INTERNATIONAL STANDARD

ISO 22883

First edition
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Castors and wheels — Requirements for applications up to 1,1 m/s (4 km/h)

Roues et roulettes — Exigences pour des applications jusqu'à 1,1 m/s (4 km/h)

Reference number
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 22883 was prepared by Technical Committee ISO/TC 110, *Industrial trucks*, Subcommittee SC 3, *Castors and wheels*.

This first edition of ISO 22883 cancels and replaces

— ISO 2175:1981, *Industrial wheels for non-powered equipment — Dimensions and nominal load capacities,*

— ISO 2184-1:1972, *Industrial castors — Dimensions of top-plates — Part 1: Oblong top-plates with 4 bolt holes,*

— ISO 3101:1981, *Wheels and castors — Triangular top plates with three fixing holes,*

— ISO 3102:1981, *Wheels and castors for non-powered equipment — Off-set for swivel castors,*

of which it constitutes a technical revision.

Castors and wheels — Requirements for applications up to 1,1 m/s (4 km/h)

1 Scope

This International Standard specifies the technical requirements, the appropriate dimensions and the requirements for testing of castors and wheels (which may include accessories) for manually propelled or power-towed industrial applications up to 1,1 m/s (4 km/h). It is not applicable to castors and wheels for furniture, swivel chairs, equipment for institutional applications, hospital beds or driven applications. Castors for specialized applications may also need to conform to other specific standards.

NOTE Castors and wheels for furniture, swivel chairs, equipment for institutional applications, hospital beds and driven applications are covered respectively by ISO 22879, ISO 22880, ISO 22881, ISO 22882 and ISO 22884.

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*

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 classification

4.1 Characteristics

The characteristics of a castor are

— fixing system,

— offset,

— wheel, and

— load capacity.

4.2 Fixing system

4.2.1 General

The fixing system includes the top plate, solid stem and single bolt fixing.

4.2.2 Top plates

4.2.2.1 General

Top plates are identified by classification, and include triangular top plates with three fixing holes and rectangular top plates with four fixing holes.

4.2.2.2 Types of top plates

4.2.2.2.1 Triangular top plate with three fixing holes

The design of the outer profile is left to the manufacturer, provided that it is inscribed in a square of maximum size $d \times d$ as shown in Figure 1 and indicated in Table 1.

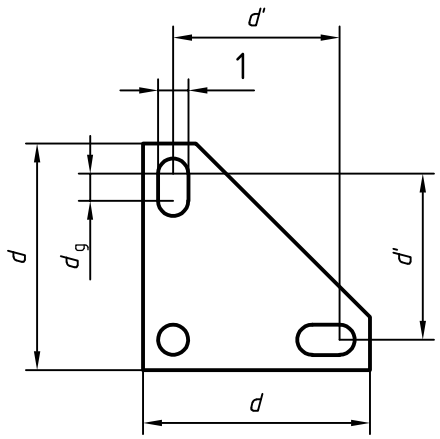
The fixing holes are located at the corners of a triangle inscribed in the outer profile. The holes may be oblong and form slots, provided the width of the slot is suitable for a bolt of diameter (D_{G1}) as in Table 1. Table 1 lists the standardized dimensions of the different classes of top plates, showing for each the corresponding wheel diameter (D) where it is applicable.

4.2.2.2.2 Rectangular top plate with four fixing holes

The design of the outer profile is left to the manufacturer, provided that it is inscribed in a rectangle of maximum size $l \times b$ as shown in Figure 2 and indicated in Table 2.

The fixing holes are located at the corners of a rectangle inscribed in the outer profile. The holes may be oblong and form slots, provided the width of the slot is suitable for bolts of diameter (D_{G1}) as in Table 2.

Table 2 lists the standardized dimensions of the different classes of top plates, showing for each the corresponding wheel diameter (D) where it is applicable.



Key

1 adapted to D_{G1}

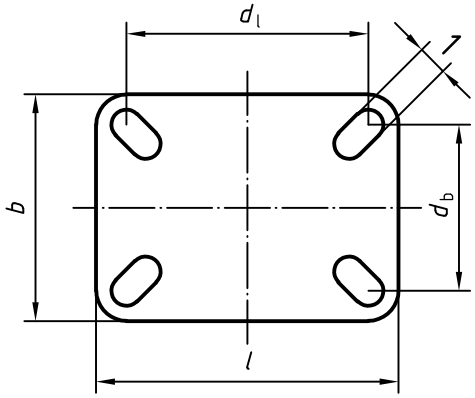
NOTE The symbols $A \times A$ (top plate outer dimensions) and $a \times a$ (bolt hole spacing) may be used in place of the recommended symbols stated above as these are of common use within the trade.

