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JAPANESE INDUSTRIAL STANDARD

Driver Hand Control Reach for
Passenger Cars

JIS D 0023-1984

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standard in Japanese is to be evidence

Translated
by
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1. Scope

This Japanese Industrial Standard specifies the driver hand control reach for passenger cars in setting the steering device required for driving.

2. Definitions

For the purposes of this standard, the following definitions apply:

- (1) steering device The device to be operated by a driver with his hand in order to carry out actuation and stopping of lighting device, wiper, etc. required for driving automobile.
- (2) male female driver population ratio The ratio of estimated number of male drivers to that of female drivers.
- (3) envelope The surface indicates the range where out of driver group equipped with a specified seat belt in the estimated male female driver population ratio, at least indicates driver hand reach.
- (4) H-point The pivot centre of the torso line and thigh centerlines of human body model specified in ISO 6549.

Applicable Standard:

ISO 6549-Road vehicles-Procedure for H-Point determination

Corresponding International Standard:

ISO 3958-Road vehicles-Passenger cars-Driver hand control reach

Reference Standards:

JIS D 0033-Location of Hand Controls, Indicators and Tell-Tales for Passenger Cars

JIS D 0301-Measuring Method of Automobile Body Interior Dimensions

JIS D 4603-Retractors for Motorist's Seat Belts

JIS D 4604-Seat Belt Assemblies for Automobiles

ISO 4040-Road vehicles-Passenger cars-Location of hand controls, indicators and tell-tales

- (5) R-point The design reference point corresponding to the position of H-point of the model when seated based on the human-body model and loading gist specified in ISO 6549, with adjusting each seat at the rearmost position⁽¹⁾.

Note ⁽¹⁾ In the case where the up-down of seat, seat back angle, fitting angle of seat cushion, etc. are adjustable, it shall be the design reference position.

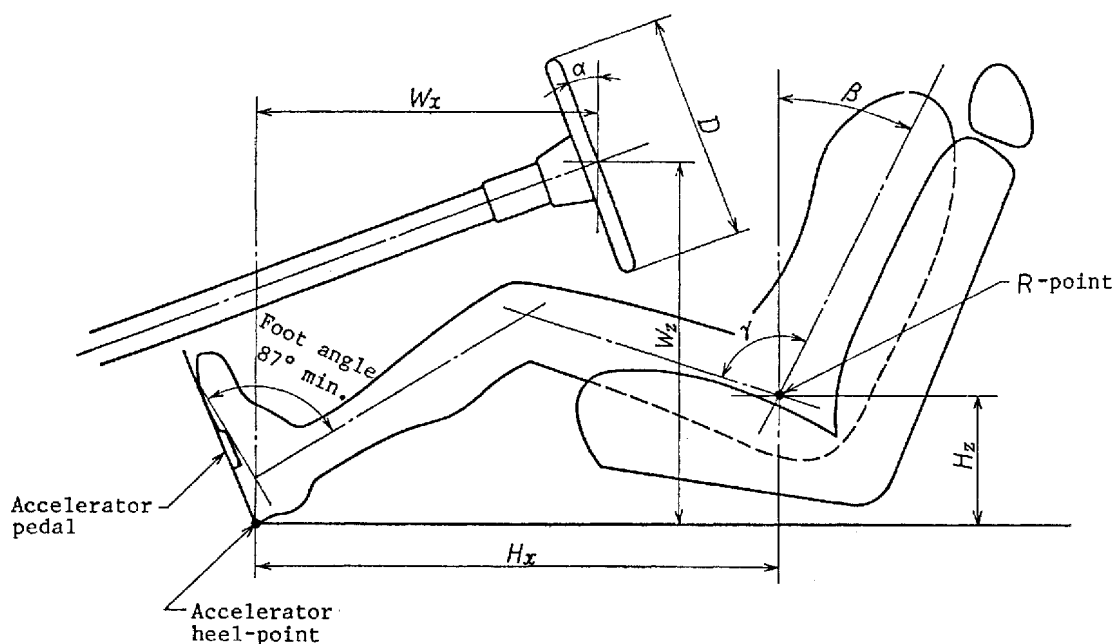
- (6) accelerator heel-point The contact point of the heel of right foot put on the accelerator pedal of human body model specified in ISO 6549 with the floor surface. Provided that the foot angle shall be not less than 87°.
- (7) horizontal R-point travel The horizontal distance between the R-point and the foremost designed H-point.
- (8) centerplane of occupant A vertical plane passing longitudinally through the centre of the operator.
- (9) general package factor (G) A factor to be calculated according to the following formula:

