
**Passenger car tyres — Spare unit
substitutive equipment (SUSE)**

*Pneumatiques pour voitures particulières — Équipements de
substitution de roue de secours (SUSE)*

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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

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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 16992 was prepared by Technical Committee ISO/TC 31, *Tyres, rims and valves*, Subcommittee SC 3, *Passenger car tyres and rims*.

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Introduction

Road vehicles, in order to assure unrestricted mobility, need to be equipped with fully efficient tyres in all positions.

Traditionally, therefore, road vehicles are provided with a spare unit intended to reinstate vehicle mobility in case of loss of efficiency of one tyre. That spare unit may be

- either of the same type as the units normally equipping the vehicle;
- or of “temporary use” type, thus intended for use only under restricted conditions.

Some vehicles, however, may be constructed and provided with devices which may reinstate their mobility also in the absence of a spare unit on board. Various types of such devices (emergency solutions, products, systems) are available to users in order not to lose or to recover the possibility to continue their journey in case of loss of efficiency of one or more tyres.

The term “spare unit substitutive equipment” (SUSE) is proposed as a general name for all equipment intended to replace a spare unit on board the vehicle.

The term “extended mobility system” is proposed for the assembly of several independent but interacting components specified and approved by a system manager.

This International Standard mainly concerns extended mobility systems for vehicles equipped with passenger car tyres, thus allowing continued driving in restricted conditions after a loss of efficiency of at least one of the tyres of the vehicle.

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This International Standard specifies minimum performance levels for SUSE. It is a help for fixing objective requirements for a SUSE and allows the standard level of a given existing extended mobility system to be determined.

Passenger car tyres — Spare unit substitutive equipment (SUSE)

1 Scope

This International Standard describes spare unit substitutive equipment (SUSE) for passenger car tyres. This equipment is designed to allow the user to continue the journey (with or without a stop) in a reasonably safe manner.

NOTE 1 Some equipment becomes effective automatically and thus avoids the necessity of stopping the vehicle immediately for inspection and corrective action.

This International Standard only aims to qualify the performance of extended mobility systems. It details specifications only for extended mobility systems suitable to permit the extended mobility of the vehicle.

NOTE 2 Other types of SUSE are described in Annexes A and B.

This International Standard applies from the moment the extended mobility system becomes effective, and the driver has continued control of the vehicle (in speed and direction) in order to attempt to reach an appropriate place for servicing.

This International Standard does not cover

- the vehicle thus equipped;
- the tyre while operating in inflated mode;
- the characteristics of the pressure survey device and of the warning function relative to the inflated mode or to the partially deflated mode due to slow pressure losses;
- the transitory phase, if any, before the equipment becomes effective;
- the inspection, assessment, and the servicing of the extended mobility system, after it has been activated in flat tyre running mode.

This International Standard includes

- the description of the various types of SUSE;
- the description and performance levels of complete extended mobility systems.

NOTE 3 The performance level which the user reasonably has the right to expect, and the restrictive conditions placed upon that level, can vary to a large degree according to the equipment installed and to real operating conditions of the tyre in flat-tyre running mode.

2 Conformance

2.1 When in inflated mode, and therefore functionally efficient, a tyre which is part of a SUSE shall conform in all respects to the usual criteria of a pneumatic tyre which can only be used in an inflated state, normal tyre load (i.e. conform to ISO 4000 and to ISO 10191) and shall be similarly maintained. Therefore, the user shall continue to comply with all recommendations of the tyre and/or vehicle manufacturer, as for a normal tyre; in particular, the cold inflation pressure of each tyre shall be regularly checked. This check is necessary in order that it is at least adequate for the intended service (position, load, speed, camber, etc.) and conforms to the specifications of the vehicle manufacturer and/or the tyre manufacturer.

2.2 Whichever SUSE is chosen to equip a vehicle, it shall not degrade the service properties of the tyre in inflated mode.

