



FORMEROL® F.10/SUGRU® TECHNICAL DATA SHEET

Sugru® is a product of FORMEROL® technology



**LET'S GET
TECHNICAL**



DESCRIPTION

- Room temperature curing hand mouldable glue
- Soft and flexible when cured
- Adheres to most materials
- Resistant to high and low temperatures
- Waterproof
- Thermal and electrical insulator

APPLICATIONS

- Fixing, adapting and creating. Great for DIY, Arts, Crafts and Prototyping
- Can be smoothed and textured
- Indoor or outdoor projects
- Creates flexible joints
- Vibration and shock protection

PROPERTIES

| FORMEROL® F.10 Technology Properties | Description |
|---|--|
| Material | RTV One-Part Moisture Curing Silicone Elastomer |
| Service Temperature Range | -50°C (-58°F) to 180°C (356°F) |
| Colour | Supplied in a range of colours. When uncured the colours can be mixed just like paint to make any colour. The colour is permanent when cured |
| Appearance | Supplied as uncured non-slumping putty in moisture proof packaging ready to be processed by extrusion, compression moulding or manual shaping at room temperature. Virtually zero shrinkage when cured |
| Work Time | Up to 30 minutes, at room temperature |
| Cure Time | Approximately 24 hour cure for the first 3 mm of depth at room temperature. eg. 3 mm cures ~ 24 hours, 5.5 mm cures ~ 48 hours, 8 mm cures ~ 72 hours. (Cure time is influenced by; area which is exposed to atmosphere, temperature and humidity) |
| Shelf Life | 13 month shelf life from the date of manufacture when stored at 21°C (70°F) in original unopened packaging |

| Cured Material | Resistance | Description |
|-----------------------|-------------------|---|
| Ozone/ UV-Resistance | Excellent | Slight fading after years in direct sunlight |
| Oxidation Resistance | Excellent | Resists chemical surface degradation caused by air |
| Moisture Resistance | Good | Waterproof (not impermeable) |
| Flame Resistance | Good | Does not readily combust when exposed to direct flame |

MECHANICAL & PHYSICAL PROPERTIES

| Properties | Industrial Standard | Typical Value for FORMEROL® F.10 | Test Unit Metric [Imperial] | Comparative Values Metric |
|--------------------------------------|---------------------|----------------------------------|--|---|
| Shore Hardness (cured) | BS EN ISO 868 | 70 | Shore A | Pencil Eraser ~ 40 Shoe Heel ~ 80 |
| Density | - | 1380 [86.15] | kg/m ³ [lb/ft ³] | Water ~ 1000 Sand ~ 1602 |
| Williams Plasticity Number (Uncured) | ASTM D926 | 155-180 | mm x 100 | Playdough ~ 111 Modelling Clay ~ 351 |
| Ultimate Tensile Strength | ASTM D638 | 1.6-2.2 [232-319] | MPa [psi] | Expanded Polystyrene (EPS) ~ 0.08 - 0.9 Polypropylene (PP) ~ 28 - 36 |
| Strain at Failure | ASTM D638 | 100 - 155 | % | Acrylic ~ 1.9 - 90 Butyl Rubber ~ 400 - 800 |
| Young's Modulus | ASTM D638 | 3.6-5.5 [522-798] | MPa [psi] | Polyurethane (PU) Thermal Insulating Foam ~ 1-2 Bath Sealant ~ 1 - 200 |
| Abrasion Resistance | ISO4649 Method A | 24 | ARI index % | FORMEROL® F.10 was tested against the standard reference compound (durable rubber) which has an ARI index of 100% |
| Thermal Conductivity | ASTM D5930 | 0.189 [1.31] | W/ mK BTU in / [hr ft ² F] | Neoprene Rubber ~ 0.08 Chalk ~ 1.72 |
| Electrical Resistivity - Surface* | BS903 | 1.40 x 10 ¹⁴ | Ohms | Polypropylene (PP) ~ 4.43x10 ¹³ Acrylonitrile Butadiene Styrene (ABS) ~ 9.09x10 ¹⁵ |
| Electrical Resistivity - Volume* | BS ISO 14 903 | 2.55 x 10 ¹⁴ | Ohms-cm | Copper ~ 1.7x10 ⁻⁶ Acrylonitrile Butadiene Styrene (ABS) ~ 1.27x10 ¹⁶ |
| Dielectric Strength | ASTM D149 | 15.67 [398] | kV/mm [V/mil] | Glass ~ 9.8 – 13.8 Butyl Rubber ~ 24 |

* Be careful with electricity – limit to consumer electronics rated below 24 Volts.

