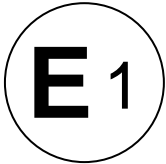




# Kraftfahrt-Bundesamt

DE-24932 Flensburg

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## MITTEILUNG

ausgestellt von:

**Kraftfahrt-Bundesamt**

**über die Genehmigung**

für einen Typ eines Sicherheitsverglasungswerkstoffs nach der  
Regelung Nr. 43 **einschließlich der Änderung 01 Ergänzung 06**

## COMMUNICATION

issued by:

**Kraftfahrt-Bundesamt**

**concerning approval**

of a type of safety glazing material pursuant to Regulation No. 43  
**including amendment 01 supplement 06**

Nummer der Genehmigung: **E1\*43R01/06\*2619\*00**  
Approval No.

1. Klasse des Sicherheitsverglasungswerkstoffs:  
Class of safety glazing material:  
**VIII/C/M**
2. Beschreibung des Verglasungstyps:  
Description of the type of glazing:  
**siehe Anlage 8**  
**see appendix 8**
3. Fabrik- oder Handelsmarken:  
Trade names or marks:  
**Makrolon AR clear 8099**
4. Name und Anschrift des Herstellers:  
Manufacturer's name and address:  
**L.P.T. S.R.L.**  
**IT-10098 RIVOLI (TO)**



# Kraftfahrt-Bundesamt

DE-24932 Flensburg

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Nummer der Genehmigung: E1\*43R01/06\*2619\*00

Approval No.:

5. Gegebenenfalls Name und Anschrift des Vertreters des Herstellers:  
If applicable, name and address of manufacturer's representative:  
**entfällt**  
**not applicable**
6. Zur Genehmigung vorgelegt am:  
Submitted for approval on:  
**08.10.2018**
7. Technischer Dienst, der die Prüfungen für die Genehmigung durchführt:  
Technical service responsible for conducting approval tests:  
**Typprüfstelle Fahrzeuge/Fahrzeugteile der TÜV Rheinland Kraftfahrt GmbH**  
**DE-51105 Köln**
8. Datum des Gutachtens des Technischen Dienstes:  
Date of report issued by that service:  
**08.10.2018**
9. Nummer des Gutachtens des Technischen Dienstes:  
Number of report issued by that service:  
**89211686-01**
10. Die Genehmigung wird **erteilt**  
Approval is **granted**
11. Grund (Gründe) für die Erweiterung der Genehmigung:  
Reason(s) for extension of approval:  
**entfällt**  
**not applicable**
12. Bemerkungen:  
Remarks:  
**Diese Genehmigung nach der ECE-Regelung Nr. 43 betrifft nicht den Einbau des Sicherheitsglases.**  
**This approval pursuant Regulation No. 43 does not concern the installation of safety-glass pane.**



# Kraftfahrt-Bundesamt

DE-24932 Flensburg

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Nummer der Genehmigung: E1\*43R01/06\*2619\*00  
Approval No.:

13. Ort: **DE-24932 Flensburg**  
Place:
14. Datum: **11.10.2018**  
Date:
15. Unterschrift: **Im Auftrag**  
Signature:

  
(Torben Fehlhaber)



16. Die Liste der Unterlagen, die bei der Genehmigungsbehörde eingereicht wurden und auf Anfrage erhältlich sind, liegt dieser Mitteilung bei.  
The list of documents filed with the Type Approval Authority which has granted approval and available on request is annexed to this communication.

**Anlage 8 gemäß Anhang 1 der ECE R43**  
**Appendix 8 pursuant to annex 1 of the Regulation No. 43**

**Nebenbestimmungen und Rechtsbehelfsbelehrung**  
**Collateral clauses and instruction on right to appeal**

**1 Prüfzeugnis mit Anlagen**  
**1 Test report with enclosures**



# Kraftfahrt-Bundesamt

DE-24932 Flensburg

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**Anlage 8 gemäß Anhang 1 der ECE R43**  
**Appendix 8 pursuant to annex 1 of the Regulation No. 43**

**Scheiben aus starrem Kunststoff**

(Haupt- und sekundäre Merkmale nach Anhang 14)

**Rigid plastic panes**

(Principal and secondary characteristics in accordance with Annex 14)

Nummer der Genehmigung: **E1\*43R01/06\*2619\*00**

Approval No.:

Hauptmerkmale

Principal characteristics

Chemische Bezeichnung des Werkstoffes - Chemical designation of the material:

**Polycarbonat - Polycarbonate**

Klassifizierung des Werkstoffes durch den Hersteller - The classification of the material by the manufacturer:

**VIII/C/M**

Herstellungsverfahren - Process of manufacture:

**extrudiert - extruded**

Form und Abmessungen - Shape and dimensions:

**siehe Zeichnungen - see drawings**

Nennstärke - Nominal thickness:

**8 mm**

Färbung des starren Kunststoffwerkstoffes - Colouring of the rigid plastic material:

**farblos - colourless**

Art und Typ der Oberflächenbeschichtung - Nature and type of surface coating:

**abriebfeste Beschichtung - abrasion resistance coating**

Sekundäre Merkmale

Secondary characteristics

Elektrische Leiter integriert - Conductors incorporated:

**nein - no**

Bemerkungen - Remarks:

**entfällt - not applicable**



# Kraftfahrt-Bundesamt

DE-24932 Flensburg

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Nummer der Genehmigung: **E1\*43R01/06\*2619\*00**

Approval No.:

- Anlage -

## Nebenbestimmungen und Rechtsbehelfsbelehrung

### Nebenbestimmungen

Jede Einrichtung, die dem genehmigten Typ entspricht, ist gemäß der angewendeten Vorschrift zu kennzeichnen.

Das Genehmigungszeichen lautet wie folgt:

**VIII/C/M**



**43R-012619**

Die Einzelerzeugnisse der reihenweisen Fertigung müssen mit den Genehmigungsunterlagen genau übereinstimmen. Änderungen an den Einzelerzeugnissen sind nur mit ausdrücklicher Zustimmung des Kraftfahrt-Bundesamtes gestattet.

Änderungen der Firmenbezeichnung, der Anschrift und der Fertigungsstätten sowie eines bei der Erteilung der Genehmigung benannten Zustellungsbevollmächtigten oder bevollmächtigten Vertreters sind dem Kraftfahrt-Bundesamt unverzüglich mitzuteilen.

Verstöße gegen diese Bestimmungen können zum Widerruf der Genehmigung führen und können überdies strafrechtlich verfolgt werden.

Die Genehmigung erlischt, wenn sie zurückgegeben oder entzogen wird, oder der genehmigte Typ den Rechtsvorschriften nicht mehr entspricht. Der Widerruf kann ausgesprochen werden, wenn die für die Erteilung und den Bestand der Genehmigung geforderten Voraussetzungen nicht mehr bestehen, wenn der Genehmigungsinhaber gegen die mit der Genehmigung verbundenen Pflichten - auch soweit sie sich aus den zu dieser Genehmigung zugeordneten besonderen Auflagen ergeben - verstößt oder wenn sich herausstellt, dass der genehmigte Typ den Erfordernissen der Verkehrssicherheit oder des Umweltschutzes nicht entspricht.

Das Kraftfahrt-Bundesamt kann jederzeit die ordnungsgemäße Ausübung der durch diese Genehmigung verliehenen Befugnisse, insbesondere die genehmigungsgerechte Fertigung sowie die Maßnahmen zur Übereinstimmung der Produktion, nachprüfen. Es kann zu diesem Zweck Proben entnehmen oder entnehmen lassen. Dem Kraftfahrt-Bundesamt und/oder seinen Beauftragten ist ungehinderter Zutritt zu Produktions- und Lagerstätten zu gewähren.

