HUNTSMAN

Enriching lives through innovation

Advanced Materials

Araldite® 2011

Structural Adhesives

TECHNICAL DATA SHEET

Araldite® 2011
Two component epoxy adhesive

Key properties

- **Multi purpose**
- **Long working life**
- **Low shrinkage**
- **Good resistance to dynamic loading**
- **Bonds a wide variety of materials in common use**

Description

Araldite® 2011 is a multipurpose, two component, room temperature curing adhesive of high strength and toughness. It is suitable for bonding a wide variety of metals, ceramics, glass, rubber, rigid plastics and most other materials in common use. It is a versatile adhesive for the craftsman as well as most industrial applications.

Product data

	2011/A	2011/B	2011 (mixed)
*Colour - visual (A112)**	*Neutral*	*pale yellow*	pale yellow
Specific gravity	ca. 1.15	ca. 0.95	ca. 1.05
*Viscosity at 25°C (Pas) (A191)**	*30-50*	*20-35*	30-45
Pot Life (100 gm at 25°C)	-	-	ca. 100 minutes
*Lap shear strength at 23°C (A501)**	-	-	*> 19 MPa*

** Specified data are on a regular basis analysed. Data which is described in this document as 'typical' is not analysed on a regular basis and is given for information purposes only. Data values are not guaranteed or warranted unless if specifically mentioned.*

Processing

Pretreatment

The strength and durability of a bonded joint are dependant on proper treatment of the surfaces to be bonded.
At the very least, joint surfaces should be cleaned with a good degreasing agent such as acetone, iso-propanol (for plastics) or other proprietary degreasing agents in order to remove all traces of oil, grease and dirt.
Low grade alcohol, gasoline (petrol) or paint thinners should never be used.
The strongest and most durable joints are obtained by either mechanically abrading or chemically etching (“pickling”) the degreased surfaces. Abrading should be followed by a second degreasing treatment.

Mix ratio	Parts by weight	Parts by volume
Araldite® 2011/A	100	100
Araldite® 2011/B	80	100

Araldite® 2011 is available in cartridges incorporating mixers and can be applied as ready to use adhesive with the aid of the tool recommended by Huntsman Advanced Materials.

Application of adhesive

The resin/hardener mix may be applied manually or robotically to the pretreated and dry joint surfaces. Huntsman's technical support group can assist the user in the selection of an suitable application method as well as suggest a variety of reputable companies that manufacture and service adhesive dispensing equipment.
A layer of adhesive 0.05 to 0.10 mm thick will normally impart the greatest lap shear strength to the joint. Huntsman stresses that proper adhesive joint design is also critical for a durable bond. The joint components should be assembled and secured in a fixed position as soon as the adhesive has been applied.
For more detailed explanations regarding surface preparation and pretreatment, adhesive joint design, and the dual syringe dispensing system, visit www.araldite2000plus.com.

Equipment maintenance

All tools should be cleaned with hot water and soap before adhesives residues have had time to cure. The removal of cured residues is a difficult and time-consuming operation.
If solvents such as acetone are used for cleaning, operatives should take the appropriate precautions and, in addition, avoid skin and eye contact.

Typical times to minimum shear strength

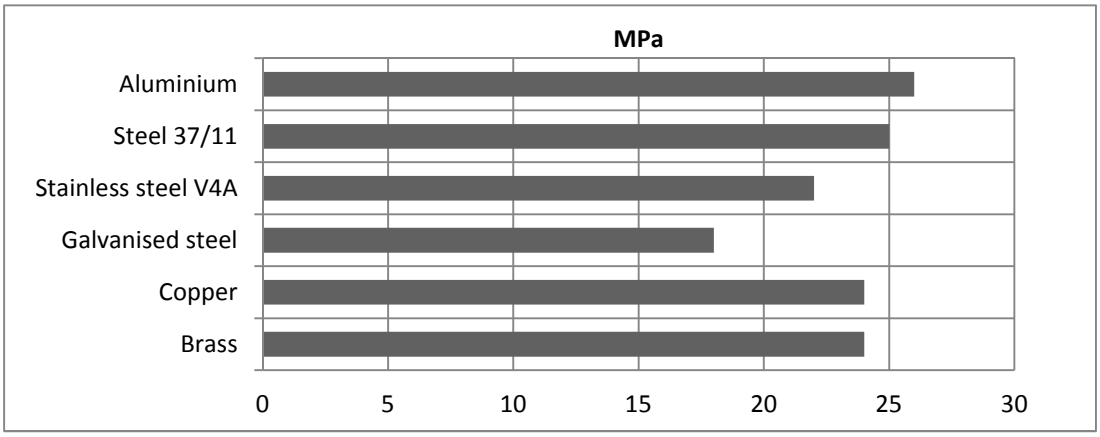
Temperature	°C	10	15	23	40	60	100
Cure time to reach	hours	24	12	7	2	-	-
LSS > 1MPa	minutes	-	-	-	-	30	6
Cure time to reach	hours	36	18	10	3	-	-
LSS > 10MPa	minutes	-	-	-	-	45	7

