HUNTSMAN

Enriching lives through innovation

Advanced Materials

Araldite® 2019

Structural Adhesives

Araldite® 2019 (Araldite® AW 4859 / Hardener HW 4859)
Two component epoxy adhesive system

Key properties

- **Very high lap shear**
- **Bonds a wide variety of materials (metal, composite and thermoplastics)**
- **Temperature resistant up to 140°C**
- **Extremely tough and resilient adhesive**
- **Contains spacers to ensure a minimum bond line thickness of 0.05 mm**

Description

Araldite® 2019 is a two-component, epoxy adhesive paste of high strength and toughness. Performances can be enhanced by post-curing at elevated temperature. It has been designed to perfectly bond onto composites, especially CFRP but it is suitable for bonding a wide variety of metals, ceramics and many other substrates in common use.

Product data

Property	Araldite® AW 4859	Hardener HW 4859	Araldite® 2019
*Appearance - visual (A112)**	*Black paste*	*Yellowish paste*	*Black paste*
Specific gravity	1.2	1.0	approx. 1.1
*Viscosity at 25°C (Pa.s) (A191)**	*200 - 250*	*15 - 25*	thixotrope
*Lap shear strength at 23°C (A501)**	-	-	*> 25 MPa*
Pot Life (100 gm at 25°C)	-	-	100 -120 min

** 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 dependent 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® AW 4859	100	100
Hardener HW 4859	43	50

The resin and hardener should be blended until they form a homogeneous mix.
Araldite® 2019 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 is applied with a spatula, to the pretreated and dry joint surfaces.
A layer of adhesive 0.05 to 0.10 mm thick will normally impart the greatest lap shear strength to the joint. The adhesive contains spacers to ensure a minimum bond line thickness of 0.05 mm.
If possible, the adhesive should be applied on both substrates and the joint components must be assembled and clamped as soon as the adhesive has been applied.
For bond line thicknesses below 0.5 mm, the components must be assembled within 60 minutes after the application of the adhesive, for higher bond line thicknesses the components must be assembled within 30 minutes after application of the adhesive.
An even contact pressure throughout the joint area will ensure optimum cure.

Mechanical processing

Specialist firms have developed metering, mixing and spreading equipment that enables the bulk processing of adhesive.
We will be pleased to advise customers on the choice of equipment for their particular needs.

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	23	40	60	100
Cure time to reach	hours	4.5			
LSS > 1 MPa	minutes		100	20	< 5
Cure time to reach	hours	6	2		
LSS > 10 MPa	minutes			30	10

LSS = Lap shear strength.

Curing requirements

To achieve optimum performance properties an elevated temperature cure or post cure is recommended. This adhesive will show good properties with a room temperature cure but will not fully cure at temperatures below 60°C.
Suggested cure schedules in order to improve the heat resistance of the adhesive are the following:

16 h at 40°C + 1 h at 80°C

3 h at 80°C

1 h at 130°C

30 min at 150°C

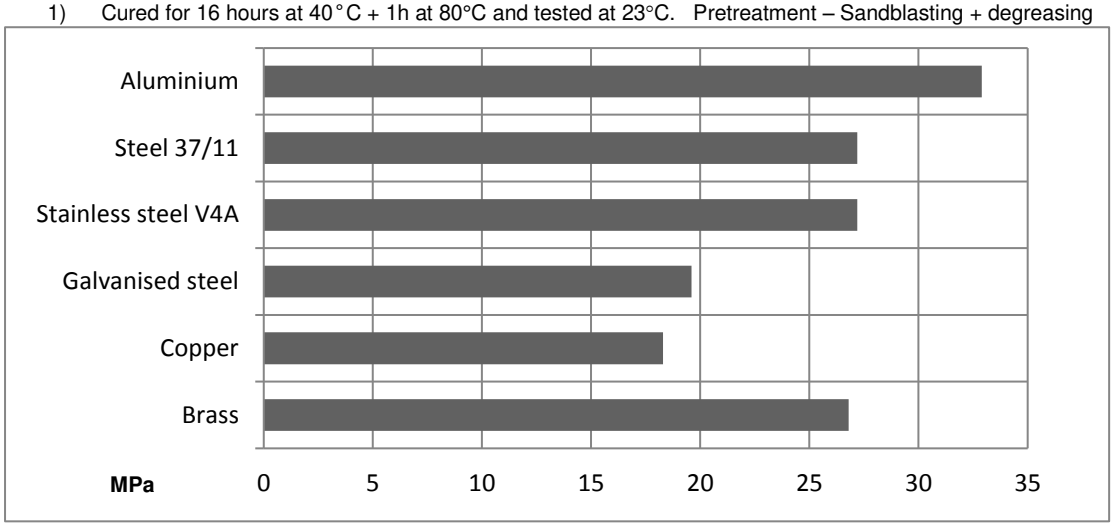
Typical cured properties

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.

