INTERNATIONAL STANDARD

ISO 4040

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Road vehicles — Location of hand controls, indicators and tell-tales in motor vehicles

Véhicules routiers — Emplacement des commandes manuelles, des indicateurs et des témoins sur les véhicules à moteur

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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 4040 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 13, *Ergonomics applicable to road vehicles*.

This fourth edition cancels and replaces the third edition (ISO 4040:1997), which has been technically revised.

Introduction

There is a recognized potential for errors in the selection of controls essential to the safe operation of a vehicle if these controls are not similarly located in all vehicles. Therefore, the standardization of these control locations must be considered a logical and beneficial design objective, especially considering that drivers have an ever-increasing opportunity to change from one vehicle to another.

Road vehicles — Location of hand controls, indicators and tell-tales in motor vehicles

1 Scope and field application

This International Standard specifies the location of the controls in motor vehicles by subdividing the space within reach of drivers into specific zones to which certain controls essential to the safe operation of vehicles are assigned. It also specifies certain combinations of functions for multifunction controls and the degree to which certain indicators and tell-tales are to be visible.

This International Standard is applicable to hand-operated controls, to indicators and to tell-tales in all motor vehicles, excluding motorcycles and mopeds, as defined in ISO 3833.

NOTE A specification for a control indicator or tell-tale does not imply that the item must be fitted.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 2575:2000, *Road vehicles — Symbols for controls, indicators and tell-tales*

ISO 3833:1977, *Road vehicles — Types — Terms and definitions*

ISO 3958:1996, *Passenger cars — Driver hand-control reach*

ISO 4513:1978, *Road vehicles — Visibility — Method for establishment of eyellipses for driver's eye location*

ISO 6549:1999, *Road vehicles — Procedure for H- and R-point determination*

SAE J941:1997, *Motor Vehicle Drivers' Eye Locations*

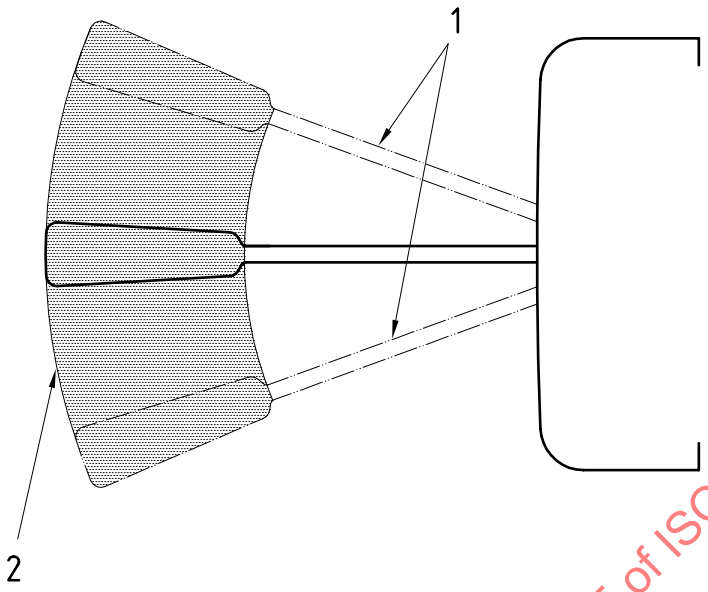
3 Terms and definitions

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

3.1
reference plane
vertical plane parallel to the longitudinal axis of the motor vehicle, passing through the steering wheel axis and within a zone 50 mm to either side of the centre of the designated seating position for the driver at the R-point as defined in ISO 6549

3.2
operational area of control
area swept by those parts of a control activated by the hand while the possible modes or positions are selected in the manner intended by the designer

EXAMPLE See Figure 1.



Key

1 Extreme location of the control

2 Operational area of the control

Figure 1 — Example of operational area of a control

3.3
display area of indicator or tell-tale
area including the identification of the quantity displayed and those portions required to determine its level at any point within the usable capacity of the instrumentation

EXAMPLE See Figure 2.

