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Transportation Safety Division

3M™ High Intensity Prismatic Reflective Sheeting Series 3930 with Pressure Sensitive Adhesive

Product Bulletin Series 3930

October 2020

1 Description

3M™ High Intensity Prismatic Reflective Sheeting Series 3930 is a non-metalized micro-prismatic lens reflective sheeting designed for the production of durable traffic control signs, work zone devices and delineators, that are exposed vertically in service. Series 3930 comprises solventless adhesive[1], coated without the use of organic solvents.

Applied to properly prepared sign substrates, Series 3930 provides long-term reflectivity and durability.

Sheeting	Color
3930	White
3931	Yellow
3932	Red
3934	Orange
3935	Blue
3937	Green

CE 3M™ High Intensity Prismatic Reflective Sheeting Series 3930 is approved for the manufacturing of signfaces for traffic signs with a European Technical Assessment (ETA). All provisions concerning the attestation of conformity and the performances described in the ETA 18/0290 were applied and the product fulfills all the prescribed requirements (see the Declaration of Performance at the end of this document for more details).

[1] Due to the use of ancillary organic materials in the manufacturing of the adhesive, traces of organic solvent can be found in the product

2 Photometric Properties

The initial minimum coefficient of retroreflection of High Intensity Prismatic, when measured according to CIE 54.2 using CIE standard illuminant A, conforms to Table 4 of EN 12899-1:2007 for Class RA 2 materials.

Geometry of measurements		Color					
α	β_1 (β_2=0)	White	Yellow	Red	Green	Blue	Orange
0,2°	+5°	250	170	45	45	20	100
	+30°	150	100	25	25	11	60
	+40°	110	70	15	12	8	29
0,33°	+5°	180	120	25	21	14	65
	+30°	100	70	14	12	8	40
	+40°	95	60	13	11	7	20
2°	+5°	5	3	1	0,5	0,2	1,5
	+30°	2,5	1,5	0,4	0,3	-	1
	+40°	1,5	1,0	0,3	0,2	-	-
"-" indicates "Value greater than zero but not significant or applicable"							

*Table A: Minimum Coefficient of Retroflection [cd / (lx * m2)] for Class RA2*

The above angular definitions apply for the CIE Goniometer system (co-planar geometry). The sheeting shall be mounted in 90° orientation on the goniometer (as shown below).

The initial chromaticity coordinates and luminance factors conform to Class CR2 of EN 12899-1:2007 for Class RA 2 materials (except orange) and ETA 18/0290 (Table B).

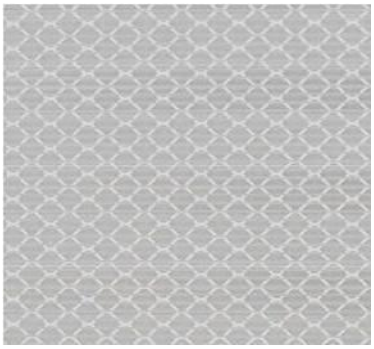
Color	1		2		3		4		Luminance factor
	x	y	x	y	X	y	x	y	β
White	0,305	0,315	0,335	0,345	0,325	0,355	0,295	0,325	≥ 0,27
Yellow	0,494	0,505	0,470	0,480	0,513	0,437	0,545	0,454	≥ 0,16
Red	0,735	0,265	0,700	0,250	0,610	0,340	0,660	0,340	≥ 0,03
Blue	0,130	0,090	0,160	0,090	0,160	0,140	0,130	0,140	≥ 0,01
Green	0,110	0,415	0,170	0,415	0,170	0,500	0,110	0,500	≥ 0,03
Orange	0,631	0,369	0,560	0,360	0,506	0,404	0,570	0,429	≥ 0,14

Table B: Chromaticity and luminance factors

3 Printed Colors

For printed color areas on white sheeting, when processed according to 3M™ recommendations, the coefficients of retroreflection shall not be less than 70% of the value for the corresponding color in table A. The chromaticity coordinates and luminance factors shall conform to table B. This complies with requirements in EN 12899-1.

4 Surface Pattern



The High Intensity Prismatic sheeting is differentiated from other prismatic or encapsulated lens sheeting by the distinctive surface pattern, permanently integrated in the sheeting.