ADHESION

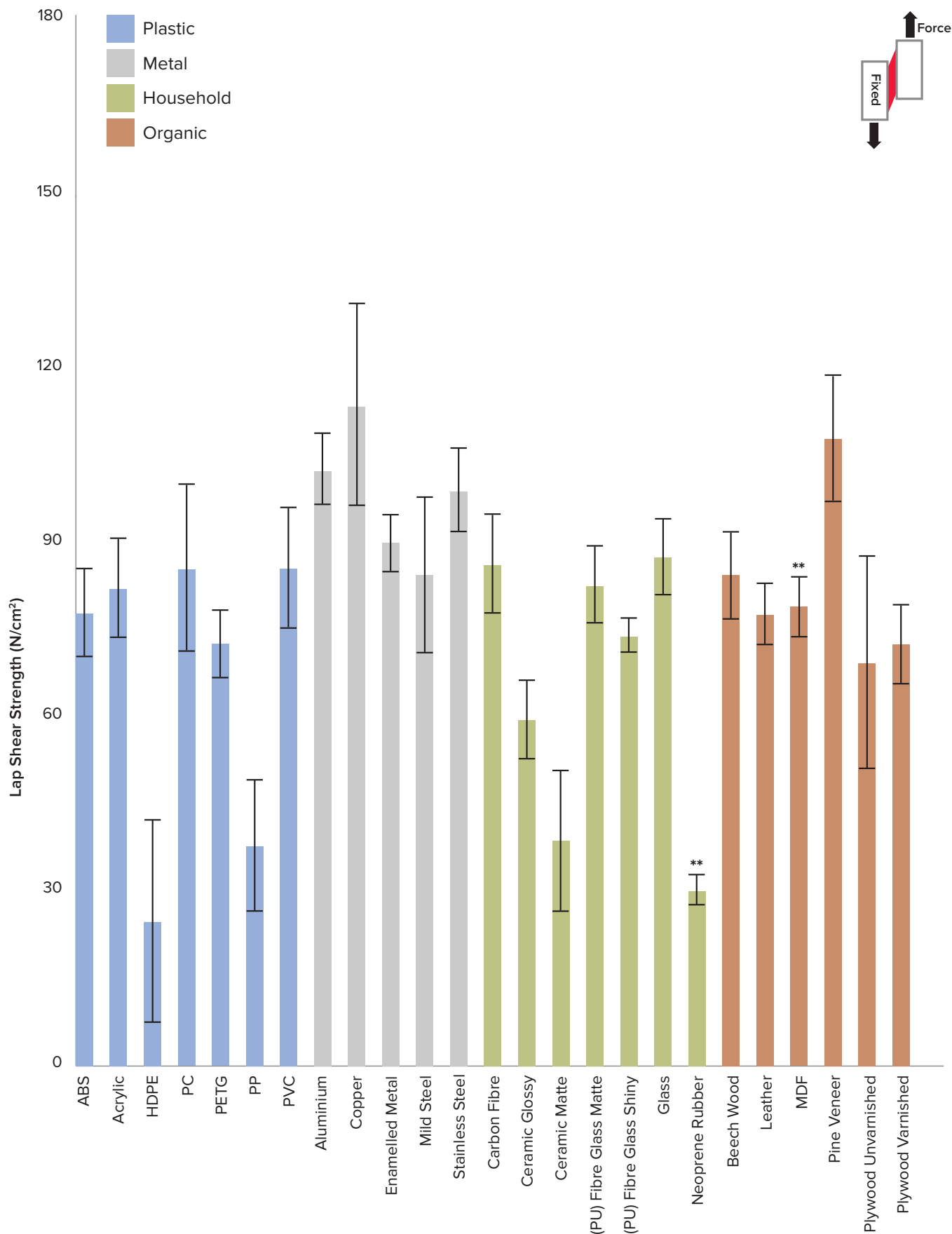
- The adhesion of FORMEROL® F.10 has been tested on a range of materials listed on the following pages
- The following results were collected by testing the adhesive properties: Cleavage strength (ASTM D1062), tensile strength (ASTM D2095) and lap shear strength (ASTM D1200)
- All adhesion test samples were made to a thickness of 2mm
- The surface of the materials were initially abraded (where relevant for the material) with sand paper and then degreased with an appropriate agent, following typical methodology employed for adhesives
- Tests were performed after 7 days of curing under lab conditions
- Please note, 'real world' performance may be reduced due to non-lab conditions

