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Castors and wheels — Requirements for castors for hospital beds

Roues et roulettes — Exigences pour roulettes pour lits d'hôpitaux

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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.

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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ISO 22882 was prepared by Technical Committee ISO/TC 110, *Industrial trucks*, Subcommittee SC 3, *Castors and wheels*.

Castors and wheels — Requirements for castors for hospital beds

1 Scope

This International Standard specifies the technical requirements, the appropriate dimensions and the requirements for testing of swivel castors for hospital beds with a wheel diameter of 100 mm or more, and which have a central locking device. Swivel castors may be used with the main principal dimensions.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 22877, *Castors and wheels — Vocabulary, symbols and multilingual terminology*

ISO 22878:2004, *Castors and wheels — Test methods and apparatus*

ISO 22881, *Castors and wheels — Requirements for use on manually propelled equipment for institutional applications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22877 apply. Symbols are given in ISO 22878:2004, Annex A.

4 Dimensions and characteristics

4.1 Characteristics

The characteristics of a castor are

— wheel diameter,

— overall height,

— offset,

— fixing system, and

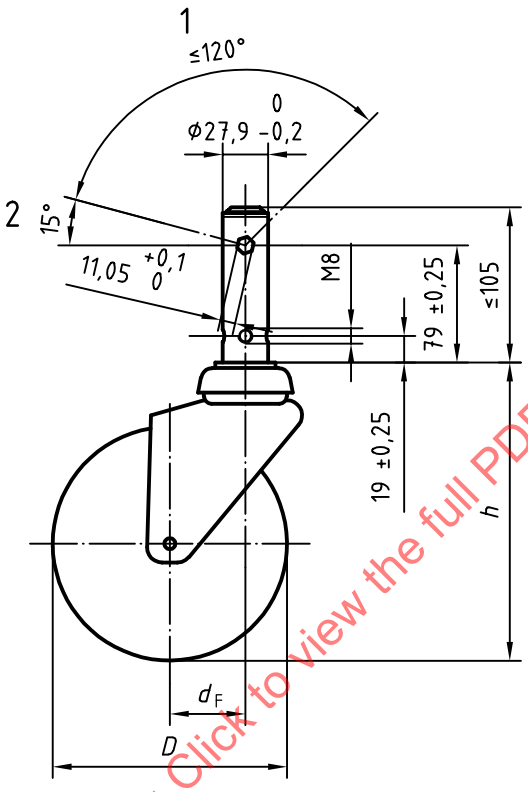
— load capacity.

4.2 Dimensions

The dimensions listed in Table 1 and shown in Figure 1 shall be used.

For dimensions of non-central locking castors used in hospital beds, refer to relevant tables in ISO 22881.

Dimensions in millimetres



Key

1 working angle

2 unlocked position

Figure 1 — Principal dimensions of the central locking fixing system

Table 1

Dimensions in millimetres

Wheel diameter[a] D	Overall height[b] h	Offset[b] d_F
100	150	46
125	175	56
150	200	65
200	250	70
250	300	80

[a] Tolerance ± 1 %.

[b] Maximum.

4.3 Fixing system

The principal dimensions of the fixing system with the central locking are

— stem length,

— stem diameter,

— distance of the threaded hole centre from the stem collar,

— thread size,

— distance of the hexagon hole centre from the stem collar,

— dimension of the hexagon hole, and

— working angle of the hexagon hole.

4.4 Load capacity

This is the maximum load, in newtons, which can be carried by a wheel or a castor so as to fully comply with the required acceptance criteria.

5 Requirements for testing

5.1 General

Test methods and apparatus shall be as specified in ISO 22878.

5.2 Standard conditions

5.2.1 Environmental conditions

Tests shall be carried out at a temperature between 15 °C and 28 °C. During the 24 h prior to the test, the samples shall remain at the specified temperature, in an environment with a relative humidity between 40 % and 70 %.

Samples shall not be artificially cooled during testing.

5.2.2 Test sequence

Tests, where relevant, shall be carried out in the sequence shown in Table 2.