NOTE It need not include, for example, bezels or the manufacturer's type number.

3.4
steering-wheel plane
plane tangential to the upper surface of the steering-wheel rim in the design condition, as designated by the vehicle manufacturer, and with the vehicle wheels in the straight-ahead position

3.5
steering-wheel axis
line at right angles to the steering-wheel plane, passing through the centre of rotation of the steering-wheel rim

3.6
zone 1
volume to the left of the reference plane bounded by the following surfaces (see Figure 3):

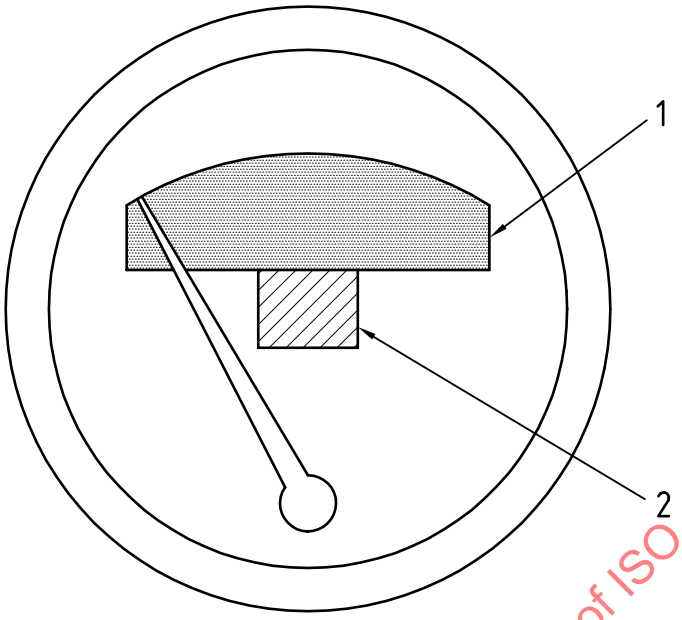
— a plane parallel to the steering-wheel plane and 20 mm above it;

— a plane parallel to the steering-wheel plane and 170 mm below it;

— a cylinder extending 100 mm beyond the periphery of the steering-wheel rim whose axis is on the steering-wheel axis;

— a cylinder lying 130 mm inside the periphery of the steering-wheel rim whose axis is on the steering-wheel axis;

— two planes intersecting along the steering-wheel axis, at 40° and 130° from the reference plane.



Key

1 Sub-area A: display of information given by pointer.

2 Sub-area B: example of display area for other information.

Figure 2 — Example of display area of indicators

3.7
zone 2
volume bounded by the following surfaces (see Figure 3):

— a plane parallel to the steering-wheel plane and 20 mm above it;

— a plane parallel to the steering-wheel plane and 170 mm below it;

— a cylinder of 50 mm radius whose axis is on the steering-wheel axis.

3.8
zone 3
volume to the right of the reference plane bounded by the following surfaces (see Figure 3):

— a plane parallel to the steering-wheel plane and 20 mm above it;

— a plane parallel to the steering-wheel plane and 170 mm below it;

— a cylinder extending 100 mm beyond the periphery of the steering-wheel rim whose axis is on the steering-wheel axis;

