
**Road vehicles — Direction-of-motion
stereotypes for automotive hand
controls**

*Véhicules routiers — Stéréotypes de sens d'action sur les commandes
manuelles dans l'automobile*

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 39, *Ergonomics*.

This third edition cancels and replaces the second edition (ISO 12214:2010), of which it constitutes a minor revision. The changes compared to the previous edition are as follows:

- the first sentence of 4.3.5.2 has been deleted and the following added: "If the wiper and turn signal are located on the same side of the steering wheel, the wiper shall only be turned on by rotating over the top";
- in 4.3.5.3, "or pushing" has been included, so that the text reads: "Pulling or pushing the left or right stalk should be the motion for turning on the headlamp high beam."

Introduction

Drivers develop expectations regarding the operating motions of various types of controls as a result of their accumulated experience with vehicle controls. To simplify the operation of controls for drivers, the direction-of-motion to operate these controls needs to conform to these expectations, or stereotypes.

The strength of a stereotype varies with the control configuration (control type, location, orientation and mounting plane). Studies have demonstrated that stereotype strength is not related to driver age, gender, or left- or right-handedness. Failure to conform to direction-of-motion stereotypes can lead to actuation errors, longer operating times and an increase in driver workload.

This document is based on past research and general human factor principles. Control labelling and tactile or shape coding are not addressed in this document. However, appropriate labelling and coding can improve the accuracy of control use.

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Road vehicles — Direction-of-motion stereotypes for automotive hand controls

1 Scope

This document gives design recommendations and requirements for the direction-of-motion of hand controls found in passenger, multipurpose and commercial vehicles, and buses.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

control configuration

particular combination of control type, location, orientation and mounting plane

3.2

direction-of-motion stereotype

direction of control motion expected by a majority of people to achieve a given effect for a specified control configuration

3.3

stereotype strength

percentage of people who activate the control in a particular direction

3.4

on/increase control

control whose function is to turn something on/off or to increase/decrease some unspecified effect

3.5

specific function control

control used to activate some specific function or achieve a specific effect

EXAMPLE Control to lock or unlock doors, raise or lower windows, or turn on headlamps, headlamp high beam or windshield wipers.

4 Design

4.1 General

This document gives the recommended direction-of-motion and control orientation for controls mounted on each of three orthogonal planes:

- horizontal (X-Y) plane;

- vertical-transverse (Y-Z) plane;
- vertical-longitudinal (X-Z) plane.

Some of the figures in this document also include inclined mounting planes. The direction-of-motion stereotypes are indicated by the unbroken arrows on each control configuration. Those control configurations exhibiting an exceptionally strong stereotype are identified. Control configurations found to have weak stereotypes are shown crossed out, in order to indicate that they are not recommended.

4.2 On/increase controls

Normally, for the control configurations shown, the on/increase control directions should be

- up,
- forward,
- right,
- pull towards (push/pull knob or stalk), and
- rotate over top.

For commercial trucks, a downward direction for the “on” control may be used.

Rocker controls mounted in a fore-aft orientation on a surface sloping down and away from drivers, and toggle controls mounted in a fore-aft orientation on a vertical-longitudinal (X-Z) plane, shall not be used.

See [Figure 1](#) for thumb wheel, toggle, lever and linear-slide controls, rotary and push/pull knobs, and rocker switches.

See [4.3.5](#) and [Figure 2](#) for stalk-mounted controls.

4.3 Specific function controls

4.3.1 General

A variety of controls are used for controlling specific functions in motor vehicles. Some of those in common use are covered in this document. Other controls can also be appropriate for these functions. It is not the intent of this document to restrict the type of control that can be used for a specific function.

As a general rule, in order to create the strongest stereotypes, the orientation and motion of the control should correspond to the orientation and motion of the controlled element.

The mounting of power mirrors or power windows, and fore-aft orientations of switches, on surfaces that slope down and away from drivers shall not be permitted.

