

**Advanced Materials****ARALDITE® 2013-2 (ARALDITE® AV 144-3 / Hardener HV 997-1)****Structural Adhesives****PROVISIONAL TECHNICAL DATA SHEET****Two-component epoxy paste adhesive****Key properties**

- Metal coloured paste
- Sag resistant; suitable for vertical applications
- Good environmental and chemical resistance
- Bonds a wide variety of materials
- Heat resistance to 80°C

**Description**

ARALDITE® 2013-2 (bulk-pack reference: ARALDITE® AV 144-3 / Hardener HV 997-1) is a two component, room temperature curing, paste adhesive of high strength and toughness. It is sag resistant and offers good environmental and chemical resistance.

Although designed primarily for metal bonding, the adhesive is also suitable for bonding other materials such as, ceramics, glass, rubbers, rigid plastics and many other materials in common use.

**Product data**

| Property                | RESIN<br>ARALDITE® 2013-2 A<br>(AV 144-3) | HARDENER<br>ARALDITE® 2013-2 B<br>(HV 997-1) | MIXED ADHESIVE |
|-------------------------|---|--|----------------|
| Appearance (visual)     | Grey soft paste                           | Beige soft paste                             | Grey paste     |
| Specific gravity        | ca. 1.5                                   | ca. 0.9                                      | ca. 1.28       |
| Viscosity at 25°C       | 40 - 80                                   | Thixotropic                                  | Thixotropic    |
| Working time (10g) 23°C | -   | -  | Ca. 2 hours    |

*Data in this document shows 'typical' values 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 pretreatment of the surfaces to be bonded. At the very least, joint surfaces should be cleaned with a good degreasing agent such as methoxy propanol, acetone or other proprietary degreasing agents 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 prior to bonding.

| Mix ratio                     | Parts by weight | Parts by volume |
|-------------------------------|-----------------|-----------------|
| ARALDITE® 2013-2 A (AV 144-3) | 100             | 100             |
| ARALDITE® 2013-2 B (HV 997-1) | 60              | 100             |

**Application of adhesive**

The resin/hardener mix may be applied manually or using automated application to pretreated surfaces ready for bonding. Huntsman's technical support group can advise further on surface pre-treatments as well as suitable application methods and dispensing equipment.

An adhesive bond thickness of 0.1 to 0.30 mm will typically impart the greatest lap shear strength to a joint. Proper adhesive joint design and surface preparation is critical to produce a durable bond. The bonded components should be assembled and held in a fixed position as soon as the adhesive has been applied, at least until the handling strength is reached (handling strength considered as 1MPa lap shear strength – see table below).

For more information regarding surface preparation and pretreatment, adhesive joint design, dispensing systems and adhesive properties, visit [www.aralditeadhesives.com](http://www.aralditeadhesives.com) and download the Technical Guide for ARALDITE® Adhesives.

**Equipment maintenance**

Tools should be cleaned using a suitable solvent, such as methoxy propanol or acetone, before adhesive residues have had time to cure. Removal of cured residues with solvents is not possible, and mechanical abrasion must be used.

If solvents 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   | 22 | 10 | 6  | -   | -  | -   |
| LSS > 1MPa         | minutes | -  | -  | -  | 80  | 20 | 3   |
| Cure time to reach | hours   | 36 | 22 | 10 | -   | -  | -   |
| LSS > 10MPa        | minutes | -  | -  | -  | 130 | 35 | 5   |

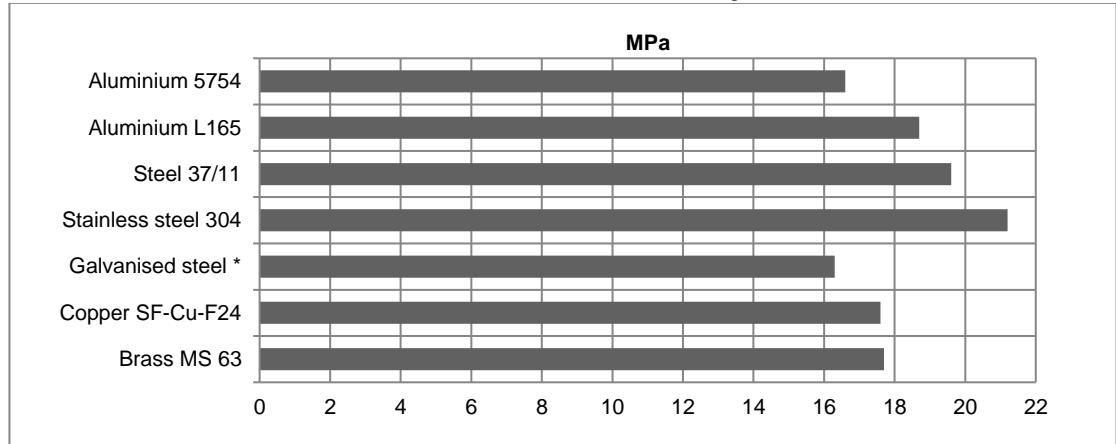
LSS = Lap shear strength.

