European Standard for Vertical Signs

Tony McCaugherty
European Regulatory Affairs

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AVERY DENNISON

Objective, Scope & Expert Team

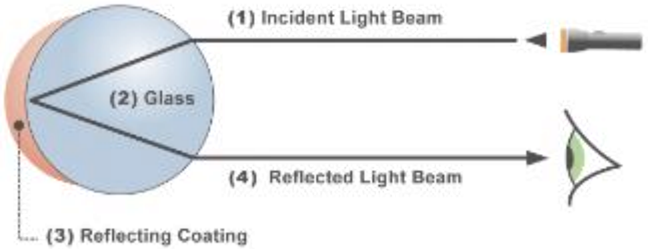
1. EC Mandate M111,
2. WG3 expert project team
3. Progress
   a. Create a driver based system that is simpler than the last failed draft (Part 6)
   b. Incorporate products that are currently on the market, under CE rules
1. Draft proposal
2. Next steps

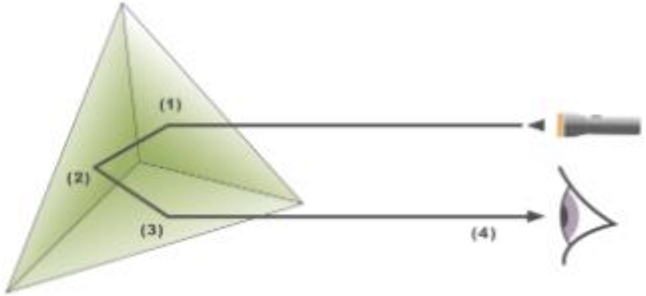
The <u>current</u> standard EN12899-1:2007

Simple test method

Complex test method

(Microprismatic sheeting performs very differently and the NEW EN adopts the 4 geometry testing, $\alpha°$, $\beta°$, $\varepsilon°$, $\omega_s°$)





EN 12899-1-1 New Standard, ‘New’ Test Method

- Complex geometries
  - Describing car position on the road vs traffic sign
    - α – observation angle
    - ß1 and ß2 – entrance angles
  - Describing sign position vs car’s headlamps
    - ω_S – orientation angle
  - Describing sign rotation vs driver’s eye
    - ε – rotation angle

CIE 54.2 - 2001

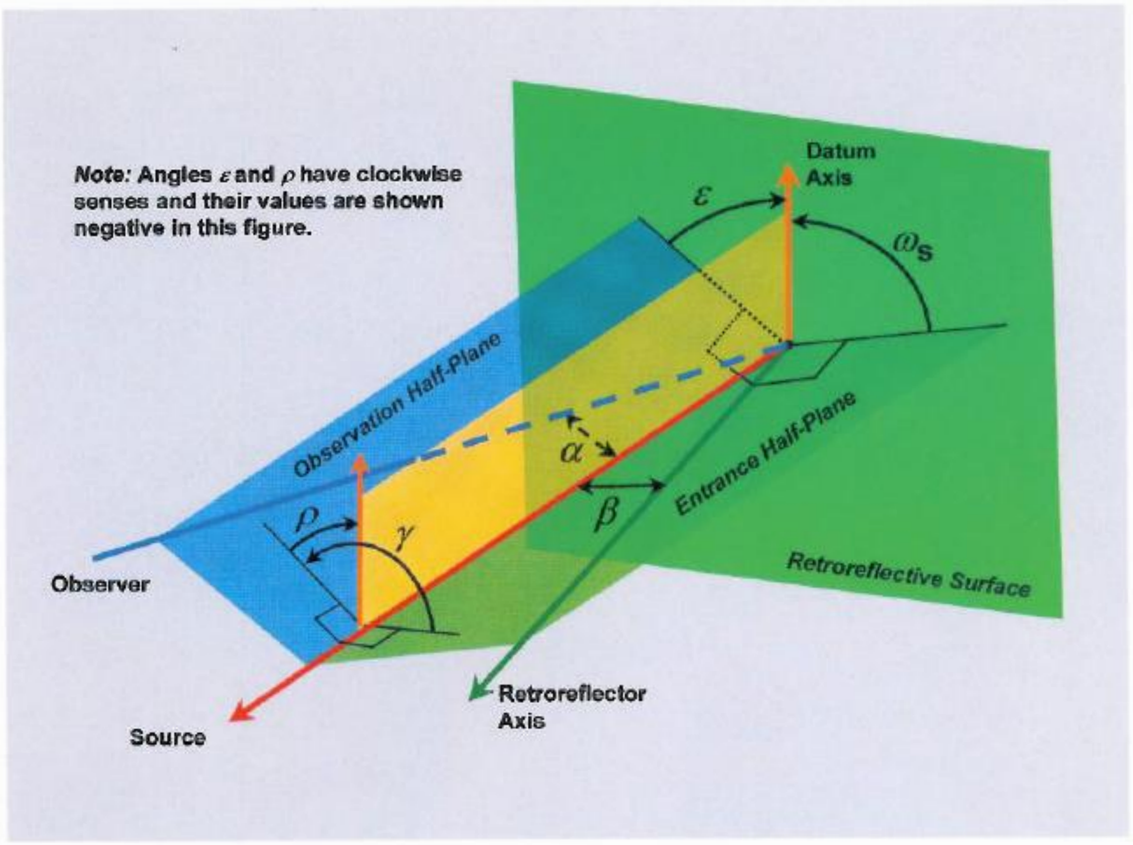


Figure 3. Relationship of all four systems.