Adhesive Strength - Lap Shear (ASTM D1002)

| | Material | Examples | Results (N/cm ²) | Imperial (psi) |
|-----------|--|-------------------------------|------------------------------|----------------|
| Plastic | Acrylonitrile Butadiene Styrene (ABS) | LEGO® | 78 | 113 |
| | Acrylic | Glass Substitute | 82 | 119 |
| | High-Density Polyethylene (HDPE) | Bottle Caps | 25 | 36 |
| | Polycarbonate (PC) | Goggles | 86 | 124 |
| | Polyethylene Terephthalate-Glycol (PETG) | Signs and Glazing | 73 | 106 |
| | Polypropylene (PP) | Plastic Chairs | 38 | 55 |
| | Polyvinylchloride (PVC) | Cables | 86 | 124 |
| Metal | Aluminium | Window Frames | 103 | 149 |
| | Copper | Wires and Pipes | 114 | 165 |
| | Enamelled Metal | Fridge Doors | 90 | 131 |
| | Mild Steel | Key Rings | 85 | 123 |
| | Stainless Steel | Cutlery | 99 | 144 |
| Household | Carbon Fibre | Bicycle Frames | 86 | 125 |
| | Ceramic Glossy Finish | Tiles and Crockery | 60 | 86 |
| | Ceramic Matte Finish | | 39 | 56 |
| | (Polyurethane) Fibre Glass Matte Finish | Bathtubs and Shower Trays | 83 | 120 |
| | (Polyurethane) Fibre Glass Shiny Finish | | 74 | 107 |
| | Glass | Windows and Table Tops | 88 | 127 |
| | Neoprene Rubber ** | Laptop Sleeves and Mouse Pads | 30 | 44 |
| Organic | Beech Wood | Tables and Chairs | 85 | 123 |
| | Leather | Bags and Shoes | 78 | 113 |
| | Medium-Density Fibreboard (MDF) ** | Storage Units | 79 | 115 |
| | Pine Veneer | Furniture Tops | 108 | 157 |
| | Plywood Unvarnished | Floors, Walls and Fences | 69 | 101 |
| | Plywood Varnished | | 73 | 105 |

** Tested material failed before FORMEROL® F.10

Adhesive Strength - Lap Shear (ASTM D1002)