2.3 The performance of a SUSE depends upon the nature of the damage that was the cause of the loss of tyre functional efficiency.

2.4 Depending on the technical characteristics and functionality, a SUSE may offer to the vehicle different degrees of mobility (i.e. restored mobility, preserved mobility or extended mobility).

3 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 4000 (all parts), *Passenger car tyres and rims*

ISO 10191, *Passenger car tyres — Verifying tyre capabilities — Laboratory test methods*

4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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4.1

normal tyre

pneumatic tyre designed for use in an inflated state

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4.2

run-flat tyre

tyre designed to operate in an inflated mode and capable of running at least a specified distance under prescribed conditions in the event that the tyre does not hold air

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4.3

spare unit

assembly of a wheel and a tyre, which may include a tube, a valve, etc., which is intended to replace a wheel and tyre assembly already fitted on a vehicle that has lost some functional efficiency

4.4

spare unit substitutive equipment

SUSE

equipment intended to maintain or restore, not replace, the basic functions of a tyre in case of a tyre/wheel assembly failure

4.5

extended mobility system

assembly of specified functionally dependent components including, but not limited to, a tyre and a run-flat warning system, which together provide the specified performance granting extended mobility to a vehicle thus equipped

NOTE Examples which do not meet this International Standard are shown in Annexes A and B.

4.6

inflated mode

normal working state of a pneumatic tyre, inflated at the cold inflation pressure recommended by the vehicle or tyre manufacturer for the intended service

4.7**loss of tyre functional efficiency**

any pressure loss of the tyre/wheel assembly which results in operation in flat tyre running mode and which could be rapid, slow, or uncontrolled, leading to a reduction of basic tyre function

4.8**flat tyre running mode**

state of a tyre while operating at an inflation pressure between 0 and 70 kPa

4.9**run-flat warning system****RFWS**

system which delivers a warning to the driver that, on a vehicle equipped with an extended mobility system, a tyre is in flat tyre running mode

NOTE Additionally, an RFWS may also warn the driver when the expected run-flat potential of the extended mobility system has been used.

4.10**significant reduction of the tyre inflation pressure**

event leading a tyre to operate at an inflation pressure insufficient for the intended service (load, speed and camber) on a given vehicle

4.11**self-supporting tyre**

any technical solution (for example, reinforced sidewalls) allowing the pneumatic tyre, mounted on the appropriate wheel and in the absence of any supplementary component, to supply the vehicle with the basic tyre functions at a specified speed and distance when operating in flat tyre running mode

4.12**internal support**

any technical solution consisting of a device, resting on the rim, that helps supply the vehicle with basic tyre functions when operating in flat tyre running mode

4.13**restored mobility**

operating condition of a vehicle that, following the loss of tyre functional efficiency, is recovered by manual deployment of a SUSE after an immediate stop

4.14**preserved mobility**

operating condition of a vehicle that, following the loss of tyre functional efficiency, is recovered automatically by means of a SUSE

4.15**extended mobility**

operating condition of a vehicle that, following the loss of tyre functional efficiency, is preserved by means of an extended mobility system

