

**European Technical Approval****ETA 11/0522**

Trade Name

1. 3M™ Diamond Grade™ DG<sup>3</sup> Series 4000 printed with 3M™ process colour series 4700
2. 3M™ Diamond Grade™ DG<sup>3</sup> Series 4000 + 3M™ Piezo Inkjet Ink Series 8800UV + 3M™ Electrocut Film 1170
3. 3M™ Diamond Grade™ DG<sup>3</sup> Series 4000 + 3M™ Piezo Inkjet Ink Series 8800UV + 3M™ Dew Resistant Overlay Film 1180
4. 3M™ Diamond Grade™ DG<sup>3</sup> Series 4000 + 3M™ Dew Resistant Overlay Film 1180
5. 3M™ Diamond Grade™ DG<sup>3</sup> Series 4000 + 3M™ Premium Protective Overlay Film 1160
6. 3M™ Diamond Grade™ DG<sup>3</sup> 4090 + 3M™ Electrocut Film 1176 with or without 3M™ Protective Overlay Film

Holder of the approval

**3M Deutschland GmbH**  
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Website

[www.3m.com](http://www.3m.com)

Generic type and use of construction product

**Micro-prismatic retro-reflective sheeting for traffic signs**

Validity from:

**2013-06-27**

to

**2018-06-26**

Manufacturing plant(s):

**3M Deutschland GmbH Plant Hilden, Düsseldorferstr.  
121-125, D-40705 Hilden, Germany**  
**3M Brownwood, Texas 76801 - US**

This European Technical Approval replaces:

**ETA 11/0522, valid from 23/12/2011 until 22/12/2016**

This European Technical Approval contains:

**29 pages including 1 annex which forms an integral part of the document**



European Organisation for Technical Approvals  
Organisation Européenne pour l'Agrément Technique  
Europäische Organisation für Technische Zulassungen

## I. LEGAL BASIS AND GENERAL CONDITIONS

1. This European Technical Approval is issued by UBAtc in accordance with:
  - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products<sup>1</sup>, modified by Council Directive 93/68/EEC<sup>2</sup> and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council<sup>3</sup>,
  - Belgian law of 25 March 1996 concerning the adaptation of legislative and administrative provisions of Member States to the Construction Products Directive (89/106/EEC) for construction products<sup>4</sup> and Belgian Royal Decree of 18 August 1998 concerning construction products<sup>5</sup>
  - Common Procedural Rules for Requesting, Preparing and the Granting of European Technical Approvals set out in the Annex to Commission Decision 94/23/EC<sup>6</sup>
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8. Compared with the previous version, this ETA comprises no changes.

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<sup>1</sup> Official Journal of the European Communities N° L 40, 11.2.1989, p. 12

<sup>2</sup> Official Journal of the European Communities N° L 220, 30.8.1993, p. 1

<sup>3</sup> Official Journal of the European Union N° L 284, 31.10.2003, p. 1

<sup>4</sup> Belgian Law Gazette, 21.05.1996

<sup>5</sup> Belgian Law Gazette, 11.09.1998

<sup>6</sup> Official Journal of the European Communities N° L 17, 20.1.1994, p. 34

## II. SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

### 1 Definition of product and intended use

#### 1.1 General

The product consists of a micro-prismatic retro-reflective sheeting made of optical prismatic lenses elements formed in a transparent synthetic resin, sealed and backed with a pressure sensitive adhesive to form a durable bond to the sign substrates. The sheeting has a smooth surface with a distinctive interlocking seal pattern and may or may not have orientation marks, visible from the face.

The product is supplied as a single coloured sheet whose trade name is "3M™ Diamond Grade™ DG<sup>3</sup> series 4000", or as a single coloured sheet with a coloured overlay film whose trade name is "3M Diamond Grade DG<sup>3</sup> series 4000 + Electrocut Film series 1170" or as a single coloured sheet printed with process colour whose trade name is "3M Diamond Grade DG<sup>3</sup> series 4000" printed with "Process Colour Series 4700 or Piezo Inkjet Ink Series 8800 UV", possibly with an additional protection by 3M™ Dew Resistant Overlay Film 1180 or 3M™ Premium Protective Overlay Film 1160 or 3M™ Protective Overlay Film 1150.

In case of digital printing, Process Colour Series 8800 UV are generally protected by a colourless overlay film, e.g. Electrocut Film 1170, Overlay Film 1160 or Overlay Film 1180.

#### 1.2 Components

An overview of the complete set of components of "3M Diamond Grade DG<sup>3</sup> series 4000", and combinations with or without "3M Electrocut Film series 1170" or "Process Colour Series 4700 or Piezo Inkjet Ink Series 8800 UV", and with or without 3M Dew Resistant Overlay Film 1180 or 3M Premium Protective Overlay Film 1160 or 3M Protective Overlay Film 1150" is presented in Table 1.

ETA 11/0521 contains	<ol style="list-style-type: none"> <li>1) 3M™ Diamond Grade™ DG<sup>3</sup> Series 4000</li> <li>2) 3M™ Diamond Grade™ DG<sup>3</sup> Series 4000 + 3M™ Electrocut Film Series 1070</li> <li>3) 3.) 3M™ Diamond Grade™ DG<sup>3</sup> Series 4000 printed with 3M™ process colour series 880 I or N</li> </ol>
This ETA contains ;	<ol style="list-style-type: none"> <li>1) 3M™ Diamond Grade™ DG<sup>3</sup> Series 4000 printed with 3M™ process colour series 4700</li> </ol>
Initial performance and performance after accelerated artificial weathering	<ol style="list-style-type: none"> <li>2) 3M™ Diamond Grade™ DG<sup>3</sup> Series 4000 + 3M™ Piezo Inkjet Ink Series 8800UV +</li> <li>3) 3M™ Electrocut Film 1170</li> <li>4) 3M™ Diamond Grade™ DG<sup>3</sup> Series 4000 + 3M™ Piezo Inkjet Ink Series 8800UV +</li> </ol>
Use option 1, see Annex 1	<ol style="list-style-type: none"> <li>5) 3M™ Dew Resistant Overlay Film 1180</li> <li>6) 3M™ Diamond Grade™ DG<sup>3</sup> Series 4000 + 3M™ Premium Protective Overlay Film 1160</li> <li>7) 3M™ Diamond Grade™ DG<sup>3</sup> Series 4000 + 3M™ Dew Resistant Overlay Film 1180</li> <li>8) 3M™ Diamond Grade™ DG<sup>3</sup> 4090 +</li> <li>9) 3M™ Electrocut Film 1176 with or without 3M™ Protective Overlay Film</li> </ol>

Components	Trade name	Colours/code	Characteristics
Micro-prismatic retro-reflective sheeting	3M™ Diamond Grade™ DG <sup>3</sup> Reflective Sheeting Series 4000	White	4090*
		Red	4092*
		Yellow	4091*
		Green	4097*
		Blue	4095*
		Fluorescent Yellow	4081*
		Fluorescent Orange	4084*
		Fluorescent Yellow/Green	4083*
Overlay film	3M™ ELECTROCUT FILM series 1170	Yellow	1171*
		Red	1172*
		Blue	1175*
		Green	1177*
		Brown	1179*
		Dark Green (Green 2)	1176
		Colourless	1170
Process colour	3M™ Process Colour Series 880 I or N	Yellow	884I or N*
		Blue	883I or N*
		Green	888I or N*
		French Red	889I or N*
Process colour	3M™ Process Colour Series 4700	Yellow	4704
		Red	4702
		Blue	4703
		Green	4708
Process colour for digital printing	Piezo Inkjet Ink Series 8800 UV	Yellow	8804
		Red	8802
		Blue	8803
		Green	8808
		Brown	8809
Protective Overlay films	3M™ Premium Protective Overlay Film 1160 (anti-graffiti)		Combined Thickness: 0,549 mm Rolls in various length and widths
	3M™ Dew resistant overlay film 1180		
	3M™ Protective Overlay Film 1150		

\* Product Combinations covered in ETA 11/0521

**Tabel 1 - Components of the product**

### 1.3 Intended use

The construction product is used to manufacture sign faces for traffic signs. The intended use includes, for example:

- retro-reflective signs, retro-reflective and trans-illuminated signs (See also EN 12899-1)
- trans-illuminated traffic bollards (See also EN 12899-2)
- road delineators with retro-reflective devices (See also EN 12899-3)
- variable message signs (See also EN 12966-1)

The intended use excludes road-markings as defined in EN 1436. The assumed intended working life of the product is 12 years provided that it is subjected to appropriate use and maintenance. The indications given as to the working life of the product cannot be interpreted as a guarantee given by the Manufacturer or by the Approval Body.

## 2 CHARACTERISTICS OF PRODUCTS AND METHODS OF VERIFICATION

### 2.1 General

The identification tests and the assessment of fitness for use of the "3M Diamond Grade DG<sup>3</sup> series 4000", and combinations with or without "3M Electrocut Film series 1170" or "Process Colour Series 4700 or Piezo Inkjet Ink Series 8800 UV", and with or without 3M Dew Resistant Overlay Film 1180 or 3M Premium Protective Overlay Film 1160 or 3M Protective Overlay Film 1150 were carried out according to the verification methods in clause 3 of this ETA.

The ETA is issued for the product on the basis of information/data deposited at UBAtc which identify the product that was assessed and judged. Changes to the production process of the product or to its components which could result in deposited information/data being incorrect, shall be notified to UBAtc before they are introduced and UBAtc will assess whether or not such changes affect the ETA and, if so, whether further assessment and/or modification to the ETA shall be necessary.

The characteristics of the product not mentioned in this ETA nor in the annexes shall correspond to the respective values laid down in the Technical Documentation of this ETA, checked by UBAtc.

Details of test results are included in the related Evaluation Report.

2.2 Characteristics of the product "3M Diamond Grade DG<sup>3</sup> series 4000", and combinations with or without "3M Electrocut Film series 1170" or "Process Colour Series 4700 or Piezo Inkjet Ink Series 8800 UV", and with or without 3M Dew Resistant Overlay Film 1180 or 3M Premium Protective Overlay Film 1160 or 3M Protective Overlay Film 1150"

### 2.2.1 Hygiene, health and the environment

#### 2.2.1.1 Release of dangerous substances

The product complies with the provisions of Guidance Paper H ("A harmonized approach relating to Dangerous substances under the construction products directive", Edition 2002) about dangerous substances.