Die mit der Erteilung der Genehmigung verliehenen Befugnisse sind nicht übertragbar. Schutzrechte Dritter werden durch diese Genehmigung nicht berührt.

### Rechtsbehelfsbelehrung

Gegen diese Genehmigung kann innerhalb eines Monats nach Bekanntgabe Widerspruch erhoben werden. Der Widerspruch ist beim **Kraftfahrt-Bundesamt, Fördestraße 16, DE-24944 Flensburg**, schriftlich oder zur Niederschrift einzulegen.



# Kraftfahrt-Bundesamt

DE-24932 Flensburg

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2

Nummer der Genehmigung: E1\*43R01/06\*2619\*00

Approval No.:

**- Attachment -**

## **Collateral clauses and instruction on right to appeal**

### **Collateral clauses**

All equipment which corresponds to the approved type is to be identified according to the applied regulation.

The approval identification is as follows: - see German version -

The individual production of serial fabrication must be in exact accordance with the approval documents. Changes in the individual production are only allowed with express consent of the Kraftfahrt-Bundesamt.

Changes in the name of the company, the address and the manufacturing plant as well as one of the parties given the authority to delivery or authorised representative named when the approval was granted is to be immediately disclosed to the Kraftfahrt-Bundesamt. Breach of this regulation can lead to recall of the approval and moreover can be legally prosecuted.

The approval expires if it is returned or withdrawn or if the type approved no longer complies with the legal requirements. The revocation can be made if the demanded requirements for issuance and the continuance of the approval no longer exist, if the holder of the approval violates the duties involved in the approval, also to the extent that they result from the assigned conditions to this approval, or if it is determined that the approved type does not comply with the requirements of traffic safety or environmental protection.

The Kraftfahrt-Bundesamt may check the proper exercise of the conferred authority taken from this approval at any time. In particular this means the compliant production as well as the measures for conformity of production. For this purpose samples can be taken or have taken. The employees or the representatives of the Kraftfahrt-Bundesamt may get unhindered access to the production and storage facilities.

The conferred authority contained with issuance of this approval is not transferable. Trade mark rights of third parties are not affected with this approval.

### **Instruction on right to appeal**

This approval can be appealed within one month after notification. The appeal is to be filed in writing or as a transcript at the **Kraftfahrt-Bundesamt, Fördestraße 16, DE-24944 Flensburg.**

**TÜV Rheinland Group**  
**Test Report No.**                    **89211686-01-rev.4**  
**Vehicle type / Type**            **: Rigid plastic panes**  
**Manufacturer**                    **: L.P.T. S.R.L.**

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## TEST REPORT

according to

**Uniform provisions concerning the approval of  
safety glazing materials and their installation on vehicles**

**UNECE-R43**

as last amended by

**Supplement 6 to the 01-series of amendments**

**10th August 2018**

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### Approval Status

EU type – approval                    : Not applicable

UNECE approval                        : Not applicable

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### Structure of the Test Report

#### Item No.

- |    |                             |
|----|-----------------------------|
| 0. | General information         |
| 1. | Tested vehicle(s)/object(s) |
| 2. | Test record                 |
| 3. | Appendices                  |
| 4. | Statement of conformity     |
- 

The Test Report shall be reproduced and published in full by the client only. It shall however be reproduced and published partially with the written permission of the Testing Laboratory only.

**TÜV Rheinland Group**  
**Test Report No.**            **89211686-01-rev.4**  
**Vehicle type / Type**        : **Rigid plastic panes**  
**Manufacturer**               : **L.P.T. S.R.L.**

**0. General Information**

0.1.     Make (trade name of the manufacturer)   : Makrolon AR clear 8099  
 0.2.     Type   : Rigid plastic panes  
 0.3.     Category of vehicle                         : Slow moving vehicle, for agricultural and forestry machinery  
 0.4.     Name and address of the manufacturer   : L.P.T. S.R.L.  
   Via Albenga, 133/b  
   I-10098 Rivoli (To), ITALIA  
 0.5.     No. of the information document         : 89211686-02  
           -Date of issue                                 : 18th June 2018  
           -Date of last change                        : n.a.

**1. Tested vehicle(s) / object(s)**

1.1       Description                                 : Plastic glazing that does not deflect vertically more than 50mm in the flexibility test.  
   Application as roof for agricultural and deforestation machinery  
 1.1.1     Vehicle / object                           : Rigid plastic panes  
   Trade name   : Makrolon AR clear 8099  
   Type(s) /variant(s) /version(s)                 : 8mm nominal  
   Identificationnumber                               : Modelnumbers 0125 and 0127, see drawings  
   Marking position is identified in the „ Scheda Technica Prodotto“ by the rectangle with lettering „AM“  
 1.1.2     Condition of vehicle(s)/object(s)       : ~~New, used, protested~~  
 1.2       Worst case selection                       : The determination of worst case scenario was done according QMA 1.301.005, section 6.2.2.2  
 1.3       Remarks                                       : Not applicable



**TÜV Rheinland Group**  
**Test Report No. 89211686-01-rev.4**  
**Vehicle type / Type : Rigid plastic panes**  
**Manufacturer : L.P.T. S.R.L.**

## 2. Test record

- 2.1. Equipment for measuring and testing : The test facilities / measurement equipment used were in compliance with the test requirements
- 2.1.1. Specifications for the test site : Not applicable
- 2.1.2. Subcontracting : Not applicable
- 2.2. Test results : See Appendix 1
- Numbering according to Annex 14 of the UNECE-R43
- 2.2.1. Test results referring to measurements : Pass / ~~Fail~~
- 2.2.2. Test results of not measurable attributes : Pass / ~~Fail~~
- 2.2.3. Alternative test methods : Not applicable
- Remarks concerning extension : ~~The vehicle type has been tested according to the modification(s) mentioned in appendix 0.~~  
 The new parts meet the requirements of the directive.  
 An actual practical test of the vehicle was not necessary. The results of the previous test(s) are still valid.
- 2.3. Additional information : The results of the test refer exclusively to the object(s) mentioned under section 1. of this report.
- Test site : TÜV Rheinland Nederland B.V.  
 Westervoortsedijk 73, 6827 AV Arnhem  
 The Netherlands
- Test date : April till October 2017
- 2.4. Remarks : Not applicable

## 3. Appendices

- Appendix 0 : List of modifications
- Appendix 1 : Test results

**TÜV Rheinland Group**  
**Test Report No.**                    89211686-01-rev.4  
**Vehicle type / Type**         : Rigid plastic panes  
**Manufacturer**                    : L.P.T. S.R.L.

#### 4. Statement of conformity

The in section 0.5. mentioned information document and the type described in that comply with the requirements mentioned on page 1.

With regard to the required level of performance to be achieved, the tested samples were representative for the type to be approved (see section 1.2).

The mentioned test results refer to the vehicle(s)/object(s) described under section 1.1 of this report.

