliness .....	36
9.5.4 Die lateral movement (type 1a, type 2a and type 2b) .....	37

10	Reel requirements .....	37
10.1	Dimensions .....	37
10.1.1	General .....	37
10.1.2	Reel dimensions .....	37
10.1.3	Reel hole dimensions .....	38
10.1.4	Drive hole dimensions (optional).....	39
10.2	Marking.....	40
11	Tape reeling requirements .....	41
11.1	All types.....	41
11.2	Specific requirements for type 1a.....	41
11.3	Specific requirements for type 4.....	41
11.4	Leader and trailer tape.....	41
11.4.1	General .....	41
11.4.2	Leader .....	42
11.4.3	Trailer.....	42
11.5	Recycling .....	42
11.6	Missing components .....	42
Annex A	(normative) Recommended measuring methods for type 1b .....	43
A.1	Measurement method for carrier tape thickness ( $T$ and $T_3$ ) .....	43
A.2	Measurement method for cavity ( $A_0$ and $B_0$ ) .....	43
A.3	Measurement method for cavity depth (dimension $K_0$ ) .....	44
Annex B	(informative) Measuring methods of electrostatic potential and charge decay performance while cover tape is peeled off from carrier tape containing surface mount devices .....	45
B.1	General.....	45
B.2	Method for measuring electrostatic potential and charge decay performance .....	46
B.2.1	General .....	46
B.2.2	Measurement instrument and device.....	48
B.2.3	Sample (test specimen) .....	50
B.2.4	Pre-treatment conditions and measurement environment conditions .....	50
B.2.5	Measurement conditions .....	51
B.2.6	Method for measuring electrostatic potential.....	51
B.2.7	Method for measuring the electrostatic charge decay performance .....	52
B.3	Items to be described in the test report and items to be specified in the related standards .....	53
B.3.1	Items to be described in the test report.....	53
B.3.2	Items specified in related standards.....	54
Bibliography	.....	55
Figure 1	– Sectional view of component cavity (type 1b).....	11
Figure 2	– 8 mm and 12 mm punched carrier-tape dimensions (4 mm cavity pitch) .....	14
Figure 3	– Illustration of 2 mm and 1 mm cavity pitch and maximum pocket offset .....	15
Figure 4	– Maximum component tilt, rotation and lateral movement .....	15
Figure 5	– Dimensions ( $P_0 = 4 \text{ mm}/P_1 = 2 \text{ mm}$ ) and ( $P_0 = 4 \text{ mm}/P_1 = 1 \text{ mm}$ ) .....	17
Figure 6	– Illustration of 2 mm and 1 mm cavity pitch and maximum pocket offset .....	18
Figure 7	– Maximum component tilt, rotation and lateral movement .....	18
Figure 8	– Blister carrier tape dimensions (8 mm, 12 mm, 16 mm and 24 mm) .....	19

