Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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European Technical Assessment

ETA-13/0249 of 2 February 2018

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General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film
Product family to which the construction product belongs	Microprismatic retro-reflective sheetings
Manufacturer	ORAFOL Europe GmbH Orafolstraße 2 16515 Oranienburg DEUTSCHLAND
Manufacturing plant	ORAFOL Europe GmbH Orafolstraße 2 16515 Oranienburg Deutschland
This European Technical Assessment contains	19 pages including 5 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 120001-01-0106
This version replaces	ETA-13/0249 issued on 17 May 2013 ETA-15/0105 issued on 28 January 2016

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Specific Part

1 Technical description of the product

The product consists of retro-reflective sheeting on the basis of microprisms, which consist of optical elements, where the retro-reflection is created by total internal reflection on prisms. The microprisms are moulded in a transparent polymer enclosed in air capsules and provided with an adhesive, which can connect the sheeting with a substrate. The sheeting has a smooth surface and a regular structure visible on the surface forming the air capsules and serving to identify the orientation.

The product is delivered as reflective sheeting, the types of which are stated in Table 1.

Trade name	Component	Colour/Code		Properties
ORALITE® 6910 Brilliant Grade	Self-adhesive retro-reflective sheeting on the basis of microprisms	White	6910-010	Sheeting thickness (without protective paper and adhesive): 0,23 mm Dimension of the roll: 1,22 m x 50 m, or customized
ORALITE® 5061 Transparent Film	Colour laminate	Transparent Yellow Red Blue Green Brown	5061-000 5061-020 5061-030 5061-050 5061-060 5061-080	Sheeting thickness: 0,075 mm Dimension of the roll: 1,22 m x 50 m or customized

Tab. 1: Types of reflective sheeting "ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film"

The indications of the manufacturer regarding the definition of the colours comply with the colour boxes of the CIE system (according to class CR2 of EN 12899-1) and are shown in Table 2.

Colour		Daylight chromaticity				Luminance factors
		1	2	3	4	
White	x y	0,305 0,315	0,335 0,345	0,325 0,355	0,295 0,325	≥ 0,27
Yellow	x y	0,494 0,505	0,470 0,480	0,513 0,437	0,545 0,454	≥ 0,16
Red	x y	0,735 0,265	0,700 0,250	0,610 0,340	0,660 0,340	≥ 0,03
Blue	x y	0,130 0,090	0,160 0,090	0,160 0,140	0,130 0,140	≥ 0,01
Green	x y	0,110 0,415	0,170 0,415	0,170 0,500	0,110 0,500	≥ 0,03
Brown	x y	0,455 0,397	0,523 0,429	0,479 0,373	0,558 0,394	$0,03 \leq \beta \leq 0,09$

Tab. 2: Daylight chromaticity and luminance factors according to the indications of the manufacturer which comply with class CR2 of EN 12899-1

2 Specification of the intended use in accordance with the applicable European Assessment Document

The construction product described here is used to manufacture signal aspects of fixed, vertical traffic signs (see also EN 12899-1:2007). The further intended applications are all other traffic signs and traffic installations, route guidance with retro-reflective elements and variable message signs.

However, the intended use excludes the manufacture of road marking elements according to EN 1436. The intended sign support material is aluminium, galvanised steel, polycarbonate or other materials. Tests within the framework of this assessment were carried out on aluminium-based samples.

The performances given in section 3 are only valid if the conditions laid down in the accompanying product data sheets and in the processing instructions given by the manufacturer have been respected throughout the production, processing, packaging, transport and storage of "ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film" (essential specifications acc. to manufacturer's instructions are given in Annex 5).

The verifications and assessment methods as well as the product information of the manufacturer on which this European Technical Assessment is based lead to the assumption of a working life of this product of at least 10 years. The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Safety and accessibility in use (BWR 4)

For the preparation of the specimens, the test pieces of the reflective sheeting were applied by the manufacturer on a plane aluminium plate with a thickness of 2,0 mm (± 0,05 mm).