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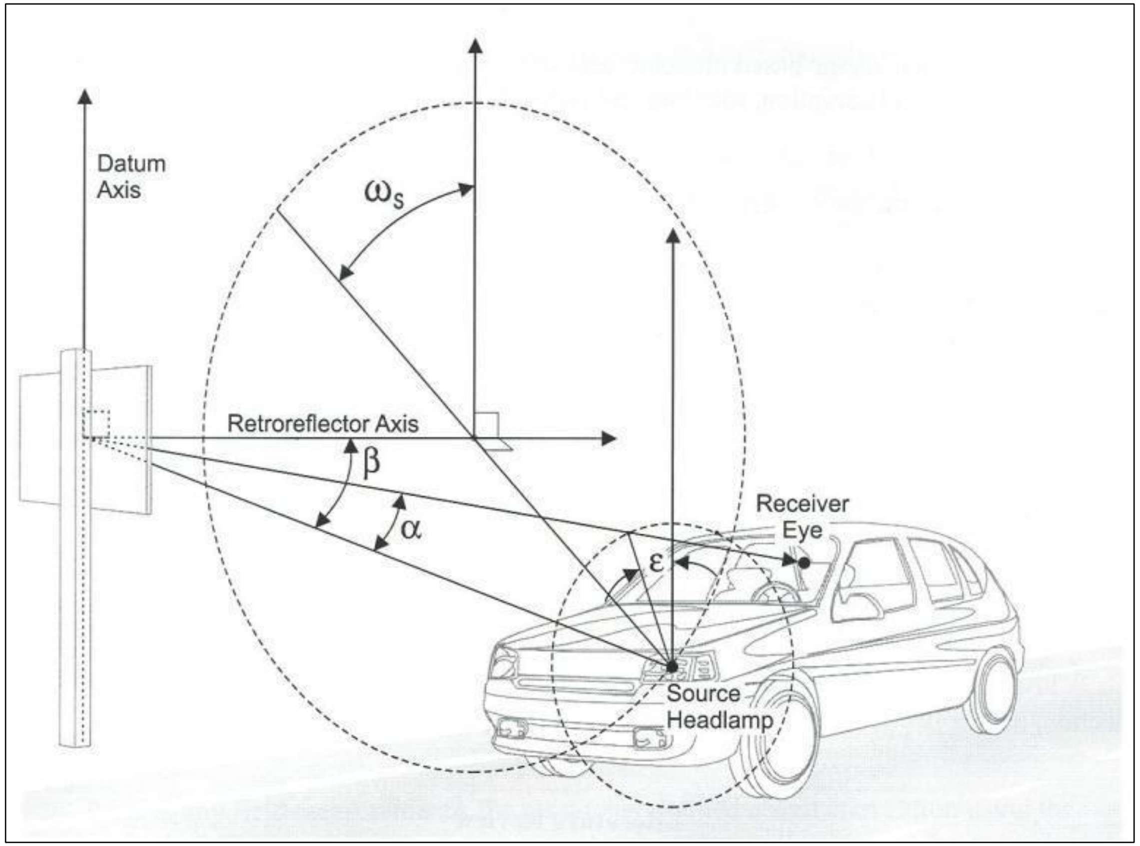
EN 12899-1-1 New Standard, ‘New’ Test Method

Figure 27 - The Application System

These retro-reflection angles are defined in CIE Report 54.2. Coefficient of retro-reflection is also defined in CIE Report 54.2. A short description of each angle follows:

- Entrance Angle, β – The angle measured between the illumination axis (headlamp) and the retro-reflector axis (perpendicular to sign).
- Observation Angle, α – The angle measured between the illumination axis (headlamp) and the observation axis (receiver’s eye).
- Orientation Angle, ω_s – The angle in the plane perpendicular to the retro-reflection axis measured counterclockwise between the entrance half-plane to the datum axis and the viewpoint source (headlamp).
- Rotation Angle, ε – The angle in the plane perpendicular to the retroreflection axis measured counterclockwise between the observation half-plane to the datum axis and the viewpoint source (headlamp).



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Test method for Retroreflectivity, simplified

prEN 12899-1-1:2019 (E)

ω_s geometries represent sign positions. L/R shoulder, L/R High, Overhead

Table A.2 — Cases to be included in thorough testing for some specific values of α and β

β	ε	ω_s				
		-90°	-75°	0°	75°	90°
β = 5° all α values	-45°			×		
	0°			×		
	45°			×		
β = 15° all α values	-45°	(×)		×		×
	0°	(×)		×		×
	45°	(×)		×		×
β = 30° and α = 0,20° or 0,33° or 0,50°	-45°	(×)				×
	0°	(×)				×
	45°	(×)				×
β = 30° and α = 1,00° or 1,50° or 2,00°	-45°	(×)	(×)		×	×
	0°	(×)	(×)		×	×
	45°	(×)	(×)		×	×
Cases marked by (×) can be omitted when right/left symmetry has been established in accordance with A.4.						

Positives of the new standard

- Designed from a driver's perspective
- Sheeting evaluated using appropriate test method
- Optional class refinement for agencies
- Table construction represents application
- Transparent overlay are included in families,
- Reduced post weathering to 0.33/5° from 5° and 30°

Three Look model

The focus of the expert group was on the ‘useful sign distance’
Tables reflect this. Bold text for geometries that are ‘useful’ Italics for Quality and Production purposes

