



## European Technical Approval ETA-12/0443

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung <i>Trade name</i>	T-6500 High Intensity Prismatic Grade lasierend bedruckt mit Farbe Serie 4930 <i>T-6500 High Intensity Prismatic Grade screen printed with colour series 4930</i>
Zulassungsinhaber <i>Holder of approval</i>	Avery Dennison Materials Europe BV Rijndijk 86 2394 ZG HAZERWOUDE NIEDERLANDE
Zulassungsgegenstand und Verwendungszweck <i>Generic type and use of construction product</i>	Mikroprismatisches retroreflektierendes Folienmaterial <i>Microprismatic Retro-reflective Sheeting</i>
Geltungsdauer: <i>Validity:</i>	vom <i>from</i> bis <i>to</i> 21 December 2012  21 December 2017
Herstellwerk <i>Manufacturing plant</i>	Avery Dennison Mount Prospect 902 Feehanville Drive IL 60056 Mount Prospect USA

Diese Zulassung umfasst  
*This Approval contains*

12 Seiten  
*12 pages*

## I LEGAL BASES AND GENERAL CONDITIONS

- 1 This European technical approval is issued by Deutsches Institut für Bautechnik 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>;
  - *Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998<sup>4</sup>, as amended by Article 2 of the law of 8 November 2011<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>.
- 2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.
- 3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European technical approval.
- 4 This European technical approval may be withdrawn by Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.
- 5 Reproduction of this European technical approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of Deutsches Institut für Bautechnik. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European technical approval.
- 6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

<sup>1</sup> Official Journal of the European Communities L 40, 11 February 1989, p. 12

<sup>2</sup> Official Journal of the European Communities L 220, 30 August 1993, p. 1

<sup>3</sup> Official Journal of the European Union L 284, 31 October 2003, p. 25

<sup>4</sup> *Bundesgesetzblatt Teil I 1998*, p. 812

<sup>5</sup> *Bundesgesetzblatt Teil I 2011*, p. 2178

<sup>6</sup> Official Journal of the European Communities L 17, 20 January 1994, p. 34

## II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

### 1 Definition of the product and intended use

#### 1.1 Definition of the construction product

The product consists of a 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	Colours/Code		Properties
Avery Dennison T-6500 High Intensity Prismatic Grade	Self-adhesive retro-reflective sheeting on the basis of microprisms	White Yellow	T-6500 T-6501	Sheeting thickness: 457-483 µm Roll measurements: 1220 mm x 45.7 m, 920 mm x 45.7 m or customized dimensions
Avery Dennison screen printing ink series 4930	Screen printing ink	Red Blue	4930 Red 4930 Blue	Consumption: 23 m <sup>2</sup> /l

Table 1: Types of the reflective sheeting "Avery Dennison T-6500 High Intensity Prismatic Grade screen printed with colour series 4930"

#### 1.2 Intended use

The construction product described here is used to manufacture signal aspects of fixed, vertical traffic signs (see also EN 12899-1). 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 application excludes the manufacture of road marking elements according to EN 1436. The intended sign support material is aluminium.

Within the framework of this approval the following product properties were assessed in consultation with the manufacturer:

- Chromaticity coordinates and luminance factor
- Coefficient of retro-reflection (Case A)
- Impact resistance
- Durability: Visibility after artificial weathering

The provisions made in this European technical approval are based on an assumed intended working life of the reflective sheeting of 10 years, provided that the conditions laid down in sections 4.1, 4.2, and 5.1 as well as in the related product data sheets for the manufacture, packaging, transport and storage are met. The indications given on the working life cannot be interpreted as a guarantee given by the producer, 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.

## **2 Characteristics of the product and methods of verification**

### **2.1 General**

The identification of the product and the judgement of the qualification for the intended use of the reflective sheeting were performed on the basis of the assessment procedures agreed within EOTA.

The European technical approval for the product was evaluated and issued on the basis of the information/data and test results specifying the product in detail are deposited with Deutsches Institut für Bautechnik. Changes during the production process of the product or its components which could include considerable modifications in the information/data deposited have to be communicated to Deutsches Institut für Bautechnik in advance. The notification has to be made before changes in the properties are made on the product so that Deutsches Institut für Bautechnik can check to what extent the planned modification has effects on the properties tested in this European technical approval and thus, can decide whether further assessment and/or alterations shall be carried out.

The properties of the product, which are not described in the European technical approval, shall correspond to the relevant values laid down in the documentation to the European technical approval, examined by Deutsches Institut für Bautechnik.

### **2.2 Properties of the product "T-6500 High Intensity Prismatic Grade screen printed with colour series 4930"**

#### **2.2.1 Release of dangerous substances**

A written confirmation from the manufacturer is available that the product meets the requirements of the Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment concerning the dangerous substances lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

Note: 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 Construction Products Directive, these requirements need also to be complied with, when and where they apply.

