

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

**ETA-13/0250**  
**of 2 February 2018**

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 laminated with  
ORALITE® 5061 Transparent Film 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

This European Technical Assessment  
contains

16 pages including 4 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

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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	Yellow      5061-020 Red          5061-030 Blue         5061-050 Green        5061-060 Brown       5061-080	Sheeting thickness: 0,075 mm Dimension of the roll: 1,22 m x 50 m or customized
ORALITE® 5090 Anti-Dew Film	Transparent protective laminate	Transparent   5090-000	Sheeting thickness: 0,06 mm Roll measurements: 1,22 m x 50 m, or customized dimensions

Tab. 1: Types of reflective sheeting "ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film 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	0,494	0,470	0,513	0,545	≥ 0,16
	y	0,505	0,480	0,437	0,454	
Red	x	0,735	0,700	0,610	0,660	≥ 0,03
	y	0,265	0,250	0,340	0,340	
Blue	x	0,130	0,160	0,160	0,130	≥ 0,01
	y	0,090	0,090	0,140	0,140	
Green	x	0,110	0,170	0,170	0,110	≥ 0,03
	y	0,415	0,415	0,500	0,500	
Brown	x	0,455	0,523	0,479	0,558	0,03 ≤ β ≤ 0,09
	y	0,397	0,429	0,373	0,394	

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 and with ORALITE® 5090 Anti-Dew Film" (essential specifications acc. to manufacturer's instructions are given in Annex 4).

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 ( $\pm 0,05$  mm).

Essential characteristic	Performance
<b>Visibility of "ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film and with ORALITE® 5090 Anti-Dew Film"</b>	
Daylight chromaticity and luminance factors	See Annex 1
Night-time colour	No performance assessed
Coefficient of retro-reflection and rotational symmetry	See Annex 2
<b>Durability of "ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film and with ORALITE® 5090 Anti-Dew Film"</b>	
Impact resistance	Passed according to EN 12899-1
Temperature resistance	No performance assessed
Visibility after artificial weathering	Superseded by natural weathering
Visibility after natural weathering	See Annex 3
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. V4-048/2012 of 15 July 2016 by Federal Highway Research Institute (Bundesanstalt für Straßenwesen - BAST) on the testing of microprismatic reflective sheetings

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

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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	$\beta$
Yellow	1	0,531	0,462	0,29
	2	0,532	0,463	0,29
	3	0,532	0,462	0,29
Red	1	0,675	0,310	0,04
	2	0,675	0,310	0,04
	3	0,675	0,310	0,04
Blue	1	0,151	0,102	0,03
	2	0,150	0,103	0,03
	3	0,151	0,103	0,03
Green	1	0,132	0,415	0,07
	2	0,133	0,415	0,07
	3	0,132	0,416	0,07
Brown	1	0,488	0,395	0,05
	2	0,496	0,398	0,04
	3	0,493	0,397	0,04

**Annex 2**

Coefficient of retro-reflection and rotational symmetry according to clause 2.2.3 of the EAD  
Coefficient of retro-reflection for "Yellow" (Part 1)

Colour		Sample				Yellow			Average of the three samples tested
						Single test result of each sample			
$\alpha$	$\beta_1$	$\beta_2$	$\epsilon$	1	2	3			
0,1°	5°	0°	0°	1157	1152	1283	1197		
	15°			1016	989	1089	1031		
	20°			892	860	942	898		
	30°			523	523	559	535		
	40°			319	314	341	325		
0,2°	5°	0°	0°	699	711	751	720		
	15°			652	663	699	671		
	20°			595	607	641	614		
	30°			411	424	449	428		
	40°			277	276	298	284		
0,33°	5°	0°	0°	312	338	326	325		
	15°			309	359	356	341		
	20°			300	349	353	334		
	30°			239	262	277	259		
	40°			199	203	216	206		
0,5°	5°	0°	0°	285	294	311	297		
	15°			250	262	272	261		
	20°			238	248	257	248		
	30°			109	125	134	123		
	40°			106	113	119	113		
1,0°	5°	0°	0°	77	78	57	71		
	15°			76	77	64	72		
	20°			76	80	69	75		
	30°			42	44	44	43		
	40°			31	31	35	32		
1,5°	5°	0°	0°	15,2	16,8	13,6	15,2		
	15°			15,3	21	13,2	16,5		
	20°			13,7	18,4	13,0	15,0		
	30°			12,1	13,1	14,1	13,1		
	40°			9,8	10,2	10,3	10,1		
2°	5°	0°	0°	7,0	6,4	5,7	6,4		
	15°			7,7	7,6	7,6	7,6		
	20°			6,9	6,7	6,5	6,7		
	30°			2,6	3,8	3,8	3,4		
	40°			2,9	2,7	3,9	3,2		