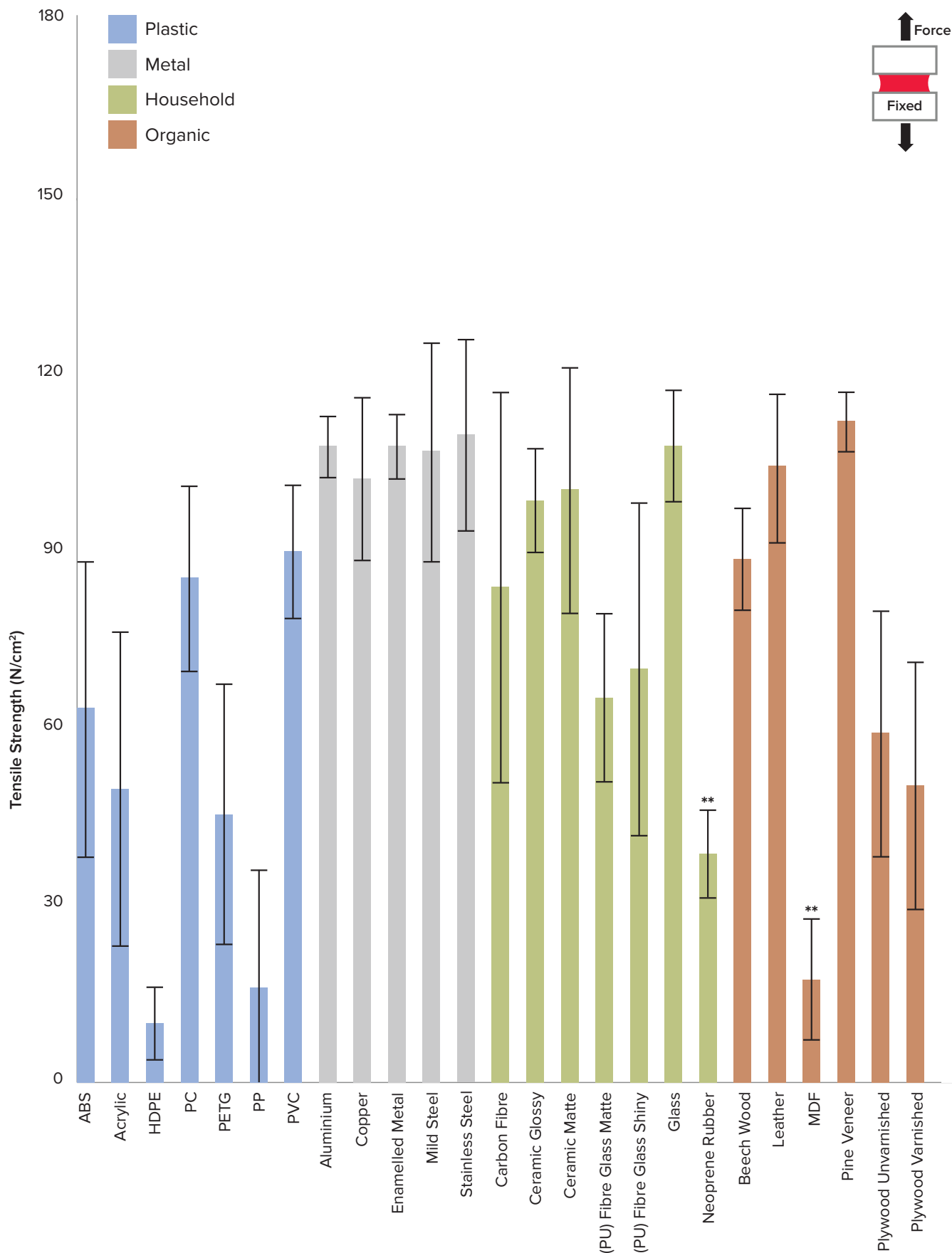
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Adhesive Strength - Tensile (ASTM D2095)

| | Material | Examples | Results (N/cm ²) | Imperial (psi) |
|-----------|--|-------------------------------|------------------------------|----------------|
| Plastic | Acrylonitrile Butadiene Styrene (ABS) | LEGO® | 64 | 92 |
| | Acrylic | Glass Substitute | 50 | 72 |
| | High-Density Polyethylene (HDPE) | Bottle Caps | 10 | 15 |
| | Polycarbonate (PC) | Goggles | 86 | 124 |
| | Polyethylene Terephthalate-Glycol (PETG) | Signs and Glazing | 46 | 66 |
| | Polypropylene (PP) | Plastic Chairs | 16 | 23 |
| | Polyvinylchloride (PVC) | Cables | 90 | 131 |
| Metal | Aluminium | Window Frames | 108 | 157 |
| | Copper | Wires and Pipes | 103 | 149 |
| | Enamelled Metal | Fridge Doors | 108 | 157 |
| | Mild Steel | Key Rings | 107 | 155 |
| | Stainless Steel | Cutlery | 110 | 159 |
| Household | Carbon Fibre | Bicycle Frames | 84 | 122 |
| | Ceramic Glossy Finish | Tiles and Crockery | 99 | 143 |
| | Ceramic Matte Finish | | 101 | 146 |
| | (Polyurethane) Fibre Glass Matte Finish | Bathtubs and Shower Trays | 65 | 95 |
| | (Polyurethane) Fibre Glass Shiny Finish | | 70 | 102 |
| | Glass | Windows and Table Tops | 108 | 157 |
| | Neoprene Rubber ** | Laptop Sleeves and Mouse Pads | 39 | 56 |
| Organic | Beech Wood | Tables and Chairs | 89 | 129 |
| | Leather | Bags and Shoes | 105 | 152 |
| | Medium-Density Fibreboard (MDF) ** | Storage Units | 18 | 25 |
| | Pine Veneer | Furniture Tops | 112 | 163 |
| | Plywood Unvarnished | Floors, Walls and Fences | 59 | 86 |
| | Plywood Varnished | | 50 | 73 |