Essential characteristic	Performance
Visibility of "ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film"	
Daylight chromaticity and luminance factors	See Annex 1
Night-time colour	No performance assessed
Coefficient of retro-reflection and rotational symmetry	See Annex 2
Durability of "ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film"	
Impact resistance	Passed according to EN 12899-1
Temperature resistance	No performance assessed
Visibility after artificial weathering	See Annex 3 (regarding “White”)
Visibility after natural weathering	See Annex 4
Adhesion	No performance assessed

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with EAD No 120001-01-0106, the applicable European legal act is: Decision 96/579/EC.

The system to be applied is: 1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

6 Reference list

This European Technical Assessment is based on the following test report:

- Test report No. V4-047/2012 of 15 July 2016 by Federal Highway Research Institute (Bundesanstalt für Straßenwesen - BASt) on the testing of microprismatic reflective sheetings
- Test report No. V4-048/2012 of 15 July 2016 by Federal Highway Research Institute (Bundesanstalt für Straßenwesen - BASt) on the testing of microprismatic reflective sheetings
- Interims test report No. V4-047/2012 of 20 February 2013 by Federal Highway Research Institute (BASt) on the testing of microprismatic reflective sheetings
- Interims test report No. V4-048/2012 of 20 February 2013 by Federal Highway Research Institute (BASt) on the testing of microprismatic reflective sheetings
- Interims test report No. V3-018/2013 of 26 February 2014 by Federal Highway Research Institute (BASt) on the testing of microprismatic reflective sheetings

Issued in Berlin on 2 February 2018 by Deutsches Institut für Bautechnik

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Deutsches Institut für Bautechnik DIBt

Annex 1

Daylight chromaticity and luminance factors according to clause 2.2.1 of the EAD

Colour	Sample	x	y	β
White	1	0,313	0,330	0,46
	2	0,312	0,329	0,46
	3	0,313	0,330	0,46
Yellow	1	0,531	0,462	0,30
	2	0,531	0,462	0,30
	3	0,531	0,462	0,30
Red	1	0,670	0,310	0,04
	2	0,666	0,310	0,04
	3	0,668	0,310	0,04
Blue	1	0,152	0,105	0,03
	2	0,152	0,103	0,03
	3	0,152	0,104	0,03
Green	1	0,135	0,415	0,07
	2	0,135	0,415	0,07
	3	0,135	0,415	0,07
Brown	1	0,495	0,397	0,04
	2	0,492	0,397	0,05
	3	0,495	0,397	0,04

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Annex 2

Coefficient of retro-reflection and rotational symmetry according to clause 2.2.3 of the EAD

Coefficient of retro-reflection for "White" (Part 1)

Colour		Sample		White Single test result of each sample			Average of the three samples tested
α	β_1	β_2	ε	1	2	3	
0,1°	5°	0°	0°	1698	1580	1625	1634
	15°			1410	1390	1392	1397
	20°			1209	1220	1197	1209
	30°			681	704	650	678
	40°			411	429	381	407
0,2°	5°			953	919	887	920
	15°			860	856	808	841
	20°			776	783	731	763
	30°			532	539	496	522
	40°			352	363	323	346
0,33°	5°			404	417	390	404
	15°			420	405	387	404
	20°			411	391	378	393
	30°			313	303	279	298
	40°			244	244	218	235
0,5°	5°			408	398	424	410
	15°			348	347	365	353
	20°			323	327	341	330
	30°			149	144	137	143
	40°			124	118	106	116
1,0°	5°			56	69	52	59
	15°			70	69	60	66
	20°			77	71	66	71
	30°			47	44	41	44
	40°			44	45	40	43
1,5°	5°			14,6	16,2	15,7	15,5
	15°			12,8	15,4	17,3	15,2
	20°			14,5	15,2	17,1	15,6
	30°			16,3	14,4	15,7	15,5
	40°			10,2	9,6	9,0	9,6
2°	5°			6,8	7,6	6,7	7,0
	15°			9,1	10,0	9,1	9,4
	20°			8,6	10,0	9,5	9,4
	30°			4,5	3,6	3,2	3,8
	40°			3,5	3,2	3,4	3,4