**Typical cured properties**

The data shown below is provided solely as technical information and does not constitute a product specification. Unless otherwise stated, the figures given below were determined by testing standard specimens made by lap-jointing 100 x 25 x 1.6 mm strips of sandblasted aluminium alloy. The bond area was 12.5 x 25 mm, with bonded specimens cured under light clamping pressure. Lap shear testing was carried out at 23°C at 10mm/min unless otherwise stated.

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

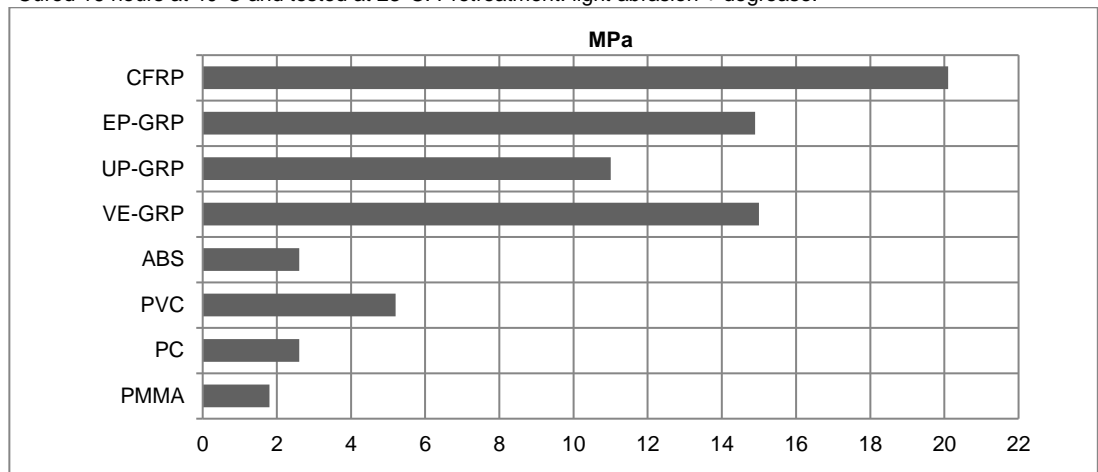
Cured 16 hours at 40°C and tested at 23°C. Pretreatment: sandblast + degrease



\* galvanised steel: degrease only

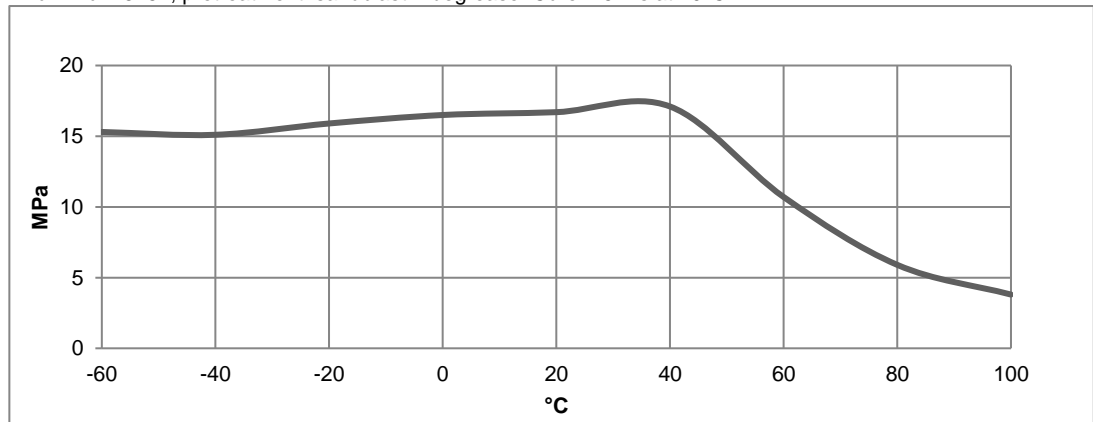
### Average lap shear strengths of typical plastic-to-plastic joints (ISO 4587; typical average values)

Cured 16 hours at 40°C and tested at 23°C. Pretreatment: light abrasion + degrease.



