

UIC Code

**800-01**

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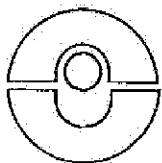
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(with updates)

**Use of certain railway concepts  
taking into account the International  
System of measurement (SI)**

**NUMERISATION DANS  
L'ETAT DU DOCUMENT**



International Union of Railways

**800-01**

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**Leaflet to be classified in Volume :**

VIII - Technical specifications

**Amendments**

1	01-01-78	_____	_____
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3	01-07-89	_____	_____
4	01-07-90	_____	_____
_____	_____	_____	_____
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**Note**

This leaflet forms part of a set which also includes :

- Leaflet 800-00 : Application within the UIC of international units of measurement (SI Units).

**Contents**

- 1 - Introduction
  - 1.1 - General
- 2 - Application
- 3 - Comparison between the descriptions and units used so far and those standardised for the future
- 4 - Standard descriptions, with applicable units and definition

## 1 - Introduction

### 1.1 - General

1.1.1 - This leaflet is intended to facilitate the application of the units of the International System of Units (SI) in relation to certain specifically railway concepts, the application of the units in question in international documents of all kinds being obligatory by virtue of UIC Leaflet 800-00.

1.1.2 - One of the most important modifications arising in relation to the practice followed so far, is due to the fact that the kilogram (kg), in the International System of Units, is defined as a unit of mass, and must therefore no longer be used as a unit of force as was the case in numerous technical documents, the unit of force in the system in question being the newton (N), derived from the basic units.

1.1.3 - In addition, the terminology currently used so far contains certain descriptions which, without being ambiguous, are clearly erroneous (e.g., "Final pressure of a spring", expressed as a unit of force ; a question of force is thus involved, while "pressure" itself is defined as force per surface unit).

1.1.4 - UIC Leaflet 800-00 gives, for various magnitudes, in addition to the units of the International System, recommendations relating to their decimal multiples and sub-multiples, also accepting other units. However, it is advisable for certain specifically railway concepts to make uniform use of well-defined units (for example, for running speed, the "km/h", as a multiple of the SI unit "m/s").

1.1.5 - In order to ensure the uniform application of the desired units, this leaflet shows against each of the technical terms the unit to be applied. To avoid any doubt remaining with regard to the exact meaning of the descriptions included, each one is accompanied by a definition.

1.1.6 - The list of descriptions does not pretend to be complete. However, for certain concepts which are not included, the unit to be applied can, generally speaking, be easily chosen by analogy with the examples shown.

## 2 - Application

2.1 - This leaflet contains two lists, as follows :

- one giving, in alphabetical order, the descriptions currently used so far, together with an indication of their unit, and the description to be used in the future, completed by the unit of the International System to be applied (Section 3) ;
- the other containing, also in alphabetical order, the descriptions to be used in the future, together with the indication of the unit of the International System to be applied and their definition (Section 4).

2.2 - Due to the alphabetical order in which they are shown, the concepts occur differently in the various languages. To enable them to be related to each other in the various languages, the French version of Section 4 contains the numbering followed by the description, the descriptions shown in the English and German versions being accompanied by the respective serial numbers shown in the French version.

2.3 - Ambiguous concepts (weight, load) used so far must either be clarified, limited in their acceptance, or replaced so that no ambiguity remains with regard to the concept of mass or force which they must express, as the case may be.

Therefore :

- in the German version the terms "Gewicht" and "Last" will continue to be used, but only in the sense of a mass as the result of a weighing operation ;
- in the English version the terms "weight" and "load" will continue to be used but only in the sense of a mass as a result of a weighing operation ;
- in the French version the terms "poids" and "charge" will be replaced either by the term "masse" or by the term "effort (or force)" depending on the physical concept in which they are used.