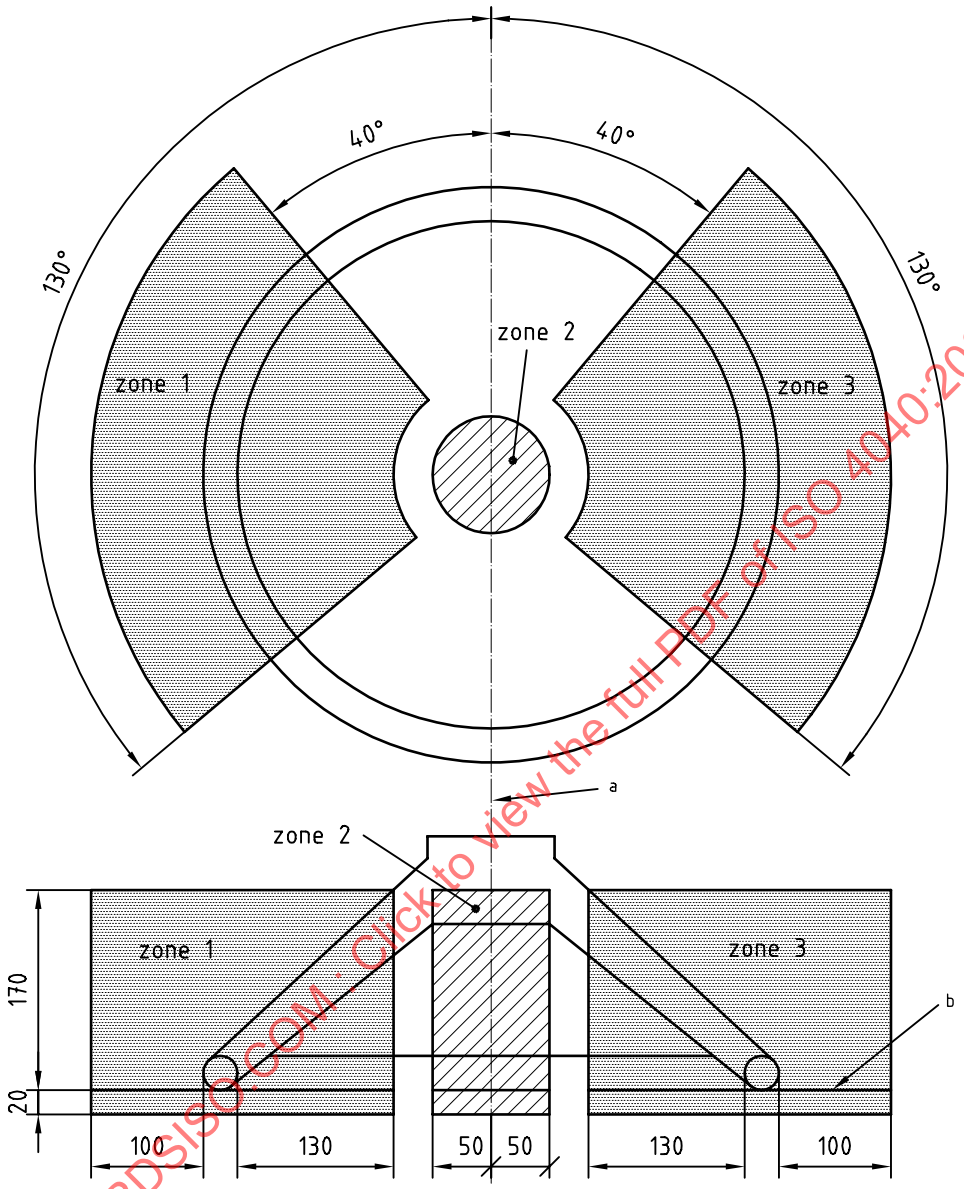
— a cylinder lying 130 mm inside the periphery of the steering-wheel rim whose axis is on the steering-wheel axis;

— two planes intersecting along the steering-wheel axis at 40° and 130° from the reference plane.

3.9
visible
seen with either eye and not necessarily both eyes simultaneously, from all positions within the 95th percentile eyellipses [see ISO 4513 and SAE J941[1)]], with the gear selector in top gear or drive position and the steering wheel in the straight-ahead position adjusted according to the manufacturer's specification

1) Eyellipses are defined for passenger cars only in ISO 4513. Eyellipses are defined for commercial vehicles and buses in SAE J941:1997, Section 5. Reference to SAE J941 will continue to be made for the commercial vehicle and bus eyellipse until reference to commercial vehicle and bus eyellipses is included in ISO 4513.

Dimensions in millimetres



[a] Steering-wheel axis

[b] Steering-wheel plane

Figure 3 — Location of zones

3.10

head movement

movement required to overcome a geometric obstruction

NOTE For the purposes of this International Standard, it does not include movement when the target is more than 30° from the line of sight.