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

Aluminium 5754, pretreatment: sandblast + degrease. Cure: 16 hrs at 40°C



### DMA (Dynamic Mechanical Analysis ISO 6721; typical average values)

#### Cure a: 16 hours 40°C

|                     |          |
|---------------------|----------|
| Tg midpoint         | 64°C     |
| Shear modulus -40°C | 1807 MPa |
| Shear Modulus 23°C  | 1228 MPa |
| Shear Modulus 50°C  | 430 MPa  |
| Shear Modulus 75°C  | 16 MPa   |
| Shear Modulus 100°C | 14 MPa   |
| Shear Modulus 125°C | 15 MPa   |

### Tensile Properties (ISO 527; typical average values) Cure 16 hours at 40°C, tested at 23°C

|                     |          |
|---------------------|----------|
| Tensile modulus     | 2580 MPa |
| Tensile strength    | 36 MPa   |
| Elongation at break | 2.6 %    |

### Compressive Properties (ISO 604; typical average values) Cure 16 hours at 40°C, tested at 23°C

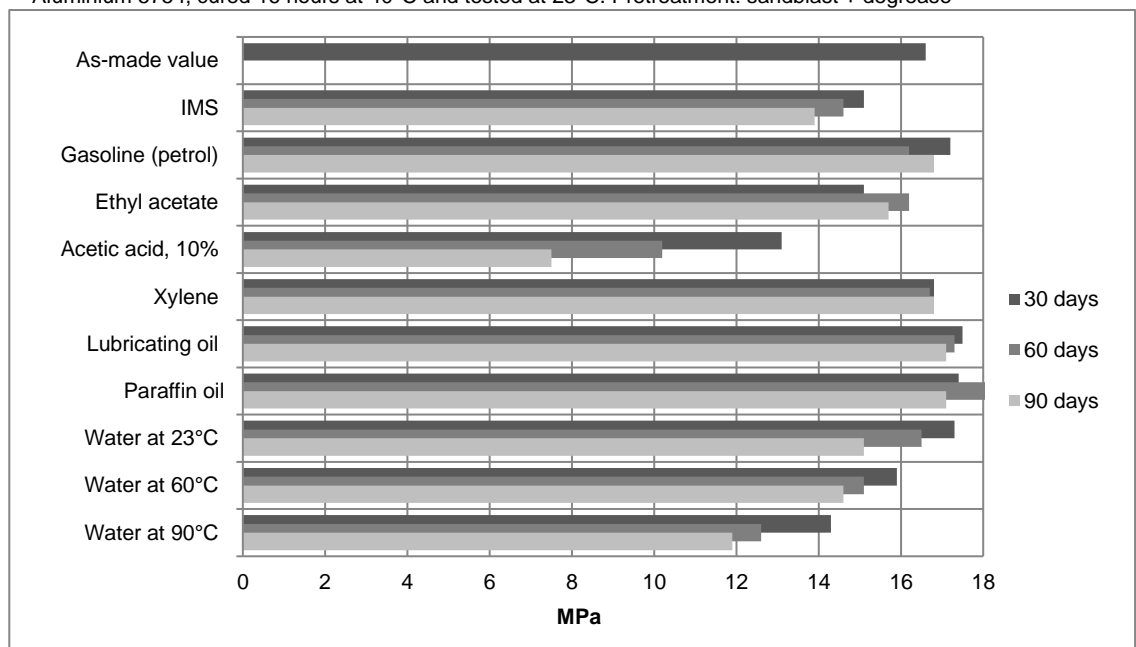
|                              |          |
|------------------------------|----------|
| Compressive modulus          | 2980 MPa |
| Maximum compressive strength | 85 MPa   |
| Strength at break            | 77 MPa   |

### Hardness (ISO 868; typical average values) Cure 16 hours at 40°C, tested at 23°C

|                  |    |
|------------------|----|
| Shore D hardness | 75 |
|------------------|----|