2.4 - In cases where several multiples or sub-multiples of units are indicated for use in the future, it will be necessary to choose the multiple or sub-multiple to be actually used, by observing the ISO 1000 Standard which states :

"The choice of a suitable multiple (decimal multiple or sub-multiple) of an SI unit is governed primarily by the resulting ease of use. For a particular application, the multiple chosen will be that which gives numerical values of a magnitude facilitating their use.

The multiple can usually be chosen so that the numerical value is between 0.1 and 1000.

However, in a table of values concerning the same magnitude, or for the examination of such values in a given context, it may generally be preferable to use the same multiple for all the values, even if the numerical values do not come within the range 0.1 to 1000. In particular applications, for certain magnitudes, the same multiple is usually employed ; for example, the millimetre is used for dimensions in most industrial drawings."

### 3 - Comparison between the descriptions and units used so far and those standardised for the future

OLD DESCRIPTION	OLD UNIT OF MEASUREMENT	STANDARD DESCRIPTION	SI UNIT APPLICABLE	SERIAL NUMBER
1	2	3	4	5
Load(ing) capacity	kg t	Lifting capacity	kg t	1
Flattening load of a spring	kgf - kp tf Mp	Carrying capacity	t	3
Breaking load (of the automatic coupler, of the draw hook, of the coupling screw)	kg - kgf - kp t - tf Mp	Final flattening force of a spring	N daN - kN	8
		Ultimate tractive force (of the automatic coupler, of the draw hook, of the coupling screw)	kN - MN	9

Load of the train:	t	Hauled mass	t	26
Load limit on starting:	t	Lifting mass	t	19
Net load	t	Total loading mass	kg · t	27
Normal load	kgf · kp tf · Mp	Vertical force per axle	kN	10
Axle load	kg · t	Mass per axle	t	21
Load per linear metre (vehicle)	t/m	Mass per length	t/m	24
Load per wheel	kp · Mp · kgf tf	Vertical wheel force	kN	11
Load hauled	kg · t	Mass per wheel	t	23
Total load	t	Mass hauled	t	26
Net load	t	Total mass of the train	t	28
	t	Net mass	t	29

1	2	3	4	5
Counterweight	kg · t	Balancing mass	kg · t	15
Specific flexibility	mm/kgf	Flexibility	mm/daN	12
	mm/kp		mm/kN	
Maximum force	kg · t	Lifting capacity	kg · t	1
		Weighing capacity	kg · t	2
Carrying force	kg · t	Lifting capacity	kg · t	1
		Weighing capacity	kg · t	2
		Carrying capacity	t	3
Load limit	t	Loading limit mass	t	18
Tractive yield point (automatic coupler, draw hook, coupling screw)	kg · kgf · kp t · tf Mp	Yield point tractive test force (of the automatic coupler, of the draw hook, of the coupling screw)	kN · MN	7

Adhesion weight	t	Adhesion mass	t	13
Weight per metre	kg/m	Linear mass	kg/m	20
Brake system changeover weight	t	Brake system changeover mass	t	14
Weight in working order	t	Mass in working order	t	16
Brake-weight	t	Braked mass	t	17
Net weight (6)	t	Total mass of the load	kg · t	27
Weight per axle	kgf · kp tf · Mp	Vertical force per axle	kN	10
	kg · t	Mass per axle	t	21
Weight per linear metre	kg/m	Linear mass	kg/m	20
	t/m	Mass per length	t/m	24

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1	2	3	4	5
Weight per seat	kg	Mass per seat (of the vehicle)	kg	22
Weight per wheel	kgf · kp tf · Mp	Vertical force per wheel	kN	11
	kg · t	Mass per wheel	t	23
Weight per unit of length (of the vehicle)	t/m	Mass per length	t/m	24
Weight per unit of power	kg/ch kg/CV kg/kW (on BR : lb/hp)	Mass per power	kg/kW t/kW	24a
	t/m <sup>3</sup>	Mass per volume	t/m <sup>3</sup>	25
Brake-weight percentage	%	Percentage of braked mass	%	30

