Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

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European Technical Assessment

ETA-15/0108 of 1 February 2016

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	ORALITE® 6910 Brilliant Grade digitally printed with ORALITE® 5019 UV Digital Printing Ink and with ORALITE® 5090 Anti Dew 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	11 pages including 3 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	European Assessment Document (EAD) 120001-00-0106

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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®	Printing ink for digital printing system	Yellow Red Orange Blue Green Brown	5019-020 5019-030 5019-035 5019-050 5019-060 5019-080	UV-Light drying ink for Inkjet digital printing system
ORALITE® 5090	Transparent protective laminate	Transparent	5090-000	Sheeting thickness: 0,06 mm Dimension of the roll: 1,22 m x 50 m or customized

Tab. 1: Types of reflective sheeting "ORALITE® 6910 Brilliant Grade digitally printed with ORALITE® 5019 UV Digital Printing Ink and with ORALITE® 5090 Anti Dew 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	
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
Orange*	x y	0,610 0,390	0,535 0,375	0,506 0,404	0,570 0,429	≥ 0,14
Green	x y	0,110 0,415	0,170 0,415	0,170 0,500	0,110 0,500	≥ 0,03
Blue	x y	0,130 0,090	0,160 0,090	0,160 0,140	0,130 0,140	≥ 0,01
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
* Class CR1 of EN 12899-1 for Orange

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 digitally printed with Oralite® 5019 UV Digital Printing Ink and with Oralite® 5090 Anti Dew Film".

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 digitally printed with Oralite® 5019 UV Digital Printing Ink and with Oralite® 5090 Anti Dew 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 digitally printed with Oralite® 5019 UV Digital Printing Ink and with Oralite® 5090 Anti Dew Film"	
Impact resistance	Passed according to EN 12899-1
Temperature resistance	No performance assessed
Visibility after artificial weathering	See Annex 3
Visibility after natural weathering	No performance assessed
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 120001-00-0106, the applicable European legal act is: Decision 96/579/EC.

The system(s) 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:

- 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 1 February 2016 by Deutsches Institut für Bautechnik

Dr.-Ing. Karsten Kathage
Head of Department

beglaubigt:
Petrik

Annex 1

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

Colour	Sample	x	y	β
Yellow	1	0,491	0,464	0,30
	2	0,491	0,464	0,30
	3	0,491	0,464	0,30
Red	1	0,620	0,336	0,11
	2	0,621	0,336	0,11
	3	0,621	0,336	0,11
Orange	1	0,557	0,409	0,19
	2	0,557	0,409	0,19
	3	0,557	0,409	0,19
Blue	1	0,149	0,131	0,04
	2	0,149	0,132	0,04
	3	0,149	0,132	0,04
Green	1	0,131	0,424	0,06
	2	0,131	0,424	0,06
	3	0,131	0,424	0,06
Brown	1	0,505	0,387	0,07
	2	0,503	0,386	0,07
	3	0,504	0,387	0,07

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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 (Part 1)