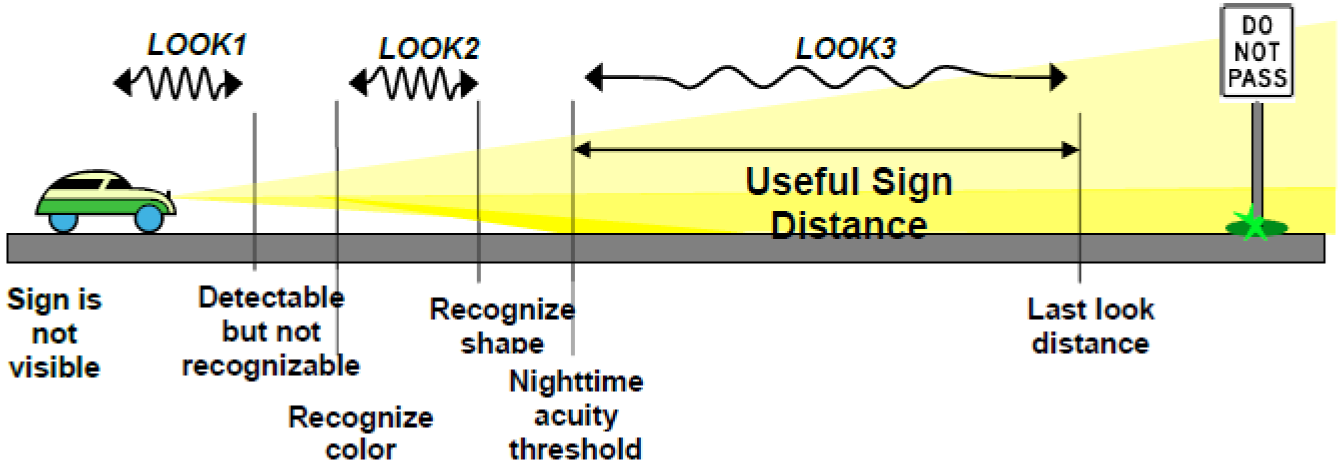


Figure 5 - A Three-Glance Look Model

Applying the Proposal Design

Sheeting manufacturers certify to EN12899-1-1

Sign makers would be able to use current sign sheeting products with cascading CE documentation.

Existing products with CE approval should stay in their 'old' class (does not exclude products)

The classifications have been designed from a driver and sign perspective

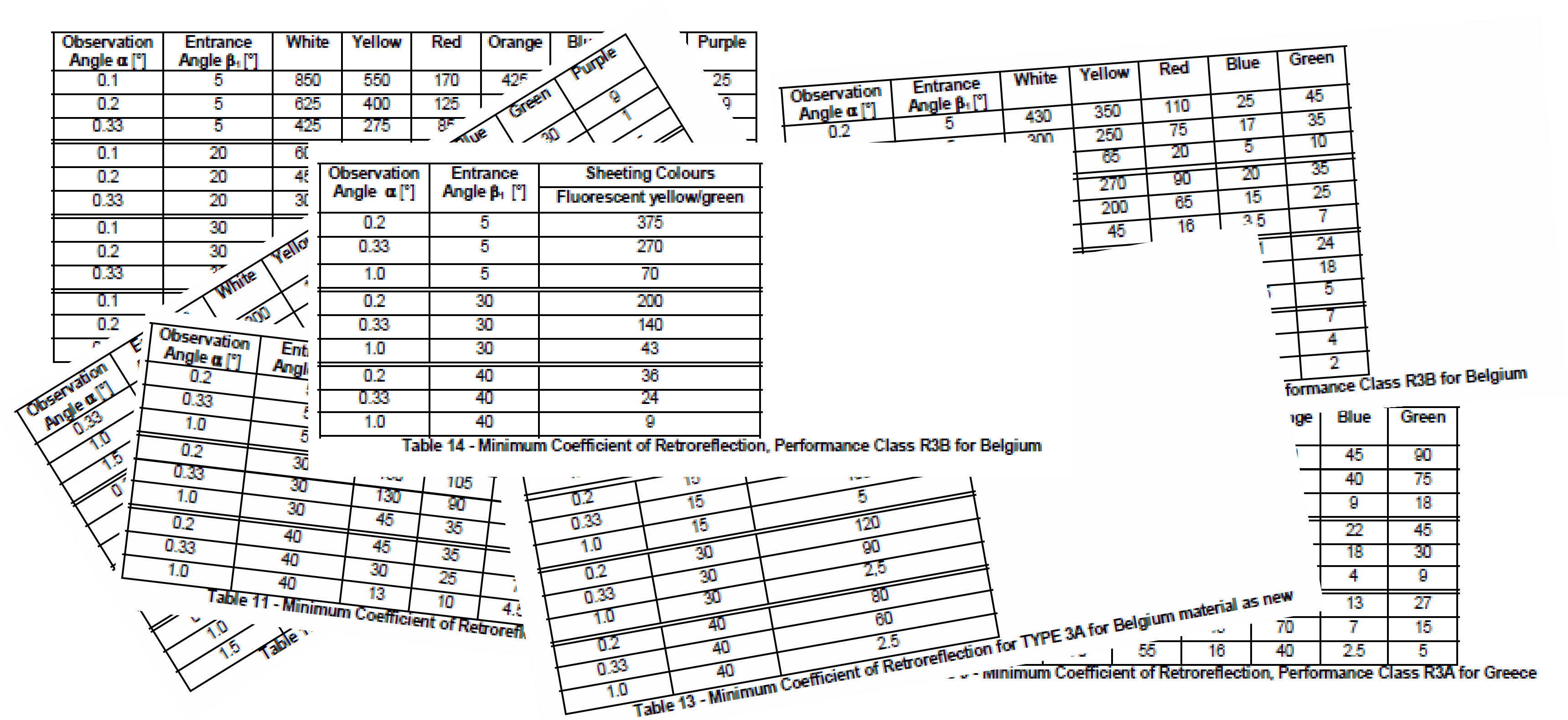
Class 1: Is intended for signs that will be used at close distances, where high levels of light may not be necessary. Examples: Parking signs, low-speed roundabouts.

Class 2: Is intended as a robust performance that encompasses medium to high speed roadways without a high level of complexity or demand.

Class 3: Is intended for medium to high speed applications with complexity and/or background competition. Only class to deliver… Examples: Highway chevrons, Overhead guide signs.