LSS = Lap shear strength.

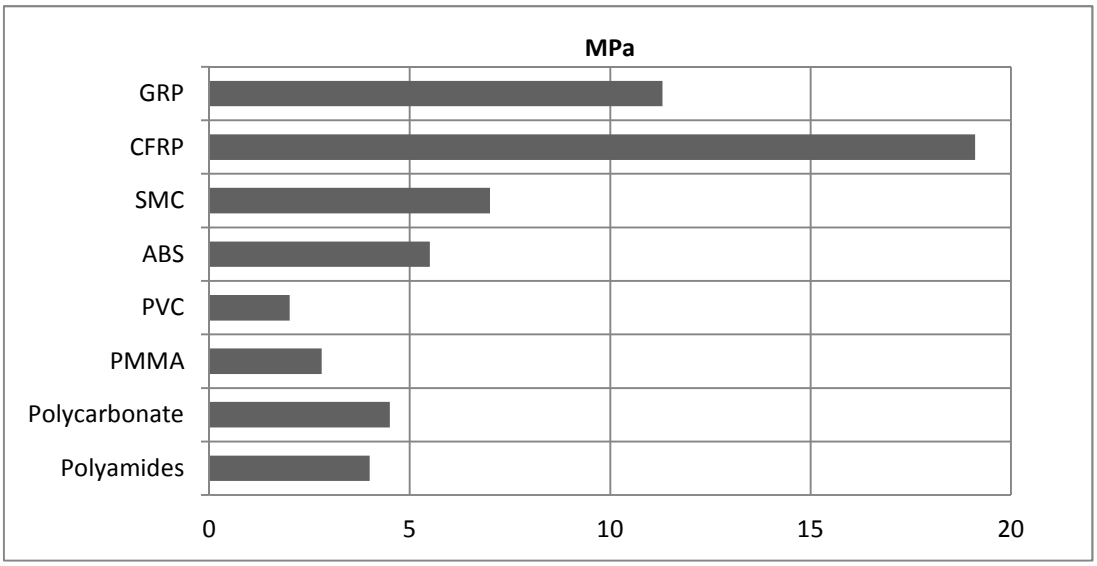
Typical cured properties

Unless otherwise stated, the figures given below were all determined by testing standard specimens made by lap-jointing 114 x 25 x 1.6 mm strips of aluminium alloy. The joint area was 12.5 x 25 mm in each case.
The figures were determined with typical production batches using standard testing methods. They are provided solely as technical information and do not constitute a product specification.

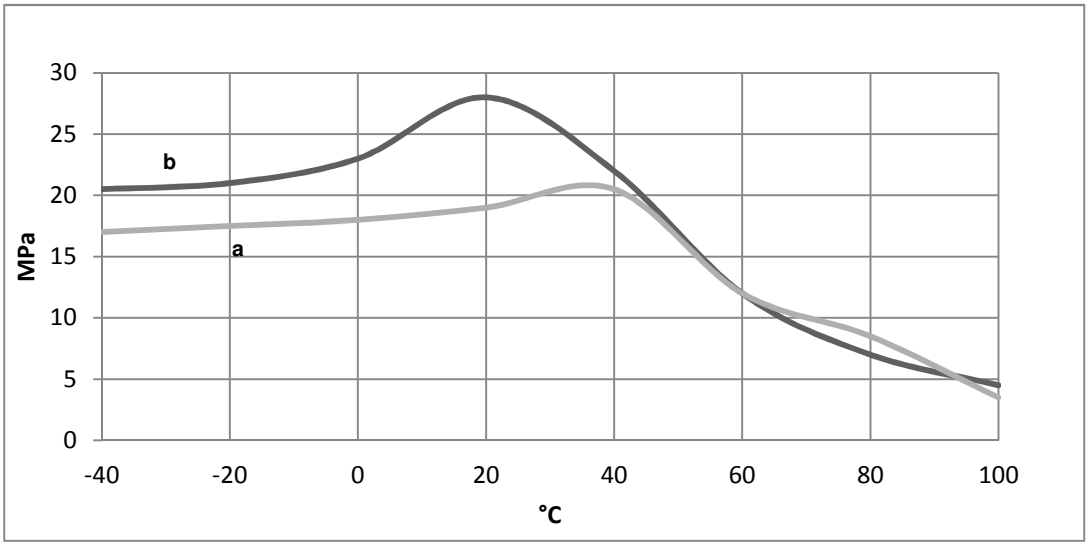
Average lap shear strengths of typical metal-to-metal joints (ISO 4587) (typical average values)
Cured for 16 hours at 40°C and tested at 23°C
Pretreatment - Sand blasting