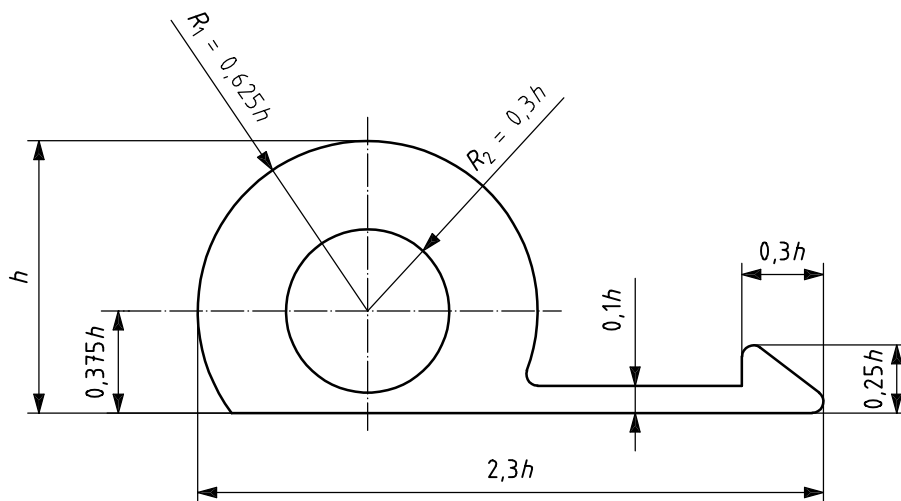
4.16**basic tyre functions**

normal capability of an inflated tyre to support a given load up to a given speed and to transmit the driving, the steering and the braking forces to the ground on which it runs

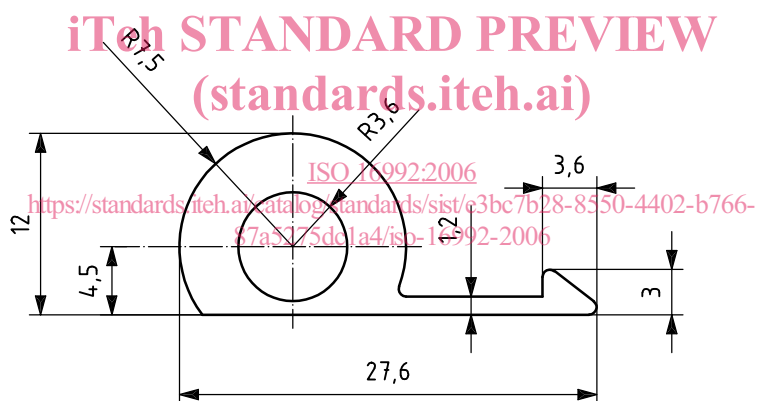
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5 ISO run-flat system symbol

See Figure 1.



Scale 2:1



Scale 1:1



Figure 1

6 Extended mobility systems

6.1 General

Extended mobility systems may be based on either self-supporting tyres or assemblies including an internal support.

6.2 Function and performance

The extended mobility system becomes effective automatically in case of a loss of tyre functional efficiency and the system informs the driver. The driver shall adjust the driving behaviour according to the instructions supplied with the extended mobility system. The driver can continue the journey, informed of the flat tyre running mode and aware of the expected performance level. An extended mobility system shall be able to operate in flat tyre running mode at a speed of 80 km/h for a distance of 80 km.

Extended mobility systems shall activate automatically and include a run-flat warning system that warns the driver

- that the flat tyre running mode has been reached;
- of any failure of the run-flat warning system.

At the end of the specified performance of an extended mobility system, operating in flat tyre running mode, the loss of mobility shall not be immediate.

7 Endurance test

The test and pass/fail criteria are shown in the table below.

Test criteria		Comments
Laboratory test on 1,7 m to 2 m diameter drums		
Conditioning	3 h at 38 °C at 250 kPa	
Inflation	Valve core removed	
Camber	0°	
Slip	0°	Wheel steer angle variations of up to ± 1° allowed, if required.
Speed	80 km/h	
Load cycle	60 min at 65 % load index	
Duration	60 min	
Ambient temperature	(38 ± 3) °C	
Pass/fail criteria	Decrease of no more than 20 % of the deflected section height compared to the start of test, and tread connected to the two sidewalls.	The deflected section height is defined as the difference between the deflected radius, measured from the centre of the rim to the surface of the drum, and one half the nominal rim diameter as defined in ISO 4000-1.

8 Markings

The ISO run-flat symbol is shown in Clause 5. This symbol shall only be applied to the self-supporting tyre (SST) when the extended mobility system successfully completes the test procedure as specified in Clause 7.

The markings for other types of system (such as systems based on an internal support) will be completed in the next revision of this International Standard.