		Colour		Yellow			Red			Orange		
		Sample		1	2	3	1	2	3	1	2	3
α	β_1	β_2	ε									
0,1	5			536	532	521	147	145	143	434	427	422
	15			457	457	444	127	126	123	371	365	362
	20			391	393	384	110	109	106	319	312	310
	30			185	199	192	54	54	50	158	154	153
	40			104	114	109	30	30	28	86	85	85
0,2	5			346	345	335	101	98	97	281	273	273
	15			305	307	297	89	87	85	249	242	242
	20			268	271	263	79	78	75	220	214	214
	30			149	161	154	45	44	41	127	124	123
	40			91	100	96	27	27	25	76	74	74
0,33	5			231	228	225	69	68	67	174	171	170
	15			204	204	200	61	60	60	157	155	153
	20			179	180	177	54	53	52	140	138	136
	30			99	107	103	32	30	29	83	81	81
	40			68	75	71	21	20	19,3	56	55	55
0,5	5			239	233	233	74	73	74	179	181	175
	15			196	191	192	61	60	60	150	151	146
	20	0	0	169	165	165	52	51	51	130	131	127
	30			67	71	69	22	21	21	54	53	53
	40			44	49	47	14,6	13,9	13,3	35	35	34
1,0	5			97	95	93	39	39	39	67	66	65
	15			90	89	88	35	35	35	63	62	62
	20			85	85	84	33	32	32	60	59	59
	30			39	40	40	15,2	15,0	14,5	29	29	28
	40			28	29	29	10,1	10,3	9,7	21	22	21
1,5	5			30	30	29	16,3	15,9	16,3	21	19,7	20
	15			31	31	30	16,1	15,7	16,0	21	20	20
	20			30	30	30	15,4	14,8	15,0	20	19,8	19,6
	30			17,3	17,6	17,9	8,4	8,2	8,0	12,4	12,5	12,3
	40			12,8	13,6	13,5	6,0	6,0	5,7	9,6	9,7	9,5
2,0	5			10,9	10,8	10,7	6,9	6,8	6,9	7,8	7,6	7,4
	15			11,2	11,3	11,1	6,8	6,6	6,7	7,8	7,7	7,6
	20			11,2	11,3	11,2	6,7	6,5	6,6	7,7	7,6	7,5
	30			7,3	7,4	7,4	4,1	4,0	4,1	4,9	5	4,8
	40			6,2	6,5	6,6	3,5	3,4	3,3	4,5	4,6	4,5

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

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Coefficient of retro-reflection (Part 2)

		Colour		Blue			Green			Brown		
		Sample		1	2	3	1	2	3	1	2	3
α	β_1	β_2	ε									
0,1	5	0	0	69	67	73	110	112	115	163	169	168
	15			58	57	61	94	95	97	140	142	141
	20			49	49	52	81	81	84	120	121	120
	30			23	23	26	42	38	41	59	59	58
	40			12,9	12,5	14,3	23	21	23	32	33	32
0,2	5			42	42	45	68	69	71	108	113	112
	15			37	36	40	61	60	63	96	98	97
	20			32	32	35	54	53	55	84	86	85
	30			17,9	17,4	20	32	29	32	48	49	48
	40			11	10,6	12,2	19,6	17,7	19,6	28	29	28
0,33	5			33	32	34	51	53	53	72	75	74
	15			27	27	29	44	45	45	64	66	65
	20			23	23	25	39	39	40	56	58	57
	30			11,6	11,4	13,2	21	19,0	21	32	34	33
	40			7,8	7,4	8,9	14,0	13,8	14,3	21	22	22
0,5	5			31	31	32	52	53	53	76	76	76
	15			26	26	27	44	44	43	63	61	62
	20			22	22	23	38	38	37	54	52	53
	30			8,8	8,7	9,4	15,3	14,3	15,2	22	23	22
	40			5,2	5,0	5,9	9,1	8,2	9,4	14,2	15,1	14,6
1,0	5			12,2	12,5	12,5	19,1	19,3	19,6	33	35	35
	15			11,0	11,1	11,3	17,8	17,9	18,3	31	31	32
	20			10,3	10,3	10,5	16,9	16,7	17,2	29	29	29
	30			4,6	4,6	4,9	7,8	7,2	8,0	13,4	13,4	13,3
	40			3,4	3,4	3,6	6,0	5,5	6,0	9,3	9,2	9,1
1,5	5			4,1	4,4	4,3	6,3	6,3	6,3	11,5	12,1	12,3
	15			3,7	4,0	3,9	6,0	5,9	6,0	11,5	12,0	12,2
	20			3,6	3,8	3,8	5,9	5,9	6,1	11,1	11,4	11,5
	30			2,0	2,1	2,2	3,5	3,3	3,6	6,5	6,3	6,3
	40			1,6	1,7	1,7	2,8	2,5	2,8	4,9	4,7	4,7
2,0	5			1,7	1,9	1,8	2,5	2,4	2,5	4,5	4,7	4,8
	15			1,4	1,5	1,5	2,2	2,2	2,3	4,4	4,6	4,8
	20			1,4	1,5	1,5	2,2	2,2	2,3	4,3	4,6	4,7
	30			0,9	1,0	1,0	1,4	1,4	1,5	2,8	2,9	2,9
	40			0,9	0,9	0,9	1,4	1,3	1,4	2,6	2,4	2,4