Figure 1 – Sheeting is positioned at 90° orientation

5 Orientation

High Intensity Prismatic is designed to be an effective wide angle reflective sheeting regardless of its orientation on the substrate or ultimate orientation after installation.
However, because the efficiency of light return from cube corner reflectors is not equal at all rotation angles, the sheeting should be positioned in 0° or 90° application orientation on the completed sign when wide entrance angle performance is important for a given sign type or situation.

6 Application

High Intensity Prismatic sheeting should be conditioned prior to application to provide a minimum sheeting temperature of 18°C throughout the roll or sheeting stack. The sheeting should be applied with mechanical squeeze roll applicators to properly prepared substrates. If the application is done by hand, use firm pressure with a rubber roller or equivalent to obtain maximum initial adhesion. Use multiple, heavy overlapping strokes. Re-roll all edges. For further information refer to Information Folder IF 1.4, 1.5 and 1.6.

7 Splices

High Intensity Prismatic sheeting should be butt spliced when more than one piece of sheeting is used on one piece of substrate. The sheeting pieces should not touch each other. A splice gap of up to 1,5 mm is acceptable. This is to prevent buckling as the sheeting expands in extreme temperature and humidity exposure.

8 Substrates

For traffic sign use, product application is limited to properly prepared aluminum (see Information Folder 1.7). The substrate should be conditioned prior to application to provide a minimum surface temperature of 15°C.
Extrusions are to be wrapped and flat panel signs are to be carefully trimmed, so that sheeting from adjacent panels do not touch on assembled signs. Users are urged to carefully evaluate all other substrates for adhesion and sign durability. High Intensity Prismatic sheeting is designed primarily for applications to flat substrates. Rivets or bolts should also support any use that requires a radius of curvature of less than 130 mm.
Sign failures caused by the substrate or improper surface preparation are not the responsibility of 3M.

9 Compatible Products

Screenprint Applications

- 3M™ Process Color Series 880I
- 3M™ Process Color Series 880N

Digital Printing Applications

- 3M™ Piezo Inkjet Ink Series 8800UV

(for Durst Rho 161TS and 162TS printer)

- 3M™ Protective Overlay Film 1170

Copy Part Applications

- 3M™ Scotchcal™ ElectroCut Film 100-12

(other colors of Scotchcal™ Opaque Graphic Film Series 100 are compatible, regional warranties apply)

- 3M™ ElectroCut Film Series 1170
- 3M™ TFEC 260 D

All Applications

- Selected 3M application tapes

<u>Important:</u> Screen-printed sign faces must be sufficiently ventilated during the filling of the drying rack or immediately run through a conveyor. If the print is not ventilated properly, the solvents may damage the top film of the sheeting. Refer to Product Bulletin 880 and Information Folder 1.8 for more details. Care should be taken to avoid flexing Series 3930 sheeting before and especially after screening. Convert from series 880I to series 880N when ink triggered cracking first appears in your shop.

10 Health and Safety Information

Read all health hazard, precautionary and first aid statements found in the Material Safety Data Sheets and/or product label of chemicals prior to handling or use.

11 General Performance Considerations

The performance and durability of 3M™ High Intensity Prismatic Reflective Sheeting Series 3930 will depend upon a number of factors including (but not limited to):

- Selection, preparation and temperature of the substrate
- Application procedures
- Geographic area
- Exposure and atmospheric conditions (e.g. snow, frost)
- Correct combination of sheeting, ink and overlay film
- Ink formulation
- Ink drying/curing methods
- Cleaning and maintenance methods

11.1 Warranty

3M™ High Intensity Prismatic Reflective Sheeting Series 3930 sold by 3M to be used for permanent traffic control signs and devices in Europe is warranted for a period up to 10 years* from date of application (concrete definition of the period is subject to the terms of sale) to be free of defects in material and workmanship, subject to the following provisions:

If Sheeting Series 3930 is processed and applied to a vertical ±10° surface in accordance with all 3M application and fabrication procedures provided in 3M's product and information folders, technical memos (which will be furnished to the agency upon request), including the exclusive use of 3M matched component systems, process colors, overlay films and recommended application equipment.