A written declaration of conformity in this respect was made by the manufacturer. In addition to the specific clauses relating to dangerous substances contained in this European Technical Approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

#### 2.2.2 Safety in use of "3M Diamond Grade DG<sup>3</sup> series 4000 printed with "PROCESS COLOUR series 4700"

##### 2.2.2.1 Visibility of "3M Diamond Grade DG<sup>3</sup> series 4000 printed with "PROCESS COLOUR series 4700"

###### 2.2.2.1.1 Day-time colour and Luminance Factor

The characteristics of Day-time colour and Luminance Factor (see Table 2) have been determined according to clause 3.2.1.

Colours		Chromaticity Coordinates				Pass/ fail	Luminance Factor $\beta$
		1	2	3	4		Class
Yellow on white	x	0.494	0.470	0.513	0.545	Pass	B2
	y	0.505	0.480	0.437	0.454		$\geq 0.24$
Red on White	x	0.735	0.700	0.610	0.660	Pass	B2
	y	0.265	0.250	0.340	0.340		$\geq 0.03$
Green on White	x	0.110	0.170	0.170	0.110	Pass	B2
	y	0.415	0.415	0.500	0.500		$\geq 0.03$
Blue on White	x	0.130	0.160	0.160	0.130	Pass	B2
	y	0.090	0.090	0.140	0.140		$\geq 0.01$

Tabel 2 - Day-time colour and Luminance Factor

#### 2.2.2.1.2 Coefficient of Retro-reflection Case A

The Coefficient of Retro-reflection - Case A (see Table 3) has been determined according to clause 3.2.2.

Colour	Class R3B Germany
Yellow on white	pass
Red on White	pass
Green on White	pass
Blue on White	pass

Tabel 3 - Coefficient of Retro-reflection - Case A

#### 2.2.2.1.3 Rotational symmetry

The rotational symmetry has been determined according to clause 3.2.3.

Colours	Pass/Fail
Yellow on White	Pass
Red on White	Pass
Blue on White	Pass
Green on White	Pass

#### 2.2.2.1.4 Impact resistance

The Impact resistance (see Table 5) has been determined according to clause 3.2.4.

**Tabel 4 - Rotational symmetry**

Product	Colour of the sheeting	Colour of the ink	Observations after the test
"3M DIAMOND GRADE DG <sup>3</sup> series 4000" printed with "PROCESS COLOUR SERIES 4700"	White	4090	Pass: no cracking has been observed outside the impact area.
		Yellow	
		Red	
		Blue	
		Green	

**Tabel 5 - Impact resistance**

#### 2.2.3 Durability "3M Diamond Grade DG<sup>3</sup> serie 4000" printed with "PROCESS COLOUR SERIES 4700"

##### 2.2.3.1 Visibility after accelerated artificial weathering of "3M DIAMOND GRADE DG<sup>3</sup> series 4000" printed with "PROCESS COLOUR SERIES 4700"

##### 2.2.3.1.1 Day-time colour and Luminance factor after accelerated artificial weathering (see Table 6) of "3M DIAMOND GRADE DG<sup>3</sup> series 4000" printed with "PROCESS COLOUR SERIES 4700"

The tests were performed according to clause 3.3.

Colours		Chromaticity Coordinates				Luminance Factor $\beta$	
		1	2	3	4	Class B1	Class B2
Yellow reference	x	0.545	0.487	0.427	0.465	≥ 0.16	≥ 0.24
	y	0.454	0.423	0.483	0.534		
Yellow on White results		Pass				Class B2	
Red reference	x	0.735	0.674	0.569	0.655	≥ 0.03	≥ 0.03
	y	0.265	0.236	0.341	0.345		
Red on White results		Pass				Class B2	
Green reference	x	0.007	0.248	0.177	0.026	≥ 0.03	≥ 0.03
	y	0.703	0.409	0.362	0.399		
Green on White results		Pass				Class B2	
Blue reference	x	0.078	0.150	0.210	0.137	≥ 0.01	≥ 0.01
	y	0.171	0.220	0.160	0.038		
Blue on White results		Pass				Class B2	

**Tabel 6 - Day-time colour and Luminance factor**

##### 2.2.3.1.2 Coefficient of retro-reflection Case A (see Table 7) after accelerated artificial weathering of "3M DIAMOND GRADE DG<sup>3</sup> serie 4000" printed with "PROCESS COLOUR SERIES 4700"

The tests were performed according to clause 3.3. The values shall not be less than 80% of the values required for new material under clause 3.2.2, as appropriate.

Colour	Class R3B Germany
Yellow	Pass
Red	Pass
Blue	Pass
Green	Pass

**2.2.4.1 Visibility of “3M Diamond Grade DG<sup>3</sup> series 4000 printed with 3M Piezo Inkjet Ink Series 8800UV + 3M Electrocut Film 1170”**

**2.2.4.1.1 Day-time colour and Luminance Factor**

The characteristics of Day-time colour and Luminance Factor (see Table 8) have been determined according to clause 3.2.1

**Tabel 7 - Coefficient of Retro-reflection - Case A**

**2.2.4 Safety in use of “3M Diamond Grade DG<sup>3</sup> series 4000 printed with 3M Piezo Inkjet Ink Series 8800UV + 3M Electrocut Film 1170”**

Colours		Chromaticity Coordinates				Luminance Factor $\beta$	
		1	2	3	4	Class B1	Class B2
White reference	x	0.305	0.335	0.325	0.295	$\geq 0.27$	$\geq 0.40$
	y	0.315	0.345	0.355	0.325		
White results		Pass				Class B2	
Yellow reference	x	0.494	0.470	0.513	0.545	$\geq 0.16$	$\geq 0.24$
	y	0.505	0.480	0.437	0.454		
Yellow on White results		Pass				Class B2	
Red reference	x	0.735	0.700	0.610	0.660	$\geq 0.03$	$\geq 0.03$
	y	0.265	0.250	0.340	0.340		
Red on White results		Pass				Class B2	
Green reference	x	0.110	0.170	0.170	0.110	$\geq 0.03$	$\geq 0.03$
	y	0.415	0.415	0.500	0.500		
Green on White results		Pass				Class B2	
Blue reference	x	0.130	0.160	0.160	0.130	$\geq 0.01$	$\geq 0.01$
	y	0.090	0.090	0.140	0.140		
Blue on White results		Pass				Class B2	
Brown reference		0.455 0.397	0.523 0.429	0.479 0.373	0.558 0.394	0.04 – 0.06	0.03 – 0.09
Brown on White results		Pass				Class B2	

**Tabel 8 - Day-time colour and Luminance factor**

**2.2.4.1.2 Coefficient of Retro-reflection Case A**

The Coefficient of Retro-reflection - Case A (see Table 9) has been determined according to clause 3.2.2.

Colour	Class R3B Germany
White	pass
Yellow on white	pass
Red on White	pass
Green on White	pass
Blue on White	pass
Brown on White*	pass*
*pass is given assuming a reference for Brown calculated as 5% of white	

**Tabel 9 - Coefficient of Retro-reflection - Case A**

**2.2.4.1.3 Rotational symmetry**

The rotational symmetry (see Table 10) has been determined according to clause 3.2.3.

Colours	Pass/Fail
White	Pass
Yellow on White	Pass
Red on White	Pass
Blue on White	Pass
Green on White	Pass
Brown on White	Pass

**Tabel 10 - Rotational symmetry**

**2.2.4.1.4 Impact resistance**

The Impact resistance (see Table 11) has been determined according to clause 3.2.4.

Product	Colour of the sheeting	Colour of the ink	Observations after the test	
"3M Diamond Grade DG <sup>3</sup> series 4000 printed with 3M Piezo Inkjet Ink Series 8800UV + 3M Electrocut Film 1170"	White	4090	Pass: no cracking has been observed outside the impact area.	
				unprinted
				Yellow
				Red
				Blue
				Green
		Brown		

**Tabel 11 - Impact resistance**

**2.2.5 Durability "3M Diamond Grade DG<sup>3</sup> series 4000 printed with 3M Piezo Inkjet Ink Series 8800UV + 3M Electrocut Film 1170"**

**2.2.5.1 Visibility after accelerated artificial weathering of "3M Diamond Grade DG<sup>3</sup> series 4000 printed with 3M Piezo Inkjet Ink Series 8800UV + 3M Electrocut Film 1170"**

**2.2.5.1.1 Day-time colour and Luminance factor (see Table 12) after accelerated artificial weathering of "3M Diamond Grade DG<sup>3</sup> series 4000 printed with 3M Piezo Inkjet Ink Series 8800UV + 3M Electrocut Film 1170"**

The tests were performed according to clause 3.3



Colours		Chromaticity Coordinates				Luminance Factor $\beta$	
		1	2	3	4	Class B1	Class B2
White reference	x	0.355	0.305	0.285	0.335	$\geq 0.27$	$\geq 0.40$
	y	0.355	0.305	0.325	0.375		
White results		Pass				Class B2	
Yellow reference	x	0.545	0.487	0.427	0.465	$\geq 0.16$	$\geq 0.24$
	y	0.454	0.423	0.483	0.534		
Yellow on White results		Pass				Class B2	
Red reference	x	0.735	0.674	0.569	0.655	$\geq 0.03$	$\geq 0.03$
	y	0.265	0.236	0.341	0.345		
Red on White results		Pass				Class B2	
Green reference	x	0.007	0.248	0.177	0.026	$\geq 0.03$	$\geq 0.03$
	y	0.703	0.409	0.362	0.399		
Green on White results		Pass				Class B2	
Blue reference	x	0.078	0.150	0.210	0.137	$\geq 0.01$	$\geq 0.01$
	y	0.171	0.220	0.160	0.038		
Blue on White results		Pass				Class B2	
Brown reference	x	0.455	0.523	0.479	0.558	0.04 – 0.06	0.03 – 0.09
	y	0.397	0.429	0.373	0.394		
Brown on White results		Pass				Class B2	

**Table 12 - Day-time colour and Luminance factor**

**2.2.5.1.2 Coefficient of retro-reflection Case A (see Table 13) after accelerated artificial weathering test of "3M Diamond Grade DG<sup>3</sup> Series 4000 + 3M Piezo Inkjet Ink Series 8800UV + 3M Electrocut Film 1170"**

The tests were performed according to clause 3.3. The values shall not be less than 80% of the values required for new material under clause 3.2.2, as appropriate.