Coefficient of retro-reflection started at  $\epsilon=0^\circ$  [cd m<sup>-2</sup> lx<sup>-1</sup>]

ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film and with ORALITE® 5090 Anti-Dew Film

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

Annex 2

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

Colour				Red			Average of the three samples tested
Sample				Single test result of each sample			
$\alpha$	$\beta_1$	$\beta_2$	$\epsilon$	1	2	3	
0,1°	5°			308	334	339	327
	15°			262	283	298	281
	20°			226	245	259	243
	30°			136	148	151	145
	40°			82	88	93	88
0,2°	5°			199	211	205	205
	15°			181	194	189	188
	20°			164	176	173	171
	30°			113	122	121	119
	40°			73	79	82	78
0,33°	5°			96	95	87	93
	15°			100	103	87	97
	20°			97	101	87	95
	30°			74	80	74	76
	40°			56	60	61	59
0,5°	5°	0°	0°	79	81	81	80
	15°			73	73	72	73
	20°			69	70	68	69
	30°			38	40	35	38
	40°			34	35	34	34
1,0°	5°			28	24	22	25
	15°			26	24	22	24
	20°			26	25	23	25
	30°			13,4	13,4	13,3	13,4
	40°			8,7	8,7	9,0	8,8
1,5°	5°			5,4	4,6	5,0	5,0
	15°			6,2	4,4	4,3	5,0
	20°			5,7	4,6	4,1	4,8
	30°			4,2	4,0	4,3	4,2
	40°			3,8	3,5	3,5	3,6
2°	5°			2,2	2,2	2,2	2,2
	15°			2,2	2,2	2,2	2,2
	20°			2,1	1,9	1,9	2,0
	30°			1,4	1,2	0,8	1,1
	40°			0,9	1,0	0,8	0,9

Coefficient of retro-reflection started at  $\epsilon=0^\circ$  [ $\text{cd m}^{-2} \text{lx}^{-1}$ ]

ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film and with ORALITE® 5090 Anti-Dew Film

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

Annex 2



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

Colour				Blue			Average of the three samples tested
Sample				Single test result of each sample			
$\alpha$	$\beta_1$	$\beta_2$	$\epsilon$	1	2	3	
0,1°	5°	0°	0°	133	120	128	127
	15°			112	102	108	107
	20°			95	88	92	92
	30°			53	47	50	50
	40°			30	27	28	28
0,2°	5°			70	61	69	67
	15°			66	55	63	61
	20°			60	50	57	56
	30°			40	35	37	37
	40°			25	23	24	24
0,33°	5°			37	32	38	36
	15°			36	28	36	33
	20°			34	27	34	32
	30°			22	17,8	21	20
	40°			16,7	15,6	15,8	16
0,5°	5°			36	35	37	36
	15°			30	30	31	30
	20°			27	27	28	27
	30°			10,1	8,6	10,2	9,6
	40°			8,2	7,2	7,8	7,7
1,0°	5°	3,7	4,3	4,7	4,2		
	15°	3,8	4,6	4,6	4,3		
	20°	4,2	4,8	4,7	4,6		
	30°	2,8	2,9	3,0	2,9		
	40°	2,7	2,7	2,7	2,7		
1,5°	5°	1,6	1,5	1,7	1,6		
	15°	1,3	1,2	1,5	1,3		
	20°	1,3	1,2	1,6	1,4		
	30°	1,0	0,8	1,1	1,0		
	40°	0,7	0,7	0,7	0,7		
2°	5°	1,0	1,1	1,1	1,1		
	15°	0,8	0,7	0,9	0,8		
	20°	0,9	0,8	0,9	0,9		
	30°	0,4	0,4	0,4	0,4		
	40°	0,5	0,4	0,5	0,5		

Coefficient of retro-reflection started at  $\epsilon=0^\circ$  [ $\text{cd m}^{-2} \text{lx}^{-1}$ ]

ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film and with ORALITE® 5090 Anti-Dew Film

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

Annex 2

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

Colour				Green			Average of the three samples tested
Sample				Single test result of each sample			
$\alpha$	$\beta_1$	$\beta_2$	$\varepsilon$	1	2	3	
0,1°	5°			298	309	323	310
	15°			250	265	283	266
	20°			215	228	246	230
	30°			128	124	140	131
	40°			74	72	83	76
0,2°	5°			165	161	166	164
	15°			157	147	156	153
	20°			144	134	144	141
	30°			99	92	104	98
	40°			63	60	70	64
0,33°	5°			79	69	74	74
	15°			82	67	72	74
	20°			79	65	71	72
	30°			56	48	55	53
	40°			43	40	46	43
0,5°	5°	0°	0°	76	79	83	79
	15°			63	67	71	67
	20°			57	62	66	62
	30°			25	22	25	24
	40°			21	19,5	22	21
1,0°	5°			10,8	9,8	9,7	10,1
	15°			11,7	11,2	11,4	11,4
	20°			13,1	12,1	12,3	12,5
	30°			7,8	7,5	7,4	7,6
	40°			6,9	6,9	7,5	7,1
1,5°	5°			3,3	2,7	2,7	2,9
	15°			3,0	2,8	2,9	2,9
	20°			3,0	2,6	2,8	2,8
	30°			2,5	2,2	2,2	2,3
	40°			1,3	1,5	1,4	1,4
2°	5°			1,7	1,9	1,9	1,8
	15°			1,7	1,7	1,6	1,7
	20°			1,8	1,8	1,9	1,8
	30°			0,7	0,6	0,6	0,6
	40°			0,7	0,8	0,7	0,7