*(3 years for 3934 Orange)

11.2 Important Notice to Purchaser

All statements, technical information and recommendations herein are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed. Before using, user shall determine the suitability of the product for its intended use, and user assumes all risk and liability whatsoever in connection therewith. All questions of warranty and liability relating to this product are governed by the terms of the sale subject where applicable to the prevailing law.

No statement or recommendation not contained herein shall have any force or effect unless in an agreement signed by authorized personnel of seller and manufacturer.

11.3 Disclaimer

THE 3M WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE, OR ANY IMPLIED WARRANTY ARISING OUT OF A COURSE OF DEALING OR OF PERFORMANCE, CUSTOM OR USAGE OF TRADE.

11.4 Limitation of Liability

Except for the limited remedy stated above, and except where prohibited by law, 3M will not be liable for any loss or damage arising from the Signs or any 3M product, whether direct, indirect, special, incidental or consequential damages (including but not limited to lost profits, business or revenue in any way), regardless of the legal theory asserted including warranty, contract, negligence or strict liability.

11.5 Other Product Information

Always confirm that you have the most current version of the applicable product bulletin, information folder or other product information from 3M's Website at http://www.mmm.com/roadsafety.

11.6 Literature References

Instructions for Squeeze Roll Applicator	IF 1.4
Hand Application Instructions	IF 1.5
Instructions for Hand Squeeze Roll Applicator	IF 1.6
Sign Base Materials	IF 1.7
Instructions for using 3M Process Colors	IF 1.8
Cutting, Matching, Premasking and Prespacing Instructions	IF 1.10
Storage and Packaging	IF 1.11
3M Process Color Series 880I	PB 880I
3M Process Color Series 880N	PB 880N
3M Piezo Inkjet Ink Series 8800UV	PB 8800UV

For Further Assistance

For help on specific questions relating to 3M™ reflective products, please contact your local 3M Application Engineer or contact:

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Technical Information PB HIP 3930 CE / 10.2020
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Declaration of Performance/ Leistungserklärung 3M High Intensity Prismatic 3930

Construction Product Code / Bezeichnung des Bauproduktes

Microprismatic Retroreflective Sheeting

1. 3M High Intensity Prismatic Series 3930
2. 3M High Intensity Prismatic Series 3930 + 3M Electrocut Film Series 1170
3. 3M High Intensity Prismatic Series 3930 printed with 3M Process Colour Series 880 I or N
4. 3M High Intensity Prismatic Series 3930 + 3M Piezo Inkjet Ink Series 8800UV + 3M Electrocut Film 1170
5. 3M High Intensity Prismatic Series 3930 + 3M Piezo Inkjet Ink Series 8800UV + 3M Dew Resistant Overlay Film 1180
6. 3M High Intensity Prismatic Series 3930 + 3M Premium Protective Overlay Film 1160
7. 3M High Intensity Prismatic Series 3930 + 3M Electrocut Film Series 1170 + 3M Premium Protective Overlay Film 1160
8. 3M High Intensity Prismatic 3930 + 3M Electrocut Film 1176 with or without 3M Protective Overlay Film
9. 3M High Intensity Prismatic Series 3930 + 3M Piezo Inkjet Ink Series 8800UV + 3M Premium Protective Overlay Film 1160
10. 3M High Intensity Prismatic Series 3930 + 3M Dew Resistant Overlay Film 1180
11. 3M High Intensity Prismatic Series 3930 + 3M Electrocut Film Series 1170 + 3M Dew Resistant Overlay Film 1180

Intended Use / Verwendungszweck

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

- Retro-reflective signs, retro-reflective and transilluminated signs (see also EN 12899-1)
- Variable message signs (see also EN 12966-1)

/

Das Bauprodukt wird für die Herstellung von Signalbildern von ortsfesten, vertikalen Verkehrszeichen verwendet. Der Verwendungszweck schließt z.B. ein:

- Retroreflektierende Verkehrszeichen, retroreflektierende und innenbeleuchtete Verkehrszeichen (siehe EN 12899-1)
- Wechselverkehrszeichen (siehe EN 12966-1)

Manufacturer / Hersteller

3M Deutschland GmbH
Carl-Schurz-Str.1
D – 41453 Neuss

Assessment and Verification of Constancy of Performance / Bewertung und Überprüfung der Leistungsbeständigkeit

System 1

StrAus-Zert, notified body 0913, Fleyer Str. 204, D-58097 Hagen performs the continuous surveillance, assessment and evaluation of the factory production control under system 1 and issued the certificate of constancy of performance 0913-CPR-2018 / 03.