Colour	Class R3B Germany
White	Pass
Yellow on white	Pass
Red on White	Pass
Green on White	Pass
Blue on White	Pass
Brown on White*	Pass
*pass is given assuming a reference for Brown calculated as 5% of white	

**Table 13 - Coefficient of Retro-reflection - Case A**

**2.2.6 Safety in use of "3M Diamond Grade DG<sup>3</sup> series 4000 printed with 3M Piezo Inkjet Ink Series 8800UV + 3M Dew Resistant Overlay Film 1180"**

**2.2.6.1 Visibility of "3M Diamond Grade DG<sup>3</sup> series 4000 printed with 3M Piezo Inkjet Ink Series 8800UV + 3M Dew Resistant Overlay Film 1180"**

**2.2.6.1.1 Day-time colour and Luminance Factor**

The characteristics of Day-time colour and Luminance Factor (see Table 14) have been determined according to clause 3.2.1.

Colours		Chromaticity Coordinates				Luminance Factor $\beta$	
		1	2	3	4	Class B1	Class B2
White reference	x	0.305	0.335	0.325	0.295	$\geq 0.27$	$\geq 0.40$
	y	0.315	0.345	0.355	0.325		
White results		Pass				Class B2	
Yellow reference	x	0.494	0.470	0.513	0.545	$\geq 0.16$	$\geq 0.24$
	y	0.505	0.480	0.437	0.454		
Yellow on White results		Pass				Class B2	
Red reference	x	0.735	0.700	0.610	0.660	$\geq 0.03$	$\geq 0.03$
	y	0.265	0.250	0.340	0.340		
Red on White results		Pass				Class B2	
Green reference	x	0.110	0.170	0.170	0.110	$\geq 0.03$	$\geq 0.03$
	y	0.415	0.415	0.500	0.500		
Green on White results		Pass				Class B2	
Blue reference	x	0.130	0.160	0.160	0.130	$\geq 0.01$	$\geq 0.01$
	y	0.090	0.090	0.140	0.140		
Blue on White results		Pass				Class B2	
Brown reference		0.455	0.523	0.479	0.558	0.04 – 0.06	0.03 – 0.09
		0.397	0.429	0.373	0.394		
Brown on White results		Pass				Class B2	

**Tabel 14 - Day-time colour and Luminance factor**

**2.2.6.1.2 Coefficient of Retro-reflection Case A**

The Coefficient of Retro-reflection - Case A (see Table 15) has been determined according to clause 3.2.2.

Colour	Class R3B Germany
White	pass
Yellow on white	pass
Red on White	pass
Green on White	pass
Blue on White	pass
Brown on White*	pass*
*pass is given assuming a reference for Brown calculated as 5% of white	

**Tabel 15 - Coefficient of Retro-reflection - Case A**

**2.2.6.1.3 Rotational symmetry**

The rotational symmetry (see Table 16) has been determined according to clause 3.2.3.

Colours	Pass/Fail
White	Pass
Yellow on White	Pass
Red on White	Pass
Blue on White	Pass
Green on White	Pass
Brown on White	Pass

**Tabel 16 - Rotational symmetry**

**2.2.6.1.4 Impact resistance**

The Impact resistance (see Table 17) has been determined according to clause 3.2.4.

Product	Colour of the sheeting	Colour of the ink	Observations after the test
"3M Diamond Grade DG <sup>3</sup> series 4000 printed with 3M Piezo Inkjet Ink Series 8800UV + 3M Dew Resistant Overlay Film 1180"	White	4090	unprinted
			Yellow
			Red
			Blue
			Green
			Brown
			Pass: no cracking has been observed outside the impact area.

**Tabel 17 - Impact resistance**

**2.2.7 Durability of "3M Diamond Grade DG<sup>3</sup> series 4000 printed with 3M Piezo Inkjet Ink Series 8800UV + 3M Dew Resistant Overlay Film 1180"**

**2.2.7.1 Visibility after accelerated artificial weathering of "3M Diamond Grade DG<sup>3</sup> series 4000 printed with 3M Piezo Inkjet Ink Series 8800UV + 3M Dew Resistant Overlay Film 1180"**

**2.2.7.1.1 Day-time colour and Luminance factor (see Table 18) after accelerated artificial weathering of "3M Diamond Grade DG<sup>3</sup> series 4000 printed with 3M Piezo Inkjet Ink Series 8800UV + 3M Dew Resistant Overlay Film 1180"**

The tests were performed according to clause 3.3.

Colours		Chromaticity Coordinates				Luminance Factor $\beta$	
		1	2	3	4	Class B1	Class B2
White reference	x	0.355	0.305	0.285	0.335	≥ 0.27	≥ 0.40
	y	0.355	0.305	0.325	0.375		
White results		Pass				Class B2	
Yellow reference	x	0.545	0.487	0.427	0.465	≥ 0.16	≥ 0.24
	y	0.454	0.423	0.483	0.534		
Yellow on White results		Pass				Class B2	
Red reference	x	0.735	0.674	0.569	0.655	≥ 0.03	≥ 0.03
	y	0.265	0.236	0.341	0.345		
Red on White results		Pass				Class B2	
Green reference	x	0.007	0.248	0.177	0.026	≥ 0.03	≥ 0.03
	y	0.703	0.409	0.362	0.399		
Green on White results		Pass				Class B2	
Blue reference	x	0.078	0.150	0.210	0.137	≥ 0.01	≥ 0.01
	y	0.171	0.220	0.160	0.038		
Blue on White results		Pass				Class B2	
Brown reference	x	0.455	0.523	0.479	0.558	0.04 – 0.06	0.03 – 0.09
	y	0.397	0.429	0.373	0.394		
Brown on White results		Pass				Class B2	

**Tabel 18 - Day-time colour and Luminance factor**

**2.2.7.1.2 Coefficient of retro-reflection Case A (see Table 19) after accelerated artificial weathering test of "3M Diamond Grade DG<sup>3</sup> Series 4000 + 3M Piezo Inkjet Ink Series 8800UV + 3M Dew Resistant Overlay Film 1180"**

The tests were performed according to clause 3.3. The values shall not be less than 80% of the values required for new material under clause 3.2.2, as appropriate.

<b>Colour</b>	<b>Class R3B Germany</b>
White	pass
Yellow on white	pass
Red on White	pass
Green on White	pass
Blue on White	pass
Brown on White*	pass*
*pass is given assuming a reference for Brown calculated as 5% of white	

**Tabel 19 - Coefficient of Retro-reflection - Case A**

**2.2.8 Safety in use of "3M Diamond Grade DG<sup>3</sup> series 4000 + 3M Dew Resistant Overlay Film 1180"**

**2.2.8.1 Visibility of "3M Diamond Grade DG<sup>3</sup> series 4000 + 3M Dew Resistant Overlay Film 1180"**

**2.2.8.1.1 Day-time colour and Luminance Factor**

The characteristics of Day-time colour and Luminance Factor (see Table 20) have been determined according to clause 3.2.1.

Colours		Chromaticity Coordinates				Luminance Factor $\beta$	
		1	2	3	4	Class B1	Class B2
White reference	x	0.305	0.335	0.325	0.295	$\geq 0.27$	$\geq 0.40$
	y	0.315	0.345	0.355	0.325		
White results	x	Pass				Class B2	
	y						
Yellow reference	x	0.494	0.470	0.513	0.545	$\geq 0.16$	$\geq 0.24$
	y	0.505	0.480	0.437	0.454		
Yellow results	x	Pass				Class B2	
	y						
Red reference	x	0.735	0.700	0.610	0.660	$\geq 0.03$	$\geq 0.03$
	y	0.265	0.250	0.340	0.340		
Red results	x	Pass				Class B2	
	y						
Green reference	x	0.110	0.170	0.170	0.110	$\geq 0.03$	$\geq 0.03$
	y	0.415	0.415	0.500	0.500		
Green results	x	Pass				Class B2	
	y						
Blue reference	x	0.130	0.160	0.160	0.130	$\geq 0.01$	$\geq 0.01$
	y	0.090	0.090	0.140	0.140		
Blue results	x	Pass				Class B2	
	y						
Fluorescent yellow reference	x	0.521	0.557	0.479	0.454	$\geq 0.38$	$\geq 0.38$
	y	0.424	0.442	0.520	0.491		
Fluorescent yellow results	x	Pass				Class B2	
	y						
Fluorescent orange reference	x	0.595	0.645	0.570	0.531	$\geq 0.25$	$\geq 0.20$
	y	0.351	0.355	0.429	0.414		
Fluorescent orange results	x	Pass				Class B1 and B2	
	y						
Fluorescent yellow/green reference	x	0.387	0.460	0.438	0.376	$\geq 0.60$	$\geq 0.70$
	y	0.610	0.540	0.508	0.568		
Fluorescent yellow/green results	x	Pass				Class B2	
	y						

**Tabel 20 - Day-time colour and Luminance factor**

### 2.2.8.1.2 Coefficient of Retro-reflection Case A

The Coefficient of Retro-reflection - Case A (see Table 21) has been determined according to clause 3.2.2.

Colour	Class R3B Germany
White	pass
Yellow	pass
Red	pass
Green	pass
Blue	pass
Fluorescent Yellow*	pass
Fluorescent Orange*	pass
Fluorescent Yellow/Green*	pass
*For fluorescent colours the reference values of standard colours have been used	

**Tabel 21 - Coefficient of Retro-reflection - Case A**

**2.2.8.1.3 Rotational symmetry**

The rotational symmetry (see Table 22) has been determined according to clause 3.2.3.

Colours	Pass/Fail
White	Pass
Yellow	Pass
Red	Pass
Blue	Pass
Green	Pass
Fluorescent Yellow	Pass
Fluorescent Orange	Pass
Fluorescent Yellow/Green	Pass

**Tabel 22 - Rotational symmetry**

**2.2.8.1.4 Impact resistance**

The Impact resistance (see Table 23) has been determined according to clause 3.2.4.