## 2.2.2 Visibility of "T-6500 High Intensity Prismatic Grade screen printed with colour series 4930"

The properties of the product set out in clause 1.2 were tested for the granting of this European technical approval.

Detailed information on the test results are deposited with Deutsches Institut für Bautechnik.

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).

### 2.2.2.1 Chromaticity coordinates and luminance factors

The determination of the chromaticity coordinates and the luminance factors (see Table 2) was based on the following conditions:

The chromaticity coordinates ( $x$ ,  $y$ ) and the luminance factor ( $\beta$ ) were measured according to CIE Publication 15.2 "Colorimetry", edition 1986, by using the 45/0 geometry and calculated for the spectral radiance of the illuminant D65 as well as for the colorimetric standard observer according to CIE 1931 ( $2^\circ$ ).

The orientation of the sample in the measuring system was shown by an orientation mark, with the orientation mark being at  $90^\circ$  to the optical plane of incidence. In doing so, the optical plane of incidence was formed from the right angle between the surface of the sample and the incident ray of light from the source of light on the sample surface.

Colour		Chromaticity coordinates				Met / not met	Luminance factor Class
		1	2	3	4		
Red	x	0.735	0.700	0.610	0.660	met	B2
	y	0.265	0.250	0.340	0.340		$\geq 0.03$
Blue	x	0.130	0.160	0.160	0.130	met	B2
	y	0.090	0.090	0.140	0.140		$\geq 0.01$
Red onto Yellow	x	0.735	0.700	0.610	0.660	met	B2
	y	0.265	0.250	0.340	0.340		$\geq 0.03$

Table 2: Chromaticity coordinates and luminance factors

### 2.2.2.2 Coefficient of retro-reflection (Case A)

The determination of the coefficient of retro-reflection  $R_A$  – Case A (see Table 3) was based on the following conditions:

The coefficient of retro-reflection  $R_A$  was measured according to the CIE Publication N° 54.2 "Retro-reflection by using the CIE illuminant A". During the measurement any of the recommended apertures could be used. The measurements were carried out at a specific observation angle  $\alpha$ , entrance angle  $\beta$ , rotation angle  $\epsilon$  and orientation angle  $\omega_s$ . In doing so, the entrance angle  $\beta$  was determined via its component  $\beta_1$  with  $\beta_2 = 0^\circ$ . The rotation angle  $\epsilon$  and the orientation angle  $\omega_s$  were to be set also equal to zero.

Geometry of measurements		Colours		
$\alpha$	$\beta_1$ ( $\beta_2 = 0$ )	Red	Blue	Red onto Yellow
12'	+ 5°	31.5	14	22.5
	+30°	17.5	7.7	12.5
	+40°	10.5	5.6	7.5
20'	+ 5°	17.5	9.8	12.5
	+30°	9.8	5.6	7.0
	+40°	9.1	4.9	6.5
2°	+ 5°	0.7	0.14	0.5
	+30°	0.28	#	0.2
	+40°	0.21	#	0.15
met / not met		met	met	met

Table 3: Minimum coefficient of retro-reflection; class R2 Europe  
# means value exceeding zero, but not clearly measurable and therefore not applicable for evaluation

### 2.2.2.3 Rotational symmetry

The rotational symmetry of the coefficient of retro-reflection was determined under the same conditions as the coefficient of retro-reflection (Case A, see 2.2.2.2). With an observation angle  $\alpha = 0,33^\circ$  and an entrance angle  $\beta_1 = 5^\circ$  ( $\beta_2 = 0^\circ$ ) the ratio between the minimum and the maximum coefficient of retro-reflection during rotation of  $\varepsilon$  was determined in  $25^\circ$  steps from  $-75^\circ$  to  $+25^\circ$ . The ratio shall not be greater than 2.5:1. The product satisfies this requirement.

Coefficient of retro-reflection ( $\text{cd} \cdot \text{lx}^{-1} \cdot \text{m}^{-2}$ ) - rotational symmetry		
Colour	Ratio	Met / not met
Red	1.0	met
Blue	1.1	met
Red onto Yellow	1.0	met

Table 4: Rotational symmetry

**2.2.3 Impact resistance**

The determination of the impact resistance was based on the following conditions:  
 The test was performed according to EN 12899-1:2001. For this purpose a weight of 450 g with a contact radius of 50 mm falls from a height of 220 mm onto the specimen. The specimen shall be reinforced such that the open surface is 100 mm x 100 mm.

