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Explanation for NWIP as Technical Specification (TS)

The TC 40 Japanese National Committee has proposed NWIP as Technical Specification.

Draft TS IEC 60286-X: Packaging of components for automatic handling - Part X: Reusable and/or recyclable plastic reels for tape packaging of components

Reducing environmental impact is an important subject for industries in view of obligation to the society and/or compliance to legislative regulations, and many action plans for the environment protection have been positively studied and implemented into our business activities. Especially, industrial waste management and reduction requirement became very severe and activities aiming at ZERO EMISSION demand us to take more effective actions.

Packaging materials such as reels and tapes which have been handled by TC 40/WG36 are mostly treated as industrial wastes after being used at assembly manufacturers. In order not to treat them as industrial wastes, technical requirements for reuse and/or recycling shall also be discussed and decided for free circulation of reusable reels in industry.

For reducing environmental impact by reuse and/or recycling, the following factors shall carefully be considered:

- energy consumption in the process, collection, transportation, selection, cleaning, treatment, pelletizing and remolding shall be as small as possible;
- packaging materials shall be reusable and/or recyclable;
- material marking for identification;
- configurations and dimensions suitable for any taping machines at component manufacturers and automatic mounting machines at assembly manufacturers.

Most appropriate way for reducing environmental impact means less energy consumption and material wastes in the total process. In view of this, reuse of packaging materials as they are would be the most suitable procedure. To achieve this objective, it will be essential to have an additional standard specifying detail configurations and dimensions exclusively for reuse because the dimensional specifications in max. and min. in the existing IEC standards allow many different types of reels which are unable to circulate freely for reuse. In Japan, a standard for reusable reels, 'ET-7200A, Reusable reels for tape packaging of electronic components and semiconductor device packages', has been issued based on the actual demands and past experiences of reuse, and such reels have been circulated and reused in the market.

The Japanese national committee would like to propose the subject standard by submitting a Technical Specification as a first step, on assumption that the same demands of reuse and circulation would become a global requirement in the future. As the proposal basically comply with the existing IEC standards (within max. and min. specifications), it can be applied as an option only for reuse purpose.

The term REUSE in the proposal has the following definition:

Usage of used reels as they are without reforming and for the same purpose.

The reusable reels will be used by any part manufacturers and the reels with components will be delivered to any assembly manufacturers. The used reels without components will be collected and reused by any part manufacturers after necessary treatments such as cleaning and inspection and then the reused reels with components will be delivered again to any assembly manufacturers. This will be repeated until the end of life.

"This document is being issued in the Technical Specification series of publications (according to subclause G.3.2.2 of part 1 of the ISO/IEC Directives) as a "Prospective standard for provisional application" in the field of Packaging of components for automatic handling because there is an urgent need for guidance on how standards in this field should be used to meet an identified need.

This document is not to be regarded as an "International Standard". It is proposed for provisional application so that information and experience of its use in practice may be gathered. Comments on the content of this document should be sent to the ...[ISO Central Secretariat or IEC Central Office]...

A review of this Technical Specification will be carried out not later than three years after its publication with the options of: extension for another three years; conversion into an International Standard; or withdrawal."

Draft TS IEC 60286-X: Packaging of components for automatic handling - Part X: Reusable and/or recyclable plastic reels for tape packaging of components

1 General

1.1 Scope

The object of this Technical Specification is to give specific technical requirements for re-usable and/or recyclable plastic reels for the purpose of environmental protection. It contains only the technical specifications of plastic reels for which re-use and/or recycling have been practically carried out.

Plastic reels which comply with the technical requirements in this TS also comply with the technical requirements in the following standards. Thus, this TS can be applied to the plastic reels as an option exclusively for re-use purpose.

IEC 60286-1: 1997, *Packaging of components for automatic handling - Part 1: Tape packaging of components with axial leads on continuous tapes*

IEC 60286-2: 1997, *Packaging of components for automatic handling - Part 2: Tape packaging of components with unidirectional leads on continuous tapes*

IEC 60286-3: 1997, *Packaging of components for automatic handling - Part 3: Packaging of surface mount components on continuous tapes*

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this Technical Specification. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this Technical Specification are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60093: 1980, *Method of test for volume resistivity and surface resistivity of solid electrical insulating materials*

ISO 11469: 1993, *Plastics Generic identification and marking of plastic products*

ISO 1043-1: 1997, *Plastics Symbols and abbreviated terms - Part 1: Basic polymers and their special characteristics*

2 Definitions

The following definitions shall apply for the purposes of this TS.