Product	Colour	Observations after the test
"3M Diamond Grade DG <sup>3</sup> series 4000 + 3M Dew Resistant Overlay Film 1180"	White	Pass: no cracking has been observed outside the impact area.
	Yellow	
	Red	
	Blue	
	Green	
	Fluorescent Yellow	
	Fluorescent Orange	
Fluorescent Yellow/Green		

**Tabel 23 - Impact resistance**

**2.2.9 Durability of "3M Diamond Grade DG<sup>3</sup> series 4000 + 3M Dew Resistant Overlay Film 1180"**

**2.2.9.1 Visibility after accelerated artificial weathering of "3M Diamond Grade DG<sup>3</sup> series 4000 + 3M Dew Resistant Overlay Film 1180"**

**2.2.9.1.1 Day-time colour and Luminance factor after accelerated artificial weathering of "3M Diamond Grade DG<sup>3</sup> series 4000 + 3M Dew Resistant Overlay Film 1180"**

The tests were performed according to clause 3.3.

Colours		Chromaticity Coordinates				Luminance Factor $\beta$	
		1	2	3	4	Class B1	Class B2
White reference	x	0.355	0.305	0.285	0.335	$\geq 0.27$	$\geq 0.40$
	y	0.355	0.305	0.325	0.375		
White results	x	Pass				Class B2	
	y						
Yellow reference	x	0.545	0.487	0.427	0.465	$\geq 0.16$	$\geq 0.24$
	y	0.454	0.423	0.483	0.534		
Yellow results	x	Pass				Class B2	
	y						
Red reference	x	0.735	0.674	0.569	0.655	$\geq 0.03$	$\geq 0.03$
	y	0.265	0.236	0.341	0.345		
Red results	x	Pass				Class B2	
	y						
Green reference	x	0.007	0.248	0.177	0.026	$\geq 0.03$	$\geq 0.03$
	y	0.703	0.409	0.362	0.399		
Green results	x	Pass				Class B2	
	y						
Blue reference	x	0.078	0.150	0.210	0.137	$\geq 0.01$	$\geq 0.01$
	y	0.171	0.220	0.160	0.038		
Blue results	x	Pass				Class B2	
	y						
Fluorescent yellow reference	x	0.521	0.557	0.479	0.454	$\geq 0.38$	$\geq 0.38$
	y	0.424	0.442	0.520	0.491		
Fluorescent yellow results	x	Pass				Class B2	
	y						
Fluorescent orange reference	x	0.595	0.645	0.570	0.531	$\geq 0.25$	$\geq 0.20$
	y	0.351	0.355	0.429	0.414		
Fluorescent orange results	x	Pass				Class B1 and B2	
	y						
Fluorescent yellow/green reference	x	0.387	0.460	0.438	0.376	$\geq 0.50$	$\geq 0.50$
	y	0.610	0.540	0.508	0.568		
Fluorescent yellow/green results	x	Pass				Class B2	
	y						

**Table 24 - Day-time colour and Luminance factor**

**2.2.9.1.2 Coefficient of retro-reflection Case A (see Table 25)**  
**after accelerated artificial weathering test of "3M**  
**Diamond Grade DG<sup>3</sup> Series 4000 + 3M Dew**  
**Resistant Overlay Film 1180"**

The tests were performed according to clause 3.3. The values shall not be less than 80% of the values required for new material under clause 3.2.2, as appropriate.

<b>_Colour</b>	<b>Class R3B Germany</b>
White	pass
Yellow	pass
Red	pass
Green	pass
Blue	pass
Fluorescent Yellow*	pass
Fluorescent Orange*	pass
Fluorescent Yellow/Green*	pass
*For fluorescent colours the reference values of standard colours have been used	

**Table 25 - Coefficient of Retro-reflection - Case A**

**2.2.10 Safety in use of "3M Diamond Grade DG<sup>3</sup> series 4000 + 3M Premium Protective Overlay Film 1160"**

**2.2.10.1 Visibility of "3M Diamond Grade DG<sup>3</sup> series 4000 + 3M Premium Protective Overlay Film 1160"**

**2.2.10.1.1 Day-time colour and Luminance Factor**

The characteristics of Day-time colour and Luminance Factor (see Table 26) have been determined according to clause 3.2.1.

<b>Colours</b>		<b>Chromaticity Coordinates</b>				<b>Luminance Factor B</b>	
		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>Class B1</b>	<b>Class B2</b>
White reference	x	0.305	0.335	0.325	0.295	≥ 0.27	≥ 0.40
	y	0.315	0.345	0.355	0.325		
White results	x	Pass				Class B2	
	y						
Yellow reference	x	0.494	0.470	0.513	0.545	≥ 0.16	≥ 0.24
	y	0.505	0.480	0.437	0.454		
Yellow results	x	Pass				Class B2	
	y						
Red reference	x	0.735	0.700	0.610	0.660	≥ 0.03	≥ 0.03
	y	0.265	0.250	0.340	0.340		
Red results	x	Pass				Class B2	
	y						
Green reference	x	0.110	0.170	0.170	0.110	≥ 0.03	≥ 0.03
	y	0.415	0.415	0.500	0.500		
Green results	x	Pass				Class B2	
	y						
Blue reference	x	0.130	0.160	0.160	0.130	≥ 0.01	≥ 0.01
	y	0.090	0.090	0.140	0.140		
Blue results	x	Pass				Class B2	
	y						
Fluorescent yellow reference	x	0.521	0.557	0.479	0.454	≥ 0.38	≥ 0.38
	y	0.424	0.442	0.520	0.491		
Fluorescent yellow results	x	Pass				Class B2	
	y						

**Table 26 - Day-time colour and Luminance factor**

**2.2.10.1.2 Coefficient of Retro-reflection Case A**

The Coefficient of Retro-reflection - Case A (see Table 27) has been determined according to clause 3.2.2.



Colour	Class R3B Germany
White	pass
Yellow	pass
Red	pass
Green	pass
Blue	pass
Fluorescent Yellow*	pass
*For fluorescent colours the reference values of standard colours have been used	

**Tabel 27 - Coefficient of Retro-reflection - Case A**

**2.2.10.1.3 Rotational symmetry**

The rotational symmetry (see Table 28) has been determined according to clause 3.2.3.

Colours	Pass/Fail
White	Pass
Yellow	Pass
Red	Pass
Blue	Pass
Green	Pass
Fluorescent Yellow	Pass

**Tabel 28 - Rotational symmetry**

**2.2.10.1.4 Impact resistance**

The Impact resistance (see Table 29) has been determined according to clause 3.2.4.

Product	Colour	Observations after the test
"3M Diamond Grade DG <sup>3</sup> series 4000 + 3M Premium Protective Overlay Film 1160"	White	Pass: no cracking has been observed outside the impact area.
	Yellow	
	Red	
	Blue	
	Green	
	Fluorescent Yellow	

**Tabel 29 - Impact resistance**

**2.2.11 Durability of "3M Diamond Grade DG<sup>3</sup> series 4000 + 3M Premium Protective Overlay Film 1160"**

**2.2.11.1 Visibility after accelerated artificial weathering of "3M Diamond Grade DG<sup>3</sup> series 4000 + 3M Premium Protective Overlay Film 1160"**

**2.2.11.1.1 Day-time colour and Luminance factor (see Table 30) after accelerated artificial weathering of "3M Diamond Grade DG<sup>3</sup> series 4000 + 3M Premium Protective Overlay Film 1160"**

The tests were performed according to clause 3.3.

Colours		Chromaticity Coordinates				Luminance Factor $\beta$	
		1	2	3	4	Class B1	Class B2
White reference	x	0.355	0.305	0.285	0.335	$\geq 0.27$	$\geq 0.40$
	y	0.355	0.305	0.325	0.375		
White results	x	Pass				Class B2	
	y						
Yellow reference	x	0.545	0.487	0.427	0.465	$\geq 0.16$	$\geq 0.24$
	y	0.454	0.423	0.483	0.534		
Yellow results	x	Pass				Class B2	
	y						
Red reference	x	0.735	0.674	0.569	0.655	$\geq 0.03$	$\geq 0.03$
	y	0.265	0.236	0.341	0.345		
Red results	x	Pass				Class B2	
	y						
Green reference	x	0.007	0.248	0.177	0.026	$\geq 0.03$	$\geq 0.03$
	y	0.703	0.409	0.362	0.399		
Green results	x	Pass				Class B2	
	y						
Blue reference	x	0.078	0.150	0.210	0.137	$\geq 0.01$	$\geq 0.01$
	y	0.171	0.220	0.160	0.038		
Blue results	x	Pass				Class B2	
	y						
Fluorescent yellow reference	x	0.521	0.557	0.479	0.454	$\geq 0.38$	$\geq 0.38$
	y	0.424	0.442	0.520	0.491		
Fluorescent yellow results	x	Pass				Class B2	
	y						

**Table 30 - Day-time colour and Luminance factor**

**2.2.11.1.2 Coefficient of retro-reflection Case A (see Table 31) after accelerated artificial weathering test of "3M Diamond Grade DG<sup>3</sup> Series 4000 + 3M Premium Protective Overlay Film 1160"**

The tests were performed according to clause 3.3. The values shall not be less than 80% of the values required for new material under clause 3.2.2, as appropriate.

Colour	Class R3B Germany
White	pass
Yellow	pass
Red	pass
Green	pass
Blue	pass
Fluorescent Yellow*	pass
*For fluorescent colours the reference values of standard colours have been used	

**Table 31 - Coefficient of Retro-reflection - Case A**

**2.2.12 Safety in use of "3M Diamond Grade DG<sup>3</sup> 4090 + 3M Electrocut Film 1176 with or without 3M Protective Overlay Film"**

**2.2.12.1 Visibility of "3M Diamond Grade DG<sup>3</sup> 4090 + 3M Electrocut Film 1176 with or without 3M Protective Overlay Film"**

**2.2.12.1.1 Day-time colour and Luminance Factor**

The characteristics of Day-time colour and Luminance Factor (see Table 32) have been determined according to clause 3.2.1

Results:

Colour		Chromaticity Coordinates				Luminance Factor $\beta$	
		1	2	3	4	Class B1	Class B2
Green 2 reference	x	0.313	0.313	0.248	0.127	0.01 - 0.07	0.01 - 0.07
	y	0.682	0.453	0.409	0.557		
ECOF 1176 results	x	Pass				Class B2	
	y						
Green 2 reference	x	0.313	0.313	0.248	0.127	0.01 - 0.07	0.01 - 0.07
	y	0.682	0.453	0.409	0.557		
ECOF1176 + 1150 overlay film results	x	Pass				Class B2	
	y						
Green 2 reference	x	0.313	0.313	0.248	0.127	0.01 - 0.07	0.01 - 0.07
	y	0.682	0.453	0.409	0.557		
ECOF 1176 + 1160 overlay film results	x	Pass				Class B2	
	y						
Green 2 reference	x	0.313	0.313	0.248	0.127	0.01 - 0.07	0.01 - 0.07
	y	0.682	0.453	0.409	0.557		
ECOF 1176 + 1180 overlay film results	x	Pass				Class B2	
	y						

**Tabel 32 - Day-time colour and Luminance factor**

**2.2.12.1.2 Coefficient of Retro-reflection Case A**

The Coefficient of Retro-reflection - Case A (see Table 33) has been determined according to clause 3.2.2.