3.11

identification

symbol according to ISO 2575, written label or some portion of the pointer and scale by which a driver can distinguish the characteristic displayed by the control, indicator or tell-tale

3.12
passive restraint readiness indicator
tell-tale or indicator indicating a malfunction that will prevent or impede the operation of a passive restraint in the designed manner, or indicating that the passive restraint is disabled

3.13
stalk control
rigid, elongated control device with a visible length at least five times as great as the smallest cross-sectional dimension

NOTE This device may be fixed or movable and located on the steering column or instrument panel. The operational area is located within reach of the driver (see ISO 3958 and 4.1).

3.14
touch control
control requiring minimal displacement to operate

3.15
proximity control
control requiring no displacement to actuate

3.16
operational surface
area on the control surface for the user to grasp/touch in order to activate the controlled function

3.17
secondary operational surface
operational surface mounted on, and external to, another operational surface

NOTE This does not include buttons on the end of a stalk control (see Figure 4).

4 Requirements for location of controls

4.1 For passenger cars, the controls listed in this clause (4.2 to 4.9) shall be located within the restrained reach of drivers as defined in ISO 3958.

For commercial vehicles and buses, these controls shall be located within reach of drivers wearing a lap belt, unrestrained reach as defined in ISO 3958.

4.2 The operational areas of the following controls shall be located in zone 1:

— headlamp beam switching;

— headlamp optical warning;

— turn signal direction indicator.

See 4.7.

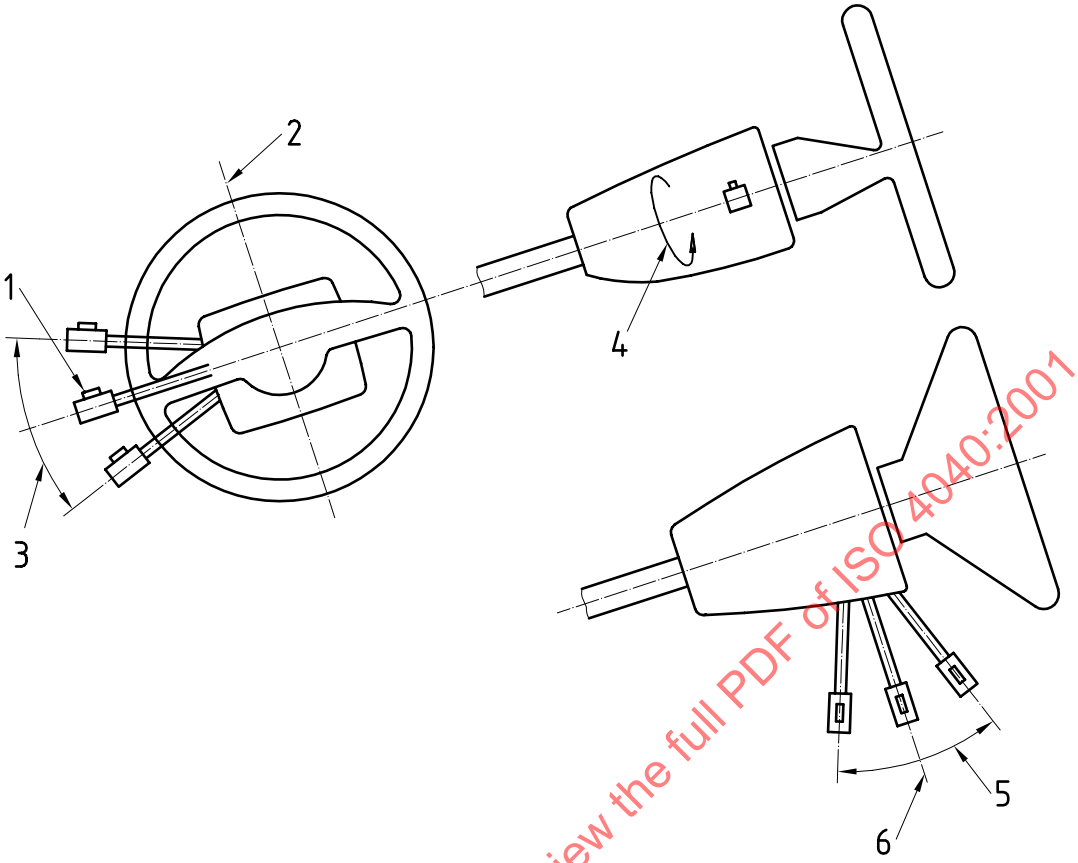
4.3 The operational area of the master lighting control shall be located