2.1

re-use

usage of plastic reels in the same shape without reforming and for the same purpose

2.2 recycling

usage of plastic materials of used reels which are unable to reuse due to damages or other reasons. The used reels are collected and pelletized, and remoulded for the same purpose

3 Dimensions

3.1 Type 1 (Plastic reels of 180 mm diameter for tape width of 8 mm and 12 mm)

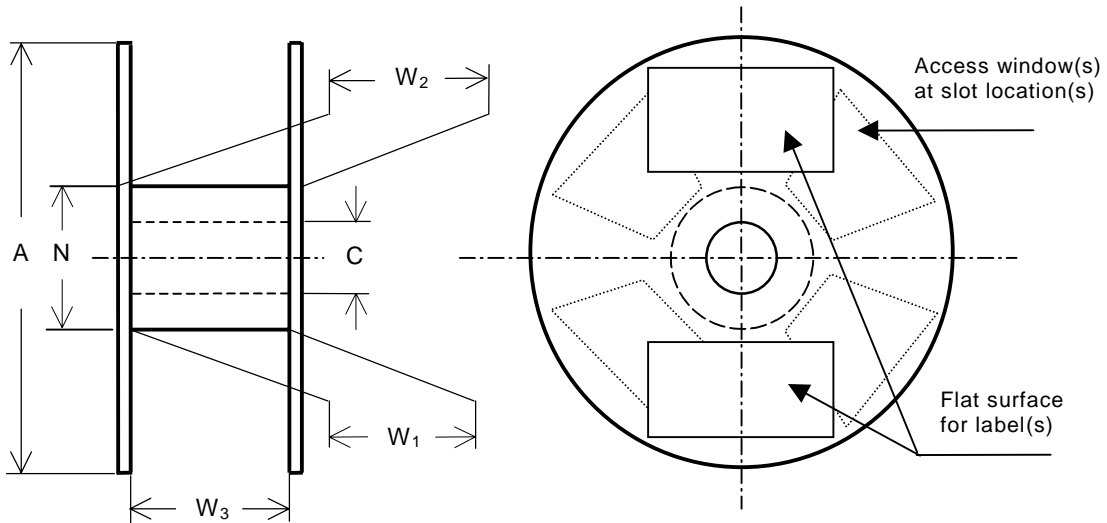


Figure 1 - Example of plastic reels of 180 mm diameter

3.1.1 Reel dimensions related to tape (see figure 1 and table 1)

The sketches in figure 1 are not intended to govern design of reels.

Table 1 - Dimensions type 1

Tape width W mm	Reel diameter A mm	Hub diameter N mm	Reel inner width W ₁ mm*	Reel overall width W ₂ mm**
8	180 - 1,5	60 $\begin{smallmatrix} +1,0 \\ 0 \end{smallmatrix}$	9,0 $\begin{smallmatrix} +1,0 \\ 0 \end{smallmatrix}$	11,4 ± 1,0 13,0 ± 1,0
12	180 - 1,5	60 $\begin{smallmatrix} +1,0 \\ 0 \end{smallmatrix}$	13,0 $\begin{smallmatrix} +1,0 \\ 0 \end{smallmatrix}$	15,4 ± 1,0 17,0 ± 1,0
* Measured at the hub.				
** Two different values of W ₂ shown in table 1 are in existence in the market place, but no interchangeability can be guaranteed.				

3.1.2 Reel inner width W₃

The distance W₃ includes flange distortion at the outer edge of the flanges, and shall accommodate tape width without interference.