Figure 9 – Illustration of 2 mm cavity pitch and pocket offset .....	20
Figure 10 – Maximum component tilt, rotation and lateral movement .....	20
Figure 11 – Type 2b carrier tape .....	22
Figure 12 – Maximum pocket offset.....	22
Figure 13 – Maximum component tilt, rotation and lateral movement .....	22
Figure 14 – Blister carrier tape.....	24
Figure 15 – Elongated sprocket hole skew .....	24
Figure 16 – Maximum component tilt, rotation and lateral movement .....	24
Figure 17 – Adhesive-backed punched carrier-tape dimensions (4 mm compartment pitch) .....	26
Figure 18 – Illustration of 2 mm compartment pitch .....	26
Figure 19 – Maximum component planar rotation and lateral displacement .....	27
Figure 20 – Example of polarity and orientation .....	29
Figure 21 – Bending radius .....	30
Figure 22 – Measuring method and camber .....	31
Figure 23 – Dot seals for thin components (as exceptions) .....	32
Figure 24 – Type 4 coordinate system .....	35
Figure 25 – Component clearance and positioning method .....	36
Figure 26 – Reel .....	37
Figure 27 – Reel hole presentation .....	39
Figure 28 – Drive hole layout .....	40
Figure 29 – Tape reeling and label area on the reel .....	41
Figure 30 – Leader and trailer.....	42
Figure A.1 – Carrier tape thickness measurement points .....	43
Figure A.2 – Cavity cross-section.....	44
Figure A.3 – Cavity depth dimension.....	44
Figure B.1 – Configuration of measurement method using electrostatic potential measuring system.....	46
Figure B.2 – Diagram of measure electrostatic potential when peeling cover tape.....	47
Figure B.3 – Configuration of electrostatic charge decay measurement method .....	47
Figure B.4 – Diagram of the measurement of electrostatic charge decay performance .....	48
Figure B.5 – Dimensions of the sample .....	50
Table 1 – Component size codes .....	10
Table 2 – Classification to symbols concerning tape, reel and common symbols.....	11
Table 3 – Constant dimensions of 8 mm and 12 mm punched carrier tape .....	16
Table 4 – Variable dimensions of 8 mm and 12 mm punched carrier tape .....	16
Table 5 – Component tilt, planar rotation and lateral movement .....	17
Table 6 – Constant dimensions of 8 mm pressed carrier tape .....	18
Table 7 – Variable dimensions of 8 mm pressed carrier tape .....	19
Table 8 – Component tilt, planar rotation and lateral movement .....	19
Table 9 – Constant dimensions of 8 mm to 24 mm blister carrier tape .....	20
Table 10 – Variable dimensions of 8 mm to 24 mm blister carrier tape .....	21
Table 11 – Component tilt, rotation and lateral movement.....	21

Table 12 – Constant dimensions of 4 mm carrier tape.....	23
Table 13 – Variable dimensions of 4 mm carrier tape.....	23
Table 14 – Component tilt, planar rotation and lateral movements .....	23
Table 15 – Constant dimensions of 32 mm to 200 mm blister carrier tape .....	25
Table 16 – Variable dimensions of 32 mm to 200 mm blister carrier tape .....	25
Table 17 – Component tilt, planar rotation and lateral movements .....	26
Table 18 – Dimensions of adhesive backed punched carrier tape .....	27
Table 19 – Variable dimensions of adhesive-backed punched carrier tape .....	28
Table 20 – Component planar rotation and lateral displacement .....	28
Table 21 – Minimum bending radius.....	30
Table 22 – Peel force.....	32
Table 23 – Absolute referencing data for component target position .....	34
Table 24 – Reel dimensions.....	38
Table 25 – Reel hole dimensions .....	39
Table 26 – Drive hole dimensions .....	40
Table B.1 – Conditions of the environment in which the samples are kept and the conditions of the measurement test environment.....	51

**iTeh Standards**  
(<https://standards.iteh.ai>)  
**Document Preview**

[IEC 60286-3:2022](#)

<https://standards.iteh.ai/catalog/standards/iec/5ea62c84-e0fe-480b-b972-a67cb87ce5e1/iec-60286-3-2022>



## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**PACKAGING OF COMPONENTS FOR AUTOMATIC HANDLING –****Part 3: Packaging of surface mount components  
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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 60286-3 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment. It is an International Standard.

This seventh edition cancels and replaces the sixth edition published in 2019. This edition constitutes a technical revision.

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

- a) addition terms and definitions.
- b) addition of a table of the classification to symbols concerning drive hole diameter and distance between the reel hole centre and the drive hole centre;
- c) addition of drive hole to the reel (optional);
- d) revision of reel hole diameter tolerances;
- e) revision of 72 mm tape size carrier tape width dimension tolerances;



- f) addition of Annex B (informative);
- g) addition of component size 0201M.

The text of this International Standard is based on the following documents:

Draft	Report on voting
40/2972/FDIS	40/2984/RVD

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

The language used for the development of this International Standard is English.

A list of all parts in the IEC 60268 series, published under the general title *Packaging of components for automatic handling*, can be found on the IEC website.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

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

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

[\(https://standards.iteh.ai\)](https://standards.iteh.ai/)  
**Document Preview**  
[IEC 60286-3:2022](https://standards.iteh.ai/catalog/standards/iec/5ea62c84-e0fe-480b-b972-a67cb87ce5e1/iec-60286-3-2022)

<https://standards.iteh.ai/catalog/standards/iec/5ea62c84-e0fe-480b-b972-a67cb87ce5e1/iec-60286-3-2022>

**IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## INTRODUCTION

Tape packaging meets the requirements of automatic component placement machines and also covers the use of tape packaging for components and singulated dies for test purposes and other operations.