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Adhesive Strength - Tensile (ASTM D2095)



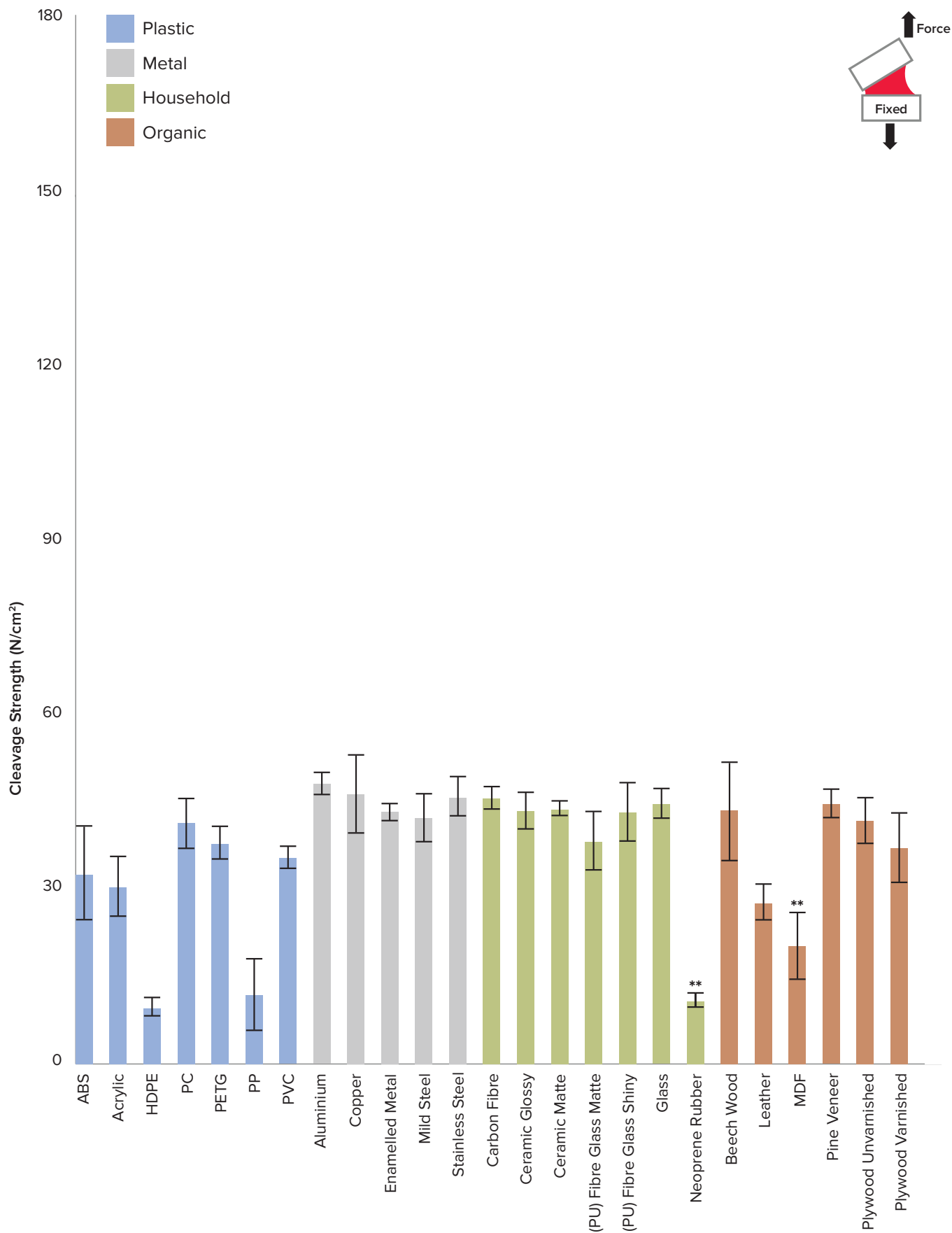
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Adhesive Strength - Cleavage (ASTM D1062)