3.2 Type 2 (Plastic reels of 254 mm diameter for tape width of 16 mm, 24 mm, 32 mm and 44 mm)

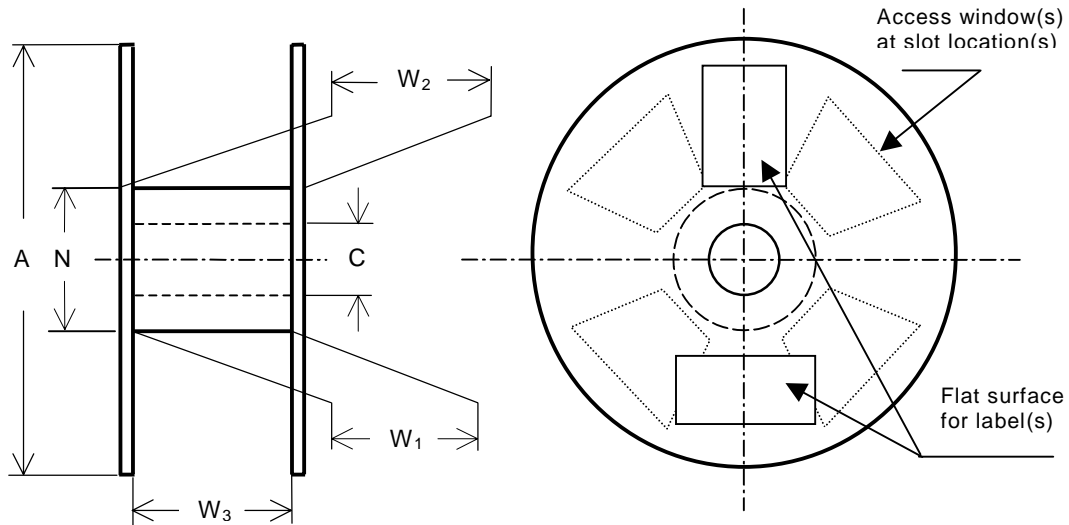


Figure 2 – Plastic reels of 254 mm diameter

3.2.1 Reel dimensions related to tape (see figure 2 and table 2)

The sketches in figure 2 are not intended to govern design of reels.

Table 2 - Dimensions type 2

Tape width W mm	Reel diameter A mm	Hub diameter N mm*	Reel inner width W ₁ mm*	Reel overall width W ₂ mm
16	254 ± 2,0	100 ± 1,0	17,4 ± 1,0	21,4 ± 1,0
24	254 ± 2,0	100 ± 1,0	25,4 ± 1,0	29,4 ± 1,0
32	254 ± 2,0	100 ± 1,0	33,4 ± 1,0	37,4 ± 1,0
44	254 ± 2,0	100 ± 1,0	45,4 ± 1,0	49,4 ± 1,0

* Measured at the hub

3.2.2 Reel inner width W₃

The distance W₃ includes flange distortion at the outer edge of the flanges, and shall accommodate tape width without interference.

3.3 Type 3 (Plastic reels of 330 mm diameter for tape width of 8 mm, 12 mm, 16 mm, 24 mm, 32 mm, 44 mm and 56 mm)

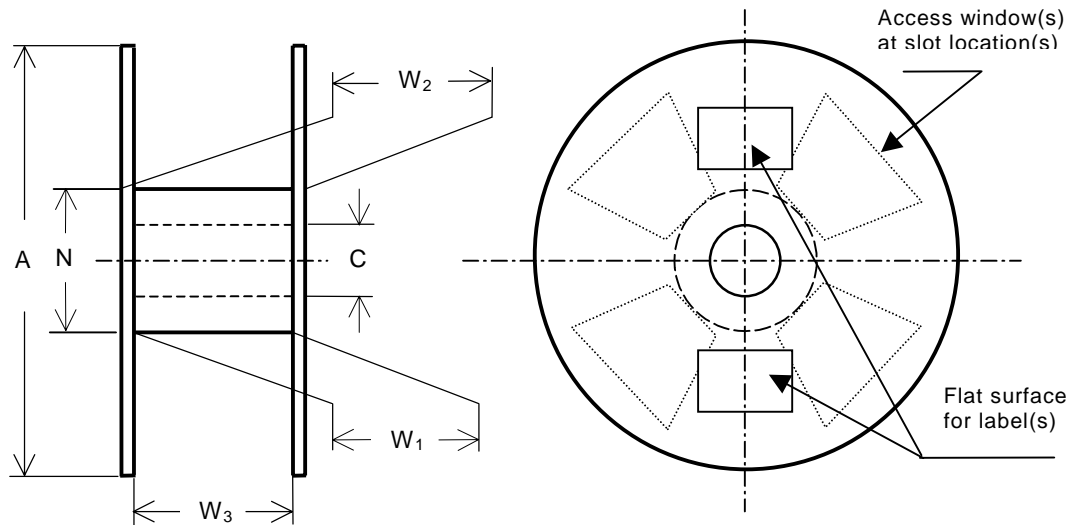


Figure 3 - Plastic reel of 330 mm diameter

3.3.1 Reel dimensions related to tape (see figure 3 and table 3)

The sketches in figure 3 are not intended to govern design of reels.