Coefficient of retro-reflection started at ε=0° [cd m^{-2} lx^{-1}]

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Coefficient of retro-reflection for "Yellow" (Part 2)

Colour			Sample	Yellow Single test result of each sample			Average of the three samples tested
α	β_1	β_2	ε	1	2	3	
0,1°	5°	0°	0°	1111	1116	1107	1111
	15°			985	982	980	982
	20°			860	858	853	857
	30°			489	484	480	484
	40°			299	299	293	297
0,2°	5°			656	645	650	650
	15°			609	600	602	604
	20°			557	550	550	552
	30°			381	379	376	379
	40°			259	260	255	258
0,33°	5°			286	277	283	282
	15°			280	274	278	277
	20°			273	271	271	272
	30°			218	219	216	218
	40°			184	186	182	184
0,5°	5°			276	278	279	278
	15°			245	241	246	244
	20°			230	224	232	229
	30°			100	100	101	100
	40°			96	99	98	98
1,0°	5°			63	62	66	64
	15°			67	66	69	67
	20°			68	69	70	69
	30°			40	39	40	40
	40°			31	30	31	31
1,5°	5°			14,1	12,6	13,9	13,5
	15°			14,4	13,1	15,3	14,3
	20°			12,3	11,6	13,6	12,5
	30°			10,3	11,2	11,8	11,1
	40°			9,4	9,4	9,6	9,5
2°	5°			6,5	6,1	6,5	6,4
	15°			6,9	6,5	6,9	6,8
	20°			6,6	6,3	6,7	6,5
	30°			2,8	2,6	2,9	2,8
	40°			2,7	3,1	2,7	2,8

Coefficient of retro-reflection started at ε=0° [cd m^{-2} lx^{-1}]

ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film

Coefficient of retro-reflection and rotational symmetry according to clause 2.2.3 of the EAD

Annex 2

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Coefficient of retro-reflection for "Red" (Part 3)

Colour / Sample				Red Single test result of each sample			Average of the three samples tested
α	β_1	β_2	ε	1	2	3	
0,1°	5°	0°	0°	305	298	334	312
	15°			262	264	289	272
	20°			226	234	247	236
	30°			129	143	134	135
	40°			77	88	80	82
0,2°	5°			194	200	201	198
	15°			177	187	181	182
	20°			159	170	162	164
	30°			106	116	108	110
	40°			68	77	71	72
0,33°	5°			88	97	81	89
	15°			92	96	81	90
	20°			90	92	80	87
	30°			68	72	65	68
	40°			52	57	53	54
0,5°	5°			74	72	79	75
	15°			69	63	70	67
	20°			67	59	66	64
	30°			34	33	31	33
	40°			30	32	30	31
1,0°	5°			24	32	19,0	25
	15°			23	32	20	25
	20°			23	31	20	25
	30°			13,1	14,9	12,1	13,4
	40°			8,4	9,4	8,1	8,6
1,5°	5°			5,9	6,4	5,0	5,8
	15°			5,8	5,1	3,5	4,8
	20°			5,1	4,6	3,2	4,3
	30°			3,6	3,4	3,7	3,6
	40°			4,0	4,0	3,5	3,8
2°	5°			2,4	2,4	2,0	2,3
	15°			2,3	2,2	2,2	2,2
	20°			2,1	2,0	1,8	2,0
	30°			1,4	0,9	0,7	1,0
	40°			1,0	1,0	1,0	1,0

Coefficient of retro-reflection started at ε=0° [cd m^{-2} lx^{-1}]

ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film

Coefficient of retro-reflection and rotational symmetry according to clause 2.2.3 of the EAD