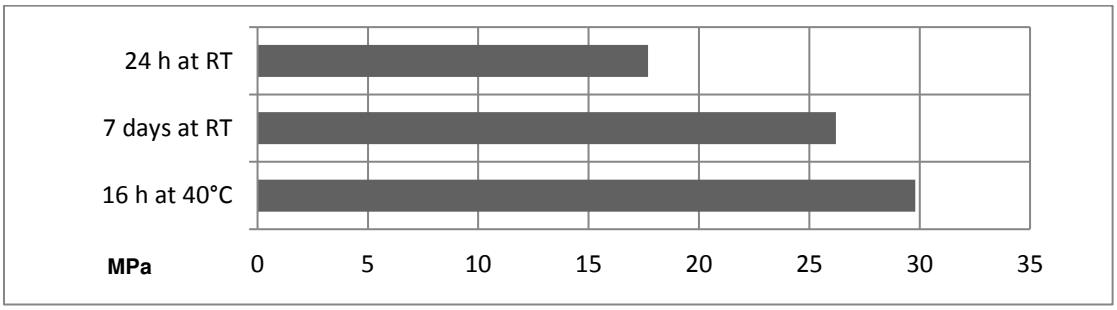
Note: The data in this edition is based on recent retesting of the product.

Average lap shear strengths of typical metal-to-metal joints (ISO 4587) (typical average values)

1) Cured for 16 hours at 40 °C + 1h at 80°C and tested at 23°C. Pretreatment – Sandblasting + degreasing

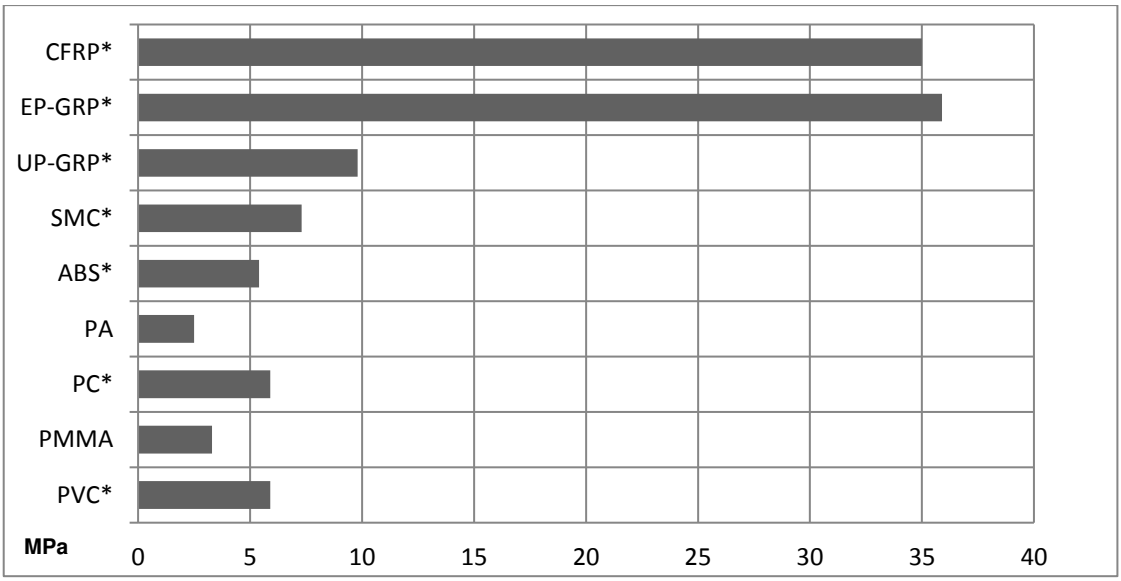


2) Other cure cycles, on aluminium and tested at 23°C. Pretreatment – Sandblasting + degreasing



Average lap shear strengths of typical plastic-to-plastic joints (ISO 4587) (typical average values)