Figure 1 — Triangular top plate

Table 1

Dimensions in millimetres

Class	Top plate outer dimensions $d \times d$	Bolt hole spacing $d' \times d'$	Fixing bolt diameter D_{G1}	Distance of slotted bolt hole centres d_g	Corresponding wheel diameter D
T41	75 × 75	55	6	⩾ 5	50 63 75/80 100
T42	115 × 115	80	8	⩾ 11	50 63 75/80 100 125
T43	145 × 145	105	8	⩾ 11	63 75/80 100 125 150/160 200
T44	145 × 145	105	10	⩾ 9	63 75/80 100 125 150/160 200
T45	175 × 175	140	10	⩾ 17	125 150/160 200 250 300
T46	175 × 175	140	12	⩾ 14	125 150/160 200 250 300



Key

1 adapted D_{G1}

NOTE The symbols $A \times B$ (top plate outer dimensions) and $a \times b$ bolt hole spacing) may be used in place of the recommended symbols stated above as these are of common use within the trade.

Figure 2 — Platines rectangulaires

Table 2

Dimensions in millimetres

Class	Top plate outer dimensions $l \times b$	Bolt hole spacing $d_l \times d_b$	Fixing bolt diameter D_{G1}	Corresponding wheel diameter D
R41	75 × 60	55 × 40	6	50 63
R42	115 × 85	80 × 60	8	50 63 75/80 100 125 150/160
R43	145 × 110	105 × 80	10 ou 12	75/80 100 125 150/160 200 250
R44	175 × 140	140 × 105	10 ou 12	125 150/160 200 250 300
R45	200 × 160	160 × 120	12 ou 14	200 250 300 350 400
R46	255 × 205	210 × 160	14 ou 16	200 250 300 350 400 500

4.2.3 Solid stem

Table 3 specifies the solid stem diameters corresponding to the wheel diameter. The length of the solid stem shall be at least 1,5 times its diameter.

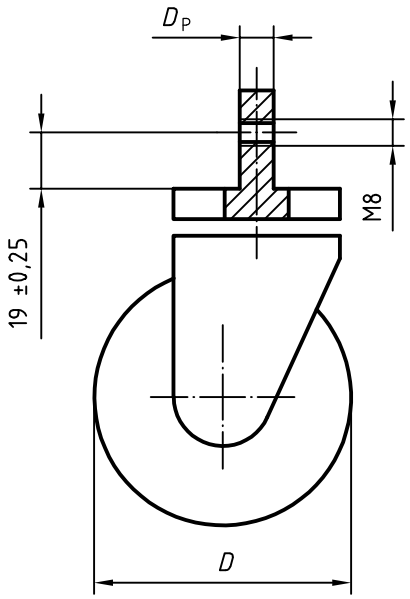
In those cases where the solid stem is supplied with a cross hole for fixing to a tubular structure, the axis of such a hole shall be at a $(19 \pm 0{,}25)$ mm (distance measured from the collar of the stem) threaded to M8 [as in Figure 3 a)] or bored to $8\ ^{+0,3}_{0}$ mm [as in Figure 3 b)].

Table 3

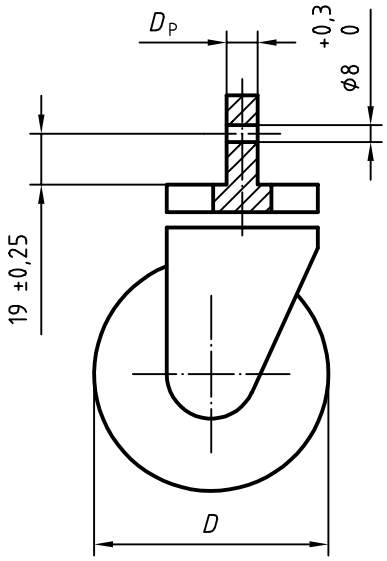
Dimensions in millimetres

Wheel diameter	**Stem dimensions**	
	Diameter	Tolerance
D	D_P	
50	20	$^{0}_{-0,3}$
	22	
63	20	
	22	
75/80	20	
	22	
100	20	
	22	
125	22	
	27	
150/160	22	
	27	
200	27	
250	27	
300	27	

Dimensions in millimetres



a) Solid stem castor with threaded fixing hole



b) Solid stem castor with plain fixing hole

Figure 3 — Solid stem castor

4.2.4 Single fixing bolt

Table 4 specifies the single fixing bolt diameters (D_{G2}) corresponding to the wheel diameter (D).