Annex 2

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Coefficient of retro-reflection for "Blue" (Part 4)

		Colour		Blue Single test result of each sample			Average of the three samples tested
		Sample		1	2	3	
α	β_1	β_2	ε				
0,1°	5°	0°	0°	103	112	123	113
	15°			87	97	102	95
	20°			74	84	87	82
	30°			43	47	50	47
	40°			24	27	28	26
0,2°	5°			62	62	69	64
	15°			57	56	65	59
	20°			51	51	59	54
	30°			33	34	38	35
	40°			21	22	23	22
0,33°	5°			38	34	38	37
	15°			36	29	37	34
	20°			32	27	34	31
	30°			18,9	17,4	21	19,1
	40°			14,3	14,4	15,5	14,7
0,5°	5°			34	36	35	35
	15°			29	30	29	29
	20°			26	27	26	26
	30°			9,4	8,7	9,7	9,3
	40°			7,3	6,7	7,5	7,2
1,0°	5°			6,1	5,2	4,3	5,2
	15°			5,7	5,2	4,4	5,1
	20°			5,8	5,3	4,8	5,3
	30°			3,2	3,0	2,9	3,0
	40°			2,4	2,8	2,6	2,6
1,5°	5°			1,9	1,6	1,7	1,7
	15°			1,8	1,4	1,3	1,5
	20°			1,9	1,3	1,3	1,5
	30°			1,0	0,8	0,8	0,9
	40°			0,7	0,6	0,6	0,6
2°	5°			1,1	1,1	1,0	1,1
	15°			0,9	0,7	0,7	0,8
	20°			0,8	0,8	0,8	0,8
	30°			0,4	0,4	0,4	0,4
	40°			0,4	0,4	0,4	0,4

Coefficient of retro-reflection started at ε=0° [cd m^{-2} lx^{-1}]

ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film

Coefficient of retro-reflection and rotational symmetry according to clause 2.2.3 of the EAD

Annex 2

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Coefficient of retro-reflection for "Green" (Part 5)

Colour				Green Single test result of each sample			Average of the three samples tested
			Sample	1	2	3	
α	β_1	β_2	ε				
0,1°	5°	0°	0°	266	274	279	273
	15°			225	232	248	235
	20°			194	201	216	204
	30°			116	122	123	120
	40°			68	71	74	71
0,2°	5°			152	156	148	152
	15°			144	149	138	144
	20°			131	137	128	132
	30°			90	95	90	92
	40°			58	61	62	60
0,33°	5°			77	73	67	72
	15°			78	77	63	73
	20°			74	75	61	70
	30°			52	54	46	51
	40°			41	42	40	41
0,5°	5°			69	69	71	70
	15°			59	58	63	60
	20°			55	54	58	56
	30°			24	24	22	23
	40°			21	21	18,0	20
1,0°	5°			11,6	10,3	10,8	10,9
	15°			12,1	11,4	12,2	11,9
	20°			12,8	12,6	12,9	12,8
	30°			7,7	7,5	7,7	7,6
	40°			6,6	6,7	7,8	7,0
1,5°	5°			3,5	3,4	3,2	3,4
	15°			3,4	3,1	3,2	3,2
	20°			3,6	3,0	2,8	3,1
	30°			2,4	2,3	1,5	2,1
	40°			1,6	1,4	1,4	1,5
2°	5°			1,8	1,7	1,9	1,8
	15°			1,8	1,7	1,5	1,7
	20°			1,8	1,8	1,7	1,8
	30°			0,9	0,7	0,8	0,8
	40°			0,7	0,7	0,7	0,7

Coefficient of retro-reflection started at ε=0° [cd m^{-2} lx^{-1}]

ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film

Coefficient of retro-reflection and rotational symmetry according to clause 2.2.3 of the EAD

Annex 2

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Coefficient of retro-reflection for "Brown" (Part 6)