Average lap shear strengths of typical plastic-to-plastic joints (ISO 4587) (typical average values)
Cured for 16 hours at 40°C and tested at 23°C
Pretreatment - Lightly abrade and alcohol degrease.



Lap shear strength versus temperature (ISO 4587) (typical average values)
Cure: (a) = 7 days /23°C; (b) = 24 hours/23°C + 30 minutes/80°C



Roller peel test (ISO 4578)(typical average values) - Cure : 16 hours/40°C	5 N/mm
Shore Hardness (typical average value) – cure 16 hours/40°C	D 74
Glass transition temperature (typical average values) - Cure : 16 hours/40°C	ca. 45°C
Thermal conductivity (ISO 8894/90) (typical average values) Cure : 20 minutes/100°C - Test: At 23°C	0.22W/mK

Electrolytic corrosion (DIN 53489) (cure 16hrs at 40°C or 20 mins at 100°C)
Test: 4 days in a conditioning chamber in 40/92 climate as specified by DIN 50015

Rating according to specified standard	A -A/B 1,2

Minimum dielectric strength at 50 Hz, 24°C (VSM 77170) (typical average values)

Instantaneous value	25-27 kV/mm
1-minute value	22-24 kV/mm

Water vapour permeability (NF 41001) (typical average values)
(38°C, 90% rh) Cure : 5 days/23°C

Test on a 1mm thick film	16g/m2/24 hours

Water absorption (ISO 62-80) (typical average values)

24 hours at 23°C	0.8%
30 mins at 100°C	1.3%

Shear modulus (DIN 53445) (typical average values) Cure : 16 hours/40°C

-50°C	-	1.5GPa
0°C	-	1.2GPa
50°C	-	0.2GPa
100°C	-	7.0MPa

Flexural Properties (ISO 178) (typical average values)
Cure 16 hours/ 40ºC - tested at 23ºC

