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Passenger car tyres — Spare unit substitutive equipment (SUSE)

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

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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*.

This second edition cancels and replaces the first edition (ISO 16992:2006), which has been technically revised.

Introduction

In order to ensure unrestricted mobility, road vehicles need to be equipped with fully efficient tyres in all positions.

Road vehicles are therefore traditionally provided with a spare unit intended to reinstate vehicle mobility in the event of loss of efficiency of one tyre. The spare unit can be either of the following:

— of the same type of the units normally equipping the vehicle, or

— of “temporary use” type, thus intended for use only under restricted conditions.

Some vehicles, however, can be constructed and provided with devices that can reinstate their mobility even in the absence of a spare unit on board. Various types of such devices (emergency solutions, products, systems) are available to users in order to ensure that they are able to continue their journey in the event of loss of efficiency of one or more tyres.

The term “spare unit substitutive equipment (SUSE)” (see definition 4.4) is used as a general name for all equipment intended to replace a spare unit on board the vehicle.

The term “extended mobility system” (see definition 4.5) refers to the assembly of several independent but interacting components specified and approved by a system manager.

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

This International Standard specifies minimum performance levels for SUSE. It provides guidance when establishing 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, which is designed to enable users to continue their journey (with or without a stop) in a reasonably safe manner.

NOTE 1 Certain equipment becomes effective automatically, thus avoiding the need to stop the vehicle immediately for inspection and corrective action.

This International Standard is intended only to qualify the performance of extended mobility systems. Its specifications only apply to extended mobility systems that can permit the extended mobility of the vehicle.

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

The specifications in this International Standard apply from the moment the extended mobility system becomes effective, with the driver continuing to control of the vehicle (in terms of speed and direction) in an attempt to reach an appropriate place for servicing.

The following are within the scope of this International Standard:

— the description of the various types of SUSE;

— the description and performance levels of complete extended mobility systems.

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

The following are outside the scope of this International Standard:

— the vehicle to be 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.

2 Conformance

2.1 When in inflated mode, and therefore functionally efficient, a tyre that is part of a SUSE shall conform in all respects to the usual criteria of a pneumatic tyre that can only be used in an inflated state, normal tyre load, i.e. it shall conform to ISO 4000 (all parts) and to ISO 10191, and it shall be similarly maintained.

The user shall therefore continue to comply with all recommendations of the tyre manufacturer, or the vehicle manufacturer, or both, as for a normal tyre. In particular, the cold inflation pressure of each tyre shall be regularly checked. This check is necessary to ensure that it is at least adequate for the intended service (position, load, speed, camber, etc.) and that it conforms to the specifications of the tyre manufacturer, or the vehicle manufacturer, or both.

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.

4.1
normal tyre
pneumatic tyre designed for use in an inflated state

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

4.3
spare unit
assembly of a tyre and a wheel intended to replace a tyre/wheel assembly already fitted on a vehicle that has lost some functional efficiency

NOTE The tyre/wheel assembly can include a tube and a valve, etc.

4.4
spare unit substitutive equipment
SUSE
equipment intended to maintain or restore, but not replace, the basic functions of a tyre in the event 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 manufacturer or the tyre manufacturer for the intended service

4.7
loss of tyre functional efficiency
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 kPa and 70 kPa

4.9
run-flat warning system
RFWS
system that 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 In addition, an RFWS can 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 on a given vehicle

NOTE The intended service comprises the load, speed and camber.

4.11
self-supporting tyre
technical solution 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

NOTE An example of a technical solution is reinforced sidewalls.

4.12
internal support
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

5 ISO 16992 run-flat system symbol

The ISO 16992 run-flat system symbol is used to identify those tyres that comply with requirements of the run-flat system specified in this International Standard (see also Clause 8).

Figure 1 provides an example of the ISO 16992 run-flat system symbol for a self-supporting tyre.

Figure 2 provides an example of the ISO 16992 run-flat system symbol for an internal support ring.

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 the event 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.