Table 3 - Dimensions type 3

Tape width W mm	Reel diameter A mm	Hub diameter N mm*	Reel inner width W ₁ mm**	Reel overall width W ₂ mm
8	330 ± 2,0	80 ± 1,0 100 ± 1,0	9,4 ± 1,0	13,4 ± 1,0
12	330 ± 2,0	80 ± 1,0 100 ± 1,0	13,4 ± 1,0	17,4 ± 1,0
16	330 ± 2,0	80 ± 1,0 100 ± 1,0	17,4 ± 1,0	21,4 ± 1,0
24	330 ± 2,0	80 ± 1,0 100 ± 1,0	25,4 ± 1,0	29,4 ± 1,0
32	330 ± 2,0	80 ± 1,0 100 ± 1,0 150 ± 1,0	33,4 ± 1,0	37,4 ± 1,0
44	330 ± 2,0	80 ± 1,0 100 ± 1,0 150 ± 1,0	45,4 ± 1,0	49,4 ± 1,0
56	330 ± 2,0	150 ± 1,0	57,4 ± 1,0	61,4 ± 1,0

- * Three different values of N shown in table 3 are in existence in the market place. Those values are determined in consideration of minimum bending radius described in clause 4.8 of IEC 60286-3, except for the hub diameter of 80 mm for tape width 32 mm and 44 mm. Market trend is towards a larger reel diameter with a smaller hub diameter.
- ** Measured at the hub.

3.3.2 Reel inner width W_3

The distance W_3 includes flange distortion at the outer edge of the flanges, and shall accommodate tape width without interference.

3.4 Type 4 (Plastic reels of 380 mm diameter for tape width of 8 mm, 12 mm, 16 mm, 24 mm, 32 mm and 44 mm)

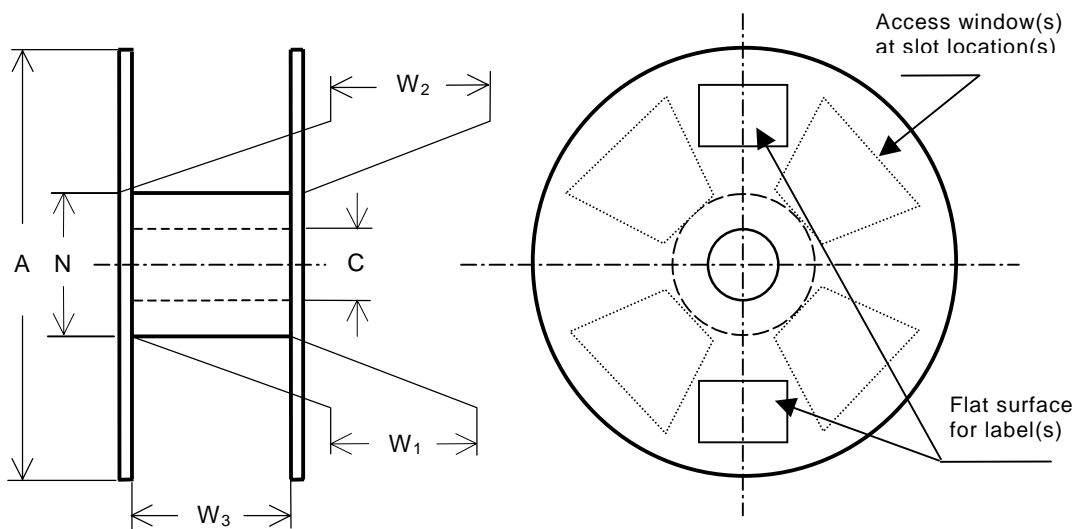


Figure 4 - Plastic reels of 380 mm diameter

3.4.1 Reel dimensions related to tape (see figure 4 and table 4)

The sketches in figure 4 are not intended to govern design of reels.