**Arnhem, 8th October, 2018**

<b>Author</b>	Signature
Mr. R. Brandhorst	
Expert Technical Service	
<b>Peer review</b>	Signature
Mr. M.A.A.M. Schets, B.Sc.	
Specialist	
<b>Approved by</b>	Signature
Mrs. C.C.M. van Houten	
Manager operations	

#### Appendix 0

##### List of modifications

Correction of :  
 Modification of :  
 Addition of :  
 Deletion of :

**TÜV Rheinland Group**  
**Test Report No.**                    **89211686-01-rev.4**  
**Vehicle type / Type**        **: Rigid plastic panes**  
**Manufacturer**                **: L.P.T. S.R.L.**

**Test results**
**Appendix 1**

Paragraphs	Requirements and test description	Result of examination
<b>4.</b>	<b>Markings</b>	
4.1.	Every piece of safety glazing material, including the samples and test pieces submitted for approval, shall bear a trade name or mark of the manufacturer. <del>Manufactured parts shall bear the ECE Regulation No. 43 number allocated to the prime manufacturer.</del> The marking shall be clearly legible and indelible.	Comply
<b>6.</b>	<b>General specifications</b>	
6.1.	All glazing materials, including glazing material for the manufacture of windscreens, shall be such that, in the event of shattering, the danger of bodily injury is reduced as far as possible. The glazing material shall be sufficiently resistant to the incidents likely to occur in normal traffic, and to atmospheric and temperature conditions, chemical action, combustion and abrasion.	Comply
6.2.	Safety glazing materials shall in addition be sufficiently transparent, shall not cause any noticeable distortions of objects as seen through the windscreen, and shall not give rise to any confusion between the colours used in road-traffic signs and signals. In the event of the windscreen's shattering, the driver shall still be able to see the road clearly enough to be able to brake and stop his vehicle safely.	Comply
<b>7.</b>	<b>Particular specifications</b>	
<b>A14/1.</b>	<b>Rigid plastic glazings shall be considered to belong to different types if they differ in at least one of the following principal characteristics</b>	
A14/1.1.	Trade name or mark	Macrolon AR clear 8099
A14/1.1.2.	Chemical designation of the material	polycarbonate thermoplastic polymer
A14/1.1.3.	Classification of the material	<b>VIII/C/M</b>
A14/1.1.4.	Manufacturing process	Extrusion
A14/1.1.5.	Shape and dimensions	Modelnumbers 0125 and 0127, see drawings
A14/1.1.6.	The thickness tolerance limit for <u>extruded</u> plastic products is $\pm 10\%$ of the nominal thickness.	Nominal thickness of 8 mm, actual thickness between 7,72 and 7,80mm
A14/1.1.7.	Colouring of the plastic product	Clear
A14/1.1.8.	Nature of the surface coating	Abrasion Resistant Coating

**TÜV Rheinland Group**

**Test Report No.**                89211686-01-rev.4  
**Vehicle type / Type**        : Rigid plastic panes  
**Manufacturer**                : L.P.T. S.R.L.

<b>A14.1.2</b>	<b>Secondary characteristics</b>	
A14/1.2.1.	Presence or absence of conductors or heating elements	Absence
A14/1.2.2	The incorporation or otherwise of opaque obscuration	Absence

<b>A14/2.</b>	<b>General</b>	
A14/2.1.	In the case of rigid plastic panes the tests shall be conducted either on flat test pieces rigorously representative of the finished product or finished parts. All optical measurements shall be carried out on real parts.	Comply
A14/2.2.	<p>The test pieces shall be freed from protecting maskings and have to be cleaned carefully before the test.</p> <p>They shall be stored for 48 hours at a temperature of 23 (± 2) °C and a Relative Humidity of 50 (± 5) %.</p>	Comply (test pieces stored in conditioned room at: 23 °C, 48 % RH)
A14/2.3.	To describe the breaking behaviour under dynamical stress, classes will be created depending on the application of the plastics. These classes are related to contact probabilities of the human head with the plastic glazing and they contain different requirements concerning the headform test.	Not applicable

<b>A14/3.</b>	<b>Flexibility test</b>	
	<p>Test method is described in Annex 3, paragraph 12</p> <p>One flat test piece measuring 300 x 25 mm shall be subjected to testing. For a test piece or sample to be considered rigid, the vertical deflection of the test piece shall be less than 50 mm after 60 seconds</p>	Comply
	Sample No.	Vertical deviation
	1	0

<b>A14/4.</b>	<b>Headform test</b>	Not applicable
	Test method is described in Annex 3, paragraph 3.2	

**TÜV Rheinland Group**

**Test Report No.**                89211686-01-rev.4  
**Vehicle type / Type**        : Rigid plastic panes  
**Manufacturer**                : L.P.T. S.R.L.

A14/5.1.	<p><b>Mechanical strength test -227 g Ball Test</b>          (1) without conductors, obscuration(s) or heating elements</p> <p>The method used shall be that described in Annex 3, paragraph 2.1.          Ten flat square pieces of 300 (+10/-0) mm side, were tested.</p> <p>The height of drop for the nominal thickness of 8mm from the underface of the ball to the upper face of the test piece or sample shall be 5 m.</p> <p>The ball test shall be considered to have given a satisfactory result if the following conditions are met:</p> <p>(a) The ball does not pass through the test piece;          (b) The laminate shall not break into separate pieces;</p> <p>As a result of the impact, cracks and fissures in the test piece are however permissible.</p> <p>A set of test pieces submitted for approval shall be considered satisfactory from the point of view of the 227gr. ball test if eight or more separate tests give a satisfactory result at the drop height.</p> <p>The ambient temperature ball drop test was performed after the humidity test (given in paragraph 6.4.4. of Annex 14)</p>	Comply
<b>8 mm clear , drop height 5 meter</b>		
Sample No.	Ball pass through	Break into several pieces
1	No	No
2	No	No
3	No	No
4	No	No
5	No	No
6	No	No
7	No	No
8	No	No
9	No	No
10	No	No
A14/5.5.	<b>Same 227 gr. Ball test at -18 (± 2) °C (see requirements above)</b>	
Sample No.	Ball pass through	Break into several pieces
1	No	No
2	No	No
3	No	No
4	No	No

**TÜV Rheinland Group**

**Test Report No.**                89211686-01-rev.4  
**Vehicle type / Type**        : Rigid plastic panes  
**Manufacturer**                : L.P.T. S.R.L.

5	No	No
6	No	No
7	No	No
8	No	No
9	No	No
10	No	No

<b>A14/6.</b>	<b>Test of resistance to the environment</b>		
<b>A14/6.1.</b>	<b>Test of resistance to abrasion (only when applicable for side windows, this is not mandatory for – sun – roofs)</b>  The requirements of Annex 3, paragraph 4 shall apply. The instrument used is the same as mentioned in paragraph 4.1. Abrasive wheels used are of type CS-10F, with valid expiry date. <i>(Light scatter resulting from abrading three AS4000S hard-coated polycarbonate samples is within the qualification range of 0,5 % to 6.3% after 500 cycles)</i>  The Hazemeter complies with the requirements of paragraph 4.1.3.  Sample: 3 pieces of flat squares of 100 x 100 mm for each type of surface shall be subjected to testing.  The plastics coating shall be subjected to a test for 500 cycles on the outer surface of the test piece.  The plastic coating shall be satisfactory with respect to abrasion resistance if the increase of light scatter $\Delta$ haze as a result of the abrasion of the test piece does not exceed 10 %.  All the test pieces meet the requirements	Comply	
8 mm coated Macrolon AR 8099, clear Sample No.	1	2	3
Corrected $\Delta$ haze $\epsilon$ (500)	4.5 %	4.8%	4.2%
	The plastics coating shall be subjected to a test for 100 cycles on the inner surface of the test piece.  The plastic coating shall be satisfactory with respect to abrasion resistance if the increase of light scatter $\Delta$ haze as a result of the abrasion of the test piece does not exceed 4 %  All the test pieces meet the requirements		Comply
8 mm coated Macrolon AR 8099, clear Sample No.	4	5	6
Corrected $\Delta$ haze $\epsilon$ (100)	2.5 %	2.7%	2.3%

**TÜV Rheinland Group**  
**Test Report No.** 89211686-01-rev.4  
**Vehicle type / Type** : Rigid plastic panes  
**Manufacturer** : L.P.T. S.R.L.