**iTeh Standards**  
**(<https://standards.iteh.ai>)**  
**Document Preview**

[IEC 60286-3:2022](#)

<https://standards.iteh.ai/catalog/standards/iec/5ea62c84-e0fe-480b-b972-a67cb87ce5e1/iec-60286-3-2022>

## PACKAGING OF COMPONENTS FOR AUTOMATIC HANDLING –

### Part 3: Packaging of surface mount components on continuous tapes

#### 1 Scope

This part of IEC 60286 is applicable to the tape packaging of electronic components without leads or with lead stumps, intended to be connected to electronic circuits. It includes only those dimensions that are essential for the taping of components intended for the above-mentioned purposes.

This document also includes requirements related to the packaging of singulated die products including bare die and bumped die (flip chips).

#### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC 60191-2, *Mechanical standardization of semiconductor devices – Part 2: Dimensions*

IEC 61340-4-5, *Electrostatics – Part 4-5: Standard test methods for specific applications – Methods for characterizing the electrostatic protection of footwear and flooring in combination with a person*

<https://standards.iteh.ai/catalog/standards/iec/5ea62c84-e0fe-480b-b972-a67cb87ce5e1/iec-60286-3-2022>

IEC 61340-4-6, *Electrostatics – Part 4-6: Standard test methods for specific applications – Wrist straps*

IEC 61340-4-7, *Electrostatics – Part 4-7: Standard test methods for specific applications – Ionization*

IEC 61340-4-9, *Electrostatics – Part 4-9: Standard test methods for specific applications – Garments*

#### 3 Terms, definitions and symbols

##### 3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply. Definitions apply to all tape types, unless specifically mentioned.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

**3.1.1  
component**

electronic part of a product that cannot be physically divided into smaller parts without losing its particular function

Note 1 to entry: This includes singulated die product.

Note 2 to entry: This is applied to all packaging-types for bare die products unless specifically mentioned otherwise.

**3.1.2  
component size**

size of component that is identified with its metric size code

Note 1 to entry: This size code is followed by a capital M.

Note 2 to entry: To avoid possible confusion with inch-based size codes, an equivalency table is shown in Table 1.

**Table 1 – Component size codes**

Metric size code	Inch size code
0201M	008004
0402M	01005
0603M	0201
1005M	0402
1608M	0603
2012M	0805

**3.1.3  
packaging**

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

**3.1.4  
pressed carrier tape**

<type 1b> carrier tape with concave cavities formed by compression of the base material

**3.1.5  
fluff**

<type 1b> fibre from the base material attached inside the cavity

Note 1 to entry: See Figure 1.

**3.1.6  
burr**

<type 1b> surface projection of tape unintentionally produced when cavity is formed

Note 1 to entry: See Figure 1.

**3.1.7  
deformation**

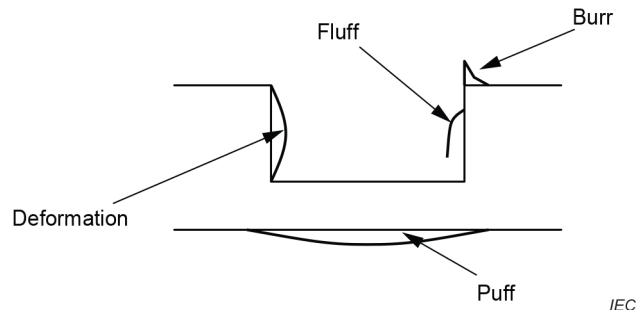
<type 1b> bulge on the inner wall of the cavity

Note 1 to entry: See Figure 1.

**3.1.8****puff**

<type 1b> bulge on the reverse side of the cavity

Note 1 to entry: See Figure 1.