$$G = 0.0018 H_z - 0.0197 \beta + 0.0027 D + 0.0106 \alpha - 0.0011 W_x + 0.0024 W_z + 0.0027 r - 3.0853$$

(Unit: mm in length, degree in angle)

where H_z , β , D , α , W_x , W_z , r , H_x are in accordance with Fig. 1.

Fig. 1. Vehicle Chamber Dimensions for Deciding General Package Factor



- H_z : Vertical distance between the R-point and the accelerator heel-point.
- β : Back angle. The angle included by a vertical line passing through R-point and the torso line.
- D : Steering wheel diameter. The maximum outside diameter of the steering wheel. If the steering wheel is not round, assume twice the largest radius.
- α : Steering wheel angle. The angle that the steering wheel surface plane makes with the vertical. However, where the steering position is adjustable, the steering shall be at design reference position.
- W_x : The horizontal distance between the centre of steering wheel on the plane tangent to the steering wheel rim and the accelerator heel-point. However, in the case where the steering position is adjustable, the steering position shall be the design reference position.
- W_z : The vertical distance between the centre of steering wheel on the plane tangent to the steering wheel rim and the accelerator heel-point. However, in the case where the steering position is adjustable, the steering position shall be the design reference position.
- r : Hip angle. The angle between the torso line and the thigh centreline.
- H_x : The horizontal distance from the R-point to the accelerator heel-point.
- (10) HR The horizontal distance to the vehicle rear from accelerator heel-point to be calculated by using a general package factor.
- (11) vertical reference plane of envelope The reference plane in front-rear direction of envelope the front-rear position of which is set by the relation between HR and H_z in the plane intersecting perpendicularly to the longitudinal centre plane of the car (see Fig. 2).
- (12) horizontal reference plane of envelope The horizontal plane passing through R-point, and further reference plane in upper-lower direction of envelope (see Fig. 2).

3. Required Conditions

Passenger cars of the following operator chamber dimensions are applied (see Fig. 1).

- (1) Back Angle (β) 0 to 33.0°
- (2) Vertical Distance from R-Point to Accelerator Heel-Point (H_z)
130 to 550 mm

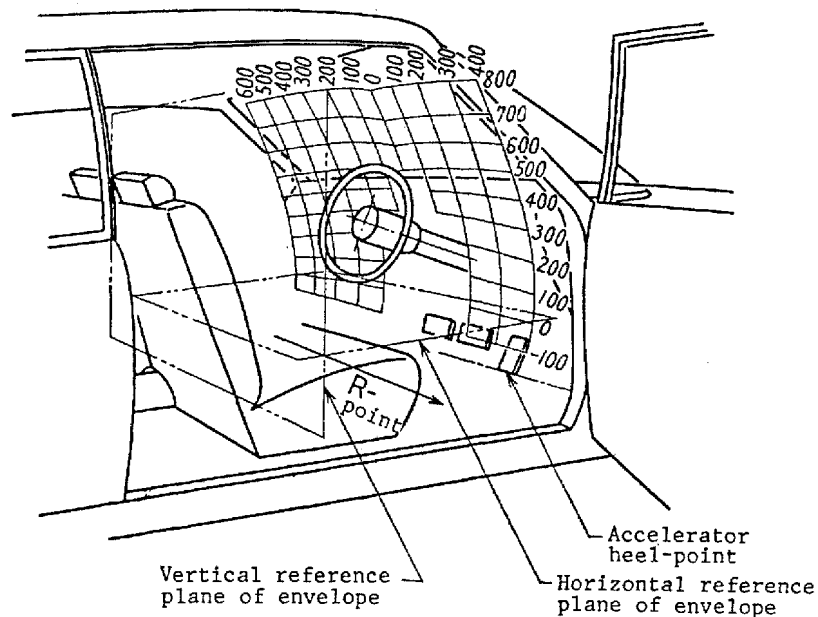
- (3) Horizontal R-Point Travel 130 mm or more
- (4) Steering Wheel Diameter (D) 330 to 600 mm
- (5) Steering Wheel Angle (α) 10.0 to 85.0°
- (6) Horizontal Distance from Steering Wheel Centre to Accelerator Heel-Point (W_x) 30 to 660 mm
- (7) Vertical Distance from Steering Wheel Centre to Accelerator Heel-Point (W_z) 530 to 880 mm