<b>A14/6.2.</b>	<b>Test of resistance to simulated weathering</b>  The requirements of Annex 3, paragraph 6.4 shall apply.  Sample: 3 flat pieces of 130 x 40 mm.  The resistance to simulated weathering shall be considered to have given a satisfactory result if : <ul style="list-style-type: none"> <li>- The light transmittance measured in accordance with Annex 3, paragraph 9.1. does not fall below 95 % of the pre-weathering value. Additionally, for windows which are required for driver visibility the value shall not fall below 70 %.</li> <li>- No bubbles or other visible decompositions, discolorations, milkiness or crazing shall occur during weathering.</li> </ul> A set of test pieces submitted for approval shall be considered satisfactory from the point of view of the resistance to simulated weathering if all test pieces have given satisfactory results.	Comply
Sample No.	Light transmittance	Visible changes
	After weathering	% of original
1	84.5 %	100.2 %
2	84.5 %	100.3 %
3	84.4 %	100.3 %
<b>A14/6.3.</b>	<b>Cross-cut test</b>  The requirements of Annex 3, paragraph 13 shall apply.  Sample: one of the test pieces from A14/6.2.  The cross-cut value shall be considered to have given a satisfactory result if : <ul style="list-style-type: none"> <li>- The cross-cut value Gt1 is met (not higher than the value mentioned)</li> </ul> The test piece shall be considered satisfactory from the point of view of approval if test gives satisfactory results.	Comply
Sample No.	Cross-cut value	
1	Gt0	

**TÜV Rheinland Group**

**Test Report No.** 89211686-01-rev.4  
**Vehicle type / Type** : Rigid plastic panes  
**Manufacturer** : L.P.T. S.R.L.

<b>A14/6.4.</b>	<b>Resistance to humidity test</b>  The requirements of Annex 3, paragraph 7 shall apply.  Sample: 10 flat square pieces of 300 mm side were tested.  Keep samples in a vertical position for two weeks in a closed container in which the temperature is maintained at 50 (± 2) °C and the Relative Humidity at 95 (± 4) %.  The humidity test shall be considered to have given a satisfactory result if: <ul style="list-style-type: none"> <li>- No visible decompositions like bubbles or milkiness occur on any sample, and</li> <li>- The light transmittance does not fall to less than 95 % of the pre-test value and additionally to no less than 70 % for any window required for driver visibility.</li> </ul>	Comply
Sample No.	Light transmittance	Visible changes
	After humidity	% of original
1	85.0 %	99.2 %
2	85.2 %	99.4 %
3	84.9 %	99.2 %
4	84.0 %	99.3 %
5	85.3 %	99.6 %
6	85.4 %	99.8 %
7	84.1 %	99.3 %
8	84.5 %	99.7 %
9	85.2 %	99.5 %
10	85.3 %	99.5 %

<b>A14/7.</b>	<b>Optical qualities</b>  The requirements of Annex 3, paragraph 9.1 shall apply for products which are requisite for driver visibility.  Sample: 4 original parts, from which pieces of 50 x 50 mm from the flattest part were cut.  A set of four samples shall be considered as satisfactory if all samples give satisfactory results.	Comply
Sample No.	Light transmittance	
1	84.7 %	
2	84.6 %	
3	84.9 %	
4	84.7 %	



**TÜV Rheinland Group**

**Test Report No.**                89211686-01-rev.4  
**Vehicle type / Type**        : Rigid plastic panes  
**Manufacturer**                : L.P.T. S.R.L.

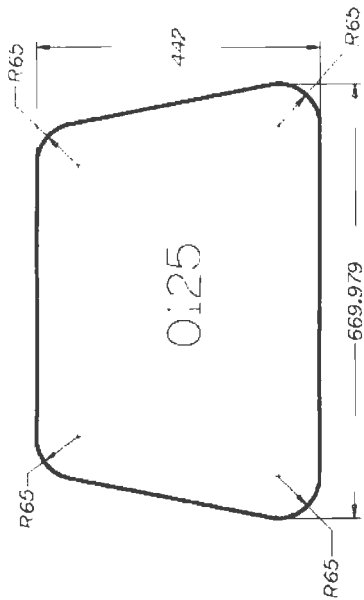
<b>A14/8.</b>	<p>Fire resistance test</p> <p>The requirements of Annex 3, paragraph 10 shall apply.</p> <p>Sample: 5 pieces, 100 x 356 mm.</p> <p>Samples conditioned for at least 24 hours, but no more than 7 days, at 23 (± 2) °C and a Relative Humidity of 50 (± 5) %.</p> <p>Burning rate : The quotient of the burnt distance measured according to this method and the time taken to burn that distance. It is expressed in millimetres per minute.</p> <p>Exposed side : The side which is facing towards the passenger compartment when the material is mounted in the vehicle.</p> <p>The fire resistance test shall be considered to have given a satisfactory result if the burning rate is less than 110 mm/min.</p> <p>For the purpose of approval a set of samples will be considered satisfactory if all samples give a satisfactory results.</p>	Comply
	Sample No.	Required limit
	1      2      3      4      5	
8mm	0      0      0      0      0	≤ 110 mm / min.

**TÜV Rheinland Group**

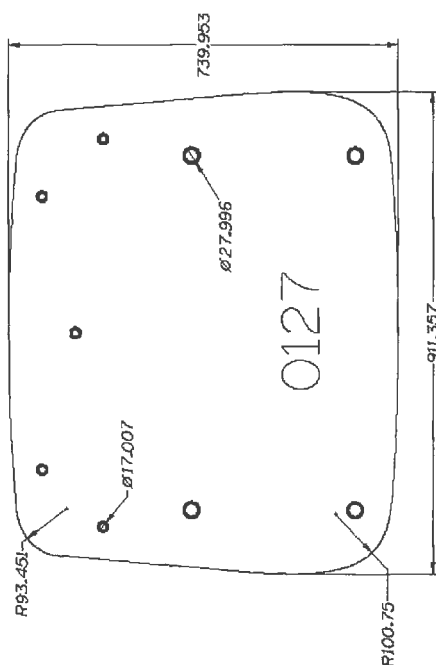
**Test Report No.** 89211686-01-rev.4  
**Vehicle type / Type** : Rigid plastic panes  
**Manufacturer** : L.P.T. S.R.L.