| | Material | Examples | Results (N/cm ²) | Imperial (psi) |
|-----------|--|-------------------------------|------------------------------|----------------|
| Plastic | Acrylonitrile Butadiene Styrene (ABS) | LEGO® | 33 | 48 |
| | Acrylic | Glass Substitute | 31 | 44 |
| | High-Density Polyethylene (HDPE) | Bottle Caps | 10 | 14 |
| | Polycarbonate (PC) | Goggles | 42 | 60 |
| | Polyethylene Terephthalate-Glycol (PETG) | Signs and Glazing | 38 | 55 |
| | Polypropylene (PP) | Plastic Chairs | 12 | 17 |
| | Polyvinylchloride (PVC) | Cables | 36 | 52 |
| Metal | Aluminium | Window Frames | 48 | 70 |
| | Copper | Wires and Pipes | 47 | 68 |
| | Enamelled Metal | Fridge Doors | 44 | 63 |
| | Mild Steel | Key Rings | 43 | 62 |
| | Stainless Steel | Cutlery | 46 | 67 |
| Household | Carbon Fibre | Bicycle Frames | 46 | 67 |
| | Ceramic Glossy Finish | Tiles and Crockery | 44 | 63 |
| | Ceramic Matte Finish | | 44 | 64 |
| | (Polyurethane) Fibre Glass Matte Finish | Bathtubs and Shower Trays | 38 | 65 |
| | (Polyurethane) Fibre Glass Shiny Finish | | 43 | 56 |
| | Glass | Windows and Table Tops | 45 | 63 |
| | Neoprene Rubber ** | Laptop Sleeves and Mouse Pads | 11 | 16 |
| Organic | Beech Wood | Tables and Chairs | 44 | 645 |
| | Leather | Bags and Shoes | 28 | 40 |
| | Medium-Density Fibreboard (MDF) ** | Storage Units | 20 | 30 |
| | Pine Veneer | Furniture Tops | 45 | 65 |
| | Plywood Unvarnished | Floors, Walls and Fences | 42 | 61 |
| | Plywood Varnished | | 37 | 54 |

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Adhesive Strength - Cleavage (ASTM D1062)



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FAQs

Does FORMEROL® F.10 degrade over time?

FORMEROL® F.10 does not degrade over time under typical ambient conditions.

Can I extend the 30 minutes working time?

FORMEROL® F.10 cures in the presence of moisture and heat. The working time can be extended by working in a colder environment.

Can I speed up the curing process?

If you place FORMEROL® F.10 in a warm place it will begin to cure a little faster. However, some properties e.g. adhesion may be adversely affected.

Is FORMEROL® F.10 mould resistant?

Currently FORMEROL® F.10 does not contain any anti-mould agents, but should not attract mould if kept clean and dry.

Is FORMEROL® F.10 food safe (FDA approved)?

Currently FORMEROL® F.10 is not food safe and should not be applied in areas that will have contact with food or drinking water.

Is FORMEROL® F.10 skin safe?

FORMEROL® F.10 contains a small fraction of sensitising ingredients and so can cause an allergic reaction for those with sensitive skin or after constant prolonged contact. Therefore, it is not recommended for uses such as in dental applications, in prosthetics, headphones or spectacles where the FORMEROL® F.10 will be in constant contact with the skin. Find more info on the SDS (Safety Data Sheet) - we have [European](#) and [American](#) versions available.

Is FORMEROL® F.10 latex free?

FORMEROL® F.10 does not contain latex. However we cannot guarantee that at some point in the manufacturing process it has not been handled by an operator wearing latex gloves.

Can I use FORMEROL® F.10 past its 'use by' date if it is still soft?

You can still use FORMEROL® F.10 past its use by date but be aware that some properties e.g. strength and cure rate may be affected.

What happens to FORMEROL® F.10 when it is exposed to temperatures higher than 180°C?

It is not recommended to use FORMEROL® F.10 at sustained temperatures higher than 180°C as it will begin to degrade.

Does FORMEROL® F.10 take longer to cure at lower temperatures?