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

Annex 2

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Rotational symmetry

			Colour	Yellow			Red			Orange		
			Sample	1	2	3	1	2	3	1	2	3
α	β_1	β_2	ε									
0,33	5	0	-75	214	215	211	65	65	64	165	163	161
			-50	217	224	220	68	67	66	169	169	167
			-25	208	212	208	67	65	64	163	163	162
			0	231	228	225	69	68	67	174	171	170
			25	211	212	208	62	63	62	157	155	153
			50	190	189	186	59	57	57	142	143	139
			Ratio	**1,22**	**1,21**	**1,21**	**1,17**	**1,19**	**1,18**	**1,23**	**1,20**	**1,22**

			Colour	Blue			Green			Brown		
			Sample	1	2	3	1	2	3	1	2	3
α	β_1	β_2	ε									
0,33	5	0	-75	30	29	31	46	48	47	68	70	69
			-50	30	28	31	45	47	48	71	73	72
			-25	28	28	30	45	45	46	69	70	70
			0	33	32	34	51	53	53	72	75	74
			25	31	30	31	47	49	49	64	67	67
			50	28	27	29	44	44	44	60	61	60
			Ratio	**1,18**	**1,19**	**1,17**	**1,16**	**1,20**	**1,20**	**1,20**	**1,23**	**1,23**

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

Annex 2

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
Yellow	1	0,471	0,472	0,35
	2	0,471	0,472	0,35
	3	0,472	0,472	0,35
Red	1	0,608	0,332	0,11
	2	0,609	0,332	0,12
	3	0,608	0,333	0,12
Orange	1	0,539	0,418	0,21
	2	0,541	0,418	0,21
	3	0,542	0,418	0,21
Blue	1	0,147	0,147	0,04
	2	0,148	0,147	0,04
	3	0,148	0,148	0,05
Green	1	0,132	0,366	0,07
	2	0,133	0,358	0,07
	3	0,133	0,365	0,07
Brown	1	0,494	0,389	0,08
	2	0,493	0,389	0,08
	3	0,493	0,389	0,08

Coefficients of retro-reflection after accelerated artificial weathering (Part 1)

				Colour	Yellow			Red			Orange		
				Sample	1	2	3	1	2	3	1	2	3
α	β_1	β_2	ε										
0,2	5	0	0		366	371	378	102	97	96	293	294	285
	30				167	183	184	49	46	46	143	142	142
0,33	5				251	250	253	71	68	66	189	190	187
	30				108	117	120	33	32	31	91	92	94
1,0	5				94	92	92	39	37	37	67	67	69
	30				38	39	40	15,6	14,8	14,5	30	29	30

Coefficients of retro-reflection after accelerated artificial weathering (Part 2)

				Colour	Blue			Green			Brown		
				Sample	1	2	3	1	2	3	1	2	3
α	β_1	β_2	ε										
0,2	5	0	0		43	44	40	78	80	78	99	110	107
	30				21	20	19,6	40	37	40	46	51	50
0,33	5				35	36	33	60	62	61	69	76	74
	30				13,6	12,9	12,6	25	24	25	32	35	34
1,0	5				10,8	11,1	10,5	19,6	19,0	19,6	31	33	33
	30				4,5	4,5	4,3	8,4	7,7	8,7	12,3	13,3	13,3

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Visibility after accelerated artificial weathering according to clause 2.2.6 of the EAD

Annex 3