4.3.2 Power mirror controls

Direction labels shown on the four-way pad control and arrows on the joystick control in [Figure 3](#) indicate stereotypes for moving the mirror field of view up, down, left or right. However, these labels are given in this document for information only.

Stereotypes are very strong for mounting planes angled 30° or more out from the door plane so that the switch faces the driver. Mirror switches mounted in a vertical-transverse plane also have very strong stereotypes. It is likely that mounting planes inclined as much as 45° to 60° from vertical-transverse toward horizontal would also produce very strong stereotypes. These configurations are therefore recommended. The four-way pad switch should not be mounted in the door plane (vertical-longitudinal).

4.3.3 Power window controls

Toggle or rocker controls mounted on surfaces that are horizontal or angled up from horizontal (0° to 60°) and with a 2×2 fore-aft switch configuration have a very strong stereotype for both window selection (left, right, front, rear) and direction of operation. The push/pull control with the same configuration also has a very strong stereotype. These control configurations are therefore recommended.

A 2×2 switch configuration mounted on a vertical plane parallel to the door panel shall not be used, and 1×4 switch configurations shall not be used at all because the switch layout does not correspond to the window layout (in plan view in [Figure 4](#)).

4.3.4 Window regulators (cranks)

Window cranks on both the left and right sides should be oriented so that the handles point forward and are about 45° above horizontal when the windows are fully raised, although angles from 15° to 75° above horizontal may also be used. It is recommended that the handle point forward when the window is fully lowered. However, other concerns such as rotational effort and travel shall be considered.

To lower a left-side window, the crank on the left-side door should be rotated clockwise. To lower a right-side window, the crank on the right-side door should be rotated anticlockwise.

See [Figure 5](#).

4.3.5 Stalk-mounted controls

4.3.5.1 Turn signal

Raising or lowering the left stalk on left-hand drive vehicles should be the motion for, respectively, signalling a right or left turn.

4.3.5.2 Wipers

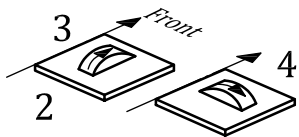
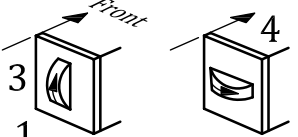
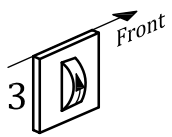
The wipers may be turned on by rotating over the top or by either raising or lowering the stalk. If the wiper and turn signal are located on the same side of the steering wheel, the wiper shall only be turned on by rotating over the top.