Flexural Strength	60 MPa
Flexural Modulus	1900 MPa

Additional electrical properties

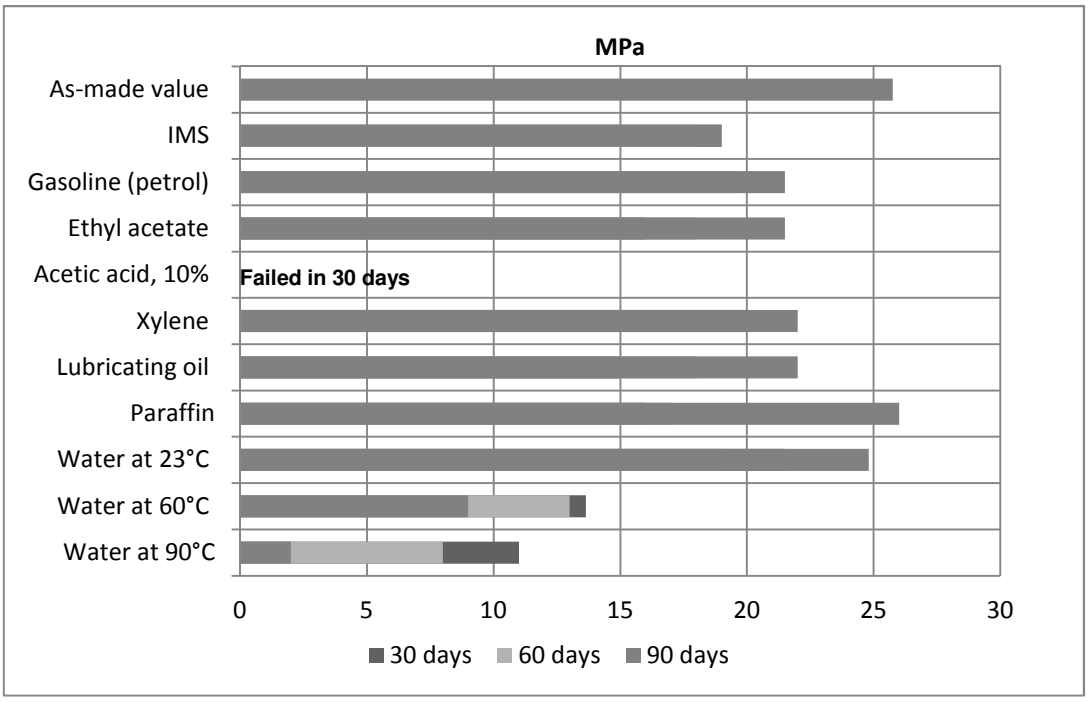
Properties	Test values	Test methods
Dielectric strength (Volt/mil)	400	ASTM D-149
Surface resistivity (Ohm)	1.2 E+16	IEC 60093
Volume resistivity (Ohm-cm)	7.1 E+14	IEC 60093
Dielectric constant at 50Hz/1kHz/10kHz	3.4/ 3.2/ 3.2	IEC 60250
Loss tangent, % at 50Hz/1kHz/10kHz	1.7/ 1.8/ 2.6	IEC 60250

Fatigue test on simple lap joints (DIN 53285) (typical average values)
Cure: 20 minutes/100°C Mean static lap shear strength: 16.3 MPa
Test carried out using a load cycle frequency of 90 Hz.

Fluctuating load as % of static shear strength	No. of load cycles to joint failure
30	10^5 - 10^6
20	10^6 - 10^7
15	> 10^7

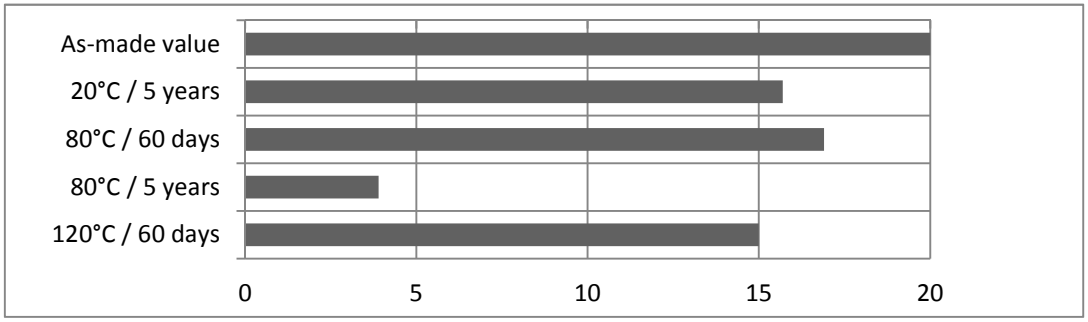
Lap shear strength versus immersion in various media at 23°C (typical average values)

Cure 16 hours at 40 °C



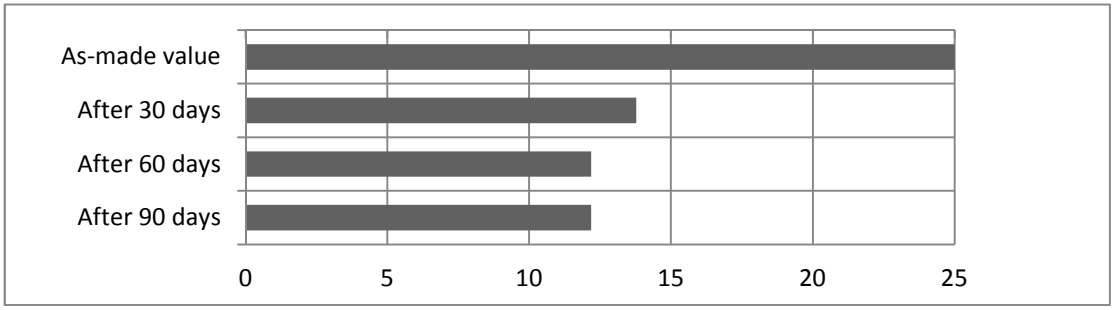
Lap shear strength versus heat ageing (typical average values)

Cure: 16 hours/40°C Test: at 23°C, 50% rh



Lap shear strength versus tropical weathering (40/92, DIN 50015) (typical average values)

Cure:16 hours/40°C - Test at 23°C.