Current table situation

EAD 120001-01-0106:2015 – Microprismatic retro-reflective sheetings
successor of CUAP 01.06/04 – 2004



Observation Angle α [°]	Entrance Angle β₁ [°]	Sheeting Colours Fluorescent yellow/green
0.2	5	375
0.33	5	270
1.0	5	70
0.2	30	200
0.33	30	140
1.0	30	43
0.2	40	36
0.33	40	24
1.0	40	9

Table 14 - Minimum Coefficient of Retroreflection, Performance Class R3B for Belgium

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Tables

Table 1 — Minimum $R_{A,C}(\alpha,\beta)$ values for retroreflection classes 1/1 and 1/2 ($cd \cdot m^{-2} \cdot lx^{-1}$)

Class 1						
	Class 1/1			Class 1/2		
α	β=5°	β=15°	β=30°	β=5°	β=15°	β=30°
0,20°	46	45	22	133	129	32
0,33°	46	45	22	66	64	32
0,50°	26	25	22	37	36	32
1,00°	9,8	9,5	8,5	14	14	12
1,50°	5,5	5,4	4,8	7,9	7,7	6,9
2,00°	3,7	3,6	1,6	3,7	3,6	1,6

Accommodating current "state of mind" – three performance classes (R1, R2, R3)

Not excluding existing products from the market

Not shifting existing products between existing classes

Current classes RA1, RA2, technically every class 3. R3A Germany, R3A Greece, Type 3A Belgium, R3B Germany, R3B Greece, R3B Belgium, T3 France, RA3 Czech Republic, etc.

Table 2 — Minimum $R_{A,C}(\alpha,\beta)$ values for retroreflection classes 2/1 and 2/2 ($cd \cdot m^{-2} \cdot lx^{-1}$)

Class 2						
	Class 2/1			Class 2/2		
α	β=5°	β=15°	β=30°	β=5°	β=15°	β=30°
0,20°	232	225	100	398	225	100
0,33°	115	112	100	197	192	100
0,50°	64	62	56	110	107	56
1,00°	14	14	12	21	20	12
1,50°	7,9	7,7	6,9	7,9	7,7	6,9
2,00°	3,7	3,6	1,6	3,7	3,6	1,6

Table 3 — Minimum $R_{A,C}(\alpha,\beta)$ values for retroreflection classes 3/1 and 3/2 ($cd \cdot m^{-2} \cdot lx^{-1}$)

Class 3						
	Class 3/1			Class 3/2		
α	β=5°	β=15°	β=30°	β=5°	β=15°	β=30°
0,20°	398	255	100	527	255	100
0,33°	263	255	100	527	255	100
0,50°	147	143	64	294	143	64
1,00°	56	41	18	112	54	18
1,50°	16	15	6,9	32	15	6,9
2,00°	3,7	3,6	1,6	3,7	3,6	1,6

Class 1

Table 1 — Minimum $R_{A,C}(\alpha,\beta)$ values for retroreflection classes 1/1 and 1/2 ($cd \cdot m^{-2} \cdot lx^{-1}$)

Class 1						
	Class 1/1			Class 1/2		
α	β=5°	β=15°	β=30°	β=5°	β=15°	β=30°
0,20°	46	45	22	133	129	32
0,33°	46	45	22	66	64	32
0,50°	26	25	22	37	36	32
1,00°	9,8	9,5	8,5	14	14	12
1,50°	5,5	5,4	4,8	7,9	7,7	6,9
2,00°	3,7	3,6	1,6	3,7	3,6	1,6

Optional refinement of Class 1

Class 1/1: Requires a low level of performance at 1.4 times the reference. And, it utilizes very large entrance and observation geometries that only occur when reading a sign at very close distance, like in a low-speed roundabout.

Class 1/2: Requires a slightly higher performance than Class 1A at 2 times the reference and does not include the most extreme observation angles that only occur infrequently.

Class 2

Table 2 — Minimum $R_{A,C}(\alpha,\beta)$ values for retroreflection classes 2/1 and 2/2 ($cd \cdot m^{-2} \cdot lx^{-1}$)

Class 2						
	Class 2/1			Class 2/2		
α	β=5°	β=15°	β=30°	β=5°	β=15°	β=30°
0,20°	**232**	**225**	100	**398**	*225*	*100*
0,33°	**115**	**112**	**100**	**197**	**192**	*100*
0,50°	**64**	**62**	**56**	**110**	**107**	*56*
1,00°	*14*	*14*	*12*	21	20	*12*
1,50°	*7,9*	*7,7*	*6,9*	*7,9*	*7,7*	*6,9*
2,00°	*3,7*	*3,6*	*1,6*	*3,7*	*3,6*	*1,6*

Optional refinement of Class 2

Class 2/1: Requires a medium level of performance at 4 times the reference. It utilizes large entrance geometries where a driver may read a sign at medium distance and speeds, and a driver will encounter higher than usual incident angles. An example of this may be a medium speed roundabout.

Class 2/2: Requires a medium/high performance at 7 times the reference and it is intended to be used at medium to high speeds. This geometries included encompass the most frequently used geometries for the majority of road signs.