Table 2

Reference in this International Standard	Test sequence	Castor types	Test procedures given in ISO 22878:2004, subclause
5.3	Initial wheel play	All	**4.2**
5.4	Initial swivel play	Swivel castors with or without accessories	**4.3**
5.5	Electrical resistance	Castors antistatic or electrically conductive	**4.4**
5.6	Fatigue test for locking/braking devices	Castors with a central locking/braking device	**4.5**
5.7	Efficiency check of wheel braking and/or locking device	Castors with a central locking/braking device	**4.6**
5.8	Efficiency check of swivel braking and/or locking device	Castors with a central locking/braking device	**4.7**
5.9	Static test	All	**4.9**
5.10	Dynamic test	All	**4.8**
5.11	Efficiency check of wheel braking and/or locking device	Castors with a central locking/braking device	**4.6**
5.12	Efficiency check of swivel braking and/or locking device	Castors with a central locking/braking device	**4.7**
5.13	Final wheel play	All	**4.2**
5.14	Final swivel play	Swivel castors with or without accessories	**4.3**

5.3 Initial wheel play

5.3.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.2.

5.3.2 Acceptance criteria

The measured initial wheel play shall not exceed the value (d_{W1}) given in Table 3.

Table 3

Dimensions in millimetres

Wheel diameter D	Maximum initial wheel play d_{W1}
100	0,50
125	0,62
150	0,75
200	1,00
250	1,25

5.4 Initial swivel play

5.4.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.3.

5.4.2 Acceptance criteria

The measured initial swivel play shall not exceed the value (d_{S1}) given in Table 4.

Table 4

Symbol	Value	Description
d_{S1}	4 mm	maximum initial swivel play

5.5 Electrical resistance test

5.5.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.4.

5.5.2 Test values

The test values shall be as listed in Table 5.

Table 5

Symbol	Value	Description
F_{max}	variable	load capacity
F_{17}	10 % of F_{max}	test load
R	variable	electrical resistance

5.5.3 Tolerances

The tolerances shall be as shown in Table 6.

Table 6

Symbol	Unit	Tolerance	
		Acceptable	Unit
F_{17}	N	$^{+2\ \%}_{0}$	N

5.5.4 Acceptance criteria

The resistance R of the sample tested shall be

— $R \leqslant 10^5\ \Omega$ for conductive castors or wheels, and

— $10^5\ \Omega < R \leqslant 10^7\ \Omega$ for antistatic castors or wheels.

5.6 Fatigue test for locking/braking device

5.6.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.5.

5.6.2 Test values

The test values shall be as listed in Table 7.

Table 7

Symbol	Value	Description
n_E	10 000	number of locking actions
f_E	10 cycles/min	frequency of locking actions
F_3	800 N	test load

5.6.3 Tolerances

The tolerances shall be as shown in Table 8.

Table 8

Symbol	Unit	Tolerance	
		Acceptable	Unit
n_E	—	$^{+1\ \%}_{0}$	—
f_E	cycles/min	$^{0}_{-2}$	cycles/min
F_3	N	$^{+2\ \%}_{0}$	N

5.6.4 Acceptance criteria

There shall be no wear and/or permanent deformation that adversely affects the performance of the sample.

5.7 Efficiency check of wheel braking and/or locking device

5.7.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.6.

5.7.2 Test values

The test values shall be as listed in Table 9.

Table 9

Symbol	Value	Description
F_{max}	variable	load capacity
F_{11}	equal to F_{max}	test load
F_{K1}	40 % of F_{max}	horizontal tractive force

5.7.3 Tolerances

The tolerances shall be as shown in Table 10.

Table 10

Symbol	Unit	Tolerance	
		Acceptable	Unit
F_{11}	N	$^{+2\ \%}_{0}$	N
F_{K1}	N	$^{+4\ \%}_{0}$	N

5.7.4 Acceptance criteria

The wheel shall have no revolving movement around its axis during the second application of the force F_{K1}.

5.8 Efficiency check of swivel braking and/or locking device

5.8.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.7.

5.8.2 Test values

The test values shall be as listed in Table 11.

