

The guideline of the head-up display layout (Version4.0)

Japan Automobile Manufacturers Association
Safety Subcommittee
Driver Vision Sub-group
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1. Scope

This guideline applies to situation when the display is within the field of vision of the windscreen when the shift position is in the forward or reverse position.

2. Definitions

2-1

"Head-up display" means device that displays information within the field of vision of the windscreen. Except for the nighttime front information providing device.

2-2

"The nighttime front information providing device" means device that uses an infrared camera to detect the reflected light of infrared rays emitted in front of the vehicle and displays the image in the windscreen field of vision during nighttime and foggy conditions.

2-3

The eye point refers to the "position of the driver's eyes" specified in the "Agreement rules according to the rear-view mirror (No. 46)".

When corrected back angles using the correction method specified in "Agreement rules according to the window glass (No. 43)" (Table 1).

"V1point", "V2 point" means the "V1point", "V2 point" defined as "Agreement rules according to the window glass (No. 43)"

2-4

"Virtual image" means light emitting portion of a virtual image projected on the windscreen. The position and size of the display virtual image calculates the eye point to the origin.

2-5

"Display region" means single area that surrounded by a trajectory line formed when a 0.85° circle is moved along the outline and inside of one or more virtual image elements. (Referred to as "envelope")

However, the inner envelope must be able to encompass a circle of 0.85° . (refer to Attachment1)

- If a part of the display element blinks, the part displayed within the interval of 0.3s is considered to be displayed simultaneously and included in the display region.

3. The display position, display region and display brightness

3-1 Display position

3-1-1

The head-up display shall not interfere with the driving by causing distraction or obstructing the driver's field of vision.

3-1-2

In addition to the paragraph 3-1-1, the display region shall satisfy the following (A) and (B).

(A) It must be below the plane where the angle between the horizontal plane and the downward direction through the V2 is 1 degr., or above the plane where the angle between the horizontal plane and the upward direction through the V1 is more than 3 deg.

However, except when the paragraph 3-2 or 3-3 are met.

(B) Not display in the range connecting the mirror surface of the rear-view mirror and the eye point.

3-2 Display region

Ratio that basic figure (Rectangle: height 2.6° , width 0.8°) covered by one or more display region do not exceed 35% at the maximum. (refer to Attachment 2)

3-3 Display brightness

Display brightness satisfy the following upper limit.

When brightness is adjustable, the maximum adjustment value shall be less than the following value.

The measurement conditions for brightness shall be a dark room with a black wall, and the measurement conditions for outside illuminance shall be upward on the road surface around the vehicle.

Illuminance	Under 500lx	500lx or more, 60,000lx or less	Over 60,000lx
Upper limit of HUD luminance	130 [cd/m ²]	$(2.4 \times 10^{-6})x^2 + 0.26x$ [cd/m ²]	$0.40x$ [cd/m ²]

x(lx):Illuminance

4. Visible light transmittance of the display

Visible light transmittance of the windscreen that is covered by the display especially provided for head-up display within the field of vision of the windscreen satisfies the "agreement rules according to the window glass (No. 43)".

5. Compatibility with safety regulation for road vehicle

When the head-up display shows the same contents as the display specified in the safety regulation for road vehicle in the instrument panel (e.g., digital display and analog display, etc.), they shall be linked.

6. Color, brightness and size of the display

6-1

The color, brightness, size, and contrast of the display shall make it easy to confirm the display both day and night.

6-2

Display shall not cause confusion to the driver of the own vehicle or other vehicles, and shall satisfy the following


- At least provide two levels of brightness.
- Also, its minimum brightness is $30\text{cd}/\text{m}^2$
- If red is used, it should be limited to warnings to indicate whether a function is working or not (warnings), cautions, and serious condition.