Class 3

Table 3 — Minimum $R_{A,C}(\alpha,\beta)$ values for retroreflection classes 3/1 and 3/2 ($cd{\cdot}m^{-2}{\cdot}lx^{-1}$)

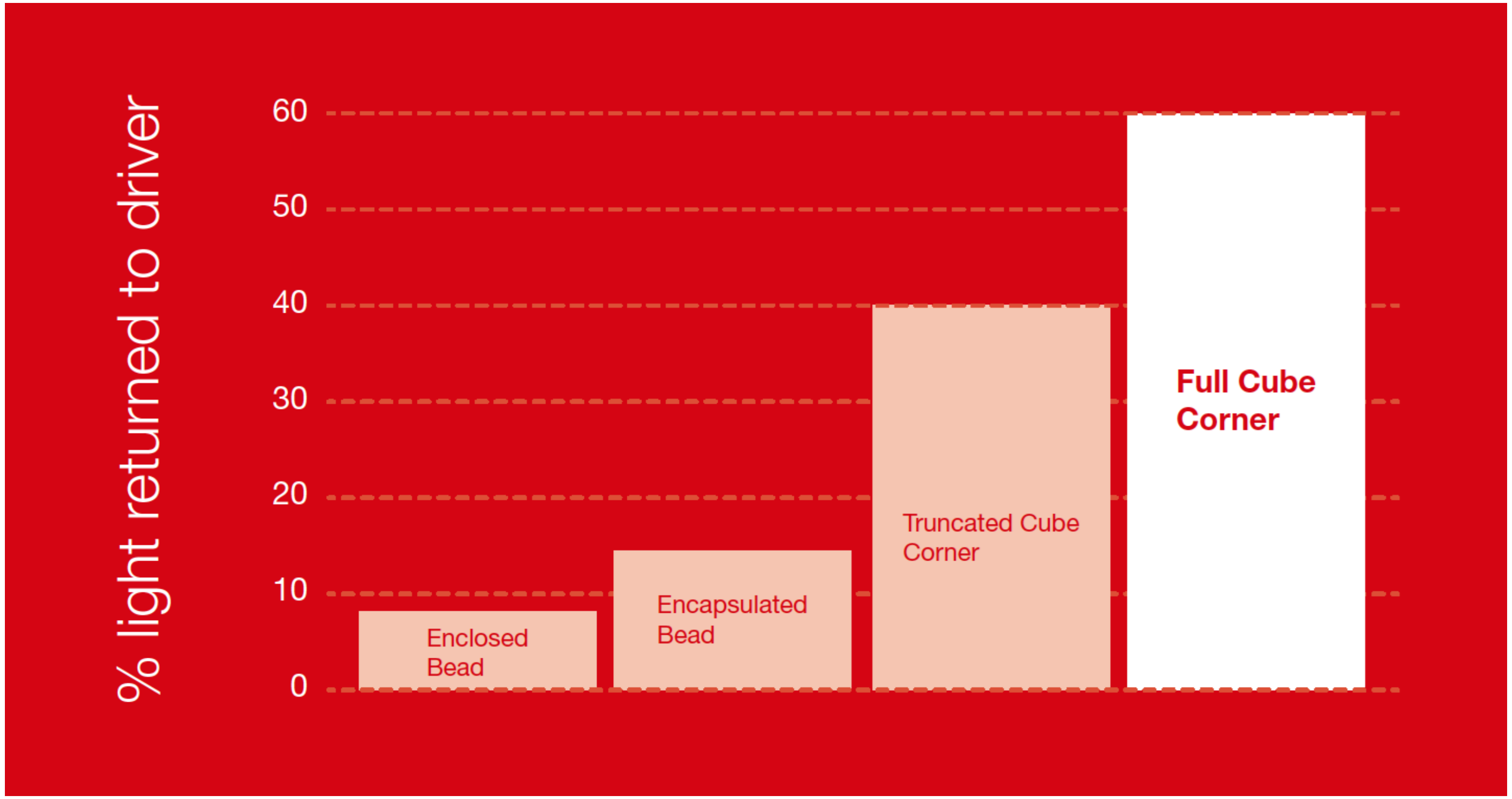
Class 3						
α	Class 3/1			Class 3/2		
	β=5°	β=15°	β=30°	β=5°	β=15°	β=30°
0,20°	**398**	255	*100*	527	255	*100*
0,33°	**263**	**255**	*100*	**527**	255	*100*
0,50°	**147**	**143**	64	**294**	143	*64*
1,00°	**56**	41	18	**112**	54	*18*
1,50°	16	15	*6,9*	32	15	*6,9*
2,00°	*3,7*	*3,6*	*1,6*	*3,7*	*3,6*	*1,6*

Optional refinement of Class 3

Class 3/1: Requires a medium/high level of performance at 8 times the reference. It utilizes large entrance geometries where a driver may read a sign at medium or long distance, and a driver will encounter higher than usual incident angles.

Class 3/2: Requires the highest performance at 16 times the reference and it is intended to be used at high speeds, especially where complexity exists. The geometries included encompass those encountered in applications like directional signs and warning signs on highways. This is the only classification that delivers…

Full Cube = More Light



50%

more light returned to the driver

Class 3 table DIN67520

Tabelle 4 — Mindestwerte für spezifische Rückstrahlwerte R_A unbedruckter Reflexstoffe entsprechend Reflexions-Klasse RA3A

Now you can see that the table Geometries are not relevant as the driver is too far away to read the signs at both 0.1 and 0.2 obs

Aufsichtfarbe	Spezifische Rückstrahlwerte R_A in $cd \cdot m^{-2} \cdot lx^{-1}$								
	α = 0,1°			α = 0,2°			α = 0,33° (20′)		
	β_1 =			β_1 =			β_1 =		
Rot	170	120	85	125	90	65	85	60	45
Orange	425	300	210	310	225	160	210	150	110
Gelb*)	550	390	275	400	290	210	275	195	145
Grün	85	60	40	60	45	30	40	30	20
Blau	55	40	28	40	30	20	28	20	15
Purpur	25	18	13	19	13	10	13	9	7
Fluoreszierendes Gelb-Grün	700	480	340	500	360	260	340	240	180
Fluoreszierendes Orange	260	130	95	140	100	70	95	65	49

*) Gilt auch für fluoreszierende Reflexstoffe mit der Aufsichtfarbe Gelb.