Colour	Class R3A Germany*	Class R3B Germany*
DG <sup>3</sup> 4090 + ECOF1176	pass	pass
DG <sup>3</sup> 4090 + ECOF1176 + 1150		pass
DG <sup>3</sup> 4090 + ECOF1176 + 1160	pass	pass
DG <sup>3</sup> 4090 + ECOF1176 + 1180	pass	pass
*Reference for Green 2 is calculated as 8% of white (similar to the ratio for Class RA2 Europe)		

**Tabel 33 - Coefficient of Retro-reflection - Case A**

**2.2.12.1.3 Rotational symmetry**

The rotational symmetry (see Table 34) has been determined according to clause 3.2.3.

Colours	Pass/Fail
DG <sup>3</sup> 4090 + ECOF1176	Pass
DG <sup>3</sup> 4090 + ECOF1176 + 1150	Pass
DG <sup>3</sup> 4090 + ECOF1176 + 1160	Pass
DG <sup>3</sup> 4090 + ECOF1176 + 1180	Pass

**Tabel 34 - Rotational symmetry**

**2.2.12.1.4 Impact resistance**

The Impact resistance (see Table 35) has been determined according to clause 3.2.4.

Product	Observations after the test
DG <sup>3</sup> 4090 + ECOF1176	Pass: no cracking has been observed outside the impact area.
DG <sup>3</sup> 4090 + ECOF1176 + 1150	
DG <sup>3</sup> 4090 + ECOF1176 + 1160	
DG <sup>3</sup> 4090 + ECOF1176 + 1180	

**2.2.13 Durability of “3M Diamond Grade DG<sup>3</sup> 4090 + 3M Electrocut Film 1176 with or without 3M Protective Overlay Film”**

**2.2.13.1 Visibility after accelerated artificial weathering of “3M Diamond Grade DG<sup>3</sup> 4090 + 3M Electrocut Film 1176 with or without 3M Protective Overlay Film”**

**2.2.13.1.1 Day-time colour and Luminance factor (see Table 36) after accelerated artificial weathering of “3M Diamond Grade DG<sup>3</sup> 4090 + 3M Electrocut Film 1176 with or without 3M Protective Overlay Film”**

The tests were performed according to clause 3.3.

**Tabel 35 - Impact resistance**

Colour		Chromaticity Coordinates				Luminance Factor $\beta$	
		1	2	3	4	Class B1	Class B2
Green 2 reference	x	0.313	0.313	0.248	0.127	0.01 - 0.07	0.01 - 0.07
	y	0.682	0.453	0.409	0.557		
ECOF 1176 results	x	Pass				Class B2	
	y	Pass					
Green 2 reference	x	0.313	0.313	0.248	0.127	0.01 - 0.07	0.01 - 0.07
	y	0.682	0.453	0.409	0.557		
ECOF1176 + 1150 overlay film results	x	Pass				Class B2	
	y	Pass					
Green 2 reference	x	0.313	0.313	0.248	0.127	0.01 - 0.07	0.01 - 0.07
	y	0.682	0.453	0.409	0.557		
ECOF 1176 + 1160 overlay film results	x	Pass				Class B2	
	y	Pass					
Green 2 reference	x	0.313	0.313	0.248	0.127	0.01 - 0.07	0.01 - 0.07
	y	0.682	0.453	0.409	0.557		
ECOF 1176 + 1180 overlay film res	x	Pass				Class B2	
	y	Pass					

**Tabel 36 - Day-time colour and Luminance factor**

**2.2.13.1.2 Coefficient of retro-reflection Case A (see Table 37) after accelerated artificial weathering test of “3M Diamond Grade DG<sup>3</sup> 4090 + 3M Electrocut Film 1176 with or without 3M Protective Overlay Film”**

The tests were performed according to clause 3.3. The values shall not be less than 80% of the values required for new material under clause 3.2.2, as appropriate.

Colour	Class R3A Germany*	Class R3B Germany*
DG <sup>3</sup> 4090 + ECOF1176	pass	pass
DG <sup>3</sup> 4090 + ECOF1176 + 1150	pass	pass
DG <sup>3</sup> 4090 + ECOF1176 + 1160	pass	pass
DG <sup>3</sup> 4090 + ECOF1176 + 1180	pass	pass

\*Reference for Green 2 is calculated as 8% of white (similar to the ratio for Class RA2 Europe)

**Tabel 37 - Coefficient of Retro-reflection - Case A**

### 3 Verification Methods for determining the relevant characteristics of the construction product

#### 3.1 Hygiene, health and the environment

##### 3.1.1 Release of dangerous substances

The product/kit shall comply with all relevant European and national provisions applicable for the uses for which it is brought to the market. The attention of the applicant should be drawn on the fact that for other uses or other Member States of destination there may be other requirements which would have to be respected. For dangerous substances contained in the product but not covered by an ETA, the NPD option (no performance determined) is applicable.

#### 3.2 Safety in use

##### 3.2.1 Day-time colour and Luminance Factor

The chromaticity coordinates (x, y) and the luminance factor ( $\beta$ ) are measured in accordance with CIE Publication 15.2 Colourimetry – 1986 using 45/0 geometry and shall be calculated from the total spectral radiance factors computed for CIE illuminant D65 for the CIE 1931 (2°) standard colorimetric observer.

The position of the sample in the measuring system will be indicated by an orientation mark. The orientation mark has to be adjusted 90° to the incident plane. The incident plane is formed out of the rectangle on the sample surface and the incoming light beam.

The chromaticity coordinates shall be within the colour boxes and the Luminance factor shall comply with values in Table 38.

Colour		Chromaticity Coordinates				Luminance Factor $\beta$	
		1	2	3	4	Class B1	Class B2
White	x	0.305	0.335	0.325	0.295	$\geq 0.27$	$\geq 0.40$
	y	0.315	0.345	0.355	0.325		
Yellow	x	0.494	0.470	0.513	0.545	$\geq 0.16$	$\geq 0.24$
	y	0.505	0.480	0.437	0.454		
Red	x	0.735	0.700	0.610	0.660	$\geq 0.03$	$\geq 0.03$
	y	0.265	0.250	0.340	0.340		
Orange	x	0.631	0.560	0.506	0.570	$\geq 0.14$	$\geq 0.14$
	y	0.369	0.360	0.404	0.429		
Green	x	0.110	0.170	0.170	0.110	$\geq 0.03$	$\geq 0.03$
	y	0.415	0.415	0.500	0.500		
Green 2	x	0.313	0.313	0.248	0.127	0.01 – 0.07	0.01 – 0.07
	y	0.682	0.453	0.409	0.557		
Brown	x	0.455	0.523	0.479	0.558	0.04 – 0.06	0.03 – 0.09
	y	0.397	0.429	0.373	0.394		
Blue	x	0.130	0.160	0.160	0.130	$\geq 0.01$	$\geq 0.01$
	y	0.090	0.090	0.140	0.140		
Fluorescent Yellow	x	0.521	0.557	0.479	0.454	$\geq 0.38$	$\geq 0.38$
	y	0.424	0.442	0.520	0.491		
Fluorescent Orange	x	0.595	0.645	0.570	0.531	$\geq 0.25$	$\geq 0.20$
	y	0.351	0.355	0.429	0.414		
Fluorescent Yellow/Green	x	0.387	0.460	0.438	0.376	$\geq 0.60$	$\geq 0.70$
	y	0.610	0.540	0.508	0.568		

**Table 38 – Permitted colour area in CIE 1931 diagram and Luminance factors for daylight appearance of new materials**

##### 3.2.2 Coefficient of Retroreflection

The coefficient of retro-reflection  $R'$  is measured in accordance with CIE Publication No. 54.2, Retro-reflection using CIE Standard Illuminant A. Any of the recommended apertures may be used. Measurements shall be taken at the specified observation angle  $\alpha$  and entrance angle  $\beta$ . The entrance angle  $\beta$  shall be set by its first component  $\beta_1$  with the second component  $\beta_2 = 0^\circ$ , the rotation angle  $\epsilon$  shall be  $\epsilon = 0^\circ$  and the orientation angle  $\omega_s$  shall be  $\omega_s = 0^\circ$ .

The requirements of minimum coefficient of Retro-reflection  $R'$  are specified in the following tables 39 to 47.