A14/9.1	<b>Resistance to chemicals, Immersion test</b>  The requirements of Annex 3, paragraph 11.2.1 shall apply.  Sample: 4 pieces, 180 x 25 mm, for each test and each chemical. Before each test, samples shall be cleaned according to the manufacturers instructions and conditioned for 48 hours at 23 (± 2) °C and a Relative Humidity of 50 (± 5) %, which conditions are maintained throughout the tests.  The cross-cut test is not applicable here.  Three samples out of of four shall give satisfactory results for each chemical.	Comply																												
8 mm Macrolon UV, coated	<table border="1"> <thead> <tr> <th colspan="4">Sample No.</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>C</td> <td>C</td> <td>C</td> <td>C</td> </tr> <tr> <td>C</td> <td>C</td> <td>C</td> <td>C</td> </tr> <tr> <td>C</td> <td>C</td> <td>C</td> <td>C</td> </tr> <tr> <td>C</td> <td>C</td> <td>C</td> <td>C</td> </tr> <tr> <td>C</td> <td>C</td> <td>C</td> <td>C</td> </tr> </tbody> </table>	Sample No.				1	2	3	4	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	Required limit
Sample No.																														
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C	C	C	C																											
Non-abrasive soap  Window-cleaning  Undiluted denaturated alcohol  Petrol (as listed in paragraph 11.1.4)  Reference kerosene	<table border="1"> <tbody> <tr> <td>C</td> <td>C</td> <td>C</td> <td>C</td> </tr> <tr> <td>C</td> <td>C</td> <td>C</td> <td>C</td> </tr> <tr> <td>C</td> <td>C</td> <td>C</td> <td>C</td> </tr> <tr> <td>C</td> <td>C</td> <td>C</td> <td>C</td> </tr> <tr> <td>C</td> <td>C</td> <td>C</td> <td>C</td> </tr> </tbody> </table>	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	Sample does not exhibit any softening, tackiness, crazing or apparant loss of transparency.  ("C" = comply)								
C	C	C	C																											
C	C	C	C																											
C	C	C	C																											
C	C	C	C																											
C	C	C	C																											
A14/9.2	<b>Resistance to chemicals, procedure under load</b>  The requirements of Annex 3, paragraph 11.2.4 shall apply.  Sample: A set of 4 samples (180 x 25 mm, for each chemical) – not being the ones mentioned in paragraph 9.1 above shall be tested. Before each test, samples shall be cleaned according to the manufacturers instructions and conditioned for 48 hours at 23 (± 2) °C and a Relative Humidity of 50 (± 5) %, which conditions are maintained throughout the tests.  Three samples out of of four shall give satisfactory results for each chemical.	Comply																												
8 mm Macrolon UV, coated	<table border="1"> <thead> <tr> <th colspan="4">Sample No.</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>C</td> <td>C</td> <td>C</td> <td>C</td> </tr> <tr> <td>C</td> <td>C</td> <td>C</td> <td>C</td> </tr> <tr> <td>C</td> <td>C</td> <td>C</td> <td>C</td> </tr> <tr> <td>C</td> <td>C</td> <td>C</td> <td>C</td> </tr> <tr> <td>C</td> <td>C</td> <td>C</td> <td>C</td> </tr> </tbody> </table>	Sample No.				1	2	3	4	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	Required limit
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C	C	C	C																											
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C	C	C	C																											
C	C	C	C																											
C	C	C	C																											

**TÜV Rheinland Group**  
**Test Report No.**                   89211686-01-rev.4  
**Vehicle type / Type**       : **Rigid plastic panes**  
**Manufacturer**                : **L.P.T. S.R.L.**



See Document " Scheda Technica Prodotto", nr. ST-PRO-1195-1165, rev.4 dated 22-09-2011 for the exact location of the marking of the product.



**TÜV Rheinland Group**  
**Test Report No.**            **89211686-01-rev.4**  
**Vehicle type / Type**        **: Rigid plastic panes**  
**Manufacturer**               **: L.P.T. S.R.L.**

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See Document " Scheda Technica Prodotto", nr. ST-PRO-1215-0127, rev.5 dated 18-02-2013 for the exact location of the marking of the product.

## Appendix L

### Communication concerning the type approval of safety glazing material

- |     |  |   |
|-----|--|---|
| 1.  | Class of safety glazing material                                 | : VIII/C/M, Rigid plastic panes   |
| 2.  | Description of the type of glazing                               | : Rigid plastic panes, please refer to Appendix 8 and Annex 14 of ECE R43 |
| 3.  | Trade name or marks  | : Macrolon AR clear 8099, coated with abrasion resistance coating         |
| 4.  | Manufacturer's name and address                                  | : L.P.T. S.R.L.<br>Via Albenga, 133/b<br>I-10098 Rivoli (To), ITALIA      |
| 5.  | If applicable, name and address of manufacturer's representative | : Not applicable  |
| 6.  | Submitted for approval on  | : 20 <sup>th</sup> February 2018  |
| 7.  | Technical service responsible for conducting approval tests      | : TÜV Rheinland Nederland B.V.  |
| 8.  | Date of report issued by that service                            | : 8 <sup>th</sup> October 2018  |
| 9.  | Number of report issued by that service                          | : 89211686-01-rev.4   |
| 10. | Approval is  | : <del>Granted / refused / extended / withdrawn</del> <sup>(1)</sup>      |
| 11. | Reason(s) for extension for approval                             | : Not applicable  |

<sup>(1)</sup> Strike out what does not apply.

**TÜV Rheinland Group**  
**Test Report No.** 89211686-01-rev.4  
**Vehicle type / Type** : Rigid plastic panes  
**Manufacturer** : L.P.T. S.R.L.

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**Annex 1 – Appendix 8**  
**Rigid plastic panes**  
**Principal and secondary characteristics as defined in annex 14 to Regulation No. 43**

**Principal characteristics**

Chemical designation of the material	:	Polycarbonate thermoplastic polymer
The classification of the material by the manufacturer	:	Makrolon AR clear 8099
Process of manufacture	:	Extrusion,
Shape and dimensions	:	Modelnumbers 0125 and 0127, see drawings
Nominal thickness	:	8 mm, actual thickness between 7,72 and 7,80mm
Colouring of the rigid plastic material	:	Clear
Nature and type of the surface coating	:	abrasion resistance coating

**Secondary characteristics**

Conductors incorporated	:	<del>Yes</del> / no
-------------------------	---	---------------------

---

<sup>(1)</sup> Strike out what does not apply.

---

**TECHNICAL DESCRIPTION**

---

1. Class of safety-glass pane : Rigid plastic panes, category VIII/C/M
2. Description of glass pane : Please refer to information folder, Appendix 1
3. Trade name or marks : Makrolon AR clear 8099
4. Name and address of manufacturer : L.P.T. S.R.L.  
Via Albenga, 133/b  
I-10098 Rivoli (To), ITALIA
5. Principal characteristics
- Chemical designation of the material : Polycarbonate thermoplastic polymer
- Classification of the material  
    by the manufacturer : Makrolon AR clear 8099
- Process of manufacture : Extrusion
- Shape and dimensions : Modelnumbers 0125 and 0127, see drawings
- Colouring of the plastic product : Clear (colourless)
- Nature of the surface coating : Abrasion resistance coating
6. Secondary characteristics
- Conductors incorporated : No
- Opaque obscuration incorporated : No
7. Approved criteria
- Greatest area (flat glass) : 0.67 m<sup>2</sup>
- Smallest angle : 80°
- Greatest developed area : Not applicable  
    (curved glass)
- Greatest height of segment : Not applicable
8. Remarks : Not applicable

Documents attached: Appendix 1--contents of list of glazings other than windscreens.