Colour / Sample				Brown Single test result of each sample			Average of the three samples tested
α	β_1	β_2	ε	1	2	3	
0,1°	5°	0°	0°	160	118	160	146
	15°			138	99	138	125
	20°			118	84	118	107
	30°			65	50	65	60
	40°			38	28	38	35
0,2°	5°			96	74	95	88
	15°			87	69	86	81
	20°			78	62	77	72
	30°			52	41	52	48
	40°			33	25	34	31
0,33°	5°			43	37	42	41
	15°			42	40	41	41
	20°			40	38	40	39
	30°			31	27	31	30
	40°			24	19,1	25	23
0,5°	5°			43	34	43	40
	15°			37	29	36	34
	20°			34	27	33	31
	30°			14,7	13,5	14,5	14,2
	40°			13,2	11,8	13,4	12,8
1,0°	5°			10,4	10,7	9,9	10,3
	15°			10,3	10,5	10,1	10,3
	20°			10,3	10,5	10,4	10,4
	30°			6,2	5,1	6,0	5,8
	40°			4,3	3,2	4,1	3,9
1,5°	5°			2,6	2,3	2,4	2,4
	15°			2,2	2,1	1,9	2,1
	20°			2,0	2,0	1,8	1,9
	30°			1,9	1,8	1,9	1,9
	40°			1,4	1,4	1,4	1,4
2°	5°			1,4	1,2	1,3	1,3
	15°			1,2	1,0	1,1	1,1
	20°			1,0	0,9	0,9	0,9
	30°			0,5	0,5	0,4	0,5
	40°			0,4	0,5	0,5	0,5

Coefficient of retro-reflection started at ε=0° [cd m^{-2} lx^{-1}]

ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film

Coefficient of retro-reflection and rotational symmetry according to clause 2.2.3 of the EAD

Annex 2

Rotational symmetry

α	β1	β2	Colour Sample ε	White 1	2	3
0,33	5	0	-75	412	414	450
			-50	452	419	434
			-25	403	389	375
			0*	404	417	390
			25	314	329	300
			50	258	249	259
			Ratio	**1,31**	**1,43**	**1,39**

* Rotational symmetry started at ε=0° [cd m^{-2} lx^{-1}]

α	β1	β2	Colour Sample ε	Blue 1	2	3
0,33	5	0	-75	25	27	29
			-50	23	28	28
			-25	26	29	28
			0*	38	34	38
			25	36	32	35
			50	24	23	26
			Ratio	**1,65**	**1,48**	**1,46**

* Rotational symmetry started at ε=0° [cd m^{-2} lx^{-1}]

α	β1	β2	Colour Sample ε	Yellow 1	2	3
0,33	5	0	-75	306	315	305
			-50	318	340	326
			-25	290	295	295
			0*	286	277	283
			25	265	256	258
			50	242	237	234
			Ratio	**1,31**	**1,43**	**1,39**

* Rotational symmetry started at ε=0° [cd m^{-2} lx^{-1}]

α	β1	β2	Colour Sample ε	Green 1	2	3
0,33	5	0	-75	66	67	65
			-50	61	62	71
			-25	60	59	63
			0*	77	73	67
			25	71	68	68
			50	55	56	57
			Ratio	**1,40**	**1,30**	**1,25**

* Rotational symmetry started at ε=0° [cd m^{-2} lx^{-1}]

α	β1	β2	Colour Sample ε	Red 1	2	3
0,33	5	0	-75	89	74	100
			-50	89	79	109
			-25	85	88	94
			0*	88	97	81
			25	77	87	70
			50	65	73	67
			Ratio	**1,37**	**1,33**	**1,63**

* Rotational symmetry started at ε=0° [cd m^{-2} lx^{-1}]

α	β1	β2	Colour Sample ε	Brown 1	2	3
0,33	5	0	-75	42	38	44
			-50	48	36	51
			-25	45	34	46
			0*	43	37	42
			25	37	35	36
			50	30	30	31
			Ratio	**1,60**	**1,27**	**1,65**