4. Envelope

4.1 Range of Envelope Taking the centre plane of operator as the reference, the range of 600 mm to centre side of vehicle, 400 mm to the outside of vehicle and from 100 mm of the lower side to 800 mm of upper side of the horizontal reference plane of envelope (see Fig. 2).

Fig. 2. Envelope

Unit: mm



4.2 Kind of Envelopes The envelopes shall be classified into the following 42 classes (Attached Tables 1 to 42) according to the seat belt, and the combination of general package factor with male female driver population ratio.

- (1) In the Case of Wearing Three-Point Type Seat Belt [Excepting emergency lock type winder mounted apparatus⁽²⁾.]

Note ⁽²⁾ The apparatus in which the drawing-out of webbing and winding-in are carried out freely during wearing, and only in the case where rapid speed change is caused by impact and the like, the lock mechanism actuates.

General package factor	Male/female driver population ratio		
	50/50	75/25	90/10
$G < -1.25$	Attached Table 1	Attached Table 2	Attached Table 3
$-1.25 \leq G < -0.75$	Attached Table 4	Attached Table 5	Attached Table 6
$-0.75 \leq G < -0.25$	Attached Table 7	Attached Table 8	Attached Table 9
$-0.25 \leq G < 0.25$	Attached Table 10	Attached Table 11	Attached Table 12
$0.25 \leq G < 0.75$	Attached Table 13	Attached Table 14	Attached Table 15
$0.75 \leq G < 1.25$	Attached Table 16	Attached Table 17	Attached Table 18
$1.25 \leq G$	Attached Table 19	Attached Table 20	Attached Table 21

(2) In the Case of Wearing Two-Point Type Seat Belt or Three-Point Type Seat Belt Mounted with Emergency Lock Type Winder

General package factor	Male/female driver population ratio		
	50/50	75/25	90/10
$G < -1.25$	Attached Table 22	Attached Table 23	Attached Table 24
$-1.25 \leq G < -0.75$	Attached Table 25	Attached Table 26	Attached Table 27
$-0.75 \leq G < -0.25$	Attached Table 28	Attached Table 29	Attached Table 30
$-0.25 \leq G < 0.25$	Attached Table 31	Attached Table 32	Attached Table 33
$0.25 \leq G < 0.75$	Attached Table 34	Attached Table 35	Attached Table 36
$0.75 \leq G < 1.25$	Attached Table 37	Attached Table 38	Attached Table 39
$1.25 \leq G$	Attached Table 40	Attached Table 41	Attached Table 42

4.3 Correction of Envelope Attached Tables 1 to 42 are specified in the case of operation by grasping with three fingers. In the cases of the following operation method, the following correction shall be carried out:

- (1) In the case of operation by finger grasping:

Value of Attached Table + 50 mm

- (2) In the case of operation by hand grasping:

Value of Attached Table - 50 mm

5. Selection of Envelopes

- 5.1 Calculation of General Package Factor Calculation G according to 2.(9).

5.2 Decision of Vertical Reference Plane of Envelope Obtain HR from the following formula and decide the front-rear position of vertical reference plane of envelope according to the following (1) or (2).

$$HR = 786 - 99G \text{ (mm)}$$

- (1) In the case of $(HR - H_z) < 0$ Measure the vertical reference plane of envelope in parallel to the longitudinal centre plane of car, and set at a distance of HR rearward from the accelerator heel-point.
- (2) In the case of $(HR - H_z) \geq 0$ Set the vertical reference plane of envelope at R-point position.