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Brake shoe pressure	kgf - kp	Brake shoe (or block) force	N - daN	4
	kgf/cm <sup>2</sup> kp/cm <sup>2</sup>	Brake shoe (or block) pressure	N/mm <sup>2</sup> daN/cm <sup>2</sup>	31
Press fit (or removal) pressure	kg - kgf - kp t - tf - Mp	Press fit (or removal) force	kN - MN	5
	kgf/mm <sup>2</sup> - kp/mm <sup>2</sup> kgf/cm <sup>2</sup> - kp/cm <sup>2</sup> hpz	Oil pressure for hydraulic press fit (or removal)	bar	32
Final pressure of a spring	kgf - kp tf - Mp	Final flattening force of a spring	N - daN kN	8
Governing pressure in a compressed air installation (of vehicle)	kg/cm <sup>2</sup> - kgf/cm <sup>2</sup> kp/cm <sup>2</sup> hpz	Governing pressure in a compressed air installation (of vehicle)	bar	33
Rating per unit of weight	ch/kg CV/kg kW/kg	Mass rating	kW/kg kW/t	34

1	2	3	4	5
Compression strength (of the automatic coupler) (2)	kg - kgf - kp t - tf - Mp	Yield point compression test force (of the automatic coupler)	kN - MN	6
Tractive strength (of the automatic coupler, of the draw hook, of the coupling hook) (1)	kg - kgf - kp t - tf - Mp	Ultimate tractive strength (force) (of the automatic coupler, of the draw hook, of the coupling screw)	kN - MN	9
		Yield point tractive test force (of the automatic coupler, of the draw hook, of the coupling screw)	kN - MN	7
Resistance to forward motion of vehicles	kgf - kp tf - Mp	Resistance to forward motion of vehicle or vehicles	kN	35

Specific resistance of vehicles to forward motion	kg/t kp/t	Resistance to forward motion related to the force of gravity	N/kN	36
			Resistance to forward motion related to the mass	daN/t
Tare	kg - t	Tare	kg - t	38
Tonnage of a train	t	Total mass of a train	t	28
		Hauled mass	t	26
Net tonnage	t	Total loading mass	kg - t	27
Total tonnage of a train	t	Total mass of a train	t	28

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#### 4 - Standard descriptions with applicable units and definition

SERIAL No.	STANDARD DESCRIPTION	S/UNIT APPLICABLE	DEFINITION
1	2	3	4
1	Lifting capacity	kg - t	Maximum mass which a lifting appliance is capable of lifting
2	Weighing capacity (of an appliance)	kg - t	Maximum mass which a weighing appliance is capable of weighing
3	Carrying capacity (of a wagon floor)	t	Permissible maximum mass under the loading conditions defined by the UIC 571 series of leaflets
4	Force at the shoe (or at the block)	N - daN	Force exerted in the radial (or axial) direction by a shoe (or a block) on the running tread of the wheel (or of the part to be braked) (3)
5	Press fit (or removal) force	kN - MN	Axial force necessary for press fit (or removal) of assemblies with tightening

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6	Yield point compression test force (of the automatic coupler)	kN · MN	Maximum compression force which the automatic coupler is capable of transmitting without suffering permanent distortion exceeding a given value (2)
7	Yield point tractive test force (of the automatic coupler, of the draw hook, of the coupling screw)	kN · MN	Maximum tractive force which the draw gear is capable of transmitting without suffering permanent distortion exceeding a given value (1)
8	Final flattening force of a spring	N daN · kN	Resisting force of the spring at end of stroke
9	Limiting tractive force (of the automatic coupler, of the draw hook, of the coupling screw)	kN · MN	Maximum tractive force which the draw gear is capable of transmitting without cracking or breaking (1)
10	Vertical force per axle	kN	Force exerted on the rails by the wheels of an axle due to the mass of the vehicle

For notes : see page 23.

