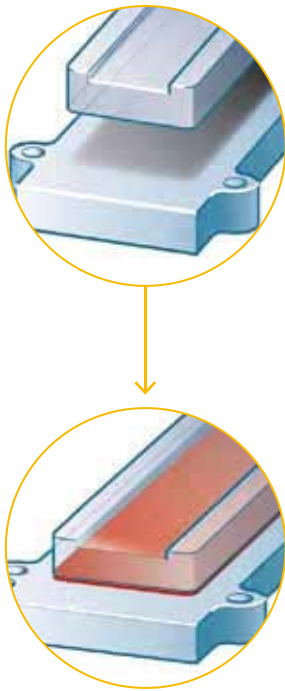


Structural Bonding

For Demanding Requirements



Why use a Henkel adhesive for structural bonding?

The Henkel range of structural bonding products offers a wide choice of solutions to meet the different requirements and conditions that apply to industrial design and construction.

Bonding

Adhesive bonding is a process in which two similar or dissimilar materials are solidly and permanently assembled using an adhesive.

Adhesives build "bridges" between the surfaces of substrates to be joined.

To achieve the optimal bonding result, the following prerequisites must be met:

- Compatibility of the adhesive with the materials to be bonded
- Compatibility of the adhesive with the specified requirements
- Correct application of the adhesive

Advantages of bonding compared to conventional joining methods

More uniform stress distribution over the entire bond face

This has a very positive effect on the static and dynamic strength achieved. Where welding and riveting result in localised stress peaks, adhesive bonding achieves uniform distribution and absorption of stress loads.

No change in surface and structure of the joined materials

Welding temperatures may change the structure and therefore the mechanical properties of materials. In addition, welding, riveting and bolting all affect the visual appearance of the parts.

Weight saving

Adhesives are particularly popular for light-weight constructions, where thin-walled parts (wall thickness < 0.5mm) must be joined.

Sealed joints

Adhesives also act as sealants, preventing loss of pressure or liquids, blocking the penetration of condensation water and protecting against corrosion.

Joining dissimilar materials and reducing the risk of corrosion

The adhesive forms an insulating film to prevent contact corrosion when different types of metals are joined. It also acts as an electrical and thermal insulator.

Surface preparation

The following key points should be observed for the design of bonded joints:

- The surfaces to be joined should be as large as possible for maximum load transmission capability
- Forces acting on the joint should be distributed across the entire bond line

Joint designs suitable for adhesive bonding

All designs involving a shear, tensile or compressive load e.g. single and double lap joint, single and double cover plate, tapered overlap and double overlapping.

Joint designs unfavourable for adhesive bonding

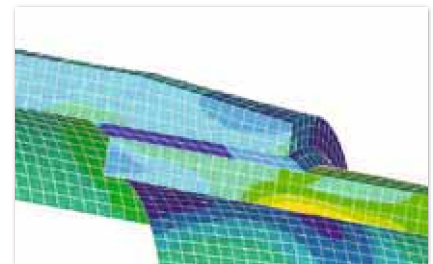
Butt joint, cleavage loading and peel loading.

Rigid bonding

Rigid adhesives are mainly used for high load transmission to replace common mechanical joining methods. Two parts bonded with such an adhesive could be considered as structurally linked. Mechanical characteristics like high strength, high modulus and high adhesion have proven to be effective for customer applications, particularly in demanding industries like aerospace and automotive.

Rigid bonding offers significant benefits for users:

- Simplifies construction by increasing strength/rigidity for load transmission
- Prevents material fatigue and failure by achieving uniform transmission of loads (stress distribution) and by maintaining structural integrity (no thermal or mechanical weakening of parts)
- Saves production costs by replacing conventional mechanical fasteners (screws, rivets or welding)
- Saves material cost and saves weight by reducing material thickness while maintaining load transmission characteristics
- Allows the most varied substrate combinations, e.g. metal/plastics, metal/glass, metal/wood etc



Stress analysis of bonded pipe joint

Available technologies

Epoxies

- Rigid bonding
- 1K or 2K solutions
- Capability to fill large gap
- Very high strength
- For small to medium surface areas
- Very good chemical resistance

Acrylics

- Rigid to slightly flexible bonding
- 1K or 2K solutions
- For small surface areas
- Very high strength
- Good chemical resistance

Polyurethanes





- Slightly flexible bonding
- 2K solution
- Capability to fill large gaps
- High strength
- For medium to large surface areas
- Good chemical resistance