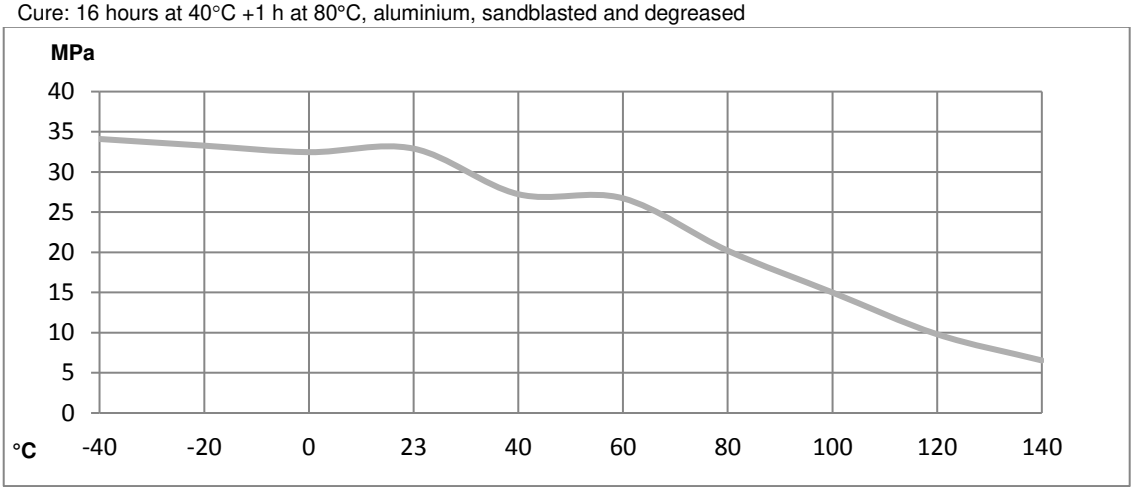
Cured for 16 hours at 40°C+ 1h at 80°C and tested at 23°C. Pretreatment - Lightly abraded and alcohol degreased.



* : substrate failure or substrate delamination

Lap shear strength versus temperature (ISO 4587) (typical average values)

Cure: 16 hours at 40°C +1 h at 80°C, aluminium, sandblasted and degreased



DSC Glass transition temperature (ISO 11357-2)

typical average values

Cure: 16 h / 40°C	60°C
Cure: 16 h / 40°C + 1 h / 80°C	81°C
Cure: 3 hour at 80°C	90°C
Cure: 1 / 130°C	102°C
Cure: 0,5 h / 150°C	99°C
Cure: 24 / RT + 2 h / 150°C	122°C

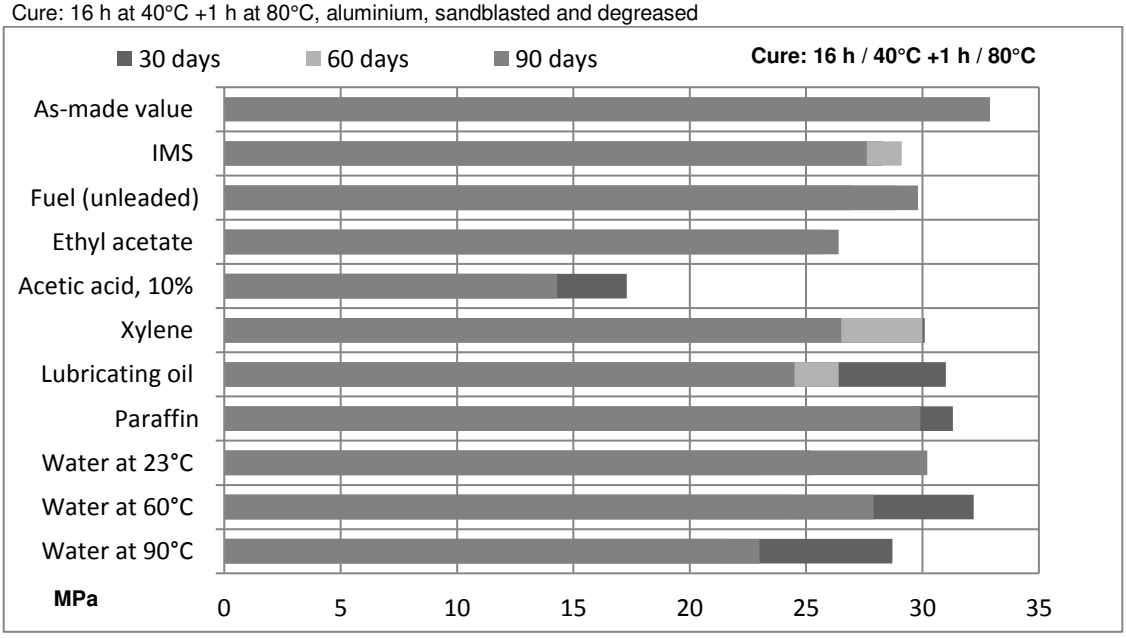
Roller peel test (ISO 4578) (typical average values)