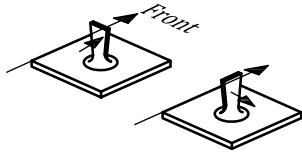
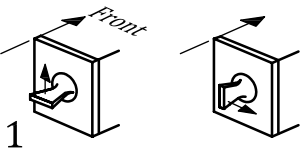
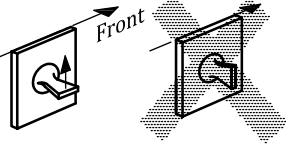
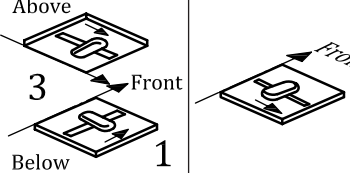
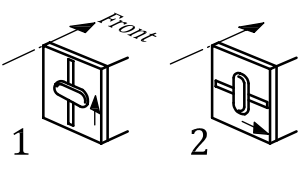
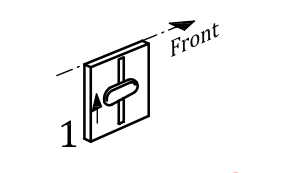
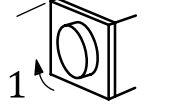
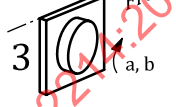
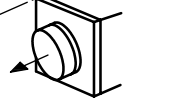
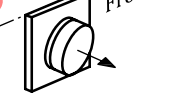
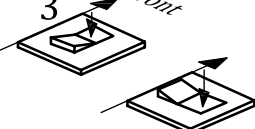
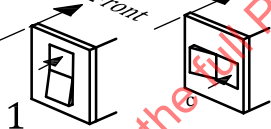
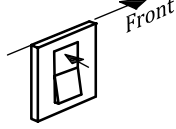
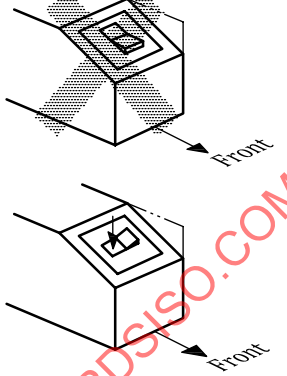
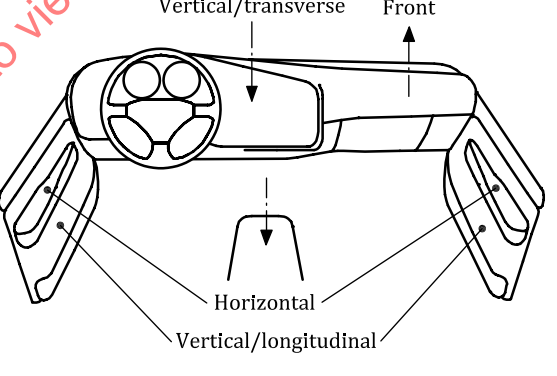
4.3.5.3 Headlamps

Rotating the left or right stalk over the top should be the direction for turning on headlamps. Pulling or pushing the left or right stalk should be the motion for turning on the headlamp high beam.

4.3.6 Power door locks

No stereotype was found for any configurations of rocker switches. Labels or tactile coding or both should be used for the lock and/or unlock settings of rocker switches that control power door locks.

Control type	Mounting plane		
	Horizontal (X-Y)	Vertical/transverse (Y-Z)	Vertical/longitudinal (X-Z)
Thumb wheel			

Toggles and levers			
Linear slide			
Rotary knob			
Push/pull			
Rocker switches			
Inclined downwards			

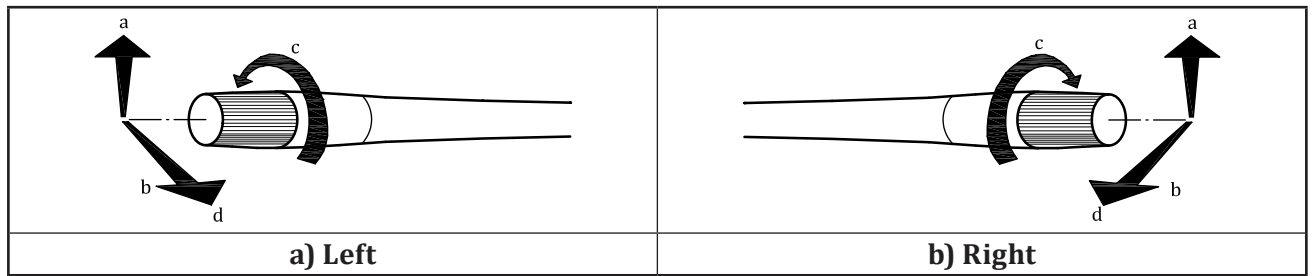
Key

- 1 very strong stereotype
- 2 very strong when mounted to the right of steering wheel in left-hand drive vehicle
- 3 not recommended in Japan
- 4 moderately strong stereotype on right side in Japan
- a Not on left in Japan.
- b Strong on right in Japan.
- c Not on right in Japan.

NOTE 1 Unbroken arrows indicate the direction-of-motion for on/increase control; the dotted reference line is parallel to the x-axis (front-rear); crossed-out configurations are not recommended.