1	2	3	4
11	Vertical force per wheel	kN	Force due to the mass of the vehicle transmitted through a wheel of an axle to the rail
12	Flexibility	mm/N mm/daN mm/kN	Quotient of the deflection by the force
13	Adhesion mass	t	Part of the mass of a tractive vehicle carried by the driven axles. For locomotives the "mass of the tractive vehicle" is taken as its "mass in running order"; in the case of multiple units, the regulations of each railway apply
14	Braking system changeover mass	t	Sum of the tare and the loading mass governing the adjustment of the "empty-loaded" device of a wagon
15	Balancing mass	kg - t	Mass of the material necessary to achieve balancing
16	Mass in running order	t	Sum of the tare of a tractive vehicle and the mass of the persons and supplies necessary for its operation. This mass is allocated wholly or partly in accordance with the definitions of the various railways

17	Braked mass	t	Mass characterizing the braking efficiency of a vehicle (or a train). By convention, the mass of the vehicle (or of the train) is braked at a rate of 100% when the braked mass is expressed by the same value as the mass
18	Loading limit mass	t	Permissible loading mass of a wagon, a van or a postal coach, of a luggage or postal compartment, of a container, calculated in accordance with UIC Leaflet 437 in the case of wagons
19	Limiting starting mass	t	Hauled mass which can be started and accelerated on the characteristic gradient of a portion of the line by a given tractive vehicle
20	Linear mass	kg/m	Mass per unit of length of a uniform body

1	2	3	4
21	Mass per axle	t	Part of the mass of the vehicle carried by an axle
22	Mass per seat (of the vehicle) (5)	kg	Quotient of the mass of the vehicle by the number of seats
23	Mass per wheel	t	Part of the mass of the vehicle carried by a certain wheel
24	Mass per length	t/m	Quotient of the mass of a vehicle by its overall length
24a	Mass per power	kg/kW t/kW	Quotient of the mass of the vehicle by the driving power
25	Mass per volume	t/m <sup>3</sup>	Quotient of the mass of the vehicle by its capacity
26	Hauled mass	t	Sum of the masses (including net masses) of all the hauled vehicles of a train

27	Total loading mass	kg · t	Mass of the load, including packing, loading gear and conditioning equipment
28	Total mass of the train	t	Sum of the masses (including net masses) of all the tractive and hauled vehicles of a train
29	Net mass (6)	t	Mass of the passengers and/or the load which can be transported
30	Percentage of braked mass	%	Ratio of the braked mass to the mass (for a vehicle or a train)
31	Pressure at the shoe (or block)	N/mm <sup>2</sup> daN/cm <sup>2</sup>	Pressure exerted between the shoe (or the block) and the running tread of the wheel (or the component to be braked) (3)
32	Oil pressure for hydraulic press-fit (or removal)	bar	Oil pressure necessary for expanding a drilling for hydraulic press fit (or removal) of assemblies with tightening

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1	2	3	4
33	Pressure in a compressed air installation (of vehicle)	bar	(4)
34	Mass rating	kW/kg kW/t	Quotient of the rating by the mass
35	Resistance to forward motion of the vehicle or vehicles	kN	Force in the reverse direction to that of the tractive force and occurring on movement of a vehicle or vehicles
36	Resistance to forward motion related to the force of gravity	N/kN	Quotient of the resistance to forward motion of a vehicle or vehicles by the vertical force due to gravity exerted on the mass of the vehicle or vehicles
37	Resistance to forward motion related to the mass	daN/t	Quotient of the resistance to forward motion of a vehicle or vehicles by its or their mass(es)
38	Tare	kg · t	Mass of a vehicle, a container, etc... when empty
39	Running speed of a vehicle or vehicles	km/h	Quotient of the distance covered by a vehicle or vehicles by the time taken to effect the corresponding journey

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Notes

- (1) See UIC Leaflets 522, 825 and 826.
- (2) See UIC Leaflet 522.
- (3) Disc or drum.
- (4) Term understandable without definition.
- (5) The general term "mass of the vehicle" is shown here as an example of a general nature only.  
In the practical application of the descriptions, it is necessary, in order to avoid any misunderstanding, to substitute the term specifically applicable, for example : fare per unit of length, mass in running order per unit of length, etc.
- (6) By analogy, in all the old descriptions where the term "weight" appears as a result of a weighing operation, this latter must be replaced by the term "mass" or, as a transitory measure, by the term "tonnage".

