SLOVENSKI STANDARD
oSIST prEN ISO 4180:2019

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Embalaža - Celovita, napolnjena transportna embalaža - Splošna pravila za pripravo programov preskušanja primernosti za uporabo (ISO/DIS 4180:2019)

Packaging - Complete, filled transport packages - General rules for the compilation of performance test schedules (ISO/DIS 4180:2019)

Emballages - Emballages d'expédition complets et pleins - Règles générales pour l'établissement de programmes d'essais de performance (ISO/DIS 4180:2019)

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Packaging — Complete, filled transport packages — General rules for the compilation of performance test schedules

Emballages — Emballages d'expédition complets et pleins — Règles générales pour l'établissement de programmes d'essais de performance

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 122, *Packaging*, Subcommittee SC 3, *Performance requirements and tests for means of packaging, packages and unit loads (as required by ISO/TC 122)*.

This second edition cancels and replaces the first edition (ISO 4180:2009) which has been technically revised. The first edition of ISO 4180:2009 cancelled and replaced ISO 4180-1:1980 and ISO 4180-2:1980.

Packaging — Complete, filled transport packages — General rules for the compilation of performance test schedules

1 Scope

This International Standard establishes general rules for the compilation of performance test schedules for complete, filled transport packages intended for use within any distribution system except for the packages used for dangerous goods.

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.

EN 14149, *Packaging — Complete, filled transport packages and unit loads — Impact test by rotational drop*

ISO 2206, *Packaging — Complete, filled transport packages — Identification of parts when testing*

ISO 2233, *Packaging — Complete, filled transport packages and unit loads — Conditioning for testing*

ISO 2234, *Packaging — Complete, filled transport packages and unit loads — Stacking tests using a static load*

ISO 2244, *Packaging — Complete, filled transport packages and unit loads — Horizontal impact tests*

ISO 2247, *Packaging — Complete, filled transport packages and unit loads — Vibration tests at fixed low frequency*

ISO 2248, *Packaging — Complete, filled transport packages — Vertical impact test by dropping*

ISO 2873, *Packaging — Complete, filled transport packages and unit loads — Low pressure test*

ISO 2875, *Packaging — Complete, filled transport packages and unit loads — Water-spray test*

ISO 2876, *Packaging — Complete, filled transport packages — Rolling test*

ISO 8318, *Packaging — Complete, filled transport packages and unit loads — Sinusoidal vibration tests using a variable frequency*

ISO 8768, *Packaging — Complete, filled transport packages — Toppling test*

ISO 10531, *Packaging — Complete, filled transport packages — Stability testing of unit loads*

ISO 12048, *Packaging — Complete, filled transport packages — Compression and stacking tests using a compression tester*

ISO 13355:2016, *Packaging — Complete, filled transport packages and unit loads — Vertical random vibration test*

ISO 21067-1, *Packaging — Vocabulary — Part 1: General terms*

IEC 60068-1:2013, *Environmental testing — Part 1: General and guidance*

IEC 60068-2-64, *Environmental testing — Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance*

IEC 20068-3-8, *Environmental testing — Part 3-8: Supporting documentation and guidance — Selecting amongst vibration tests*

3 Terms and definitions

General terms and definitions are found in ISO 21067. The following terms and definitions apply specific to this document.

3.1
performance test schedule
single laboratory test, or series of tests, intended to ascertain the performance, under working conditions, of the subject under test

3.2
hazard
factor which brings a possibility of damage or deterioration of the value to the packaged freight or product

3.3
power spectral density (acceleration power spectral density
PSD
degree of variation in energy for each frequency to the acceleration signal in a specific frequency range as a function of frequency. Refer to IEC 60068-2-64, 3-8

4 Hazard

Typical hazards in the logistics process, and the related international testing standards, are shown in Table 1.

Table 1 — Expected hazard during logistics process, and related international testing standards

Basic factor in logistics	Hazard	Related international standards	
Transport	— Vibration during transportation — Repetitive impact by flip-up	Vertical random vibration test	ISO 13355
		Sinusoidal vibration tests using a variable frequency	ISO 8318
		Vibration tests at fixed low frequency	ISO 2247
	Horizontal impact by sudden stop or start	Horizontal impact test	ISO 2244
	Horizontal impact by linking work of railway freight car		
	Variable compression test for stacking during transportation	Random vibration test	ISO 13355
		Sinusoidal vibration tests using a variable frequency	ISO 8318
	Low pressure by high altitude	Low pressure test	ISO 2873
Handling	Drop impact by human handling	Vertical impact test by dropping	ISO 2248
	Drop impact by machine handling		EN 14149
	Horizontal impact during handling by forklift or crane as such	Horizontal impact test	ISO 2244
	Rough handling by rolling	Rolling test	ISO 2876
	Topple	Toppling test	ISO 8768
	Handling of unit load	Stability testing of unit loads	ISO 10531

Table 1 *(continued)*

Basic factor in logistics	Hazard	Related international standards	
Storage	Compression load in stacking storage in warehouse	Stacking tests using a static load	ISO 2234
		Compression test using a compression tester	ISO 12048
Climate	Temperature and humidity	High temperature test	ISO 2233 IEC 60068-1
		High temperature/High humidity test	
		Low temperature test	
	Wet, dewing	Water-spray test	ISO 2875

5 Preparation of the test schedule

5.1 Test item shall be selected from Table 2 depend on the expected hazard considering logistics related elements which affect to the specimen.