Coefficient of retro-reflection started at  $\varepsilon=0^\circ$  [ $\text{cd m}^{-2} \text{lx}^{-1}$ ]

ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film and with ORALITE® 5090 Anti-Dew Film

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

Annex 2

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

Colour				Brown			Average of the three samples tested
Sample				Single test result of each sample			
$\alpha$	$\beta_1$	$\beta_2$	$\varepsilon$	1	2	3	
0,1°	5°			144	159	136	146
	15°			122	137	115	125
	20°			104	117	98	106
	30°			61	65	56	61
	40°			35	37	32	35
0,2°	5°			88	96	82	89
	15°			82	86	76	81
	20°			74	77	69	73
	30°			50	51	46	49
	40°			31	33	28	31
0,33°	5°			41	43	38	41
	15°			45	42	41	43
	20°			44	40	40	41
	30°			33	31	29	31
	40°			24	24	21	23
0,5°	5°	0°	0°	38	43	36	39
	15°			34	37	31	34
	20°			32	34	29	32
	30°			16,0	14,6	14,4	15,0
	40°			14,3	13,5	12,5	13,4
1,0°	5°			9,4	11,2	8,5	9,7
	15°			9,3	10,9	8,7	9,6
	20°			9,3	10,9	8,8	9,7
	30°			5,2	6,2	5,0	5,5
	40°			3,5	4,2	3,3	3,7
1,5°	5°			2,3	2,6	2,2	2,4
	15°			2,1	2,3	1,8	2,1
	20°			2,1	2,2	1,7	2,0
	30°			1,9	2,1	1,7	1,9
	40°			1,4	1,5	1,4	1,4
2°	5°			1,2	1,3	1,2	1,2
	15°			1,0	1,2	1,0	1,1
	20°			0,9	1,0	0,8	0,9
	30°			0,5	0,5	0,5	0,5
	40°			0,5	0,5	0,6	0,5

Coefficient of retro-reflection started at  $\varepsilon=0^\circ$  [ $\text{cd m}^{-2} \text{lx}^{-1}$ ]

ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film and with ORALITE® 5090 Anti-Dew Film

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

Annex 2

Rotational symmetry

Colour Sample				Yellow		
$\alpha$	$\beta_1$	$\beta_2$	$\varepsilon$	1	2	3
0,33	5	0	-75	278	288	327
			-50	297	275	349
			-25	302	279	322
			0*	312	338	326
			25	283	307	272
			50	247	246	222
			<b>Ratio</b>	<b>1,26</b>	<b>1,37</b>	<b>1,57</b>

\* Rotational symmetry started at  $\varepsilon=0^\circ$  [ $\text{cd m}^{-2} \text{lx}^{-1}$ ]

Colour Sample				Green		
$\alpha$	$\beta_1$	$\beta_2$	$\varepsilon$	1	2	3
0,33	5	0	-75	70	67	72
			-50	67	77	78
			-25	64	71	69
			0*	79	69	74
			25	70	62	68
			50	56	53	54
			<b>Ratio</b>	<b>1,41</b>	<b>1,45</b>	<b>1,44</b>

\* Rotational symmetry started at  $\varepsilon=0^\circ$  [ $\text{cd m}^{-2} \text{lx}^{-1}$ ]

Colour Sample				Red		
$\alpha$	$\beta_1$	$\beta_2$	$\varepsilon$	1	2	3
0,33	5	0	-75	86	93	95
			-50	87	96	105
			-25	85	92	94
			0*	96	95	87
			25	83	78	75
			50	64	62	67
			<b>Ratio</b>	<b>1,50</b>	<b>1,55</b>	<b>1,57</b>

\* Rotational symmetry started at  $\varepsilon=0^\circ$  [ $\text{cd m}^{-2} \text{lx}^{-1}$ ]

Colour Sample				Brown		
$\alpha$	$\beta_1$	$\beta_2$	$\varepsilon$	1	2	3
0,33	5	0	-75	43	43	42
			-50	41	48	42
			-25	39	46	37
			0*	41	43	38
			25	36	37	33
			50	30	31	28
			<b>Ratio</b>	<b>1,43</b>	<b>1,55</b>	<b>1,50</b>