Table 4

Dimensions in millimetres

Wheel diameter D	**Single fixing bolt diameter** D_{G2}
50	8 10
63	8 10
75/80	10 12
100	10 12
125	10 12
150/160	12 16 20
200	12 16 20
250	16 20
300	20

4.3 Offset

Table 5 specifies the minimum and maximum offset values (d_F) for the swivel castors, corresponding to the wheel diameter (D), as shown in Figure 4.

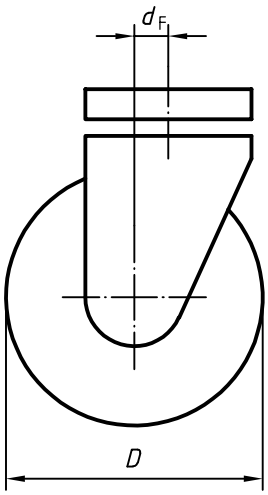


Figure 4 — Offset

Table 5

Dimensions in millimetres

Wheel diameter D	**Offset** d_F	
	Minimum	Maximum
50	10	30
63	12	40
75/80	15	50
100	20	60
125	25	70
150/160	30	85
200	40	100
250	50	115
300	60	130
350	70	140
400	80	150
500	100	170

NOTE For shock absorbing castors, the offset may vary from the dimensions stated.

4.4 Wheels

4.4.1 Characteristics and dimensions

The characteristics of a wheel are

— diameter,

— hub width,

— bore diameter,

— load capacity.

The characteristics of the wheel are illustrated in Figure 5 and the hub width (b_{T1}) and bore diameter (D_d) corresponding to each wheel diameter (D) are listed in Table 6. Wheels are not restricted to these hub widths and bores when used in castors.

The user of a wheel shall verify the mechanical strength of axle components (bolts, nuts, bushes, spacers, etc.).

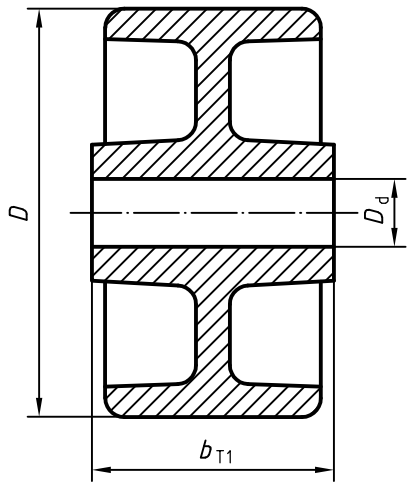


Figure 5 — Wheel dimensions

Table 6

Dimensions in millimetres

Wheel diameter D	Hub width b_{T1}	Bore diameters[a] D_d
50	30	8 10
63	30	8 10
75/80	30	8 10 12 15
	45/50	12 15

Table 6 (*continued*)

Dimensions in millimetres

Wheel diameter D	**Hub width** b_{T1}	**Bore diameters**[a] D_d
100	30	8
		10
		12
		15
	45/50	12
		15
		20
125	45/50	12
		15
		20
	60	20
		25
150/160	45/50	20
		25
	60	20
		25
		30
200	45/50	20
		25
	60	20
		25
		30
	75	20
		25
		30
		35
		40
	90	25
		30
		35
		40
	120	30
		35
		40
		50

Table 6 (*continued*)

Dimensions in millimetres

Wheel diameter D	**Hub width** b_{T1}	**Bore diameters**[a] D_d
250	60	25
		30
	75/90	25
		30
		35
		40
	120	30
		35
		40
		50
300	60	25
		30
		35
	75	25
		30
		35
		40
	90	25
		30
		35
		40
		50
	120	35
		40
		50
350	90	25
		30
		35
		40
		50
	120	35
		40
		50
400	90	25
		30
		35
		40
		50
	120	35
		40
		50

Table 6 (*continued*)

Dimensions in millimetres

Wheel diameter D	Hub width b_{T1}	Bore diameters[a] D_d
500	90	25
		30
		35
		40
		50
	120	35
		40
		50

[a] The bores refer to the nominal diameter of the axle.

4.4.2 Wheel diameter tolerance

The tolerance on wheel diameter (D) shall be $\pm$ 1 %.

4.4.3 Hub width tolerance

The tolerance on hub width (b_{T1}) shall be $^{0}_{-2\ \%}$ with a minimum value of 1 mm.

4.5 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 procedures and apparatus shall be as specified in ISO 22878. For this type of castor and wheel, a static test is not necessary.

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 applicable, shall be carried out in the sequence shown in Table 7.