Class 3 table DIN67520

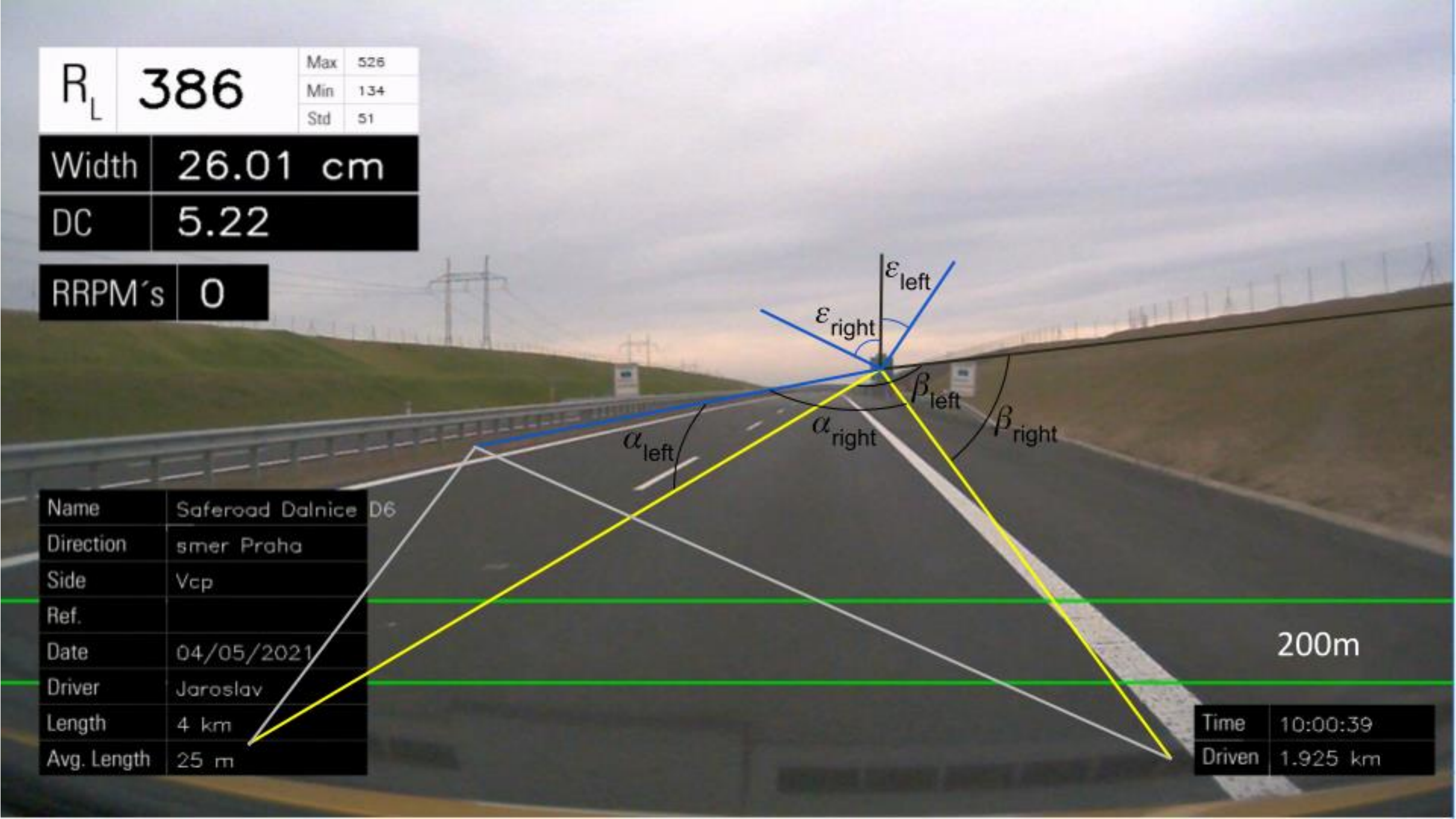
Tabelle 5 — Mindestwerte für spezifische Rückstrahlwerte R_A unbedruckter Reflexstoffe entsprechend Reflexions-Klasse RA3B

Aufsichtfarbe	Spezifische Rückstrahlwerte R_A in $cd \cdot m^{-2} \cdot lx^{-1}$											
	α = 0,33° (20′)				α = 1°				α = 1,5°			
	β_1 =				β_1 =				β_1 =			
Rot	60	48	33	6	7	6	4	1	3	2,5	2	0,5
Orange	150	120	83	15	18	15	10	2	7,5	6,5	4,5	1
Gelb*)	195	155	110	20	23	20	13	2	10	8	6	1
Grün	30	24	17	3	3,5	3	2	0,5	1,5	1	0,5	#
Blau	19	16	11	2	2,5	2	1,5	0,5	1	0,5	0,5	#
Purpur	9	7,5	5	1	1	1	0,5	#	0,5	#	#	#
Fluoreszierendes Gelb-Grün	240	190	130	24	28	24	16	2,5	12	10	7	1
Fluoreszierendes Orange	90	70	30	9	10	9	6	1	4,5	4	2,5	#