Table 11

Symbol	Value	Description
F_{max}	variable	load capacity
F_{11}	equal to F_{max}	test load
F_{K2}	40 % of F_{max}	horizontal tractive force

5.8.3 Tolerances

The tolerances shall be as shown in Table 12.

Table 12

Symbol	Unit	Tolerance	
		Acceptable	Unit
F_{11}	N	$^{+2\ \%}_{0}$	N
F_{K2}	N	$^{+4\ \%}_{0}$	N

5.8.4 Acceptance criteria

No swivelling movement shall be detected during the second application of the force F_{K2}.

5.9 Static test

5.9.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.9.

5.9.2 Test values

The test values shall be as listed in Table 13.

Table 13

Symbol	Value	Description
F_{max}	variable	load capacity
y_1	3	load factor
F_6	$F_{max} \times y_1$	test load
t_{y1}	1 h	time of application of the load
t_{y2}	24 h	time elapsed prior to inspection

5.9.3 Tolerances

The tolerances shall be as shown in Table 14.

Table 14

Symbol	Unit	Tolerance	
		Acceptable	Unit
F_6	N	$^{+2\ \%}_{0}$	N
t_{y1}	h	$^{+15}_{0}$	min
t_{y2}	h	± 1	h

5.9.4 Acceptance criteria

There shall be no permanent deformation of the sample that adversely affects its performance.

5.10 Dynamic test

5.10.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.8.

5.10.2 Test values

The test values shall be as listed in Table 15.

Table 15

Symbol	Value	Description
F_{max}	variable	load capacity
v_1	1,1 m/s (4 km/h)	average speed of running period
v_2	1,1 m/s (4 km/h)	speed at impact with obstacles
h_1	height of obstacles for wheels with — tread hardness $\geqslant$ 90 Shore A: 2,5 % of D — tread hardness $<$ 90 Shore A: 5,0 % of D	height of obstacles
d_c	1 m to 3 m	distance between obstacles
n	1 000	number of obstacles
n_{r1}	30 000	number of wheel revolutions
t_{z1}	3 min	running period
t_{z2}	1 min	pause
D	variable	wheel diameter

The actual wheel diameter shall be measured prior to commencement and on completion of the test to establish wear.

5.10.3 Tolerances

The tolerances shall be as shown in Table 16.

Table 16

Symbol	Unit	Tolerance	
		Acceptable	Unit
v_1	m/s	$^{+5\ \%}_{0}$	m/s
v_2	m/s	$^{+5\ \%}_{0}$	m/s
h_1	mm	$^{0}_{-5\ \%}$	mm
n	—	$^{+1\ \%}_{0}$	—
n_{r1}	—	$^{+1\ \%}_{0}$	—
t_{z1}	min	$\pm$ 10	s

5.10.4 Acceptance criteria

There shall be no permanent deformation of the sample that adversely affects its performance. The reduction of the wheel diameter shall not exceed 2 % of the measured diameter at the commencement of the test sequence.

5.11 Efficiency check of wheel braking and/or locking device

Repeat test 5.7.

5.12 Efficiency check of swivel braking and/or locking device

Repeat test 5.8.

5.13 Final wheel play

5.13.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.2.

5.13.2 Acceptance criteria

The wheel wear play shall not exceed the value d_{W2} given in Table 17.

Table 17

Dimensions in millimetres

Wheel diameter D	Maximum wheel wear play d_{W2}
100	0,50
125	0,62
150/160	0,75
200	1,00
250	1,25

5.14 Final swivel play

5.14.1 Test objectives, apparatus and procedures

These shall be as specified in ISO 22878:2004, 4.3.

5.14.2 Acceptance criteria

The swivel wear play shall not exceed the value d_{S2} listed in Table 18.

Table 18

Symbol	Value	Description
d_{S2}	4 mm	maximum swivel wear play

6 Conformity

On request, the manufacturer shall declare by a certificate of conformity that the castors are in accordance with the requirements as stated in this International Standard.

The type of testing machine shall be stated in the conformity document.