**APPENDIX 1**

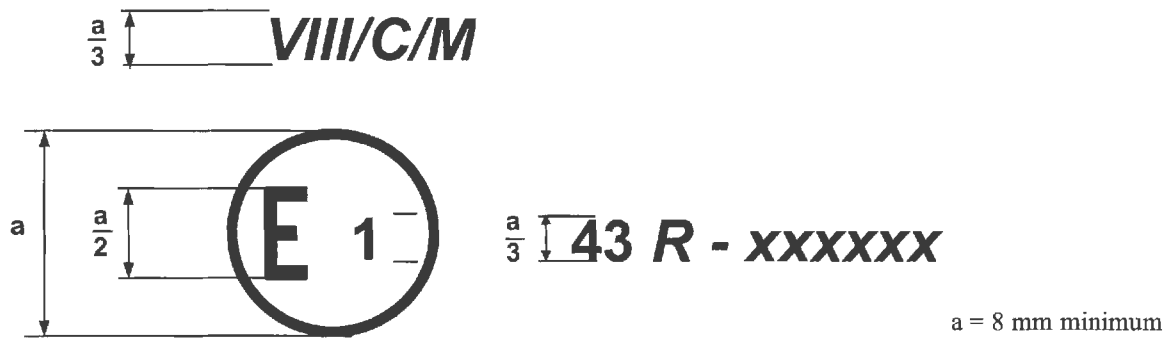
In case of glazings other than windscreens, diagrams as following:

Greatest area (flat glass)	:	0.67 m <sup>2</sup>
Smallest angle	:	80°
Greatest developed area (curved glass)	:	not applicable
Greatest height of segment	:	not applicable

**Trade mark: Makrolon AR clear 8099**

**Approval mark:**

**Rigid plastic panes having a light transmittance  $\geq 70$  per cent**





Product data sheet, June 2016

# Makrolon® AR

## Abrasion-resistant solid polycarbonate sheet



I Line  
Innovative

### Your benefits:

- extreme impact strength
- good abrasion resistance
- excellent weathering resistance
- high clarity



**Makrolon® AR** sheet is an abrasion and enhanced UV resistant polycarbonate sheet that offers glasslike hardness coupled with the impact strength of standard polycarbonate. Additionally, **Makrolon® AR** offers on both surfaces enhanced resistance against yellowing and hazing for an extended service life in high profile architectural glazing. **Makrolon® AR** has a 10-years warranty against breakage and 5-years warranty against delamination and weathering.

### Applications:

Typical applications for **Makrolon® AR** sheet include transparent sound barriers, school and hospital shelter glazing. **Makrolon® AR** is also used extensively in correctional and psychiatric facilities. Additionally, the product performs well for view windows and machine guards in harsh chemical environments. Due to its scratch-resistant coating, **Makrolon® AR** cannot be formed like other **Makrolon®** sheets.

	Test Conditions	Typical values <sup>(1)</sup>	Unit	Standard
<b>PHYSICAL</b>				
Density		1200	kg/m <sup>3</sup>	ISO 1183-1
Water absorption saturation	water at 23 °C	0.30	%	ISO 62
Water absorption equilibrium	23 °C, 50% relative humidity	0.12	%	ISO 62
Refractive index	Procedure A	1.587	–	ISO 489
<b>MECHANICAL</b>				
Tensile modulus	1 mm/min	2350	MPa	ISO 527-1,-2
Yield stress	50 mm/min	> 60	MPa	ISO 527-1,-2
Yield strain	50 mm/min	6	%	ISO 527-1,-2
Nominal strain at break	50 mm/min	> 50	%	ISO 527-1,-2
Flexural modulus	2 mm/min	2350	MPa	ISO 178
Flexural strength	2 mm/min	90	MPa	ISO 178
Charpy impact strength	23 °C, unnotched	non-break	kJ/m <sup>2</sup>	ISO 179-1eU
Charpy impact strength	23 °C, 3 mm, notched	80P	kJ/m <sup>2</sup>	ISO 179-1eA
Izod impact strength	23 °C, 3.2 mm, notched	90P	kJ/m <sup>2</sup>	ISO 180-A
Taber abrasion resistance	Δ haze after 100 cycles (500 g CS 10F) after 500 cycles	1 – 4 4 – 9	% %	ASTM D1044 & ANSI Z26.1
<b>THERMAL</b>				
Vicat softening temperature	50 N, 50°C/h	148	°C	ISO 306
Thermal conductivity	23°C	0.20	W/(m.K)	ISO 8302
Coefficient of linear thermal expansion	23 to 55°C	0.65	10 <sup>-4</sup> /K	ISO 11359-1,-2
Temperature of deflection under load	1.80 Mpa	128	°C	ISO 75-1,-2
Temperature of deflection under load	0.45 Mpa	140	°C	ISO 75-1,-2

<sup>(1)</sup> These values are measured on injection molded samples, and are not intended for specification purposes.



# Makrolon® AR

## Abrasion-resistant solid polycarbonate sheet



Ideas, innovative, intelligent, interesting... Covestro i-line represents the next generation of quality products. This seal guarantees innovative and intelligent first-class solutions at all times for a multitude of requirements.

### Light Transmission:

Test Method according to DIN EN ISO 13468-2.

The stated thicknesses are not all available as standard. Please ask us for more information.

The stated values are typical values only.

Light transmission in %	3	4	5	6	8	10	12	15
Makrolon® AR clear 8099	88	87	87	86	85	83	82	80
Makrolon® AR bronze 8850	50	50	50	50	50			

### Available sizes:

Makrolon® AR is available in thicknesses of 3 – 15 mm and in the following sizes; other sizes, colors and sheet thicknesses on request.

### Colors:

Makrolon® AR clear 8099  
Makrolon® AR bronze 8850

### Sizes:

3,000 x 2,000 mm  
3,000 x 2,000 mm

### Permanent Service Temperature:

The permanent service temperature without load is approx. 120°C.

### Fire Rating (\*):

Country	Standard	Rating	thickness	Colour
Germany	DIN 4102	B 2	3 – 12 mm	clear 8099
USA	UL 94	V2 HB V0	0,75 - 1,4 mm ≥ 1,5 mm ≥ 10 mm	all colours all colours clear 8099

(\*): Fire certificates are limited in time and scope, always check if the mentioned certificate is valid for the purchased Polycarbonate sheet type at the date of delivery. Polycarbonate sheets may change their fire behavior due to ageing and weathering. The indicated fire rating was tested on new / unweathered Product in accordance with the indicated fire classification standards.