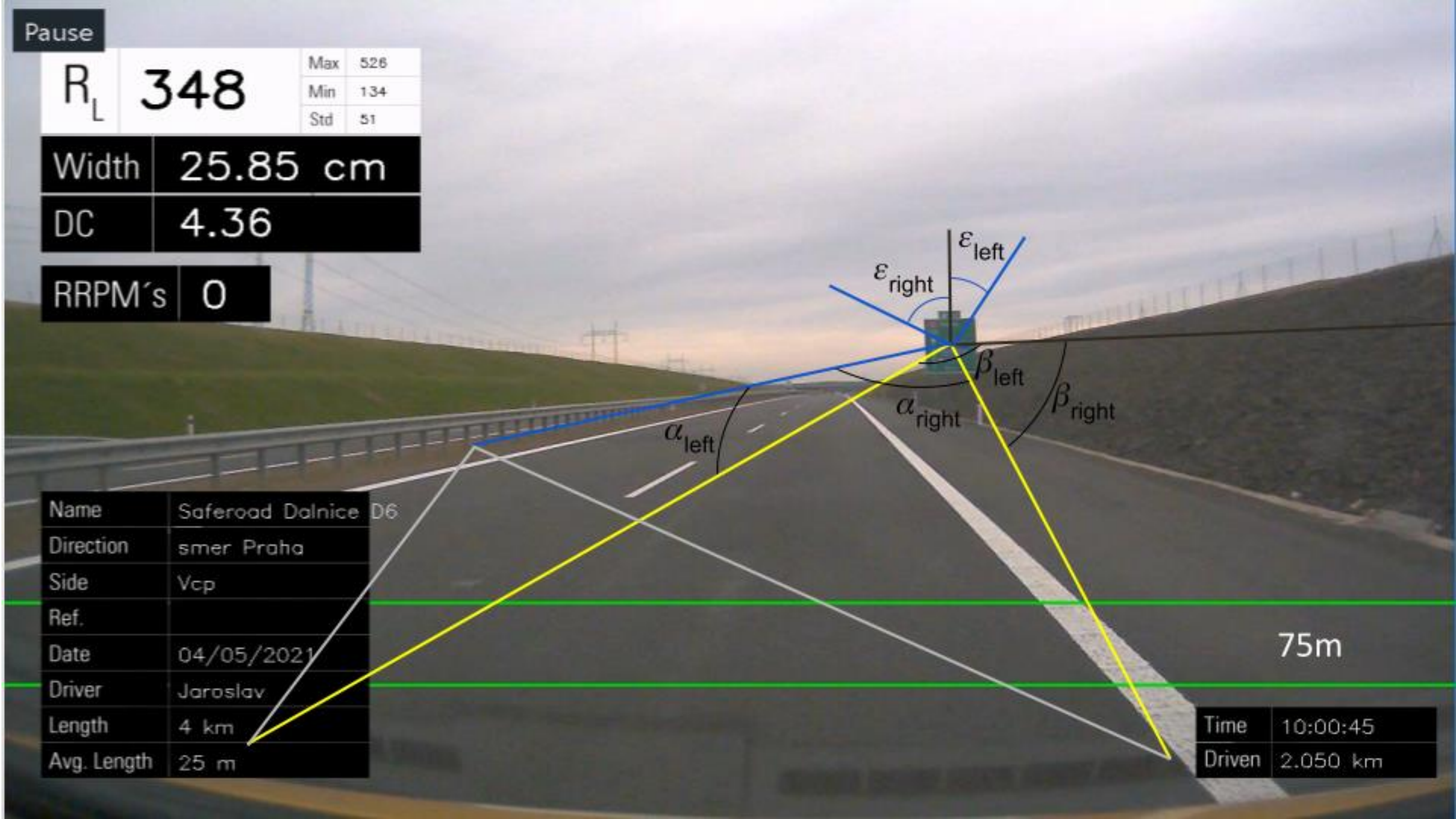
bedeutet „Werte größer als null, aber nicht anwendbar“.

*) Gilt auch für fluoreszierende Reflexstoffe mit der Aufsichtfarbe Gelb.

And that the geometries in the R3B table are more relevant to the driver.



R_L 386
Max 526
Min 134
Std 51
Width 26.01 cm
DC 5.22
RRPM´s 0
ε_{left}
ε_{right}
β_{left}
α_{right}
β_{right}
α_{left}
Name Saferoad Dalnice D6
Direction smer Praha
Side Vcp
Ref.
Date 04/05/2021
Driver Jaroslav
Length 4 km
Avg. Length 25 m
200m
Time 10:00:39
Driven 1.925 km



Pause
R_L
348
Max 526
Min 134
Std 51
Width 25.85 cm
DC 4.36
RRPM´s 0
ε_{left}
ε_{right}
β_{left}
β_{right}
α_{right}
α_{left}
Name Saferoad Dalnice D6
Direction smer Praha
Side Vcp
Ref.
Date 04/05/2021
Driver Jaroslav
Length 4 km
Avg. Length 25 m
75m
Time 10:00:45
Driven 2.050 km

Q & A

Thank You!