**Figure 1 – Sectional view of component cavity (type 1b)**

**3.1.9****blister carrier tape****embossed carrier tape**

carrier tape which is identified as tape belonging to type 2a, type 2b and type3

**3.1.10****punched carrier tape**

<type 1a> carrier tape on which the concave cavities are formed by punching a hole on the base material and covering up the bottom by the cover tape

**3.2 Symbols**

The symbols used in this document are listed in Table 2.

**Table 2 – Classification to symbols concerning tape, reel and common symbols**

Symbols	Definitions	Figure references
$A$	Reel diameter	26
$A_0$	Cavity's bottom dimension in direction of unreeling	2, 4, 5, 7, 8, 10, 11, 13, 14, 16, 20 and A.2
$B$	Reel hole key's groove width	27
$B_0$	Cavity's bottom dimension in direction of tape width	2, 4, 5, 7, 8, 10, 11, 13, 14, 16, 20 and A.2
$B_1$	Cavity's rim in direction of tape width	8, 11 and 14
$C$	Reel hole diameter	26 and 27
$C_T$	Distance of puff under cavity in direction of tape width	5
$d$	Difference of diameter between sprocket hole and round foramen	14
$D$	Reel slot diameter	27
$D_0$	Sprocket hole diameter	2, 5, 8, 11, 14 and 17
$D_1$	Cavity's bottom hole diameter	8 and 14
$D_{DH}$	Drive hole diameter	28
$E_1$	Shorter distance in direction of width between the origin point of round sprocket hole and the edge of a side of tape	2, 5, 8, 11, 14 and 17

Symbols	Definitions	Figure references
$E_2$	Longer distance in direction of width between the origin point of round sprocket hole and the edge of a side of tape	2, 5, 8 and 11
$F$	Distance in direction of width between the origin point of round sprocket hole and the centre of cavity	2, 5, 8, 11 and 14
$F_A$	Distance in direction of width between the origin point of round sprocket hole and the centre of compartment	17, 19, 24 and 25
$G$	Shorter distance in direction of width between the cavity and the edge of a side of tape	2, 5, 8, 11 and 17
$K_0$	Cavity depth	2, 5, 8, 11, 14 and A.3
$M$	Distance between the reel hole centre and the drive hole centre	28
$N$	Hub diameter	26
$P_0$	Pitch of the sprocket holes	2, 3, 5, 6, 8, 9, 11, 14 and 17
$P_1$	Cavity pitch	2, 3, 5, 6, 8, 9, 11, 14, 17 and 18
$P_2$	Pitch between the centre of a cavity on the same line with the origin point of round sprocket hole and the centre of the next cavity in direction of unreeling	2, 3, 5, 6, 8, 9, 11 and 14
$P_{2A}$	Pitch between the centre line of the origin point of round sprocket hole and the centre line of compartment in direction of unreeling	17, 18, 19, 24 and 25
$P_3$	Pitch between the centre of a cavity on the same line with the origin point of round sprocket hole and the centre of the second next cavity in direction of unreeling	3 and 6
$P_4$	Pitch between the centre of a cavity on the same line with the origin point of round sprocket hole and the centre of the third next cavity in direction of unreeling	3 and 6
$S$	Sprocket hole pitch in direction of width	14
$R$	Bending radius of carrier tape	21
$r$	Curvature radius of reel hole key's groove	27
$T$	Carrier tape thickness without cover tape	2, 5, 8, 11, 14, 17, 25 and A.1
$T_1$	Top cover tape thickness	2, 5, 8, 11 and 14
$T_2$	Sum of outer cavity height and top cover tape thickness	8, 11 and 14
$T_3$	Thickenss of pressed carrier tape including bulge	5 and A.1
$T_4$	Bottom cover tape thickness or Adhesive tape thickness	2 and 17
$V_1$	Compartment dimension in direcion of unreeling	17 and 18
$V_2$	Compartment dimension in direction of width	17 and 18
$W$	Carrier tape width	2, 5, 8, 11, 14 and 17
$W_P$	Distance between adhesive tapes	17
$W_1$	Reel inner width (measured at hub)	26
$W_2$	Reel overall width	26
$W_3$	Reel inner width in the rim	26
$Z$	Component thickness	25