On aluminium sandblasted, cured 16 h at 40°C	6 - 8 N/mm
On aluminium sandblasted, cured 16 h at 40°C + 4 h at 80°C	1 - 3 N/mm

Lap shear strength versus immersion in various media (ISO 4587) (typical average values)

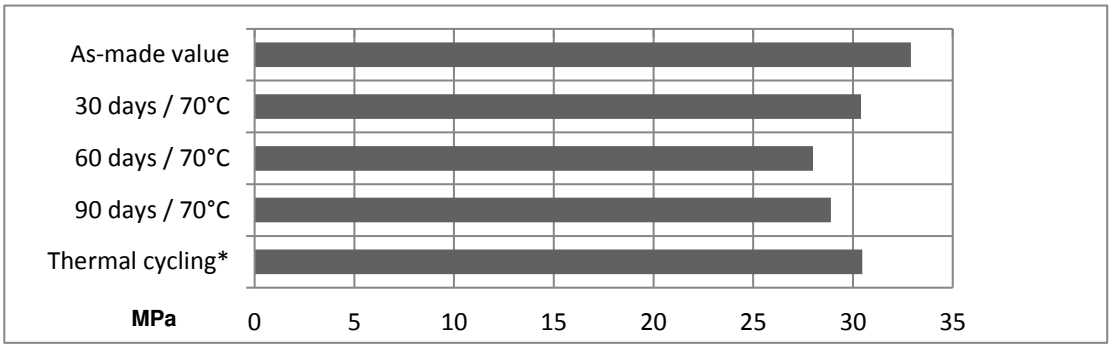
Unless otherwise stated, L.S.S. was determined after immersion for 30, 60 and 90 days at 23°C.

Cure: 16 h at 40°C +1 h at 80°C, aluminium, sandblasted and degreased



Lap shear strength versus heat ageing (ISO 4587) (typical average values)

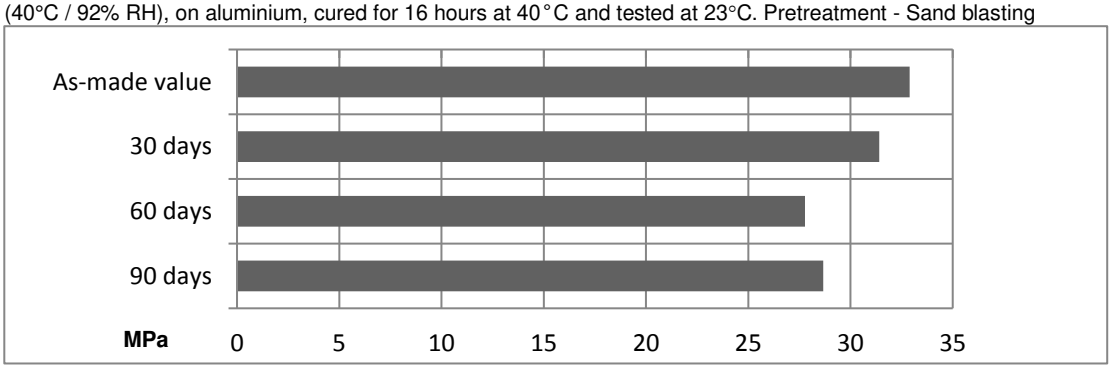
Cure: 16 h / 40°C + 1h / 80°C, on aluminium sandblasted and degreased, tested at 23°C



*25 cycles: -30°C to + 70°C

Lap shear strength versus tropical weathering (ISO 4587) (typical average values)

(40°C / 92% RH), on aluminium, cured for 16 hours at 40 °C and tested at 23°C. Pretreatment - Sand blasting



Mechanical properties (typical values)

Cure: 16 h / 40ºC + 1h at 80°C

Tensile strength at 23°C (ISO 527)	40 MPa
E-modulus	1600 MPa
Elongation at break	4.3 %
Flexural strength at 23°C (ISO 178)	65 MPa
Flexural modulus	1500 MPa
Shore Hardness (D scale) (ISO 868/03) tested at 23ºC, 50%RH	75 D
Bend notch test (ISO 13586) tested at 23ºC, 50%RH	K_{1c} = 1.7 MPa.m$^{1/2}$ G_{1c} = 1.9 kJ.m^{-2}
Shear modulus G' (ISO 6721)	-40°C - 1.3 GPa 0°C - 920 MPa 23°C - 800 MPa 60°C - 490 MPa 90°C - 60 MPa 140°C - 1.2 MPa

Storage

Araldite® 2019 (AW 4859 / HW 4859) must be stored at room temperature provided the components are 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.

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

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

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