Table 4 - Dimensions type 4

Tape width W mm	Reel diameter A mm	Hub diameter N mm*	Reel inner width W ₁ mm**	Reel overall width W ₂ mm
8	380 ± 2,0	80 ± 1,0 100 ± 1,0	9,4 ± 1,0	13,4 ± 1,0
12	380 ± 2,0	80 ± 1,0 100 ± 1,0	13,4 ± 1,0	17,4 ± 1,0
16	380 ± 2,0	80 ± 1,0 100 ± 1,0	17,4 ± 1,0	21,4 ± 1,0
24	380 ± 2,0	80 ± 1,0 100 ± 1,0	25,4 ± 1,0	29,4 ± 1,0
32	380 ± 2,0	80 ± 1,0 100 ± 1,0	33,4 ± 1,0	37,4 ± 1,0
44	380 ± 2,0	80 ± 1,0 100 ± 1,0	45,4 ± 1,0	49,4 ± 1,0
<p>* Two different values of N shown in table 4 are in existence in the market place. Those values are determined in consideration of minimum bending radius described in clause 4.8 of IEC 60286-3, except for the hub diameter of 80 mm for tape width 32 mm and 44 mm. Market trend is towards a large reel diameter with a smaller hub diameter.</p> <p>** Measured at the hub.</p>				

3.4.2 Reel inner width W₃

The distance W₃ includes flange distortion at the outer edge of the flanges, and shall accommodate tape width without interference.

3.5 Reel hole

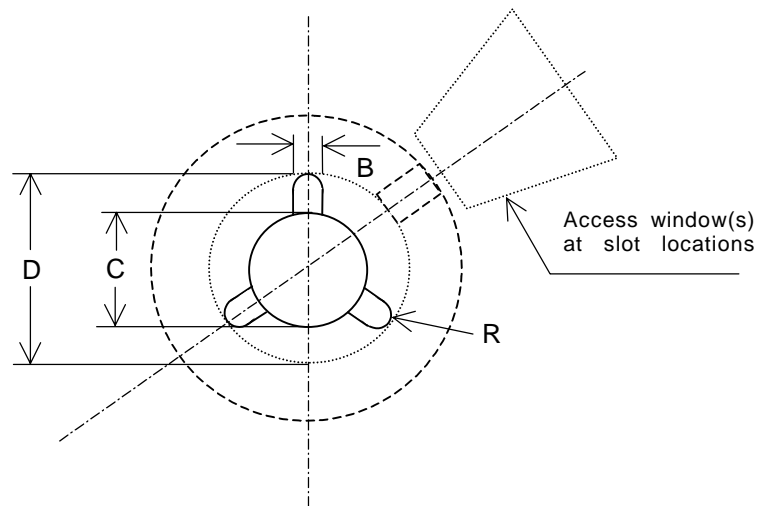


Figure 5 - Reel hole presentation

Table 5 - Dimensions

Dimensions mm	
B	$2,0 \pm 0,5$
D	$21,0 \pm 0,8$
C	$13,0 \pm 0,2$
R	1,0

3.6 Tape slot and access window

One or more adequate tape slot(s) at the hub of the reel shall be provided for the trailer. The depth of the slot(s) shall be 18 mm minimum to hold the trailer in position. There shall also be one or more corresponding access window(s). The dimensions of the access window(s) may be as large as possible to reduce plastic material consumption for a reel on condition that the flanges are constructed to comply with the mechanical strength requirements prescribed in table 6.

4 Material

The reel shall be made of recyclable polystyrene without colorant or recycled material of the same. In case of reels with conductive characteristics, carbon material can be added.

NOTE Recyclable plastic material of polystyrene is widely used in the market place. It is known as the most preferable material in characteristics, availability and recyclability.

5 Marking

5.1 Material identification

The reel shall be permanently marked with a recycling symbol and a material identification marking in accordance with ISO 1043-1 and ISO 11469.

5.2 Space for labels

The reel shall provide flat and smooth surfaces for labels in at least two different places on the outside of the flange opposite the round sprocket holes of tapes. The preferred dimensions of each space shall be 105 mm minimum × 50 mm minimum.

5.3 Type designation

The type designation showing reel types, reel diameter, tape width and hub diameter may be marked to identify specific type of the reel for easy handling. The marking shall be placed on the outside of the space for labels.

5.4 Other information

Further information such as manufacturer's identification and date code may also be marked.

6 Characteristics

The reel shall comply with the characteristic requirements specified in table 6 and shall be so constructed to have adequate strength for repeated usage including transportation, storage, collection, cleaning, treatment etc.