Geometry of measurements		Colours								
$\alpha$	$\beta_1 (\beta_2 = 0^\circ)$	White	Yellow	Red	Green	Dark Green	Blue	Brown	Orange	Grey
12'	+ 5°	250	170	45	45	20	20	12	100	125
	+ 30°	150	100	25	25	15	11	8.5	60	75
	+ 40°	110	70	15	12	6	8	5.0	29	55
20'	+ 5°	180	120	25	21	14	14	8	65	90
	+ 30°	100	70	14	12	11	8	5	40	50
	+ 40°	95	60	13	11	5	7	3	20	47
2°	+ 5°	5	3	1	0.5	0.5	0.2	0.2	1.5	2.5
	+ 30°	2.5	1.5	0.4	0.3	0.3	#	#	1	1.2
	+ 40°	1.5	1.0	0.3	0.2	0.2	#	#	#	0.7

# indicates "Value greater than zero but not significant or applicable"

**Table 39 – Minimum Coefficient of Retroreflection, Performance Class RA2 Europe (EN 12899-1)**

Observation Angle $\alpha$ [°]	Entrance Angle $\beta_1$ [°]	White	Yellow	Red	Orange	Blue	Green	Green2 <sup>1</sup>	Brown <sup>2</sup>
0.1	5	850	550	170	425	55	85	68	42.5
0.2	5	625	400	125	310	40	60	50	31.25
0.33	5	425	275	85	210	28	40	34	21.25
0.1	20	600	390	120	300	40	60	48	30
0.2	20	450	290	90	225	30	45	36	22.5
0.33	20	300	195	60	150	20	30	24	15
0.1	30	425	275	85	210	28	40	34	21.25
0.2	30	325	210	65	160	20	30	26	16.25
0.33	30	225	145	45	110	15	20	18	11.25
0.1	40	275	175	55	135	18	25	22	13.75
0.2	40	200	130	40	100	13	20	16	10
0.33	40	150	95	30	75	10	15	12	7.5

(1) calculated as 8% of white  
(2) calculated as 5% of white

**Table 40 – Minimum Coefficient of Retroreflection, Performance Class R3A for Germany**

Observation Angle $\alpha$ [°]	Entrance Angle $\beta_1$ [°]	White	Yellow	Red	Orange	Blue	Green
0.1	5	900	720	250	450	45	90
0.2	5	720	600	195	360	40	75
0.5	5	180	140	40	110	9	18
0.1	30	495	405	135	315	22	45
0.2	30	360	310	90	225	18	30
0.5	30	90	75	23	50	4	9
0.1	40	340	270	85	180	13	27
0.2	40	180	155	45	70	7	15
0.5	40	70	55	16	40	2.5	5

**Table 41 – Minimum Coefficient of Retroreflection, Performance Class R3A for Greece**

Geometry of measurement		Colours						
Observation Angle $\alpha$ [°]	Entrance Angle $\beta_1$ [°]	White	Yellow	Red	Blue	Green	Fluorescent yellow (*)	Fluorescent orange (**)
0.33	5	300	195	60	19	30	195	150
1.0	5	35	23	7	2.5	3.5	23	18
1.5	5	15	10	3	1	1.5	10	7.5
0.33	20	240	155	48	16	24	155	120
1.0	20	30	20	6	2	3	20	15
1.5	20	13	8	2.5	-	1	8	6.5
0.33	30	165	110	33	11	17	110	83
1.0	30	20	13	4	1.5	2	13	10
1.5	30	9	6	2	-	-	6	4.5
0.33	40	30	20	6	2	3	20	15
1.0	40	3.5	2	1	-	-	2	2
1.5	40	1.5	1	-	-	-	1	1

(\*) For Fluorescent yellow the values of simple yellow have been used, in addition to reference in CUAP 01.06/04  
(\*\*) For Fluorescent orange the values of simple orange have been used, in addition to reference in CUAP 01.06/04

**Tabel 42 – Minimum Coefficient of Retroreflection, Performance Class R3B for Germany**

Geometry of measurement		Colours					
Observation Angle $\alpha$ [°]	Entrance Angle $\beta_1$ [°]	White	Yellow	Red	Blue	Green	Fluorescent yellow (*)
0.2	5	400	300	80	20	45	300
0.33	5	300	250	75	15	33	250
1.0	5	70	55	13	3.5	8	55
0.2	30	150	105	30	11	24	105
0.33	30	130	90	30	7	18	90
1.0	30	45	35	10	2	4.5	35
0.2	40	45	35	9	3	7	35
0.33	40	30	25	7	1.4	4	25
1.0	40	13	10	4.5	-	1.8	10

(\*) For Fluorescent yellow the values of simple yellow have been used

**Tabel 43 – Minimum Coefficient of Retroreflection, Performance Class R3B for Greece**

Geometry of measurement		Colours					
Observation Angle $\alpha$ [°]	Entrance Angle $\beta_1$ [°]	White	Yellow	Red	Blue	Green	Fluorescent yellow (*)
0.2	5	430	350	110	25	45	350
0.33	5	300	250	75	17	35	250
1.0	5	80	65	20	5	10	65
0.2	15	350	270	90	20	35	270
0.33	15	250	200	65	15	25	200
1.0	15	60	45	16	3.5	7	45
0.2	30	235	190	60	11	24	190
0.33	30	150	130	35	7	18	130
1.0	30	50	40	13	2.5	5	40
0.2	40	55	40	12	3	7	40
0.33	40	30	25	7	2	4	25
1.0	40	15	13	5	1	2	13

(\*) For Fluorescent yellow the values of simple yellow have been used

**Tabel 44 – Minimum Coefficient of Retroreflection, Performance Class R3B for Belgium**

Observation Angle $\alpha$ [°]	Entrance Angle $\beta_1$ [°]	Sheeting Colours
		Fluorescent orange
0.2	5	200
0.33	5	150
1.0	5	7,5
0.2	15	175
0.33	15	130
1.0	15	5
0.2	30	120
0.33	30	90
1.0	30	2,5
0.2	40	80
0.33	40	60
1.0	40	2,5

Observation Angle $\alpha$ [°]	Entrance Angle $\beta_1$ [°]	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

**Tabel 45 – Minimum Coefficient of Retroreflection, Performance Class R3B for Belgium**

**Tabel 46 – Minimum Coefficient of Retroreflection, Performance Class 3A for Belgium**



Geometry of measurements		Colour							
$\alpha$	$\beta_1$ ( $\beta_2=0$ )	White	Yellow	Red	Green	Blue	Brown	Orange	Grey
12'	+5°	70	50	14,5	9	4	1	25	42
	+30°	30	22	6	3,5	1,7	0,3	10	18
	+40°	10	7	2	1,5	0,5	#	2,2	6
20'	+5°	50	35	10	7	2	0,6	20	30
	+30°	24	16	4	3	1	0,2	8	14,4
	+40°	9	6	1,8	1,2	#	#	2,2	5,4
2°	+5°	5	3	1	0,5	#	#	1,2	3
	+30°	2,5	1,5	0,5	0,3	#	#	0,5	1,5
	+40°	1,5	1,0	0,5	0,2	#	#	#	0,9

# indicates "Value greater than zero but not significant or applicable".

**Tabel 47 – Minimum Coefficient of Retroreflection, Performance Class RA1 Europe**

For material processed with process colours, with or without clear overlay film, the minimum value of the coefficient of Retro-reflection shall not be less than 70% of the values specified in the tables. For material processed with red process colour or red overlay film over yellow microprismatic sheeting, the coefficient of Retro-reflection shall not be less than 50% of the values specified in the tables.

### 3.2.3 Rotational symmetry

Additional requirement for performance class 3A and 3B: When measured according to clause 3.2.2, rotational symmetry, for the observation angle  $\alpha = 0.33^\circ$  and entrance angle  $\beta_1 = 5^\circ$  ( $\beta_2 = 0^\circ$ ), the ratio between the minimum and the maximum coefficient of Retro-reflection when rotating from  $\varepsilon - 75^\circ$  to  $+ 50^\circ$  in  $25^\circ$  steps, shall not be greater than 2.5.1.

### 3.2.4 Impact resistance

The test is carried out according to EN 12899-1 using a hard body having a mass of 450 g with a contact radius of 50 mm. The hard body is dropped from a height of 220 mm on a sample that shall be supported over an open area of 100 mm x 100 mm.

### 3.3 Visibility after accelerated artificial weathering

The apparatus shall be either an air cooled or water cooled Xenon arc weathering device capable of exposing samples in accordance with EN ISO 4892-2: 1994.

Preparation of test specimens should be in accordance with the general guideline given in EN ISO 4892-2: 1994.

The samples shall be exposed in accordance to EN ISO 4892-2: 1994 using the parameters given in the following table, for a period of 2000 hours.

Exposure parameters	Air cooled lamp	Water cooled lamp
Light/dark/water spray cycle	Continuous light with water spray on specimens for 18 minutes every 2 hours	Continuous light with water spray on specimens for 18 minutes every 2 hours
Black standard temperature during light only periods	(65 ± 3) °C using a black standard thermometer	(65 ± 3)°C using a black standard thermometer
Relative humidity	(50 ± 5) %	(50 ± 5) %
Irradiance (W/m <sup>2</sup> ) controlled at		
- over 300-400 nm range	60	60
- over 300-800 nm range	550	630

**Tabel 48 – Artificial weathering test parameters**

Note 1 – Water used for specimen spray should contain no more than 1 ppm silica. Higher levels of silica may produce spotting on samples and variability in results. Water of the required purity may be obtained by distillation or by a combination of deionisation and reverse osmosis.

Note 2 – Whilst irradiance levels should be set at the above levels, variations in filter ages and transmissivity, and in calibration variations, will be generally mean that irradiance error will be in the order of ± 10%.

After weathering, following test shall be carried out

- day time colour (according to clause 3.2.1)
- Luminance factor (according to clause 3.2.1)
- Coefficient of Retroreflection – (according to clause 3.2.2)

After exposure the coefficient of retro-reflection measured at an observation angle  $\alpha = 0.33^\circ$  (or  $\alpha = 0.2^\circ$ ) and  $\alpha = 1^\circ$  (if specified for new materials) and entrance angle  $\beta_1 = 5^\circ$  and  $30^\circ$  ( $\beta_2 = 0^\circ$ ), shall not be less than 80% of the values required for new material in 3.2.2.

### 3.4 Visibility after accelerated natural (outdoor) exposure

The retro-reflective sheeting surface of the test specimens of a minimum of 20 cm x 20 cm in dimension shall be subjected to 3 years unprotected outdoor exposure, facing the equator (South) and inclined 45° from the vertical, taking into account the different European climatic conditions in term of temperature, UV and RH, in accordance with ISO 877:1994, using method A.

After the exposure period, the test specimens shall be washed in a 5% HCl solution for 45 seconds and then in water, using a soft brush or sponge to avoid scratching, and given a final flush with de-ionized water.

After weathering, following test shall be carried out

- day time colour (according to clause 3.2.1)
- Luminance factor (according to clause 3.2.1)
- Coefficient of Retroreflection – (according to clause 3.2.2)

After exposure the coefficient of retro-reflection measured at an observation angle  $\alpha = 0.33^\circ$  (or  $\alpha = 0.2^\circ$ ) and  $\alpha = 1^\circ$  (if specified for new materials) and entrance angle  $\beta_1 = 5^\circ$  and  $30^\circ$  ( $\beta_2 = 0^\circ$ ), shall not be less than 80% of the values required for new material in 3.2.2.