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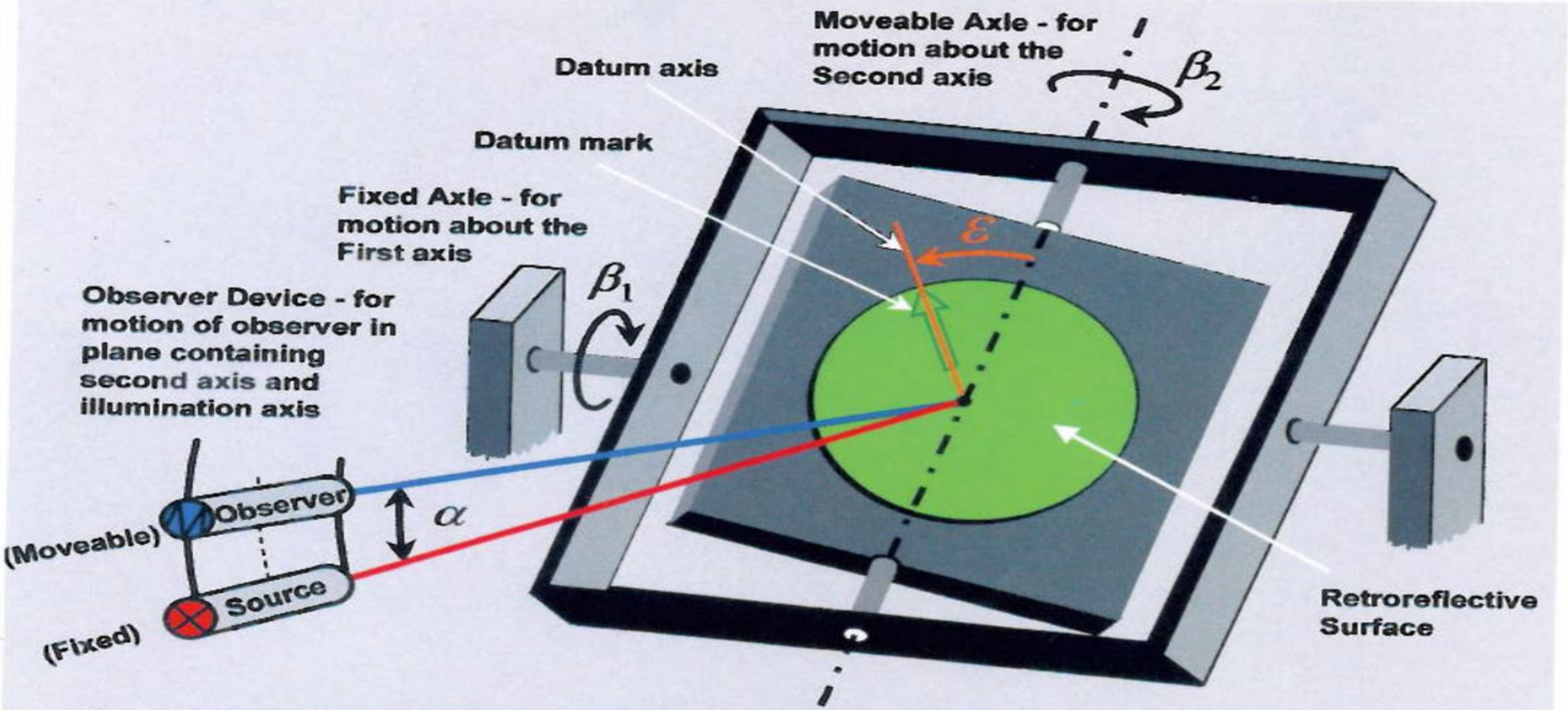
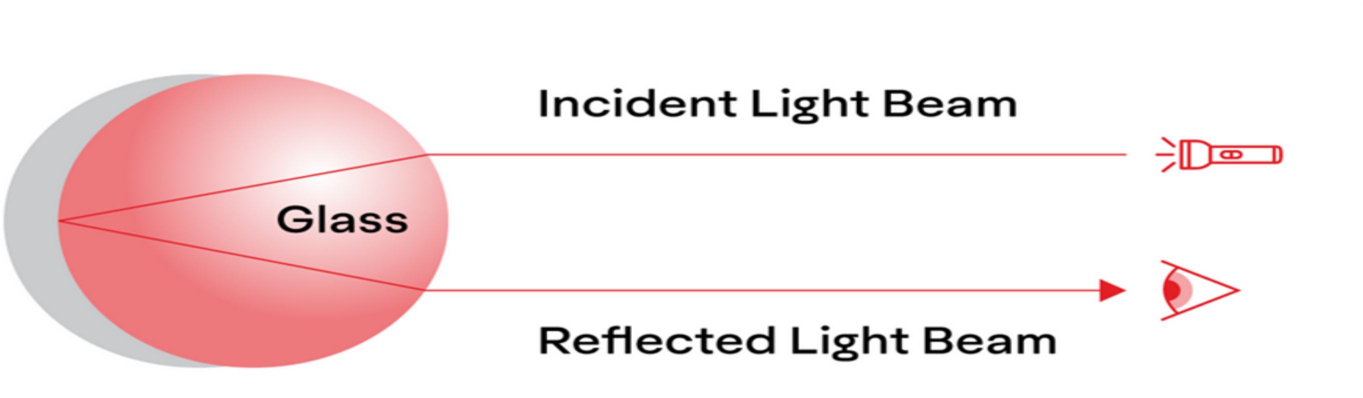


Note: The principle fixed axis is the illumination axis. The first axis is perpendicular to the plane containing the observation and illumination axes. The retroreflector axis is fixed in the retroreflector and moveable with β_1 and β_2. The sample must be mounted so that the retroreflector axis is normal to the mounting plate. All angles and directions of rotation are shown positive.

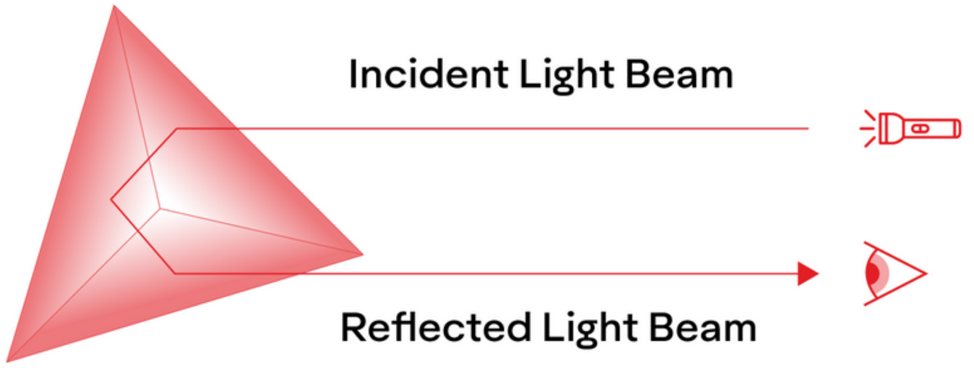
Figure 5. A representation of a mechanism embodying the CIE goniometer system for specifying and measuring retroreflectors.

Need for change

- Technology
- glass bead



- microprismatic



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source: Avery Dennison