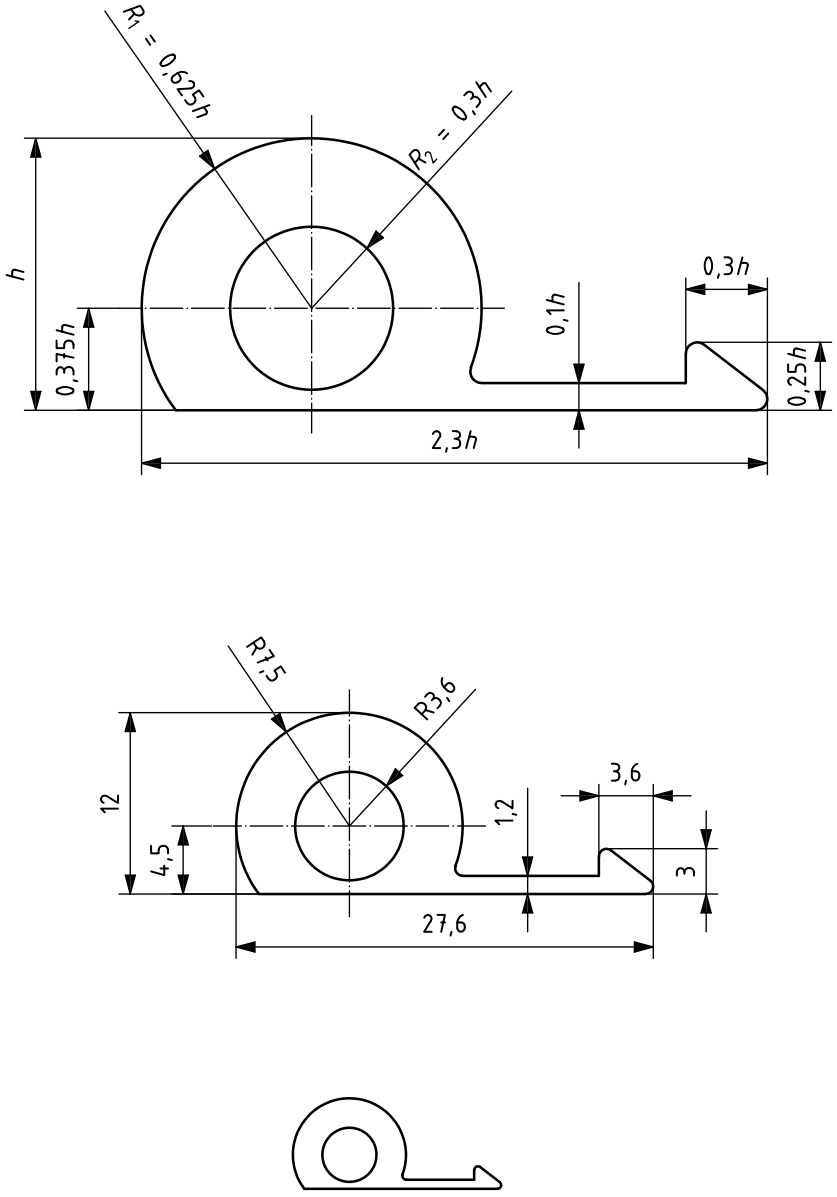
Extended mobility systems shall activate automatically and include a run-flat warning system that warns the driver of the following:

— that the flat tyre running mode has been reached;

— 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.

