

JAPANESE TECHNICAL GUIDELINE TO LANE-KEEPING ASSIST DEVICES OF MOTOR VEHICLES

1. Scope

This Technical Guideline shall apply to functions of lane-keeping assist devices (hereinafter referred to simply as “the device”) which are provided by motor vehicle manufacturers for the purpose of reducing the operating load of the driver when he attempts to keep his motor vehicle within the lane. However, this Technical Guideline shall not apply to the operation of the device whose additional steering wheel turning force is less than 6N and its time of duration is six seconds or less and which is regarded as a warning.

2. Definitions

(1) Steering wheel turning force

This refers to a quotient that is obtained when the torque of the steering wheel shaft which occurs when the driver operates the steering wheel is divided by the effective radius of the steering wheel.

(2) Additional steering wheel turning force

This refers to a quotient that is obtained when the torque of the steering wheel shaft which occurs by means of the operation of an actuator is divided by the effective radius of the steering wheel. (Here, the actuator refers to a device to boost the torque being applied to the steering wheel shaft.)

3. Conditions of Operation and Cancellation

- (1) The device shall be operative only during a high-speed running. (For the time being, A vehicle speed of more than 50 km/h shall be the operable condition of the device at which the device can start its operation.)

- (2) The operation shall be cancelled when there is no steering operation of the driver. (For the time being, when the vehicle is running on a curve whose radius of curvature is less than 1000 m, if there is no steering operation for five seconds or more, it shall be regarded that there is no steering operation of the driver.)
- (3) The lateral acceleration caused by the additional steering wheel turning force while cornering shall not exceed 2 m/s^2 (0.2G).
- (4) In the case of the device that becomes operative only when the vehicle is running on lanes which can be considered straight, the operation needs not to be cancelled when there is no steering operation. (For the time being, when the vehicle is running on roads whose radius of curvature is 1000 m or more and the lateral acceleration is 0.5 m/s^2 (0.05G) or less while the vehicle is running, it is assumed that the vehicle is running on roads which can be considered straight.)
- (5) The device shall be equipped with a switch whereby at his will the driver can select the status of operation/non-operation of the device. Furthermore, the device shall become operative only when the driver operates the switch at his will to opt for the operation of the device. Moreover, when the driver performs any operation while the device concerned is operating, priority shall be given to the driver's operation.
- (6) The operation of the device shall not be carried out suddenly.

4. Steering Wheel Turning Force and Lateral Acceleration

- (1) Steering wheel turning force

The device shall be so constructed that, even when the device concerned is operating so as to assist the keeping of motor vehicle within the lane, the device can make it possible for the driver's intentional operation to be carried out easily. (For the time being, when the maximum steering wheel turning force is 28 N or less while

the device is operating, this case shall be handled as a case of rendering easy operation of the steering wheel.)

(2) Lateral Acceleration

The lateral acceleration caused by the operation of the device shall not exceed any lateral accelerations which occur in daily running, for example, when the vehicle encounters one-way grades or external disturbances, e.g. lateral wind, so that the subsequent sudden behavior of the motor vehicle may not surprise the driver. (For the time being, the maximum lateral acceleration caused by the operation of the device shall not exceed 0.5 m/s^2 (0.05 G), except for the lateral acceleration which is caused normally by the cornering of the vehicle. However, concerning the device which operates at nearby the lane marking, the maximum lateral acceleration shall not exceed 1 m/s^2 (0.1 G))

5. Indicating Devices in Driver's Seat

The device shall indicate the following items enumerated below in the driver's seat:

- ① Operating status
 - (a) Connecting status of each switch;
 - (b) Operation/non-operation of the device;
 - (c) Indication of function limit; and
- ② Situation of malfunctions

6. Announcement

- (1) An announcement shall be made through sounds and indications so that the driver may be able to immediately perform the required operations in the following cases enumerated below:
 - ① Case where the device fails to operate due to malfunction;
 - ② Case where the operation of the device is cancelled without the

driver's will while the device is operating; and

- ③ Case where there is the possibility that the device can no longer render the assist to the running of the vehicle within the lane while the device is operating.
- (2) An announcement shall be made through sounds or indications so that the driver may be able to immediately perform the required operations in the following cases enumerated below:
- ① Case where, despite the fact that the switch is operated at the driver's will in his attempt to operate the device, the device fails to operate because of unfulfilling the operating conditions; and
 - ② Case where the operation of the device is cancelled at the driver's will while the device is operating (except cases where the cancellation is made through the main switch).

7. Fail-Safe Functions

- (1) The device shall be capable of monitoring the operating conditions of the device concerned so that any malfunction may be detected.
- (2) In cases where the device should encounter any malfunction, the device shall have a function which makes it possible for the operation of the device concerned to be stopped safely.
- (3) The principal functions of the device shall be preferably of a dual system.

8. Information to Be Known to Users

The following information shall be known appropriately to the users through the instruction manuals, caution labels and so forth. Especially, concerning ④, special attention shall be paid so as to see it that every user

comes to know it thoroughly.

- ① Cases where the device can operate and cases where the device cannot operate (including cases where the device becomes a standby status and the differences in operating conditions between those by the main switch and those by the auxiliary switch);
- ② Sounds and indications that are emitted or made by the device and the meanings thereof;
- ③ Effects of the device;
- ④ Limit of functions of the device, the contents of stoppage of functions at the time when the limit of functions of the device is exceeded as well as the required steps to be taken by the driver when the functions are stopped; and
- ⑤ Other operating instructions.