Table 6 – Characteristic requirements

No	Item	Requirements	Test method
1	Surface resistivity	10 ⁹ ohms/square or less (Applicable to only reels with carbon material)	IEC 60093 (material) *
2	Fracture strength of weld line	30 N or more	See Annex A
3	Flexibility of flanges	Pull force of 2,0 N or more	See Annex B
4	Drop test	There shall be no significant damages such as cracking which deteriorate basic functions of reel	Height: 1 m Direction: one time each in vertical and horizontal direction. Test floor: concrete
5	Storage test at high temperature	There shall be no dimensional changes exceeding the specified requirements and no visible damages	Expose to 50 ± 2 °C for 24 hours, then leave at room temperature for 3 hours.
6	Storage test at low temperature	There shall be no dimensional changes exceeding the specified requirements and no visible damages	Expose to -25 ± 2 °C for 24 hours, then leave at room temperature for 3 hours and conduct drop test specified in item 4.
7	Fixing strength	30 N or more	See Annex C
8	Mechanical strength of arbor hole	There shall be no significant damages such as cracks warping, distortion and other visible changes	Secure the reel to the shaft with vanes shown below and hold the reel, then apply 2 Nm of torque to the shaft.
* Test method for packaging products is under consideration in TC 101, document 101/42/NP.			

Annex A (normative)

Test methods for fracture strength of weld line

The objective of this annex A is to specify a practical example of test method for fracture strength of weld line which may appear at the rim of flanges depending on the configuration of injection mould reels. The weld line is mechanically deemed to be the weakest part of the flange, and the fracture strength is an important characteristic for reuse and handling of injection mould reels.

A.1 Fracture strength test

A.1.1 Test specimens

Reels for the test shall be selected at randomly from production. The reels shall be kept at room temperature for 24 hours or more after moulding, and then subjected to the test.

A.1.2 Test environment

- temperature : 15 °C to 35 °C;
- relative humidity : 25 % to 75 %.

A.1.3 Test set-up

See figure A.1.

A.1.4 Test procedure

The test shall be carried out in accordance with the following procedure:

- position the weld line at the center of opening of the fixing board and hold reel firmly in place by hand;
- place the hook of the push-pull gauge around the weld line;
- pull the push-pull gauge perpendicularly at the speed of 3 cm/s to 4 cm/s, and read the pull force when the weld line breaks.

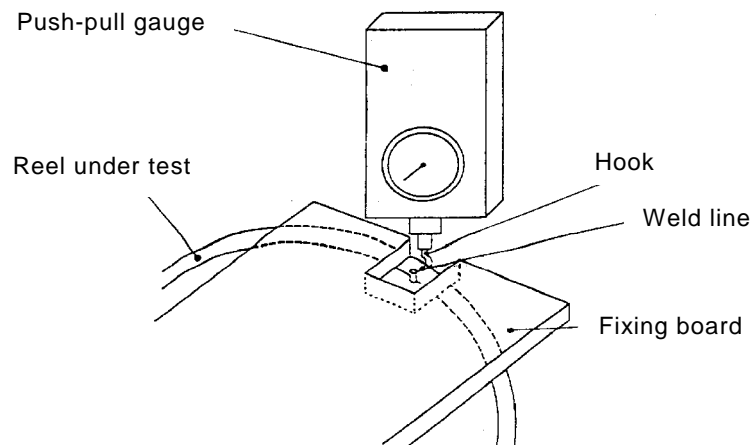


Figure A.1 - Test set-up for fracture strength

Annex B (normative)

Test method for flexibility of flanges

The objective of this annex B is to specify a practical example of test method for flexibility of flanges. The flexibility is one of the factors showing durability and is important to determine the thickness and configuration of the flange of reel for the purpose of reuse.

B.1 Flexibility test

B.1.1 Test specimens

Reels for the test shall be selected at randomly from production. The reels shall be kept at room temperature for 24 hours or more after moulding, and then subjected to the test.

B.1.2 Test environment

- temperature : 15 °C to 35 °C;
- relative humidity : 25 % to 75 %.

B.1.3 Test set-up

See figure B.1.