Product	Colour	met / not met
Microprismatic reflective sheeting	Red T-6500 & 4930 Red	met: There were no damages.
T-6500 High Intensity Prismatic Grade screen printed with colour series 4930	Blue T-6500 & 4930 Blue	
	Red onto Yellow T-6501 & 4930 Red	

Table 5: Impact resistance

**2.2.4 Durability of "T-6500 High Intensity Prismatic Grade screen printed with colour series 4930"**

For the assessment of the durability an artificial weathering was carried out.  
 The artificial weathering was performed according to ISO 4892-2:1994. For that purpose the specimens were weathered for a period of 2000 hours using the following parameters:

Weathering parameters	Air-cooled lamp	Water-cooled lamp
Irradiation cycle/dark phase cycle/spray cycle	Continuous light with spray on the test specimens for 18 min every 2h	Continuous light with spray on the test specimens for 18 min every 2h
Black standard temperature only during irradiation	(65 ± 3)°C with blackpanel thermometer	(65 ± 3)°C with blackpanel thermometer
relative humidity	(50 ± 5) %	(50 ± 5) %
irradiance (W/m <sup>2</sup> ) controlled in the - range over 300 nm to 400 nm - range over 300 nm to 800 nm	60 550	60 630

NOTE: 1 - The water used for spraying the test pieces should not contain more than 1ppm silica. Higher proportions of silica can leave residues on the test specimens and cause different results. Water with the required purity can be obtained by distillation or by a combination of deionization and osmosis.

NOTE 2 - During irradiation, the aforementioned values should be reached, changes in the age of the filter and the transmissivity, and changes in the calibration generally mean that the irradiation defect is of the order of 10 %.

Table 6

After the artificial weathering the following tests were carried out:

- Determination of the chromaticity coordinates
- determination of the luminance factors
- determination of the coefficient of retro-reflection

After the artificial weathering the coefficient of retro-reflection with an observation angle of  $\alpha = 0.33^\circ$  (or  $\alpha = 0.2^\circ$ ) and of  $\alpha = 1.0^\circ$  (if specified for new material) and the illumination angles  $\beta_1 = 5^\circ$  and  $30^\circ$  ( $\beta_2 = 0^\circ$ ) must not be less than 80 % of the required coefficient of retro-reflection in new condition.

#### 2.2.4.1 Chromaticity coordinates and luminance factors after artificial weathering

Colour		Chromaticity coordinates				Met / not met	Luminance factor Class
		1	2	3	4		
Red	x	0.735	0.674	0.569	0.655	met	B2 $\geq 0.03$
	y	0.265	0.236	0.341	0.345		
Blue	x	0.078	0.150	0.210	0.137	met	B2 $\geq 0.01$
	y	0.171	0.220	0.160	0.038		
Red onto Yellow	x	0.735	0.674	0.569	0.655	met	B2 $\geq 0.03$
	y	0.265	0.236	0.341	0.345		

Table 7: Chromaticity coordinates and luminance factors after artificial weathering

#### 2.2.4.2 Coefficient of retro-reflection after artificial weathering

Colours	met/not met* (met: $\geq 80\%$ of the values required in new condition)
Red	met
Blue	met
Red onto Yellow	met

Table 8: Coefficient of retro-reflection (Case A) after artificial weathering  
\*assessment was made for the classes which were met in new condition

### 3 Evaluation and attestation of conformity and CE marking

#### 3.1 System of attestation of conformity

According to the Decision 96/579/EC of 24.06.1996<sup>7</sup>, amended by the Decision 1999/453/EC<sup>8</sup>, system 1 of the attestation of conformity shall apply. This system of attestation of conformity is described in the following:

<sup>7</sup> Official Journal of the European Communities L 254 of 08.10.1996  
<sup>8</sup> Official Journal of the European Communities L 178 of 14.07.1999



System 1: Certification of the conformity of the product by an approved certification body on the basis of:

- (a) Tasks for the manufacturer:
  - (1) factory production control;
  - (2) further testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan;
- (b) Tasks for the approved body:
  - (3) initial type-testing of the product;
  - (4) initial inspection of factory and of factory production control;
  - (5) continuous surveillance, assessment and approval of factory production control.

Note: Approved bodies are also referred to as "notified bodies".

## 3.2 Responsibilities

### 3.2.1 Tasks for the manufacturer

#### 3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production (production of the retro-reflective sheeting on the basis of microprisms, transparent colour laminate, screen printing ink). All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European technical approval.

The manufacturer may only use components stated in the technical documentation of this European technical approval. A quality control on the incoming materials bought and the material components respectively will be conducted before these can be used. The manufacturer shall only use materials and/or material components which are entered in the relevant documents of the receiving control according to the test plan

The factory production control shall be in accordance with the Control plan of 17.02.2012 relating to the European technical approval ETA-12/0443 issued on 21.12.2012, which is part of the technical documentation of this European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited with Deutsches Institut für Bautechnik.<sup>9</sup>

The results of the production control are recorded and evaluated. The records include, inter alia, the following information:

- Designation of the product, basic material and components,
- type of surveillance and check,
- information on the production time frame of the products and time for testing the products and the materials and material components,
- results of the surveillance and of the control and, if necessary, details for comparison with the requirements demanded,
- signatures of the persons responsible for the factory production control.