\* Rotational symmetry started at  $\varepsilon=0^\circ$  [ $\text{cd m}^{-2} \text{lx}^{-1}$ ]

Colour Sample				Blue		
$\alpha$	$\beta_1$	$\beta_2$	$\varepsilon$	1	2	3
0,33	5	0	-75	31	29	30
			-50	32	32	31
			-25	30	29	30
			0*	37	32	38
			25	32	30	33
			50	24	23	22
			<b>Ratio</b>	<b>1,54</b>	<b>1,39</b>	<b>1,73</b>

\* Rotational symmetry started at  $\varepsilon=0^\circ$  [ $\text{cd m}^{-2} \text{lx}^{-1}$ ]

### Annex 3

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	$\beta$
Yellow	1	0,532	0,462	0,30
	2	0,533	0,461	0,31
	3	0,533	0,461	0,30
Red	1	0,670	0,308	0,03
	2	0,670	0,308	0,03
	3	0,670	0,307	0,03
Blue	1	0,147	0,110	0,04
	2	0,149	0,111	0,04
	3	0,149	0,113	0,04
Green	1	0,134	0,434	0,07
	2	0,133	0,439	0,07
	3	0,134	0,437	0,07
Brown	1	0,491	0,399	0,05
	2	0,501	0,403	0,05
	3	0,498	0,403	0,04

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

Colour	Sample				Yellow Single test result of each sample			Average of the three samples tested
	$\alpha$	$\beta_1$	$\beta_2$	$\varepsilon$	1	2	3	
0,2°	5°	0°	0°	688	718	738	715	
				420	475	466	454	
0,33°	5°	0°	0°	288	319	317	308	
				246	289	263	266	
1,0°	5°	0°	0°	49	61	58	56	
				37	35	43	38	

Coefficient of retro-reflection after natural weathering started at  $\varepsilon=0^\circ$  [ $\text{cd m}^{-2} \text{lx}^{-1}$ ]

ORALITE® 6910 Brilliant Grade laminated with ORALITE® 5061 Transparent Film and with ORALITE® 5090 Anti-Dew Film

Visibility after natural weathering according to clause 2.2.6 of the EAD

Annex 3

English translation prepared by DIBt

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

Colour				Red			Average of the three samples tested
$\alpha$	$\beta_1$	Sample		Single test result of each sample			
		$\beta_2$	$\varepsilon$	1	2	3	
0,2°	5°			193	195	206	198
				81	110	123	105
0,33°	5°	0°	0°	81	84	90	85
	30°			36	66	81	61
1,0°	5°			17,4	15,9	18,2	17,2
	30°			19,8	13,1	11,0	14,6

Coefficient of retro-reflection after natural weathering started at  $\varepsilon=0^\circ$  [ $\text{cd m}^{-2} \text{lx}^{-1}$ ]

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

Colour				Blue			Average of the three samples tested
$\alpha$	$\beta_1$	Sample		Single test result of each sample			
		$\beta_2$	$\varepsilon$	1	2	3	
0,2°	5°			59	74	62	65
				38	46	41	42
0,33°	5°	0°	0°	34	40	40	38
	30°			21	27	24	24
1,0°	5°			3,0	3,2	3,5	3,2
	30°			2,9	2,6	2,6	2,7

Coefficient of retro-reflection after natural weathering started at  $\varepsilon=0^\circ$  [ $\text{cd m}^{-2} \text{lx}^{-1}$ ]

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Visibility after natural weathering according to clause 2.2.6 of the EAD

Annex 3

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

Colour				Green			Average of the three samples tested
Sample				Single test result of each sample			
$\alpha$	$\beta_1$	$\beta_2$	$\epsilon$	1	2	3	
0,2°	5°			147	130	132	136
	30°			91	80	78	83
0,33°	5°	0°	0°	67	65	64	65
	30°			53	43	43	46
1,0°	5°			9,6	12,2	9,8	10,5
	30°			6,2	6,9	7,0	6,7

Coefficient of retro-reflection after natural weathering started at  $\epsilon=0^\circ$  [ $\text{cd m}^{-2} \text{lx}^{-1}$ ]

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

Colour				Brown			Average of the three samples tested
Sample				Single test result of each sample			
$\alpha$	$\beta_1$	$\beta_2$	$\epsilon$	1	2	3	
0,2°	5°			86	98	105	96
	30°			49	57	59	55
0,33°	5°	0°	0°	39	46	46	44
	30°			30	36	38	35
1,0°	5°			8,7	9,4	8,1	8,7
	30°			5,0	6,0	5,4	5,5

Coefficient of retro-reflection after natural weathering started at  $\epsilon=0^\circ$  [ $\text{cd m}^{-2} \text{lx}^{-1}$ ]

**Annex 4**

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.

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