/

StrAus-Zert, notifizierte Stelle Nr. 0913, Fleyer Str. 204, D-58097 Hagen führt die laufende Überwachung, Beurteilung und Anerkennung der werkseigenen Produktionskontrolle nach System 1 durch und hat das Zertifikat der Leistungsbeständigkeit 0913-CPD-2018 / 03 ausgestellt.

UBAtc, Rue du Lombard 42, B-1000 Brussels, performed the initial type testing and initial inspection of the factory and the FPC under system 1 and issued ETA 18/0290
/
UBAtc, Rue du Lombard 42, B-1000 Brussels, führte die Erstprüfung und Erstinspektion des Werks und der werkseigenen Produktionskontrolle nach System 1 durch und hat ETA 18/0290 ausgestellt.

Declared Performance / erklärte Leistung (ETA 18/0290)

Safety in Use / Nutzungssicherheit

Essential Characteristics / Wesentliche Merkmale	**Performance / Leistung**	**Technical Specification / Technische Spezifikation**
Visibility Characteristics		
Daytime Colour and Luminance Factor	Table 1.2 (see Amendment)	EAD 120001-01-0106 (sept 2016) ETA 18/0290
Coefficient of Retroreflection	Table A.1 (see Amendment)	
Rotational Symmetry	Ratio > 1:2.5	
Durability		
Impact Resistance	No apparent cracking or delamination	EAD 120001-01-0106 (sept 2016) ETA 18/0290
Daytime Colour and Luminance Factor	Table 1.3 (see Amendment)	
Coefficient of Retroreflection	Values > 80% of Table A.1 (see Amendment)	

The performance of the construction product identified above is in conformity with the declared performance. This declaration of performance is issued under the sole responsibility of the manufacturer. /
Die Leistung des oben genannten Bauproduktes entspricht der erklärten Leistung. Verantwortlich für die Erstellung dieser Leistungserklärung ist allein der Hersteller.

Neuss, July 2018

Dr. Dan C. Snustad
Technical Director
3M D-A-CH Region & 3M West Europe

Amendment to the Declaration of Performance

'3M High Intensity Prismatic 3930'

This declaration covers the product 'Microprismatic retroreflective sheeting'.

Sign plates or complete assemblies of fixed vertical road traffic signs according to EN 12899-1:2007 can be manufactured with the following products and product combinations, according to ETA 18/0290 and respective Evaluation Reports.

Components	Trade name	Colours/code		Characteristics
Microprismatic retro-reflective sheeting	3M™ High Intensity Prismatic Reflective Sheeting Series 3930	White	3930	Thickness: 0.32 – 0.49 mm Rolls in various length and width
		Red	3932	
		Yellow	3931	
		Green	3937	
		Blue	3935	
Overlay film	3M™ Electrocut Film Series 1170	Clear	1170	Combined Thickness: 0.549 mm Rolls in various length and width
		Yellow	1171	
		Red	1172	
		Blue	1175	
		Worboys (Dark) Green	1176	
		Green	1177	
		Brown	1179	
Process colour	3M™ Process Colour Series 880 I or N	Yellow	884 I or N	20 - 25 m²/l
		Blue	883 I or N	
		Green	888 I or N	
		Red	882 I or N	
Process colour for digital printing	3M™ Piezo Inkjet Ink Series 8800 UV	Yellow		18 - 20 m²/l
		Red		
		Blue		
		Green		
		Brown		
Overlay film	3M™ Premium Protective Overlay Film 1160	Clear		Combined Thickness: 0.549 mm Rolls in various length and width
Overlay film	3M™ Dew Resistant Overlay Film 1180	Clear		Combined Thickness: 0.549 mm Rolls in various length and width
Overlay film	3M™ Protective Overlay Film 1150	Clear		Combined Thickness: 0.549 mm Rolls in various length and width

Table 1.1: Complete set of Microprismatic retro-reflective sheeting covered by this ETA