* Rotational symmetry started at ε=0° [cd m^{-2} lx^{-1}]

ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film

Coefficient of retro-reflection and rotational symmetry according to clause 2.2.3 of the EAD

Annex 2

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Annex 3

Visibility after accelerated artificial weathering according to clause 2.2.6 of the EAD
Daylight chromaticity and luminance factors after accelerated artificial weathering

Colour	Sample	x	y	β
White	1	0,315	0,334	0,50
	2	0,315	0,334	0,51
	3	0,315	0,334	0,49

Coefficient of retro-reflection after accelerated artificial weathering

Colour				White Single test result of each sample			Average of the three samples tested
Sample				1	2	3	
α	β_1	β_2	ε				
0,2	5	0	0	762	741	712	738
	30			503	446	352	434
0,33	5			456	431	390	426
	30			303	277	203	261
1,0	5			64	58	55	59
	30			43	40	37	40

Coefficient of retro-reflection after accelerated artificial weathering started at ε=0° [cd m^{-2} lx^{-1}]

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Annex 4

Visibility after natural weathering according to clause 2.2.6 of the EAD
Daylight chromaticity and luminance factors after natural weathering

Colour	Sample	x	y	β
Yellow	**1**	0,528	0,459	0,31
	2	0,527	0,459	0,32
	3	0,527	0,459	0,31
Red	**1**	0,632	0,306	0,04
	2	0,630	0,306	0,03
	3	0,629	0,306	0,04
Blue	**1**	0,150	0,118	0,05
	2	0,151	0,118	0,04
	3	0,150	0,118	0,04
Green	**1**	0,142	0,429	0,08
	2	0,143	0,426	0,08
	3	0,143	0,429	0,08
Brown	**1**	0,492	0,396	0,05
	2	0,494	0,398	0,05
	3	0,490	0,397	0,05

Coefficients of retro-reflection after natural weathering for "Yellow"

		Colour		Yellow Single test result of each sample			Average of the three samples tested
		Sample		1	2	3	
α	β_1	β_2	ε				
0,2°	5°	0°	0°	645	631	683	653
	30°			365	375	423	388
0,33°	5°			304	307	295	302
	30°			230	232	248	237
1,0°	5°			70	64	53	62
	30°			38	37	36	37

Coefficient of retro-reflection after natural weathering started at ε=0° [cd m^{-2} lx^{-1}]

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Coefficients of retro-reflection after natural weathering for "Red"

Colour / Sample				Red Single test result of each sample			Average of the three samples tested
α	β_1	β_2	ε	1	2	3	
0,2°	5°	0°	0°	174	196	177	182
	30°			102	112	102	105
0,33°	5°			75	87	79	80
	30°			63	72	66	67
1,0°	5°			17,2	18,3	17,2	17,6
	30°			10,5	11,6	10,8	11,0

Coefficient of retro-reflection after natural weathering started at ε=0° [cd m^{-2} lx^{-1}]

Coefficients of retro-reflection after natural weathering for "Blue"

Colour / Sample				Blue Single test result of each sample			Average of the three samples tested
α	β_1	β_2	ε	1	2	3	
0,2°	5°	0°	0°	68	64	58	63
	30°			42	36	35	38
0,33°	5°			37	38	36	37
	30°			21	20	17,9	19,6
1,0°	5°			4,0	5,3	4,5	4,6
	30°			2,7	2,9	2,6	2,7

Coefficient of retro-reflection after natural weathering started at ε=0° [cd m^{-2} lx^{-1}]

ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film

Visibility after natural weathering according to clause 2.2.6 of the EAD

Annex 4

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Coefficients of retro-reflection after natural weathering for "Green"

Colour / Sample				Green Single test result of each sample			Average of the three samples tested
α	β_1	β_2	ε	1	2	3	
0,2°	5°	0°	0°	118	140	123	127
	30°			67	84	76	76
0,33°	5°			54	65	63	61
	30°			35	48	44	42
1,0°	5°			7,2	8,2	9,8	8,4
	30°			5,8	6,6	6,2	6,2