Table 1: back angle correction value of the eye point

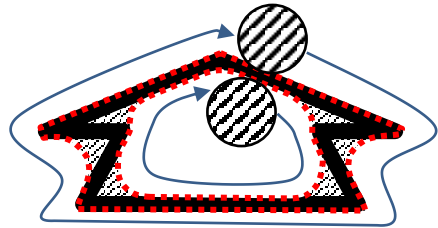
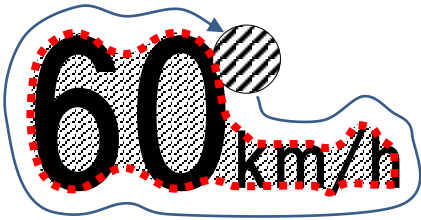
バックアングル β (ISO L 40)度	水平距離X mm	鉛直距離Z mm
5.0	-186.4	27.6
6.0	-176.5	27.3
7.0	-166.6	27.0
8.0	-156.8	26.5
9.0	-147.1	25.9
10.0	-137.4	25.1
11.0	-127.8	24.3
12.0	-118.3	23.3
13.0	-108.8	22.2
14.0	-99.4	21.0
15.0	-90.0	19.7
16.0	-80.7	18.3
17.0	-71.5	16.7
18.0	-62.3	15.0
19.0	-53.2	13.2
20.0	-44.2	11.3
21.0	-35.2	9.3
22.0	-26.3	7.2
23.0	-17.5	4.9
24.0	-8.7	2.5
25.0	0.0	0.0
26.0	8.6	-2.6
27.0	17.2	-5.1
28.0	25.8	-8.2
29.0	34.2	-11.2
30.0	42.6	-14.3
31.0	50.9	-17.5
32.0	59.2	-20.8
33.0	67.4	-24.3
34.0	75.6	-27.9
35.0	83.6	-31.5
36.0	91.6	-35.1
37.0	99.6	-39.3
38.0	107.5	-43.3
39.0	115.3	-47.5
40.0	123.0	-51.8

Attachment 1

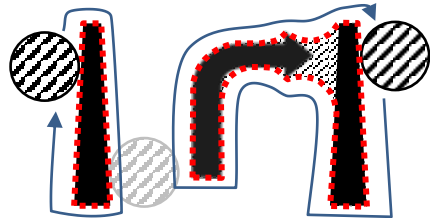
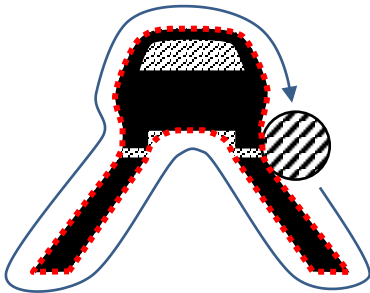
Creation of the envelope of the display virtual image

When a circle with a diameter of 0.85° is moved along the exterior and interior of the displayed virtual image, the trajectory line is the envelope, and the interior is the display region ().

 0.85° Circle



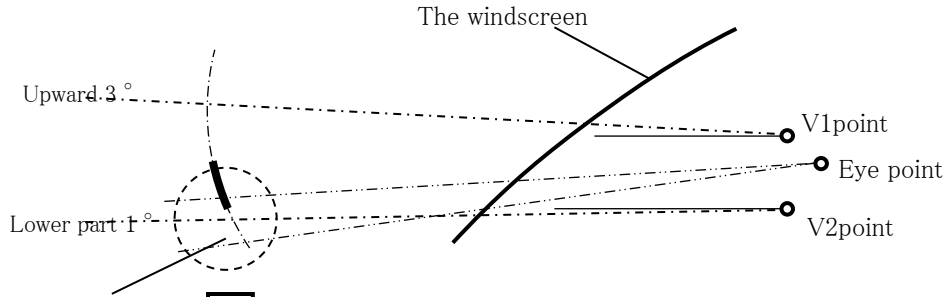
※ The area surrounded by the display virtual image that can contain 0.85° is excluded from the display region.



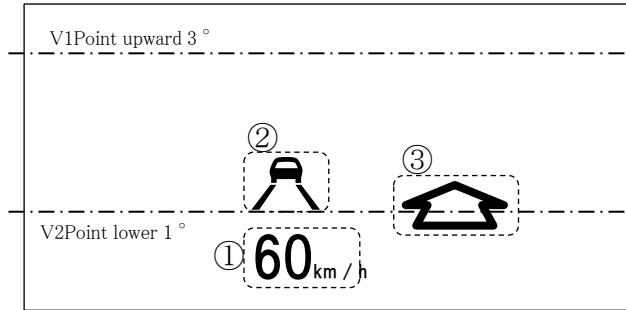
※ If the gap between the displayed virtual images is larger than 0.85° , they shall be separate display region.