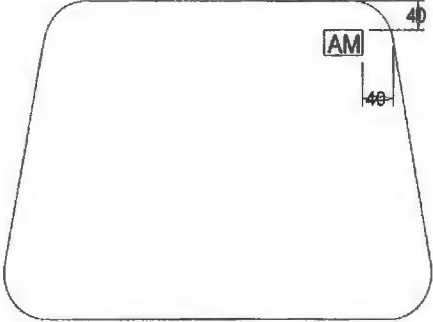


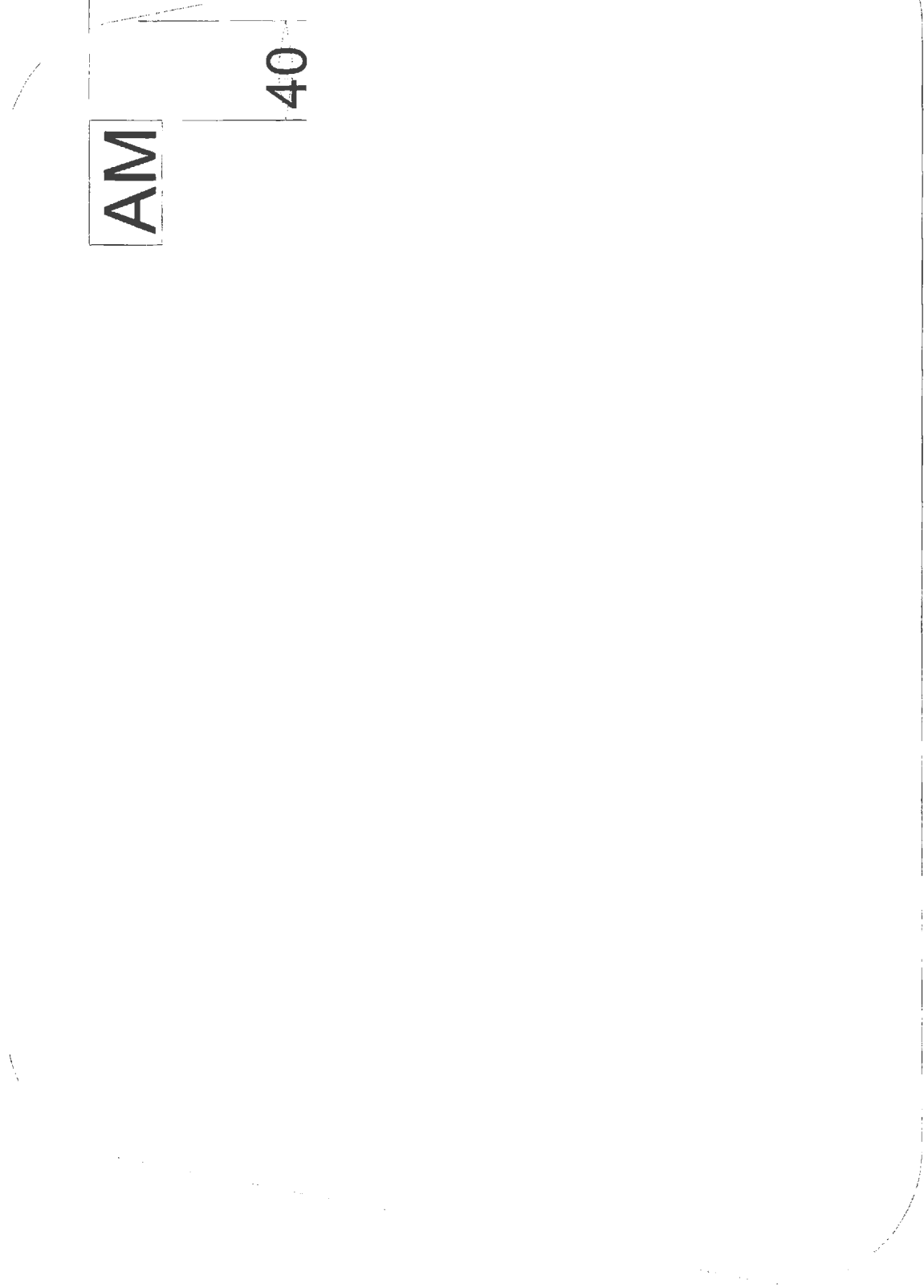
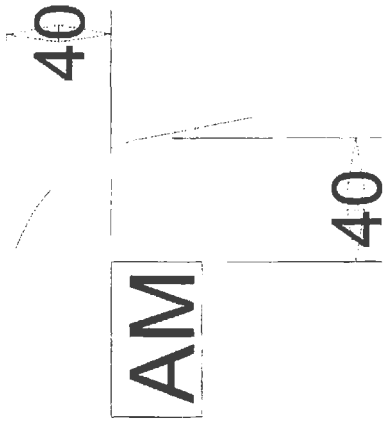
Covestro Deutschland AG  
Business Unit Polycarbonates  
51365 Leverkusen  
Germany

www.sheets.covestro.com  
sales.sheetsEMFA@covestro.com

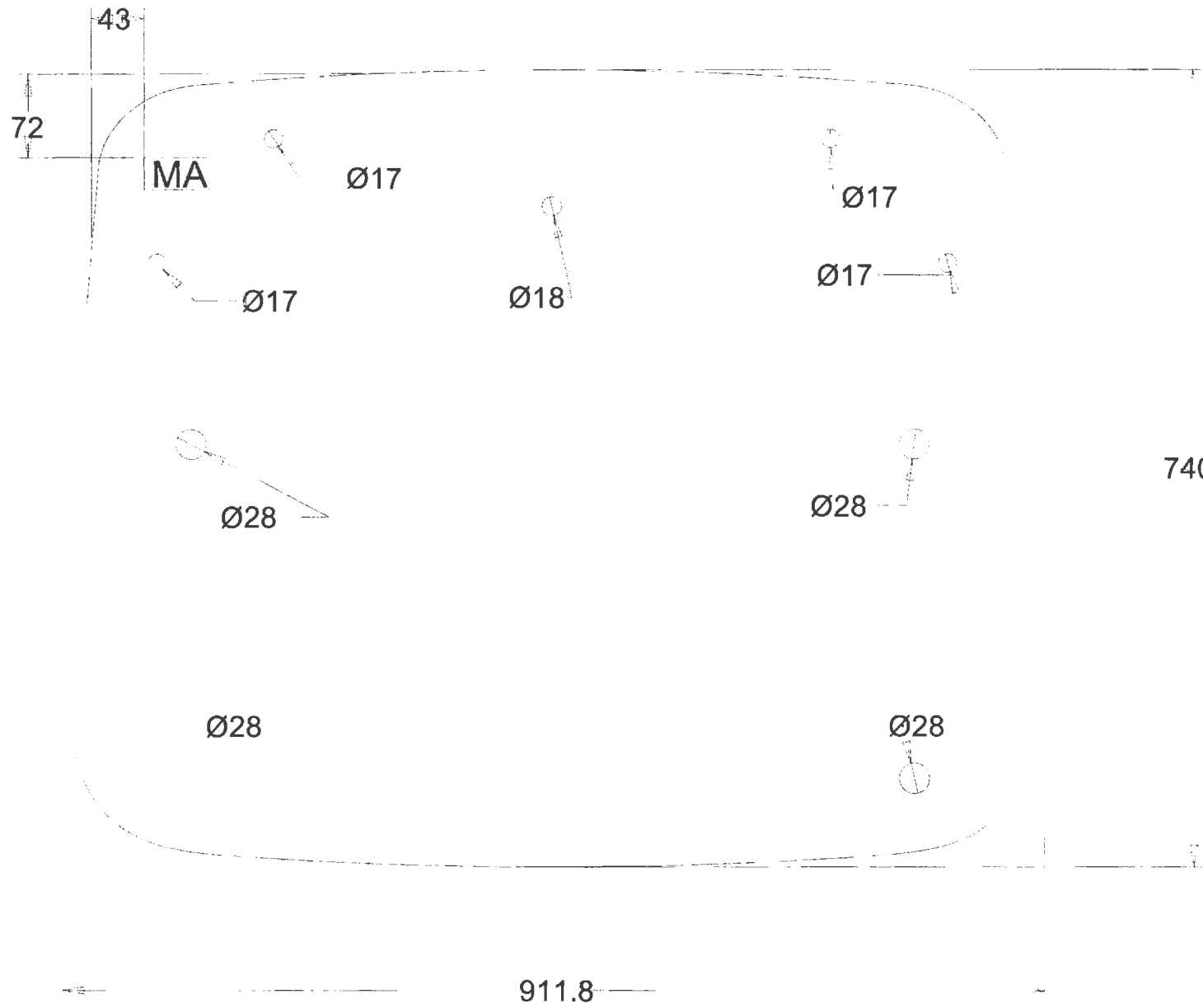
The manner in which you use and the purpose to which you put and utilize our products, technical assistance and information (whether verbal, written or by way of production evaluations), including any suggested formulations and recommendations, are beyond our control. Therefore, it is imperative that you test our products, technical assistance, information and recommendations to determine to your own satisfaction whether our products, technical assistance and information are suitable for your intended uses and applications. This application-specific analysis must at least include testing to determine suitability from a technical as well as health, safety, and environmental standpoint. Such testing has not necessarily been done by Covestro. Unless we otherwise agree in writing, all products are sold strictly pursuant to the terms of our standard conditions of sale which are available upon request. All information and technical assistance is given without warranty or guarantee and is subject to change without notice. It is expressly understood and agreed that you assume and hereby expressly release us from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance, and information. Any statement or recommendation not contained herein is unauthorized and shall not bind us. Nothing herein shall be construed as a recommendation to use any product in conflict with any claim of any patent relative to any material or its use. No license is implied or in fact granted under the claims of any patent.