Colours		Chromaticity Coordinates				Luminance Factor ß
		1	2	3	4	
White *Tolerance Sphere**	x y	*0.305* *0.315*	*0.335* *0.345*	*0.325* *0.355*	*0.295* *0.325*	*≥0.27*
Yellow *Tolerance Sphere**	x y	*0.494* *0.505*	*0.470* *0.480*	*0.513* *0.437*	*0.545* *0.454*	*≥0.16*
Red *Tolerance Sphere**	x y	*0.735* *0.265*	*0.700* *0.250*	*0.610* *0.340*	*0.660* *0.340*	*≥0.03*
Red on Yellow *Tolerance Sphere**	x y	*0.735* *0.265*	*0.700* *0.250*	*0.610* *0.340*	*0.660* *0.340*	*≥0.03*
Blue *Tolerance Sphere**	x y	*0.130* *0.090*	*0.160* *0.090*	*0.160* *0.140*	*0.130* *0.140*	*≥0.01*
Green *Tolerance Sphere**	x y	*0.110* *0.415*	*0.170* *0.415*	*0.170* *0.500*	*0.110* *0.500*	*≥0.03*
Orange *Tolerance Sphere*	x y	0.631 0.369	0.560 0.360	0.506 0.404	0.570 0.429	*≥0.14*
Brown *Tolerance Sphere**	x y	*0.455* *0.397*	*0.523* *0.429*	*0.479* *0.373*	*0.558* *0.394*	*0.03-0.09*
Grey *Tolerance Sphere**	x y	*0.305* *0.315*	*0.335* *0.345*	*0.325* *0.355*	*0.295* *0.325*	*0.11-0.18*
Dark Green *Tolerance Sphere*	x y	*0.313* *0.682*	*0.313* *0.453*	*0.248* *0.409*	*0.127* *0.557*	*0.01-0.07*
* Chromaticity Coordinates are similar to EN 12899-1:2007 Class CR2						

Table 1.2: Manufacturer's specification for initial daylight chromaticity and luminance factor

Colours		Chromaticity Coordinates				Luminance Factor ß
		1	2	3	4	
White *Tolerance Sphere**	x y	0.355 0.355	0.305 0.305	0.285 0.325	0.335 0.375	*≥0.27*
Yellow *Tolerance Sphere**	x y	0.545 0.454	0.487 0.423	0.427 0.483	0.465 0.534	*≥0.16*
Red *Tolerance Sphere**	x y	0.735 0.265	0.674 0.236	0.569 0.341	0.655 0.345	*≥0.03*
Red on Yellow *Tolerance Sphere**	x y	0.735 0.265	0.674 0.236	0.569 0.341	0.655 0.345	*≥0.03*
Blue *Tolerance Sphere**	x y	0.078 0.171	0.150 0.220	0.210 0.160	0.137 0.038	*≥0.01*
Green Tolerance Sphere*	x y	0.007 0.703	0.248 0.409	0.177 0.362	0.026 0.399	*≥0.03*
Orange *Tolerance Sphere*	x y	0.631 0.369	0.560 0.360	0.506 0.404	0.570 0.429	*≥0.14*
Brown *Tolerance Sphere**	x y	*0.455* *0.397*	*0.523* *0.429*	*0.479* *0.373*	*0.558* *0.394*	*0.03-0.09*
Grey Tolerance Sphere*	x y	0.350 0.360	0.300 0.310	0.285 0.325	0.335 0.375	*0.11-0.18*
Dark Green *Tolerance Sphere**	x y	*0.313* *0.682*	*0.313* *0.453*	*0.248* *0.409*	*0.127* *0.557*	*0.01-0.07*
* Chromaticity Coordinates are similar to EN 12899-1:2007 Class CR1						

Table 1.3: Manufacturer's specification for daylight chromaticity and luminance factor 'in-use'

Geometry of measurement		Colour								
α	β_1 ($\beta_2 = 0$)	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"

NOTE Coloured areas of signs created by digital or screen printing or using overlay film will need to meet 70% of the values in the table.

Table A.1

Manufacturer's Specification for the Minimum Initial Coefficient of Retro-reflection R_A value

(Values are identical to EN 12899-1:2007 Class RA2)