Attachment 2

3-2 or 3-3 The target range



Position of the virtual image on the head-up display when viewed from the eye point



If you ① virtual image display satisfies the 3-1-2
→ outside the scope of 3-2

② when a virtual image display all does not meet the
3-1-2

→ 3-2 or 3-3 of target

③ If a part of the virtual image display does not
meet the 3-1-2

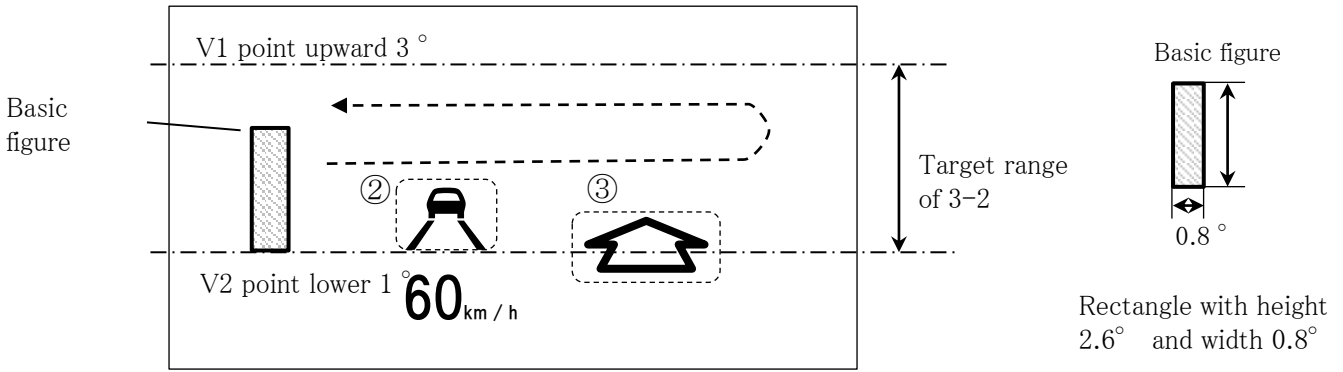
→ 3-1-2 does not meet the part only 3-2 or 3-3
of the object

Attachment 2 (continued)

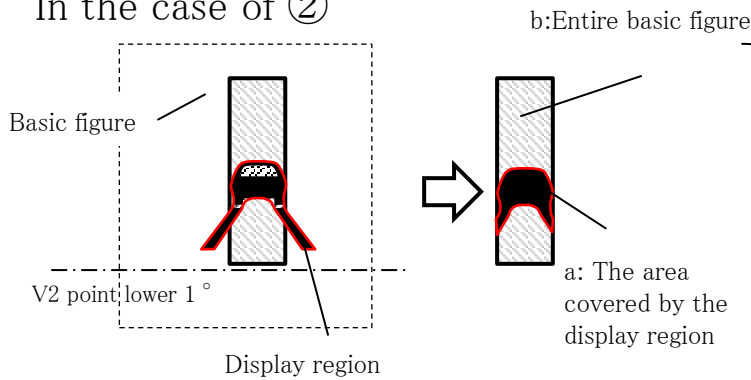
3-2 How to Verify

Calculate the ratio of the portion where the display region of the virtual image display covers the basic figure to the entire basic figure for the display virtual image that is the target of 3-2 among the display virtual images in the windscreen field of vision.

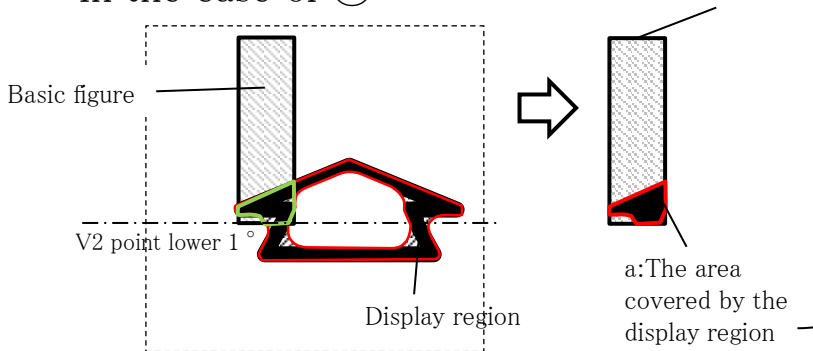
(The basic figure should be checked everywhere within the area of the front windscreen visibility range from 1° below the V2 point to 3° above the V1 point.)



In the case of ②



In the case of ③



$$\text{Percentage of the display region that covers the reference graphic} = \frac{\text{a: The area covered by the display region}}{\text{b: Entire basic figure}}$$