The records shall be made available to the responsible inspection bodies during the continuous examination. On demand these shall be made available to Deutsches Institut für Bautechnik.

<sup>9</sup> The control plan is a confidential part of the European technical approval and only handed over to the approved bodies involved in the procedure of attestation of conformity. See chapter 3.2.2.

Details concerning extension, type and frequency of the controls and surveillance which are necessary in the context of factory production control shall be in conformity with the test plan which is part of the technical documentation of this European technical approval.

#### 3.2.1.2 Other tasks for the manufacturer

The manufacturer shall, on the basis of a contract, involve bodies which are approved for the tasks referred to in section 3.1 in the field of the micro-prismatic retro-reflective sheetings for traffic signs in order to undertake the actions laid down in section 3.2.2. For this purpose the test and "control" plan according to sections 3.2.1.1 and 3.2.2 shall be handed over to the approved bodies by the manufacturer.

#### 3.2.2 Tasks for the approved bodies

The approved bodies shall perform the following tasks in accordance with the provisions laid down in the control plan:

- initial type-testing of the product.
- initial inspection of factory and factory production control,
- continuous surveillance, assessment and approval of factory production control.

The approved bodies shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the product stating the conformity with the provisions of this European technical approval.

In cases where the provisions of the European technical approval and its control plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform Deutsches Institut für Bautechnik without delay.

#### 3.3 CE marking

The CE marking shall be affixed on the packaging or on the papers enclosed when delivering the product. The letters "CE" shall be followed by the identification number of the approved certification body and be accompanied by the following additional information:

- the name and address of the producer (legal entity responsible for the manufacture),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate of conformity for the product,
- the number of the European technical approval,
- designation of the product "T-6500 High Intensity Prismatic Grade screen printed with colour series 4930"
- Information on the product characteristics stated in section 1.2.

#### **4 Assumptions under which the fitness of the product for the intended use was favourably assessed**

##### **4.1 Manufacturing**

The European technical approval is issued for the product on the basis of agreed data/information, deposited with Deutsches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, shall be notified to Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the approval and consequently the validity of the CE marking on the basis of the approval and if so whether further assessment or alterations to the approval shall be necessary.

##### **4.2 Installation**

It is the task of the manufacturer to see to it that all persons involved will be informed about the Specific Conditions of this European technical approval.

The sign bases foreseen consist of aluminium.

The use of the products is subject to national provisions.

The choice and the preparation of the sign support material, as well as the generally applicable rules on the bonding of the product "T-6500 High Intensity Prismatic Grade screen printed with colour series 4930" which are fully described in the current versions of the publications and the technical documentation by the holder of the European technical approval, shall be observed taking account of the national provisions on the use of the product.

"T-6500 High Intensity Prismatic Grade screen printed with colour series 4930" is equipped with a self-adhesive coating, so that the sheeting can be glued on the sign support material which, at a room temperature of > 18 °C, can be done with one of the following methods: Mechanically driven roller applicator, manually operated roller applicator, application with a hand roller. If a heater assembly is used, the sign support surface should be adjusted to a minimum temperature of >18°C.

The users are instructed to carefully check the qualification of the sign support material used as to its bonding property as well as to the durability qualification. "T-6500 High Intensity Prismatic Grade screen printed with colour series 4930" has been developed especially for adhesion on flat surfaces. Processing defects which were caused by the choice of an unsuitable substrate or by an improper preparation, are not the responsibility of the holder of the European technical approval.

Furthermore, for printing 4930 series inks the following instructions are recommended:

- Use 62T-68T mesh size and a medium hard squeegee.
- Thoroughly mix the ink for at least 10 minutes prior to use. Then leave it at rest until air has escaped.
- 4930 can be used without thinner. A maximum of 10 % thinner can be used to compensate for loss of solvent during the printing process.
- 4930 ink can be air-dried or oven-dried. In case of oven drying the temperature should not be higher than 85 °C.

Further instructions are given by the manufacturer within the Instructional Bulletin.

## 5 Indications to the manufacturer

### 5.1 Packaging, transport and storage

The sheeting should be stored in a cool, dry room at a temperature between 18 °C and 24 °C and a relative air humidity of 45 %-55 % and should be processed within one year after delivery. The rolls should be stored horizontally in the packaging board. Precutted sheeting sheets should be stored flat only. Prepared signs should be stored standing on the edge in dry surroundings. Finished signs should always be kept dry during storage and transport. Should these get wet, it shall be made sure that these will be dried as soon as possible. The protective packaging should remain on the roll until further processing.

Dr.-Ing. Karsten Kathage  
Vice President

*beglaubigt:*  
Sterling