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

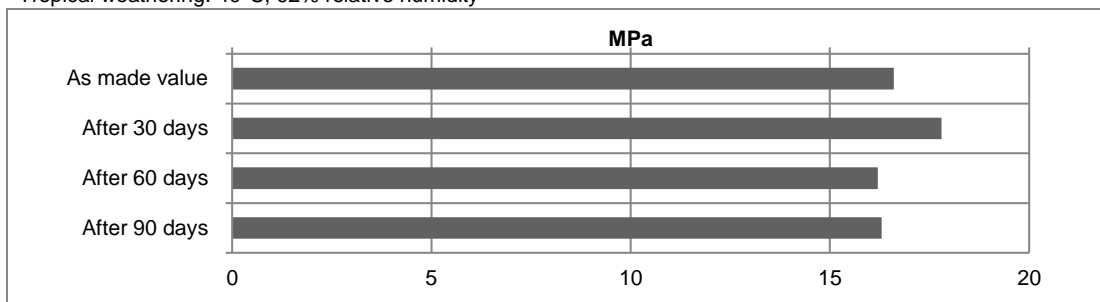
Aluminium 5754, cured 16 hours at 40°C and tested at 23°C. Pretreatment: sandblast + degrease



### Lap shear strength versus tropical weathering (DIN 50015; typical average values)

Aluminium 5754, cured 16 hours at 40°C and tested at 23°C. Pretreatment: sandblast + degrease

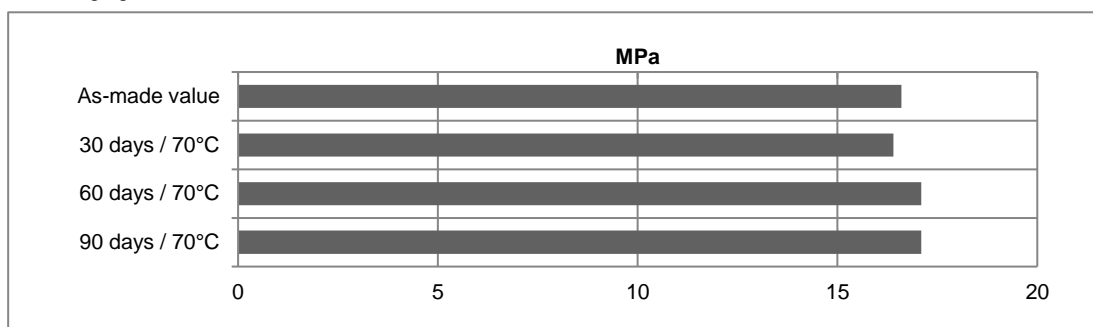
Tropical weathering: 40°C, 92% relative humidity



### Lap shear strength versus heat ageing at 70°C (ISO 4587; typical average values)

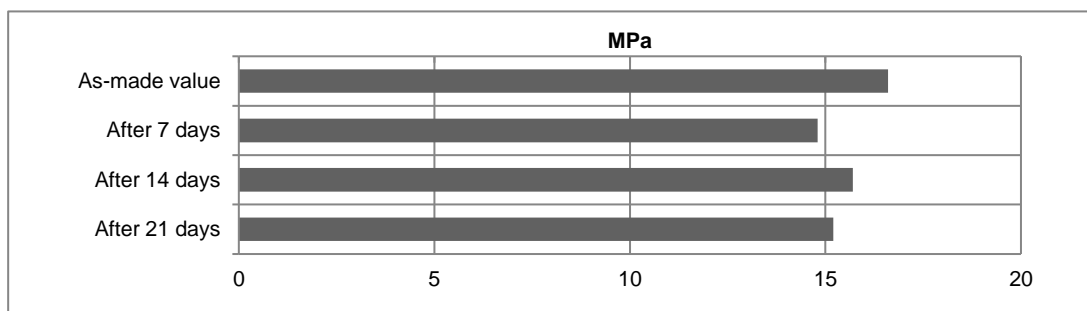
Aluminium 5754, cured 16 hours at 40°C and tested at 23°C. Pretreatment: sandblast + degrease

Heat ageing at 70°C



### Lap shear strength versus cataplasma ageing (ISO 9142 E2; typical average values)

Aluminium 5754, cured 16 hours at 40°C and tested at 23°C. Pretreatment: sandblast + degrease



**Storage**

ARALDITE® 2013-2 (AV 144-3 / HV 997-1) should be stored at room temperature in the original sealed containers, kept in a dry place protected from extremes of temperature and strong sunlight. The expiry date is indicated on the individual container labels.

**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 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.

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