Dimensions in millimetres



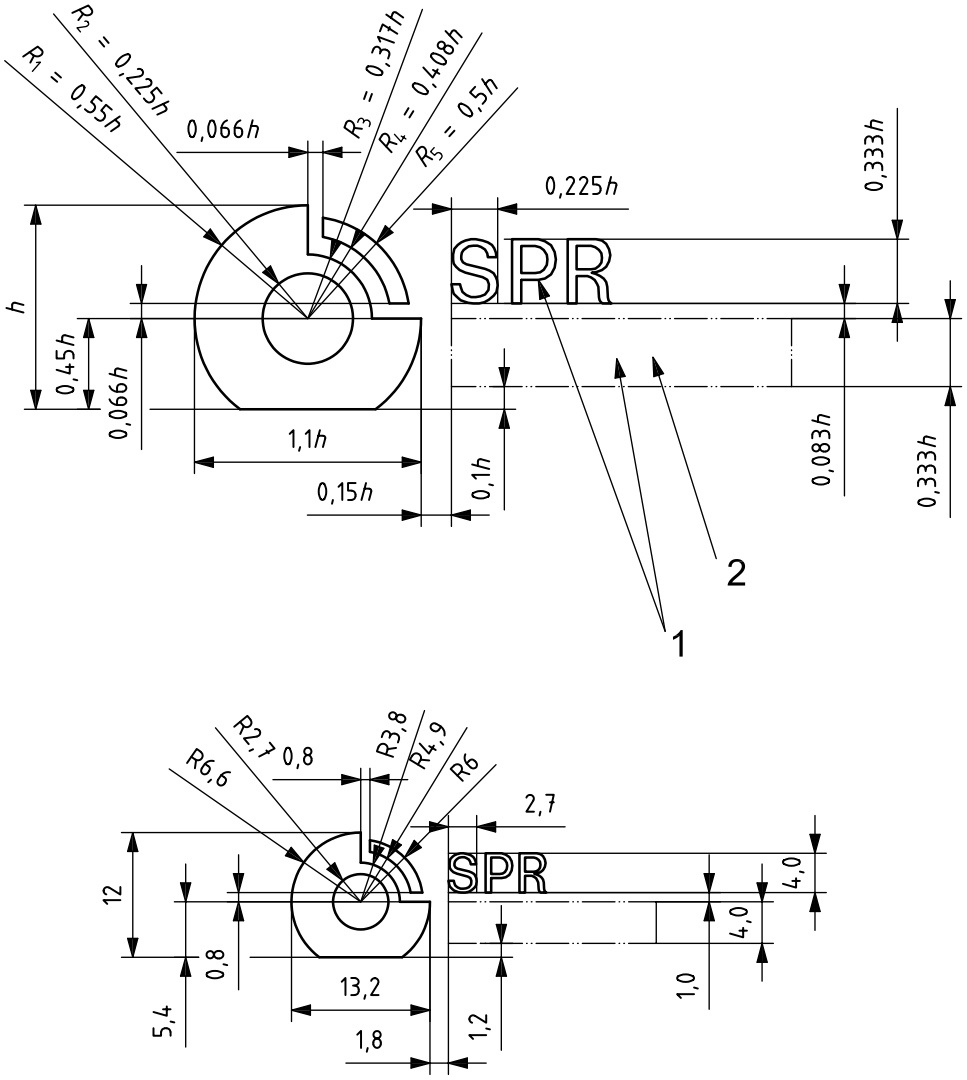
Key

h	figure height
R_1, R_2	circle radii

NOTE This figure can be drawn with h = 12 mm. Actual symbol size with h = 12 mm.

Figure 1 — Example of ISO 16992 run-flat system symbol for a self-supporting tyre

Dimensions in millimetres



SPR

Key

1	recommended font: ⟨Helvetica Bold Narrow⟩
2	area for optional marking at manufacturer's discretion
h	figure height
R_1, R_2, R_3, R_4, R_5	circle radii

NOTE This figure can be drawn with h = 12 mm. Actual symbol size with h = 12 mm.

Figure 2 — Example of ISO 16992 run-flat system symbol for an internal support ring

7 Endurance test

Table 1 specifies the test and pass/fail criteria for a laboratory test to verify the endurance of passenger car tyres.

Table 1 — Test and pass/fail criteria for endurance test

Test criteria		Comments
Drum diameter, d	1,7 m $\leqslant d \leqslant$ 2,0 m	—
Conditioning	3 h at 38 °C and 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 of the nominal rim diameter as defined in ISO 4000-1.

8 Markings

The ISO 16992 run-flat symbol is illustrated in Figures 1 and 2.

The symbol in Figure 1 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.

For extended mobility systems based on an internal support ring, the symbol in Figure 2 applies. This symbol shall only be applied to a normal tyre, when the normal tyre being equipped with the appropriate internal support ring successfully completes the test procedure as specified in Clause 7.

Annex A
(informative)

Properties of a SUSE providing restored mobility

Restored mobility corresponds at least to the minimum service level expected by the driver in the event of voluntary absence of a spare unit.

By definition, this type of SUSE does not become effective automatically.

The driver stops and takes appropriate action before expecting to be able to continue the journey, whether or not the vehicle is equipped with a pressure survey system or a run-flat warning system.

The efficiency and the performance of the equipment depend on the nature of the damage at the origin of the significant reduction of the tyre inflation pressure.

This type of SUSE may be ineffective even when the tyre can be subsequently repaired.

The presence of this type of SUSE on board a vehicle does not automatically guarantee vehicle mobility in all possible situations.

Loss of vehicle control due to air loss is possible.

Roadside down-time and associated exposure to hazards cannot be guaranteed.

EXAMPLE Inflation canisters and sealing canisters; electric inflation compressor; repair products and tools; reacting chemicals to be injected.

A SUSE providing restored mobility cannot be qualified as a SUSE system.

Annex B
(informative)

Properties of a SUSE providing preserved mobility

Preserved mobility corresponds to a higher service level than the restored mobility expected by the driver in the event of voluntary absence of a spare unit.

By definition, this type of SUSE becomes effective automatically, but the user might not be informed.

The driver need not stop and can continue the journey.

The equipment might not warn the driver that the flat tyre running mode has been activated. The driver might be required to adjust driving behaviour to avoid loss of functional efficiency.

The passive safety may be improved (postponed event).

The performance of the equipment depends on the nature of the damage at the origin of the significant reduction of the tyre inflation pressure.

This type of SUSE might become ineffective after reaching its limits without informing the driver.

EXAMPLE Pre-applied sealant; self-supporting tyres in the absence of a pressure warning device.

An assembly of components given in these examples does not constitute a SUSE system.

A SUSE providing preserved mobility cannot be qualified as a SUSE system.

Bibliography

[1] ISO 4223 (all parts), *Definitions of some terms used in the tyre industry*

[2] ISO 21750, *Road vehicles — Safety enhancement in conjunction with tyre inflation pressure monitoring*

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