### 3.5 Temperature resistance

The photometric properties of the test specimens are determined by measuring the coefficient of Retro-reflection R' according to test method under 3.2.2. Measurements shall be taken only for the observation angle  $\alpha = 0.33^\circ$  and entrance angle  $\beta_1 = 5^\circ$  ( $\beta_2 = 0^\circ$ ;  $\beta_3 = 0^\circ$ ).

The test specimens shall be then exposed in an air circulating oven for a period of 24 hours according to one of the following temperature

Class	Temperature
1	80°C (± 2)
2	65°C (± 2)
3	50°C (± 2)

**Tabel 49**

After exposure the test specimens shall be conditioned according ISO 139 "Standard atmospheres for conditioning and testing".

The photometric properties of the test specimens shall be re-determined by re-measuring the coefficient of Retro-reflection R' according to this clause.

When tested, the coefficient of Retro-reflection of the specimen shall be between 85% and 115% of the corresponding actual value measured before exposure.

## 4 Evaluation of Conformity and CE Marking

### 4.1 Attestation of conformity system

The system of attestation of conformity is System 1 as described in Council Directive 89/106/EEC, Annex III, Clause 2 "Certification of Conformity of the product by an Approved Body and is detailed as followed:

#### a) Task of the manufacturer

(1) Factory Production Control (FPC), including further testing of samples taken at the factory by the manufacturer in accordance with the prescribed test plan.

#### b) Tasks of the approval body

(1) Initial Type Testing (ITT) of the product

(2) Initial inspection of the factory and of the Factory Production Control (FPC)

(3) Continuous surveillance, assessment and approval of the FPC.

### 4.2 Responsibilities

#### 4.2.1 Task of the manufacturer

##### 4.2.1.1 Factory Production Control (FPC)

The ETA holder has a FPC system in his plants and exercises permanent internal control of the production, including test samples in accordance with his control plan.

The control plan and the provisions taken by the ETA holder for components not produced by him have been agreed with the Approval Body and deposited with UBAtc where it is only made available to Notified Bodies involved in the conformity attestation procedure.

This control plan will be given to the Notified Body chosen by the ETA holder to perform the foreseen tasks on attestation of conformity.

The manufacturer only uses raw materials supplied with the relevant inspection documents as laid down in the control plan. The incoming raw materials are subjected to verifications by the manufacturer before acceptance.

All the elements, requirements and provisions adopted by the manufacturer are documented in a systematic manner in the form of written processes and procedures. This production control system ensures conformity with this ETA.

The results of FPC are recorded and evaluated. The records include:

- Designation of the product, raw materials and components.
- Type of control or testing
- Date of the product's manufacture and date of testing of the product or raw materials and components.
- Results of controls and testing and, if appropriate, comparison with requirements.
- Signature of person responsible for FPC.

The records shall be presented to the inspection body during the continuous surveillance. On request, they shall be presented to UBAtc.

Details of the extent, nature and frequency of testing and controls to be performed with FPC shall correspond to the control plan which is part of the technical documentation of this ETA.

#### **4.2.2 Tasks of the Notified Body**

##### **4.2.2.1 Initial Type Testing (ITT)**

For ITT, the results of the test performed as part of the assessment for this ETA shall be used unless there are changes in the production line or plant. In such cases, the necessary new ITT has to be agreed between UBAtc and the Notified Body involved.

##### **4.2.2.2 Initial Inspection of factory and Factory Production Control (FPC)**

The Notified Body shall ascertain that, in accordance with the control plan the factory (in particular, employees and equipment) and the FPC are suitable to ensure continuous and orderly manufacturing of the components according to specifications mentioned in clause 2 and 3 of this ETA.

##### **4.2.2.3 Continuous surveillance, assessment and approval of FPC**

The Notified Body should visit the factory at least once a year for surveillance. It has to be verified that the system of FPC and the specified manufacturing process are maintained, taking into account the deposited control plan. Continuous surveillance and assessment of FPC have to be performed in accordance to the control plan.

During each visit, the Notified Body shall utilize an ad-hoc check list and shall examine, among others:

- the control registers of raw materials, products in course of manufacture and finished products.
- The document attesting the respect of the control frequencies.
- The conformity of the products subjected to this ETA.

In cases where the provisions of the ETA and the control plan are no longer fulfilled, the conformity certificate should be withdrawn.

#### **4.3 CE Marking**

The CE marking shall be affixed on the product or the packaging or on the transport documents (DDT) accompanying the components of the product. The symbol "CE" shall be followed by identification number of the Notified Body involved and shall be accompanied by the following information:

- Name or identification mark of the ETA holder.
- Legal address of the ETA holder and the manufacturing plants
- The last 2 digits of the year in which the CE marking was affixed.
- The number of the CE certificate of conformity of FPC
- The number of this ETA
- Product identification
- Product Performance referring to this ETA

## **5 Assumptions under which the fitness of the products for the intended use was favourably assessed**

### **5.1 Manufacturing**

3M Diamond Grade DG<sup>3</sup> series 4000, and combinations with or without 3M Electrocut Film series 1170 or Process Colour Series 4700 or Piezo Inkjet Ink Series 8800 UV, and with or without 3M Dew Resistant Overlay Film 1180 or 3M Premium Protective Overlay Film 1160 or 3M Protective Overlay Film 1150, shall correspond, as far as their composition and manufacturing process is concerned, to the products subject to the approval tests. A manufacturing process has been deposited with UBAtc.

### **5.2 Installation**

#### **5.2.1 General**

It is the responsibility of the ETA holder to guarantee that the information about design and installation of the systems as described in clause 2.1 of this ETA, are effectively communicated to the concerned people. This information can be given using reproductions of the respective parts of this ETA. Besides, all the data concerning the execution shall be indicated clearly on the packaging and or the enclosed instruction sheets using one or several illustrations.

In any case, it is suitable to comply with national regulations and particularly concerning national traffic code.

#### **5.2.2 Design**

Most clean, smooth, relatively non-porous, flat, rigid, weather resistant surfaces are satisfactory for proper application of Diamond Grade sheeting. Those found to be most reliable and durable are properly prepared aluminium sheets and extrusions. Users are urged to carefully evaluate all other substrates for adhesion and sign durability, including impact resistance.

#### **5.2.3 Application**

##### **5.2.3.1 3M Diamond Grade DG<sup>3</sup> Reflective Sheeting Series 4000**

The sheeting must be stored in a cool, dry area, preferably at 18-24°C and 30-50% RH, and should be applied within one year from delivery. Rolls should be stored horizontally in the shipping carton. Partially used rolls should be returned to the shipping carton or suspended horizontally on a rod or pipe through the core.

Unprocessed sheets should be stored flat. Finished signs and applied blanks should be stored on edge.

Package for shipment must prevent movement and chafing. Store sign packages indoors on edges. Panels or finished signs must remain dry during shipping and storage. If packaged signs become wet, unpack immediately and allow to dry.

The recognition and preparation of the substrate as well as the generalities about the application of this product series, which is fully described in the current version of the ETA holder catalogue, its technical bulletins and web site [www.3M.com/TSS](http://www.3M.com/TSS), shall be carried out in compliance with national regulations in effect, if any.

"3M Diamond Grade DG<sup>3</sup> Reflective Sheeting Series 4000" sheeting incorporates a pressure sensitive adhesive and shall be applied to the sign substrate at room temperature (18°C) or higher by any of the following methods: mechanical squeeze roll applicator, hand squeeze roll applicator, hand application. If the heater is needed to warm to the minimum application temperature of 18°C, it must be directed at the substrate only.

Users are urged to carefully evaluate all substrates for adhesion and sign durability. "3M Diamond Grade DG<sup>3</sup> Reflective Sheeting Series 4000" is designed primarily for application to flat substrates. Sign failures caused by the substrate or improper surface preparation are not the responsibility of the ETA holder.

### 5.2.3.2 3M Electrocut film Series 1170

Electrocut film shall be stored in a cool, dry area 18-24°C and 30 – 50 % RH, and shall be used within one year from date of purchase.

These overlay films have a transparent film release liner designed to aid the cutting process and the removal of the film weed after cutting. It is recommended that inside radius corner fonts be used when cutting film. More over the ETA holder recommend the following steps:

- Adjust knife pressure to cut cleanly through the film without cutting into the liner. A 30° blade works best. Spacing between the letters or numbers should be adjusted to the aesthetic preference of the user. Consult the operating manual for instructions on how to regulate spacing. Do not cut at high speed on variable speed machines.
- Avoid sharp bends when cutting and handling film as this may cause film to release from the liner.
- After cutting is complete, lay sheets flat, face to face, back to back. Always store sheets in this manner until the sheeting has been weeded and transfer tape has been applied.
- Use a stripping tool designed for weeding films that has a blunt (not sharp) edge.
- After weeding is complete, store sheets flat, face to face, and back to back, until transfer tape has been applied.
- Transfer tape can be applied either by hand using a plastic squeegee or through a hand squeeze roll laminator. If applying the transfer tape by hand, care must be taken to always squeeze from the centre to the outside in all directions.

Series 1170 film may be applied to the sheeting either before or after the sheeting has been applied to a substrate. The use of hand squeeze roll laminator is recommended to ensure satisfactory results. Use the "split liner method" – Start in the middle of the sheet and remove half the liner to ensure proper alignment.

After Series 1170 film and sheeting have been applied, remove the transfer tape by carefully removing the tape at as low angle as possible.

- When the application tape has been removed, re-roll the sign through the laminator to ensure good adhesion. Adequate pressure is a key factor relating to the ultimate strength and durability of the sheeting - to - substrate adhesion.
- A clean cutting blade is required. To remove the adhesive build up use soft cloth damped with mineral spirits, isopropyl alcohol or 3M Natural Cleaner.

### 5.2.3.3 Process Colour Series 4700

For screen processing, the equipment and set-up are the following: proper colour and durability is achieved by using a high grade polyester, monofilament screen fabric mesh size P.E. 157. Other size screen fabrics do not produce satisfactory colour and durability. Screen printing should be accomplished using the off-contact screening method. Direct contact screen printing should not be used. Be sure that screens, sheeting, plus screening and drying areas are dust, dirt and lint free.