— to the left of the reference plane for left-hand drive vehicles, or

— to the right of the reference plane, if panel mounted, for right-hand drive vehicles.

4.4 A portion of the operational area of a control for the audible warning (horn) shall be located either in zone 1 or zone 2.

Additional audible warning controls may be located elsewhere, or may have operational areas extending beyond these zones.



Key

1 Secondary operational surface
2 Steering-wheel vertical centreline
3 Approx. parallel to steering-wheel plane
4 Rotation approx. about axis of control
5 Approx. parallel to steering-wheel axis
6 Directed towards steering-wheel axis (push, includes buttons on end of control)

Figure 4 — Modes of operation for stalk controls

4.5 The operational area of the hand-operated parking brake shall be located

— to the right of the reference plane for left-hand drive vehicles, or

— to the left of the reference plane for right-hand drive vehicles.

If space is needed, the hand-operated parking brake may be located to the left of the reference plane for left-hand drive vehicles or to the right of the reference plane for right-hand drive vehicles.

4.6 The windscreen washer and wiper control may be located on either side of the reference plane. When there is one stalk control (other than the gear selector) in zone 3, it shall operate the windscreen washer and wiper. If there are two or more stalks in zone 3 (other than the gear selector) the windscreen washer and wiper shall be controlled by that stalk with an operational area closest to the steering-wheel rim. See 4.7.

4.7 It is strongly recommended that the requirements of 4.2 and 4.6 be applied to both left- and right-hand drive vehicles. However, some countries have a long-standing practice in right-hand drive vehicles of mirror-imaging (about the reference plane) the controls covered by those requirements. In those countries only, 4.2 and 4.6 may be applied to right-hand drive vehicles by substituting zone 3 for zone 1 in 4.2, and zone 1 for zone 3 in 4.6.[2)]

4.8 The ignition switch control shall be located to the right of the reference plane. For commercial vehicles and buses, the ignition switch control may be located outboard of the reference plane so that it can be operated from outside the vehicle.

4.9 All or part of the hazard warning control shall be located inboard of the reference plane. For commercial vehicles, the hazard warning control may be located outboard of the reference plane so that it can be operated from outside the vehicle.

5 Requirements for combining functions into multifunction controls

5.1 The following pairs of functions shall be operated by the same control:

— windscreen wiping on/off and windscreen washing on/off (if power-operated);

— optical warning and headlight-beam switching.

5.2 The master light control shall not be operated by the same control as that of any of the following functions:

— audible warning;

— windscreen wiping;

— windscreen washing;

— turn signal direction indicator.

A combination of the master light (see Table 1) function with these functions is allowed, providing one of the modes to be avoided for the function is chosen for the master light function.

5.3 For commercial vehicles, the turn signal and retarder functions should not be operated by the same control.

6 Requirements for display visibility

6.1 The display area of the speedometer shall be visible without head movement (see Figure 2).

6.2 The identification and those parts of the display area required to indicate that $1/4$ or less of the maximum stored fuel is available shall be visible without head movement on the fuel level indicator (see Figure 2).

The remaining parts of the display area shall also be visible; however, for these, head movement is permitted.

6.3 The indication and those parts of the display area required to indicate a critical condition shall be visible without head movement for the following indicators:

— engine oil pressure;

— engine coolant temperature;

— air brake reservoir pressure indicator.

The remaining parts of the display area shall also be visible; however, for these, head movement is permitted.

2) This provision shall be deleted at the next five-year review of ISO 4040.