Makrolon® is a registered trademark of Covestro AG

SAINT-GOBAIN SEKURIT		Technical Product Sheet			ST-PRO-1165 Rev: 04		Date: 22/09/2011		
Customer: CNH			Cabin: CABIN MANDRIANO APH						
Project: UNMOVABLE HATCH			POLYCARBONATE shaped outside with internal marking						
<b>1.0 Product description:</b>									
Code:	Assembling side	Colour:	Thickness:	Customer's drawing n.	Rev.:	Date:			
0125		clear 8099	8	84297668	A	23/12/09			
Manufacturing and control grid					GC PRO 001		Assembly type:		SEALS ON CABIN
					Reference specifications:				
<b>2.0 Product size:</b>									
	Original	Finished				Vertical lowering max [mm]:			
Width [mm]:	800	670				Range of curvature [mm]			
height [mm]:	500	442				Position from the upper edge [mm]			
Surface [m <sup>2</sup> ]	0,40	0,30				Fragmentation point [mm]			
Weight [kg]	1,6	1,2							
Exemplary sketch view: external side of the car						Marking Code:			
 <p>the mark can be read from the inside of the car</p>									
<p><b>N.B:</b>The mark must be HOT-WIRE WITH A SPECIAL PRINTER before being sent to the customer packed in the pre-assembly area, the protective film must be lifted before marking and then placed before packing.</p>									
<b>3.0 Texture:</b>									
Type:	Not sharp edges	Size control equipment: POLYCARBONATE SAMPLE			Flat glass dimensional tolerance: ± 0,5 mm radial respect the sample glass				
<b>4.0 Puncture:</b>									
Ø - Holes: NO			Hole position tolerance:						
Flaring:			Control equipment:						
<b>5.0 Silk-screen printing:</b>									
<b>5.1 Decoration 1:</b>			<b>5.2 Decoration 2:</b>			<b>5.3 Heating circuit:</b>			
Side to be silk-screen printed:		NO	Side to be silk-screen printed:		NO	Side to be silk-screen printed: NO			
Colour:			Colour:			Voltage [V]:			
Code frame :			Code frame:			Resistance [Ω]:			
Paint:			Paint:			Pitch:			
Glass edge distance:			Glass edge distance:			Connectors:			
<b>5.4 Approval mark:</b>									
Side to be marked:		INSIDE			Legible mark:		INSIDE		
Mark Code:		Colour: clear			Tolerance from mark position:		± 5 mm		
<b>6.0 Tamper/Control:</b>									
Production furnace:			Tolerance width:						
Test equipment:			Tolerance height:						
Control position:			Curvature:						
Control instruction:			Bulge:						
Tamponing:			Increase/100 mm :						
Blowing:			Maximal depth:						
<b>7.0 Packaging:</b>									
ST-IMB- 462									
<b>8.0 Upgrades:</b>									
Rev.:	Date:	Edits description:							
0	05/11/2012	FIRST EMISSION: issued code 0125 for the internal marking of outside shaped polycarbonate							
Date Issue:		Written by:			Verified by:				
05/11/2012		Olivero Marco			Osella Luigi				



SAINT-GOBAIN SEKURIT		Technical Product Sheet		ST-PRO-1215		Date:	
Customer: SAME		Cabin: D2L		Rev: 05		18/02/2013	
Project: OPENING HATCH FOPS		POLYCARBONATE shaped outside with internal marking					
<b>Product description:</b>							
Code:	Assembling side	Colour:	Thickness:	Customer's drawing n.	Rev.:	date:	
01/2 95M		CLEAR 8099	8	0.021.2673.0 (WITHOUT MARK)		20/01/2014	
01/2 95M		CLEAR 8099	8	0.021.2673.0 (WITH MARK)		20/01/2014	
Manufacturing and control grid		GC PRO 001		Assembly type:			
				Reference specifications:			
<b>Product size:</b>							
Width [mm]:	Original	Finished	Vertical lowering max [mm]:				
height [mm]:	911,8	911,8	Range of curvature [mm]				
Surface [m <sup>2</sup> ]	740,6	740,6	Position from the upper edge [mm]				
Weight [kg]	0,68	0,68	Fragmentation point [mm]		POINT 3 (glass center)		
	4,0	3,0					
<b>Exemplary sketch view: internal side of the car</b>						<b>Marking Code</b>	
<p>the mark can be read from the inside of the car</p>							
<b>B: The mark must be HOT-WIRE WITH A SPECIAL PRINTER before being sent to the customer packed in the pre-assembly area, the protective film must be lifted before marking and then placed before packing</b>							
Type:	Not sharp edges	Size control equipment: POLYCARBONATE SAMPLE		Flat glass dimensional tolerance: ± 0,5 mm radial respect the sample glass			
<b>Puncture:</b>							
Ø - Holes:		N°4 punctures d.17 +/-0,5mm N°4 punctures d.28 +/-0,5 mm N°1 puncture d.18 +/- 0,5 mm		Hole position tolerance: ± 1 mm			
Flaring:		NO		Control equipment: SAMPLE			
<b>5.1 Decoration 1:</b>		<b>5.2 Decoration 2:</b>		<b>5.3 Heating circuit:</b>			
Side to be silk-screen printed:		NO		Side to be silk-screen printed:		NO	
Colour:				Colour:			
Code frame:				Code frame:			
Paint:				Paint:			
Glass edge distance				Glass edge distance:			
<b>5.4 Approval mark:</b>							
Side to be marked:		INSIDE		Legible mark:		INSIDE	
Mark Code:		Colour: CLEAR		Tolerance from mark position:		± 5 mm	
<b>Control:</b>							
Production furnace:				Tolerance width:		0/- 2 mm radial	
Test equipment:				Tolerance height:		0/- 2 mm radial	
Control position:				Curvature:			
Control instruction:				Bulge:			
Tamponing:				Planarità :			
Blowing:				Maximal depth:			
<b>7.1 ST-IMB-</b>		<b>7.2 Label:</b>		<b>7.3 Label position:</b>			
ST-IMB-531							
<b>Rev.:</b>							
Rev.: 0		Date: 20/01/2014		Edits description: FIRST EMISSION			
Date Issue: 20/01/2014		Written by: Olivero Marco		Verified by: Osella Luigi			



## Certificate of Conformity

**Date of production** : 29-04-2018  
**Customer** : Tüv Rheinland, Nederland  
**Customer reference** : PO 1130088 / VO 180063  
  
**PC base material** : Lexan 3 mm, transparent, Color 112  
**PC Lot number** : 6534555  
  
**Coating type** : AS4000S/SHP401  
**Coating applied on** : Both sides  
**Coated Lot Number** : EPO180926

## Properties

Description	Unit	Result	Test Method
Coating thickness	[micron]	5 – 10	Zeiss MCS-Spectroscopy
Coating adhesion <sup>1</sup>		GT-0	DIN 53151/ISO 2409
Taberhaze	[%]	0 - 10	ASTM D1044/D1003
Visual aspect <sup>2</sup>		OK	Visual

<sup>1</sup> : GT-0 reflects 100 % adhesion, no failure.

<sup>2</sup> : Inspection with the human eye, at arm length distance

The coating AS4000S has been applied on both sides in an industrial flow coating process.  
Curing time of the coating is minimum 30 minutes @ 130 °C.

**Nanogate Eurogard Systems / Quality Department**

Date: 05-10-2018

**Erik van Extel**  
Quality Manager

**nanogate**