5.3 Selection of Envelopes Select the corresponding envelope out of Attached Tables 1 to 42 depending upon the general package factor of the objective vehicle, estimated male/female driver population ratio and combination of seat belts.

6. Hand Reach

6.1 Express the right-left, upper-lower and front-rear positions of the objective steering device by the distance from the operator centre plane, horizontal reference plane of envelope and vertical reference plane of envelope.

6.2 By using the right-left and upper-lower positions of the objective steering device obtained in 6.1 read the boundary value of hand reach according to Attached Table. If the position does not exist in the tables, obtain by carrying out the following correction.

- (1) In the case of the range specified in 4.1, carry out the curve correction in horizontal direction at first and next in vertical direction.
- (2) In the case of the range outside the range specified in 4.1, carry out the correction by extending the curve.

6.3 In the case where relative to the boundary value of hand reach decided in 6.2, the centre of knob surface of the objective steering device exists at the same position or at the rear of the vehicle, the steering device shall be in the operator's hand reach range.

Attached Table 1. Hand-Reach Envelope

Seat belt: Three point type seat belt⁽³⁾

General package factor $G < -1.25$

Male/female driver
population ratio 50/50

Unit: mm

R-point reference upper-lower position	Vehicle centre side from centre line of occupant									Vehicle outside from centre line of occupant						
	600	500	400	300	250	200	100	50	0	0	50	100	200	250	300	400
800		377	426	468	483	495	504	501	493	502	497	490	470	456	438	387
700		455	499	532	546	557	566	562	550	556	551	546	531	520	506	463
600	449	514	555	584	595	604	611	605	590	584	586	586	576	567	555	519
500	486	553	595	622	631	637	638	630	614	589	603	609	606	598	586	556
450	498	565	609	636	644	649	645	636	620	583	604	615	615	607	595	567
400	506	572	619	646	654	656	648	637	621	571	601	618	621	612	600	574
350	511	574	625	654	660	660	646	633	619	555	594	616	623	614	601	576
300	510	572	626	658	662	660	639					611	622	612	597	574
250	506	564	624	658	662	657	628					602	617	605	590	567
200	498	551	618	656	658	649	613					590	608	596	578	557
100	469	510	593	640	639	624							581	566	544	524
0	423	449	551	610	607	584										474
-100	360	367	493	567	561	528										410

Note ⁽³⁾ Except the emergency lock type winder mounted apparatus.

Remark: The numerical values in Attached Table indicate the hand-reach by horizontal distance from the vertical reference plane of envelope.

Attached Table 2. Hand-Reach Envelope

Seat belt: Three point type seat belt⁽³⁾

General package factor $G < -1.25$

Male/female driver
population ratio 75/25

Unit: mm

R-point reference upper-lower position	Vehicle centre side from centre line of occupant									Vehicle outside from centre line of occupant						
	600	500	400	300	250	200	100	50	0	0	50	100	200	250	300	400
800		419	466	505	520	532	542	539	530	532	526	520	501	488	470	422
700		492	534	567	580	590	600	595	582	584	579	574	560	550	536	496
600	480	545	586	615	626	634	640	634	619	609	612	612	604	596	584	550
500	513	580	622	649	658	664	663	654	638	610	625	634	633	625	614	584
450	523	589	634	662	670	673	668	658	642	602	625	639	641	634	622	594
400	529	594	642	671	678	679	668	657	642	587	620	640	647	639	626	600
350	531	594	646	677	682	681	664	651	637	568	611	637	648	640	627	601
300	529	589	646	679	683	680	656					631	646	637	623	598
250	523	578	642	678	681	675	643					621	641	630	615	591
200	513	563	633	673	675	666	625					607	632	620	603	579
100	480	517	604	654	654	637							604	590	568	544
0	430	451	558	621	618	593										492
-100	363	364	496	575	569	534										426

Remark: The numerical values in Attached Table indicate the hand-reach by horizontal distance from the vertical reference plane of envelope.

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