B.1.4 Test procedure

The test shall be carried out in accordance with the following procedure:

- place a reel to be tested on the flat plane, then position the fixing board on a center line of the reel at right angle to a rib as illustrated in figure B.1 and hold the reel in place by hand;
- place the hook of the push-pull gauge at the outer edge of the flange;
- pull the push-pull gauge perpendicularly at the speed of 2 cm/s to 3 cm/s, and read the pull force when the flange warps by 20 mm.

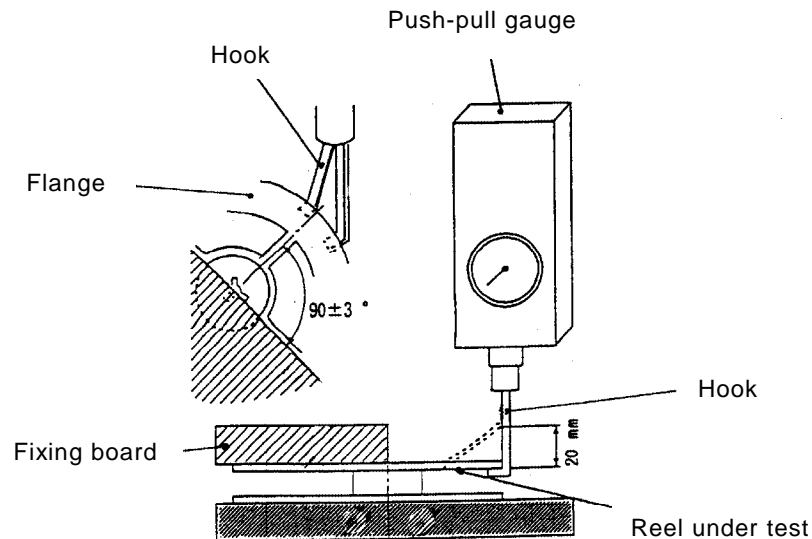


Figure B.1 - Test set-up for flexibility test

Annex C (normative)

Test method for fixing strength

The objective of this annex C is to specify a practical example of test method for fixing strength of reels which are constructed to be assembled by welding or other means. Those types of reels consist of more than one piece of parts for assembly, and the fixing strength is an important characteristic for reuse considering excessive shock and vibration applied during transportation and repeated usage.

C.1 Fixing strength test

C.1.1 Test specimens

Reels for the test shall be selected at randomly from production. The reels shall be kept at room temperature for 24 hours or more after moulding and assembly, and then subjected to the test.

C.1.2 Test environment

- temperature : 15 °C to 35 °C;
- relative humidity : 25 % to 75 %.

C.1.3 Test set-up

See figure C.1

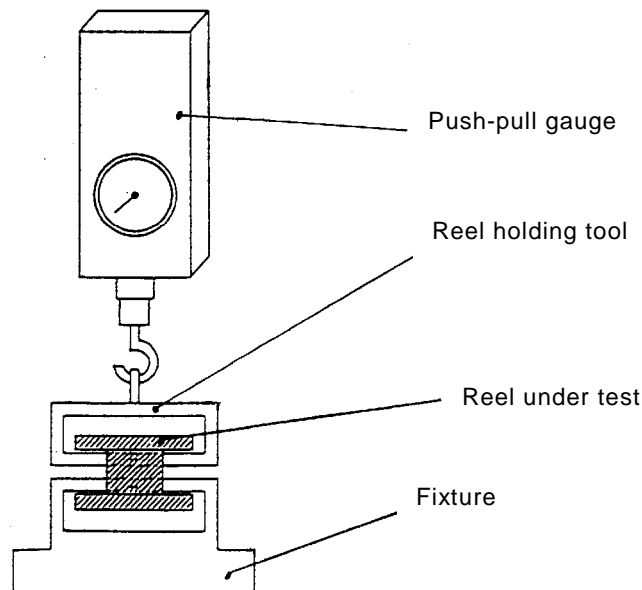


Figure C.1 - Test set-up for fracture strength

C.1.4 Test procedure

The test shall be carried out in accordance with the following procedure:

- mount flange of the reel under test on the fixture;
 - install the holding tool on the upper flange;
 - place the hook of the push-pull gauge on the reel holding tool;
 - pull the push-pull gauge perpendicularly at the speed of 3 cm/s to 4 cm/s and read the pull force when the reel disassembles. The test can be terminated if the reel withstands the pull force of 30 N for 10 s without disassembly.
-