NOTE 2 Toggle controls mounted in the X-Z plane can be used for controlling the fore/aft (X) or up/down (Z) motion of a seat. See 4.3.1.

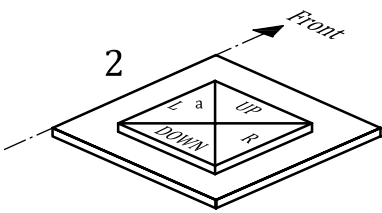
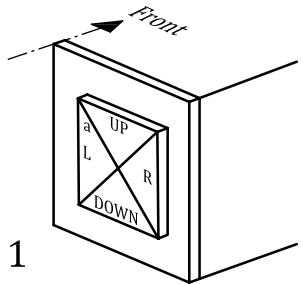
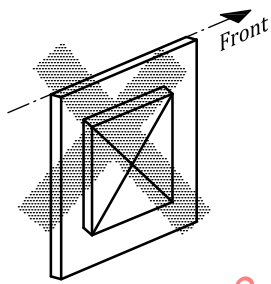
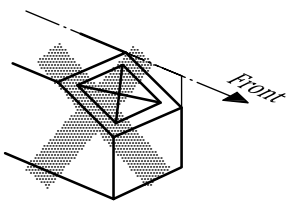
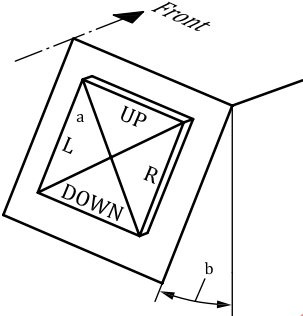
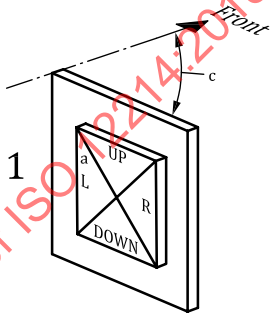
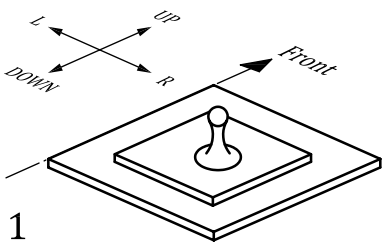
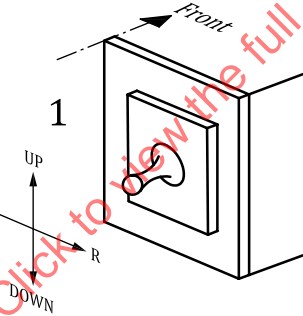
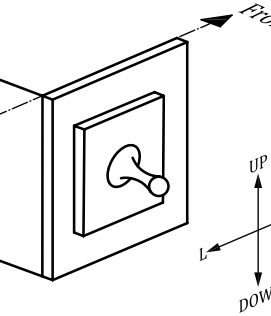
Figure 1 — On/increase controls

**Key**

- a Raise. In Japan, there is a very weak stereotype in favour of lowering, not raising.
- b The Japanese stereotype is very weak.
- c Over the top.
- d Pull.

NOTE Unbroken arrows indicate the direction-of-motion for on/increase (turn signal not included).

Figure 2 — Stalk-mounted controls

Control type	Mounting plane		
	Horizontal (X-Y)	Vertical/transverse (Y-Z)	Vertical/longitudinal (X-Z)
Four-way pad			
Inclined surface			
Joystick			

Key

- 1 very strong stereotype
- 2 very strong stereotype if to right of driver
- a Area of control to be activated to move field of view right, left, up or down.
- b Can be any angle between 0° and 90°.
- c Can be any angle between 30° and 90°.

NOTE Unbroken arrows indicate the direction-of-motion for the corresponding field of view motion; the dotted reference line is parallel to the x-axis (front-rear); crossed-out configurations are not recommended.

Figure 3 — Power mirror controls