FORMEROL® F.10 cures 3mm deep every 24 hours at 21°C and may take considerably longer to cure at temperatures that are below this point.

Can FORMEROL® F.10 be removed once cured?

FORMEROL® F.10 can be removed from non-porous surfaces by cutting off the bulk of the material with a sharp blade. Scrape off the residue with a non-abrasive tool.

Will FORMEROL® F.10 stain surfaces once cured?

FORMEROL® F.10 may leave some pigment residue when handling in its uncured state but under normal circumstances once FORMEROL® F.10 is cured it will not stain any surfaces. Cured FORMEROL® F.10 is similar to shoe rubber in so much as the pigment is 'set', but can rub off on a light surface if scuffed.

Does it help to roughen the surface of a material when applying FORMEROL® F.10?

When using any adhesive roughening or 'keying' the surface always helps adhesion and makes a stronger bond. Be aware that this will permanently scratch the surface of your material.

How thin/thick should the layer of FORMEROL® F.10 I apply be?

This will depend on your application. The thinner the layer of FORMEROL® F.10, the faster the cure will be. If you require a strong adhesive bond it is recommended that you do not use a layer that is too thick but rather covers more surface area. The thicker the FORMEROL® F.10, the less flexible it will be and the longer it will take to cure. Anything thicker than 3mm will take longer than 24 hours to fully cure.

Can FORMEROL® F.10 be used on a painted surface?

FORMEROL® F.10 can stick to a painted surface. However the strength will be limited to how strongly the paint is adhered to the surface.

Is FORMEROL® F.10 affected by solvents?

FORMEROL® F.10 is a silicone and may swell in some solvents and oils as well as some strong acids and bases. The swelling may affect FORMEROL® F.10 properties such as strength and adhesion.

What is the best way to dispose of FORMEROL® F.10?

As FORMEROL® F.10 is not biodegradable it is recommended to dispose of it in general waste. Find more info on the SDS (Safety Data Sheet) - we have [European](#) and [American](#) versions available.

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GLOSSARY

Adhesive Strength

The maximum force per cross-sectional area of a material required to cause failure of the adhesive joint.

Cleavage mode: when the force is applied to one side of the joint forcing it to be cleaved apart.

Lap shear mode: when the force is applied parallel to the joint causing it to shear apart.

Tensile mode: when the force is applied perpendicular to the joint causing it to be pulled apart.

Dielectric Strength

The voltage at which electricity breaks through a set thickness of a material.

Elastomer

A polymer exhibiting viscoelastic properties.

Extrusion

A processing technique whereby bulk material is pressed through a die to convert into a shaped profile.

Non slumping

A material's ability to hold its shape and not flow when uncured.

RTV

Room Temperature Vulcanising – Curing takes place at room temperature. Vulcanisation occurs when a material forms crosslinks and changes from a liquid or putty to a solid.

Shore Hardness

A measure of a material's resistance to surface indentation.

Strain at failure

The maximum a material extends at the point of failure.

Ultimate tensile strength

The maximum force per cross-sectional area of a material prior to the point of failure.

Williams Plasticity

A measure of how much a material will deform under a set load.

Young's Modulus

A measure of the stiffness of a material.

ADDITIONAL INFORMATION

Processing

FORMEROL® F.10 materials are processed at room temperature, in a dry atmosphere; most commonly by compression moulding, extrusion or manual shaping.

Packaging

Typical sealing materials include any polymer film with good moisture barrier properties e.g. PE/ALU/PET laminates.

Expiry Information

The shelf life is 13 months from the date of manufacture when stored at 21°C (70°F) in original unopened packaging. Keeping unopened single-use packs in the fridge will make them last longer.

Please note that FORMEROL® is a standard material and its properties can be varied for specific applications.

FORMEROL® F.10 is a developmental product. Typical properties are illustrative of the current product formulation but may change. This information is offered in good faith. All data is produced in good faith, but not exhaustive and does not replace the user's good judgment for safe application.

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FORMEROL®F.10 technology is protected by the following international patents and applications:

European Patent No. 2089465 B1

Chinese Patent No. ZL200780050641.6

Macau Patent No. J/001226

US Patent No. US 9,284,454 B2

Indian Patent No. 272415