HUNTSMAN

Enriching lives through innovation

Storage

Araldite® 2011/A and Araldite® 2011/B must be stored at room temperature and the components must be stored in sealed containers. The expiry date is indicated on the label.

Handling precautions

Caution

Our products are generally quite harmless to handle provided that certain precautions normally taken when handling chemicals are observed. The uncured materials must not, for instance, be allowed to come into contact with foodstuffs or food utensils, and measures should be taken to prevent the uncured materials from coming in contact with the skin, since people with particularly sensitive skin may be affected. The wearing of impervious rubber or plastic gloves will normally be necessary; likewise the use of eye protection. The skin should be thoroughly cleansed at the end of each working period by washing with soap and warm water. The use of solvents is to be avoided. Disposable paper - not cloth towels - should be used to dry the skin. Adequate ventilation of the working area is recommended. These precautions are described in greater detail in the Material Safety Data sheets for the individual products and should be referred to for fuller information.

Huntsman Advanced Materials
(Switzerland) GmbH
Klybeckstrasse 200
4057 Basel
Switzerland

Tel: +41 (0)61 299 11 11
Fax: +41 (0)61 299 11 12

www.huntsman.com/advanced_materials
Email: advanced_materials@huntsman.com

Huntsman Advanced Materials warrants only that its products meet the specifications agreed with the user. Specified data are analysed on a regular basis. Data which is described in this document as 'typical' or 'guideline' is not analysed on a regular basis and is given for information purposes only. Data values are not guaranteed or warranted unless if specifically mentioned.

The manufacture of materials is the subject of granted patents and patent applications; freedom to operate patented processes is not implied by this publication.

While all the information and recommendations in this publication are, to the best of Huntsman Advanced Material's knowledge, information and belief, accurate at the date of publication, **nothing herein is to be construed as a warranty, whether express or implied, including but without limitation, as to merchantability or fitness for a particular purpose**. **In all cases, it is the responsibility of the user to determine the applicability of such information and recommendations and the suitability of any product for its own particular purpose.**

The behaviour of the products referred to in this publication in manufacturing processes and their suitability in any given end-use environment are dependent upon various conditions such as chemical compatibility, temperature, and other variables, which are not known to Huntsman Advanced Materials. It is the responsibility of the user to evaluate the manufacturing circumstances and the final product under actual end-use requirements and to adequately advise and warn purchasers and users thereof.

Products may be toxic and require special precautions in handling. The user should obtain Safety Data Sheets from Huntsman Advanced Materials containing detailed information on toxicity, together with proper shipping, handling and storage procedures, and should comply with all applicable safety and environmental standards.

Hazards, toxicity and behaviour of the products may differ when used with other materials and are dependent on manufacturing circumstances or other processes. Such hazards, toxicity and behaviour should be determined by the user and made known to handlers, processors and end users.

Except where explicitly agreed otherwise, the sale of products referred to in this publication is subject to the general terms and conditions of sale of Huntsman Advanced Materials LLC or of its affiliated companies including without limitation, Huntsman Advanced Materials (Europe) BVBA, Huntsman Advanced Materials Americas Inc., Huntsman Advanced Materials (UAE) FZE, Huntsman Advanced Materials (Guangdong) Company Limited, and Huntsman Advanced Materials (Hong Kong) Ltd.

Huntsman Advanced Materials is an international business unit of Huntsman Corporation. Huntsman Advanced Materials trades through Huntsman affiliated companies in different countries including but not limited to Huntsman Advanced Materials LLC in the USA and Huntsman Advanced Materials (Europe) BVBA in Europe.

All trademarks mentioned are either property of or licensed to Huntsman Corporation or an affiliate thereof in one or more, but not all, countries.

Copyright © 2014 Huntsman Corporation or an affiliate thereof. All rights reserved