For the mixing and thinning, it is important that the colours and sheeting be brought to normal ambient room temperature and humidity of the screen printing area before processing. Thin sparingly using 3M Thinner of the same series as the process colours. Do not use extenders, drying agents, or other materials as they will adversely affect performance life.

Air Drying: processed sheeting for air drying must be placed on open racks to allow adequate air circulation. High volume fans must be directed through the racks. Drying times will be increased by high humidity, low temperature, poor air circulation, heavy colour coat, and excessive thinning. Addition of drying agents is not recommended. Processed sheetings must be air dried for a minimum of 3 hours per colour.

Oven drying: Processed sheeting for oven drying must be placed on open racks individually with sufficient open space for unobstructed air flow.

All inks should not be stored at elevated temperatures and must be used within one year after the date of purchase or within the indicated shelf life.

### 5.2.3.4 3M Piezo Inkjet Ink Series 8800 UV

3M Piezo Ink Jet Ink Series 8800UV is designed as part of the 3M MCS™ (Matched Component System) for application using the Durst Rho 161TS / 162TS Printer onto 3M Diamond Grade DG<sup>3</sup> Series 4000 BEFORE mounting the sheeting onto a sign substrate. These UV-curable inks are durable, weather-resistant, and have excellent color retention when used in combination with 3M ElectroCut™ Film 1170 or 3M Dew Resistant Overlay Film 1180 as an overlaminates.

Detailed printing guidelines in order to achieve traffic sign colors according to this ETA can be obtained in the latest Product Bulletin for 3M Piezo Ink Jet Ink Series 8800UV.

Above mentioned overlaminates must always be applied, following below instructions:

To avoid a silvering artifact (trapped air between ink layer and overlaminates), the lamination process should be conducted under a controlled set of conditions.

Recommended laminator specifications and set-up:

Roll diameter: max. 350 mm; Roll weight: approximately 80 kg;  
Roll width: 1400-1600 mm

Core size: 3 inches; 2 Take-up shafts; 2 Supply shafts

Heatable top roller: min. 45°C; Pressure: > 3 N/mm<sup>2</sup>

3M Piezo Ink Jet Ink Series 8800UV should not be stored at elevated temperatures. It must be used within the indicated shelf life.

**5.2.3.5 Protective Overlay Films: 3M Dew Resistant Overlay Film 1180 and 3M Premium Protective Overlay Film 1160 and 3M Protective Overlay Film 1150**

Protective Overlay film shall be stored in a cool, dry area at 18-24°C and 30 – 50 % RH, and shall be used within one year from date of purchase.

The application of any Protective Overlay Film is typically done on the finished signface (after the application of the ECF and ink) but PRIOR to the application of frames or sign assembly.

The Protective Overlay Film must be applied using a squeeze roll applicator (see 3M Information Folder IF1.13). The split liner method may be used.

3M Dew Resistant Overlay Film Series 1180 provides a very sensitive active layer that is prone to contamination and scratches. This active layer is therefore protected by a water-soluble, clear protective coating. This protective coating should remain on the sign as long as possible. Ideally it should be removed after the traffic sign is erected. If the protective coating is removed before sign erection, precautions have to be taken to prevent any contamination or mechanical damage. Due to the protective coating, it is strongly recommended NOT to overlap the Dew Resistant Overlay Film.

**Annex 1: Use Options**

VISIBILITY		USE OPTIONS											
		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9	Option 10	Option 11	Option 12
Daytime Colour		Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1
Luminance factor		Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1	Tm 4.4.2.1 Lv 5.4.1
Fluorescence Luminance factor		NOT TO BE TESTED	NOT TO BE TESTED	Tm 4.4.2.2 Lv 5.4.2	NOT TO BE TESTED	Tm 4.4.2.2 Lv 5.4.2	NOT TO BE TESTED	NOT TO BE TESTED	Tm 4.4.2.2 Lv 5.4.2	NOT TO BE TESTED	NOT TO BE TESTED	NOT TO BE TESTED	NOT TO BE TESTED
Night-time colour		NOT TO BE TESTED	Tm 4.4.2.3 Lv 5.4.3	Tm 4.4.2.3 Lv 5.4.3	Tm 4.4.2.3 Lv 5.4.3	Tm 4.4.2.3 Lv 5.4.3	Tm 4.4.2.3 Lv 5.4.3	NOT TO BE TESTED	NOT TO BE TESTED	NOT TO BE TESTED	NOT TO BE TESTED	Tm 4.4.2.3 Lv 5.4.3	NOT TO BE TESTED
Coefficient of Retro-reflection-Case A or Case B		Tm 4.4.2.4 Lv 5.4.4	Tm 4.4.2.4 Lv 5.4.4	Tm 4.4.2.4 Lv 5.4.4	Tm 4.4.2.4 Lv 5.4.4	Tm 4.4.2.4 Lv 5.4.4	Tm 4.4.2.4 Lv 5.4.4	Tm 4.4.2.4 Lv 5.4.4	Tm 4.4.2.4 Lv 5.4.4	Tm 4.4.2.4 Lv 5.4.4	Tm 4.4.2.4 Lv 5.4.4	Tm 4.4.2.4 Lv 5.4.4	Tm 4.4.2.4 Lv 5.4.4
Colour Contrast Factors		NOT TO BE TESTED	Tm 4.4.2.5 Lv 5.4.5	NOT TO BE TESTED	Tm 4.4.2.5 Lv 5.4.5	NOT TO BE TESTED	Tm 4.4.2.5 Lv 5.4.5	Tm 4.4.2.5 Lv 5.4.5	NOT TO BE TESTED	Tm 4.4.2.5 Lv 5.4.5	NOT TO BE TESTED	NOT TO BE TESTED	NOT TO BE TESTED
Total luminous transmittance		NOT TO BE TESTED	NOT TO BE TESTED	NOT TO BE TESTED	Tm 4.4.2.6 Lv 5.4.6	NOT TO BE TESTED	Tm 4.4.2.6 Lv 5.4.6	NOT TO BE TESTED	NOT TO BE TESTED	Tm 4.4.2.6 Lv 5.4.6	NOT TO BE TESTED	NOT TO BE TESTED	NOT TO BE TESTED
Impact resistance		Tm 4.4.2.7 Lv 5.4.7	Tm 4.4.2.7 Lv 5.4.7	Tm 4.4.2.7 Lv 5.4.7	Tm 4.4.2.7 Lv 5.4.7	Tm 4.4.2.7 Lv 5.4.7	Tm 4.4.2.7 Lv 5.4.7	Tm 4.4.2.7 Lv 5.4.7	Tm 4.4.2.7 Lv 5.4.7	Tm 4.4.2.7 Lv 5.4.7	Tm 4.4.2.7 Lv 5.4.7	Tm 4.4.2.7 Lv 5.4.7	NOT TO BE TESTED
<b>DURABILITY</b>													
Temperature resistance		NOT TO BE TESTED	Tm 4.7.1 Lv 5.7.1	Tm 4.7.1 Lv 5.7.1	Tm 4.7.1 Lv 5.7.1	NOT TO BE TESTED	NOT TO BE TESTED	Tm 4.7.1 Lv 5.7.1	Tm 4.7.1 Lv 5.7.1	Tm 4.7.1 Lv 5.7.1	Tm 4.7.1 Lv 5.7.1	Tm 4.7.1 Lv 5.7.1	NOT TO BE TESTED
Visibility after accelerated weathering test	Day-time colour (*)	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2
	Luminance factor (*)	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2	Tm 4.7.2 + 4.4.2.1 Lv 5.7.2
	Fluorescence Luminance factor (*)	NOT TO BE TESTED	NOT TO BE TESTED	Tm 4.7.2 + 4.4.2.2 Lv 5.7.3	NOT TO BE TESTED	Tm 4.7.2 + 4.4.2.2 Lv 5.7.3	NOT TO BE TESTED	NOT TO BE TESTED	4.7.2 + 4.4.2.2 Lv 5.7.3	NOT TO BE TESTED	NOT TO BE TESTED	NOT TO BE TESTED	NOT TO BE TESTED
	Coefficient of Retro-reflection (*)	Tm 4.7.2 + 4.4.2.4 Lv 5.7.4	Tm 4.7.2 + 4.4.2.4 Lv 5.7.4	Tm 4.7.2 + 4.4.2.4 Lv 5.7.4	Tm 4.7.2 + 4.4.2.4 Lv 5.7.4	Tm 4.7.2 + 4.4.2.4 Lv 5.7.4	Tm 4.7.2 + 4.4.2.4 Lv 5.7.4	Tm 4.7.2 + 4.4.2.4 Lv 5.7.4	Tm 4.7.2 + 4.4.2.4 Lv 5.7.4	Tm 4.7.2 + 4.4.2.4 Lv 5.7.4	Tm 4.7.2 + 4.4.2.4 Lv 5.7.4	Tm 4.7.2 + 4.4.2.4 Lv 5.7.4	Tm 4.7.2 + 4.4.2.4 Lv 5.7.4
Visibility after outdoor exposure	Day-time colour	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2
	Luminance factor	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2
	Coefficient of Retro-reflection	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2	Tm 4.7.3 + 4.4.2.1 Lv 5.7.2
	Fluorescence Luminance factor	NOT TO BE TESTED	NOT TO BE TESTED	Tm 4.7.3 + 4.4.2.2 Lv 5.7.3	NOT TO BE TESTED	Tm 4.7.3 + 4.4.2.2 Lv 5.7.3	NOT TO BE TESTED	NOT TO BE TESTED	Tm 4.7.3 + 4.4.2.2 Lv 5.7.3	NOT TO BE TESTED	NOT TO BE TESTED	NOT TO BE TESTED	NOT TO BE TESTED

Tm = Test method

Lv = Limit values

(\*) = The tests after accelerated exposure can be carried out for the first issue of the ETA in order not to delay the issuing process. In case of further issue of the ETA, then these tests shall be carried out after the outdoor exposure.

**Table 1 – Use options**

Note: The assessment of the product is performed according to the content of the Option chosen by the manufacturer. Details concerning the characteristics foreseen by the chosen Option as well as test results will be included in an Annex of the ETA.