Coefficient of retro-reflection after natural weathering started at ε=0° [cd m^{-2} lx^{-1}]

Coefficients of retro-reflection after natural weathering for "Brown"

Colour / Sample				Brown Single test result of each sample			Average of the three samples tested
α	β_1	β_2	ε	1	2	3	
0,2°	5°	0°	0°	91	96	95	94
	30°			52	57	54	54
0,33°	5°			40	44	45	43
	30°			33	37	36	35
1,0°	5°			6,6	8,1	9,6	8,1
	30°			5,0	5,6	5,0	5,2

Coefficient of retro-reflection after natural weathering started at ε=0° [cd m^{-2} lx^{-1}]

ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film

Visibility after natural weathering according to clause 2.2.6 of the EAD

Annex 4

Deutsches Institut für Bautechnik DIBt

Annex 5

Essential specifications concerning manufacturing, packaging, transport and storage according to manufacturer's instruction

Application

The envisaged substrates are aluminium, galvanized steel, polycarbonate or other.

Surfaces to which the material will be applied must be thoroughly cleaned from dust, grease or any contamination, which could affect the adhesion of the material. Freshly lacquered or painted surfaces should be completely cured. The compatibility of selected lacquers and paints should be tested by the user, prior to application of the material.

For the application of the retro-reflective film and its additional components described in Chapter 1 detailed information have been published by the manufacturer. In the following, only the most important aspects of the application are given:

Cutting, die cutting, plotting

The product can be cut by means of a commercial stack cutter. The holding-down clamp should be set to very low pressure and, as an additional measure, the film be protected from compression. It is recommended to limit the stacking height at 40 sheets to 50 sheets.

Commercial cutting plotters with tangential blades, preferably of the flatbed type, should be used as plotter systems.

Adhesive bonding and laminating

The self-adhesive retro-reflective material can only be used for dry application.

Bonding should not be carried out at air and material temperatures of less than 15 °C. The optimum bonding temperature is about 21 °C. The films should be stored for a period of at least 48 hours in the premises designated for their processing.

In order to achieve good adhesion of the films, the substrate must be dry and free of dust, oil, fats, silicon or other contamination. If the substrate needs to be treated with a solvent, the next processing step cannot be carried out until the solvent is completely evaporated. When bonding films to metallic substrates, slight grinding of the surfaces is advantageous.

When several film webs need to be bonded side by side, they should always overlap. Depending on the format, the overlap should be 3 mm to 5 mm. Please make sure that a right side of the film web is always bonded to a left side, thus ensuring the uniform orientation of the film's honeycomb structure.

Packaging, transport and storage

The product should be stored in a cool and dry place (temperature range from 20 °C to 24 °C; relative air humidity of 40 % to 60 %) that is protected from direct sunlight.

Rolled material should be handled and stored in the original carton. The rolls have standard spacers that prevent contact between the roll surface and the carton and thus the formation of pressure marks and surface damage. Please make sure that partly processed rolls, too, are never stored or handled without spacer.

When making the rolls available for processing, it is advisable to use a horizontal suspension system (such as a paternoster system or a rack). Even if the rolls are stored in a vertical, freestanding position, a negative influence on the film's characteristics is generally not expected. Here again, it is crucial to place the roll on the spacer so as to avoid breakage of the edges. In practice it was shown, however, that this type of storage complicates the handling of the films.

Blank or printed film sheets are supplied in cartons that have been designed especially for the sheet dimensions, 50 sheets per carton. If the sheets are stored outside the carton, please make sure to put individual sheets on a flat and stable support so that they do not adjoin or overlap at the edges. Sheets may be stacked. In order to limit the weight load, not more than 40 sheets to 50 sheets should be stacked.

ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film	Annex 5
Essential specifications concerning manufacturing, packaging, transport and storage according to manufacturer's instruction	