The characteristics of the specimen, test equipment and past damage experience should be considered when select the test item.

Table 3 shows an example of hazards and corresponding test items.

5.2 The test schedule shall be chosen by accumulated or integrated from selected hazard. Follow the Article 6 for the selection of test level.

However, the test level can be modified by the agreement between stakeholders.

Table 4 shows example of performance test schedule.

5.3 There is no predetermined test sequence. If the user does not have specific information about the distribution cycle and corresponding hazards on its package, refer to Table 4 for the example of test order. Each test method may also be performed individually when necessary.

5.4 The test level based on the actual measurement data shall be prior if available.

5.5 Refer to ISO 10531 for handling and stability test of the unit load.

Table 2 — Selection guide for test item and test level

	Symbol	Test item	Guide for selection of test		Test methods
			Type of hazard	Examples of the product	
Transport	A1	Vertical random vibration test in general transportation	Vertical vibration or stacking load in general transportation [A]	— Electric, electronics or mechanical products — High precision surfaced products — Powder or granular products	6.4.2
	A2	Sinusoidal vibration test in general transportation			6.4.3
	A3	Random vibration test in rough road transportation	Repetitive shock by poor road		6.4.4
	A4	Sinusoidal vibration test in rough road transportation			6.4.5
	A5	Vibration tests at fixed low frequency			ISO 2247
	A6	Stacked vibration test	Variable compression by vibration during transportation		6.4.6
Handling	B1	Free-fall test	Human handling	— Electronic component or product which has mechanical structure — Liquid or semi-liquid product — Liquid, semi-liquid, powder or granular products which are weak to sharp item — Pressure sensitive product, powder or granular products	6.5.2
	B2	Rotational drop test	Machinery handling		6.5.3
	B3	Horizontal impact test	Horizontal impact during handling or transportation		6.5.4
	Toppling test		Toppling during handling		ISO 8768
	Rolling test		Rough handling by rolling		ISO 2786
Storage	C	Compression test	Stacking pressure in warehouse	Container for warehouse storage and products	6.6
Climate	D1	Temperature and humidity environmental test	High temperature with low humidity	Deformation or cracking by the high temperature	6.7
			High temperature/High humidity	— Sensitive to corrosion — Hygroscopic product — Mold, spoil, degrade	6.7
			Low temperature	Degradation by contraction or embrittlement	6.7
	D2	Low pressure test	Low pressure	— Failure, deformation — Leak of the contents	6.8
	Water spray test		Rain	Wet damage	ISO 2875[B]

[A] Random vibration has priority.

[B] Test condition may be specified by the agreement of stakeholders.

Table 3 — Example of hazards and corresponding test items

No.	Activity	Hazard	Correspond test item	Selection of test method
1	Unitization at factory	Machine handling	Rotational drop test: B2	6.5.3
2	Container loading by forklift	Machine handling	Rotational drop test: B2	6.5.3
			Horizontal impact test: B3	6.5.4
3	Transport to port	150 km, paved road, by trailer	Vertical random vibration test: A1	6.4.2
4	Storage at port	Maximum stack height: 2,4 m	Compression test: C	6.6
5	Load to container ship	Machine handling	Rotational drop test: B2	6.5.3
			Horizontal impact test: B3	6.5.4
6	Transport by ship	Vibration	Vertical random vibration test: A1	6.4.2
		Maximum stack height: 2,4 m	Compression test: C	6.6
7	Unload from container ship	Machine handling	Rotational drop test: B2	6.5.3
8	Transport container to warehouse	3 000 km, paved road, by trailer	Vertical random vibration test: A1	6.4.2
			Horizontal impact test: B3	6.5.4
9	Storage operation by forklift Storage at warehouse	Machine handling	Rotational drop test: B2	6.5.3
			Horizontal impact test: B3	6.5.4
		Maximum stack height: 5 m	Compression test: C	6.6
		Temperature/Humidity	Temperature and humidity environmental test: D1	6.7
10	De-banning at warehouse Reload to local distribution truck	Man handling	Free-fall test: B1	6.5.2
11	Transport to final destination	Partly unpaved, truck	Random vibration: A1	6.4.2
			Random vibration test in rough road transportation: A3	6.4.4
		Partly air cargo	Low pressure test: D2	6.8
12	Unloading at final destination	Man handling	Free-fall test: B1	6.5.2