Table 7

Reference in this International Standard	Test sequence	Castors and wheel types	Test procedures given in ISO 22878:2004, subclause
5.3	Initial wheel play	All castors	**4.2**
5.4	Initial swivel play	Swivel castors with or without accessories	**4.3**
5.5	Electrical resistance	Castors and wheels electrically conductive or antistatic	**4.4**
5.6	Fatigue test for braking and/or locking devices	Castors with — wheel locking/braking device — directional locking device — total locking/braking device — central locking/braking device If the device is operated by means of threaded mechanism, this test is not applicable.	**4.5**
5.7	Efficiency check of wheel braking and/or locking device	Castors with — wheel locking/braking device — total locking/braking device — central locking/braking device	**4.6**
5.8	Efficiency check of swivel braking and/or locking device	Castors with — directional locking/braking device — total locking/braking device — central locking/braking device	**4.7**
5.9	Static test	Test is not required	**4.9**
5.10	Dynamic test	All	**4.8**
5.11	Efficiency check of wheel braking and/or locking device	Castors with — wheel locking/braking device — total locking/braking device — central locking/braking device	**4.6**
5.12	Efficiency check of swivel braking and/or locking device	Castors with — directional locking/braking device — total locking/braking device — 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} shown in Table 8.

Table 8

Symbol	Value	Description
D	variable	wheel diameter
d_{W1}	1 % of D	maximum initial wheel play

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} shown in Table 9.

Table 9

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 10.

Table 10

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 11.

Table 11

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 braking and/or locking 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 12.

Table 12

Symbol	Value	Description
n_E	5 000	number of locking actions
f_E	10 cycles per min	frequency of locking actions
F_{max}	variable	load capacity
F_3	10 % of F_{max}	test load

5.6.3 Tolerances

The tolerances shall be as shown in Table 13.

Table 13

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 14.

Table 14

Symbol	Value	Description
F_{max}	variable	load capacity
F_{11}	equal to F_{max}	test load
F_{K1}	tread hardness $\geqslant$ 90 Shore A: 10 % of F_{max} tread hardness $<$ 90 Shore A: 15 % of F_{max}	horizontal tractive force

5.7.3 Tolerances

The tolerances shall be as shown in Table 15.

Table 15

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

5.7.4 Acceptance criteria

There shall be no revolving movement around the wheel 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 16.

Table 16

Symbol	Value	Description
F_{max}	variable	load capacity
F_{11}	equal to F_{max}	test load
F_{K2}	tread hardness $\geqslant$ 90 Shore A: 10 % of F_{max} tread hardness $<$ 90 Shore A: 15 % of F_{max}	horizontal tractive force

5.8.3 Tolerances

The tolerances shall be as shown in Table 17.

Table 17

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

This test is not required.

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 18.

Table 18

Symbol	Value	Description
F_{max}	variable	load capacity[a]
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	500	number of obstacles
n_{r1}	15 000	number of wheel revolutions
t_{z1}	3 min	running period
t_{z2}	1 min	pause
D	variable	wheel diameter

[a] For load capacities above 10 000 N a simulated load applied mechanically, hydraulically or pneumatically is acceptable provided that it has been previously verified. A real load is preferred.

5.10.3 Tolerances

The tolerances shall be as shown in Table 19.

Table 19

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
t_{z2}	min	$\pm$ 10	s

5.10.4 Acceptance criteria

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

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 20.

Table 20

Symbol	Value	Description
D	variable	wheel diameter
d_{W2}	0,8 % of D	maximum wheel wear play

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} given in Table 21.

Table 21

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 or wheels are in accordance with the requirements as stated in this International Standard.

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

7 Marking of the product

7.1 Product marking

All the products shall be permanently and visibly marked with a name and/or trademark of the manufacturer.

7.2 Marking of electrically conductive or antistatic castors or wheels

All products shall bear on their outer surface a clearly visible mark as follows:

— antistatic: a white mark and, where appropriate and possible, the word “antistatic”;

— conductive: a yellow mark and, where appropriate, and possible the word “conductive”.

Bibliography

[1] ISO 7619-1, *Rubber, vulcanized or thermoplastic — Determination of indentation hardness — Part 1: Durometer method (Shore hardness)*

[2] ISO 7619-2, *Rubber, vulcanized or thermoplastic — Determination of indentation hardness — Part 2: IRHD pocket meter method*

[3] ISO 22879, *Castors and wheels — Requirements for castors for furniture*

[4] ISO 22880, *Castors and wheels — Requirements for castors for swivel chairs*

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

[6] ISO 22882, *Castors and wheels — Requirements for castors for hospital beds*

[7] ISO 22884, *Castors and wheels — Requirements for applications over 1,1 m/s (4 km/h) and up to 4,4 m/s (16 km/h)*

ICS 53.060

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