Liste de concordance des termes techniques  
Gegenüberstellung wichtiger Fachausdrücke  
Comparative list of technical terms

Français - Französisch - French		Allemand - Deutsch - German		Anglais - English - English	
accélération	m/s <sup>2</sup>	Beschleunigung	m/s <sup>2</sup>	acceleration	m/s <sup>2</sup>
accélération angulaire	rad/s <sup>2</sup>	Winkelbeschleunigung	rad/s <sup>2</sup>	angular acceleration	rad/s <sup>2</sup>
allongement	m/m ; %	Dehnung	m/m ; %	elongation, strain	m/m ; %
angle	rad	Winkel	rad	angle	rad
capacité thermique massique	J/(kg · K)	spezif. Wärme- kapazität	J/kg · K	specific heat capacity	J/kg · K
charge	kg	Last	kg	load	kg
contrainte	N/mm <sup>2</sup>	mechanische Spannung	N/mm <sup>2</sup>	stress	N/mm <sup>2</sup>
énergie	J	Energie	J	energy	J
force, effort	N	Kraft	N	force	N
fréquence de rotation	Tr/min	Drehgeschwindigkeit	Tr/min	rotational frequency	Tr/min
hauteur	m	Höhe	m	haight	m
impulsion	kg · m/s N · s	Impuls	kg · m/s N · s	momentum	kg · m/s N · s
largeur	m	Breite	m	width	m
longueur	m	Länge	m	length	m
masse	kg	Gewicht	kg	weight	kg
masse volumique	kg/m <sup>3</sup>	Dichte	kg/m <sup>3</sup>	density	kg/m <sup>3</sup>
moment d'inertie	kg · m <sup>2</sup>	Trägheitsmoment	kg · m <sup>2</sup>	moment of inertia	kg · m <sup>2</sup>
moment de couple	N · m	Drehmoment	N · m	torque, couple	N · m
moment de flexion	N · m	Biegemoment	N · m	bending moment	N · m
poids	N	Gewichtskraft	N	weight-force	N
pression	bar	Druck	bar	pressure	bar
puissance	W	Leistung	W	power	W
quantité de chaleur	J	Wärmemenge	J	quantity of heat	J
sollicitation	N	Beanspruchung	N	force, effort	N
superficie	m <sup>2</sup>	Fläche	m <sup>2</sup>	area	m <sup>2</sup>
température	°C ; K	Temperatur	°C ; K	temperature	°C ; K
temps	s	Zeit	s	time	s
travail	J	Arbeit	J	work	J
vitesse	m /s	Geschwindigkeit	m /s	velocity, speed	m /s
vitesse angulaire	rad/s	Winkelgeschwindigkeit	rad/s	angular velocity	rad/s
volume	m <sup>3</sup>	Volumen	m <sup>3</sup>	volume	m <sup>3</sup>

**Application**

As from 1 January 1977.

All UIC railways.

**Record references**

*Most recent heading under which the question has been examined :*

*- Question additional to the programme - Item 3.1 - Revision of Leaflet 800-01 "Use of certain railway concepts taking into account the International System of measurement (SI)".*

*(Sub-Committee for Dimensional Standardisation : Paris, January 1989).*

*- Item 5 - Other business*

*(Sub-Committee for Dimensional Standardisation: Paris, January 1990).*