Structural Bonding – Acrylics

Product Table

Solution	No-mix		
	General purpose	High temperature	Glass bonding
	LOCTITE AA 330	LOCTITE AA 3342	LOCTITE AA 3298
Activator	7388	7386	7386
Mix ratio by volume (A:B)	–	–	–
Colour	Pale yellow	Yellow opaque	Green-grey
Viscosity	67,500 mPa·s	90,000 mPa·s	29,000 mPa·s
Working life	–	–	–
Fixture time	3 min.	1 – 1.5 min.	3 min.
Shear strength (GBMS)	15 – 30 N/mm ²	15 – 30 N/mm ²	26 – 32 N/mm ²
Service temperature (up to)	+100°C	+180°C	+120°C
Pack sizes	1 ltr, 5 ltr	300ml	300ml
	<p>LOCTITE AA 330</p> <ul style="list-style-type: none"> • General purpose product • Good impact resistance • Ideal for bonding dissimilar substrates like PVC, phenolic and acrylic compounds • Use with activator LOCTITE SF 7386 or LOCTITE SF 7388 	<p>LOCTITE AA 3342</p> <ul style="list-style-type: none"> • High temperature resistance • Good impact resistance • Good humidity resistance • Use with activator LOCTITE SF 7386 	<p>LOCTITE AA 3298</p> <ul style="list-style-type: none"> • Very good adhesion on glass • High strength • Good impact resistance • Use with activator LOCTITE SF 7386

Pre-mix

Magnet bonding	General purpose	Clear bond line	Polyolefin bonder
LOCTITE AA 326	LOCTITE AA 3295	LOCTITE AA V5004	LOCTITE AA 3038
			
7649	–	–	–
–	1:1	1:1	1:10
Yellow to amber	Green	Pale mauve, clear	Yellow
18,000 mPa·s	17,000 mPa·s	18,000 mPa·s	12,000 mPa·s
–	4 min.	0.5 min.	4 min.
3 min.	5 – 10 min.	3 min.	> 40 min.
15 N/mm ²	25 N/mm ²	21 N/mm ²	13 N/mm ² (PBT)
+120°C	+120°C	+80°C	+100°C
50ml, 250ml	50ml, 600ml	50ml	50ml, 490ml, 15kg, 18kg
LOCTITE AA 326 <ul style="list-style-type: none"> • Product for magnet bonding • Medium viscosity (thixotropic) • Good adhesion to different types of ferrite • Use with activator LOCTITE SF 7649 	LOCTITE AA 3295 <ul style="list-style-type: none"> • 2K general purpose product • Good impact resistance • Bonding of metals, ceramics and plastics 	LOCTITE AA V5004 <ul style="list-style-type: none"> • Clear bond line after curing • Fast curing • Medium strength • Good adhesion to metals and plastics 	LOCTITE AA 3038 <ul style="list-style-type: none"> • Very good adhesion to polyolefin substrates (PP, PE) • Good impact resistance • Good adhesion to e-coated metals

Structural Bonding – Acrylics

Product List

Product	Activator	Mix ratio by volume (A:B)	Colour	Viscosity	Working life
LOCTITE AA 319	LOCTITE SF 7649	–	Light amber	2,750 mPa·s	–
LOCTITE AA 326	LOCTITE SF 7649	–	Yellow to amber	18,000 mPa·s	–
LOCTITE AA 329	LOCTITE SF 7386	–	Light straw	26,500 mPa·s	–
LOCTITE AA 330	LOCTITE SF 7388	–	Pale yellow	67,500 mPa·s	–
LOCTITE AA 366	LOCTITE SF 7649	–	Yellow to amber	7,500 mPa·s	–
LOCTITE AA 3038	–	1:10	Yellow	12,000 mPa·s	4 min.
LOCTITE AA 3295	–	1:1	Green	17,000 mPa·s	4 min.
LOCTITE AA 3298	LOCTITE SF 7386	–	Green-grey	29,000 mPa·s	–
LOCTITE AA 3342	LOCTITE SF 7386	–	Yellow opaque	90,000 mPa·s	–
LOCTITE AA 3504	LOCTITE SF 7649	–	Amber	1,050 mPa·s	–
LOCTITE AA V1315	–	1:1	Off-white	Thixotropic	–
LOCTITE AA V5004	–	1:1	Pale mauve, clear	18,000 mPa·s	0.5 min.

Fixture time	Shear strength (GBMS)	Service temperature (up to)	Pack sizes	Comments
1 min.	10 N/mm ²	+120°C	0.5g kit	Glass-metal bonder
3 min.	15 N/mm ²	+120°C	50ml, 250ml	Magnet bonder
1 min.	20 N/mm ²	+100°C	315ml, 1 ltr	Fast fixture
3 min.	15 – 30 N/mm ²	+100°C	1 ltr, 5 ltr	General purpose
–	13.5 N/mm ²	+120°C	250ml	Additional UV cure
> 40 min.	13 (PBT) N/mm ²	+100°C	50ml, 490ml, 15kg, 18kg	PO bonder
5 – 10 min.	25 N/mm ²	+120°C	50ml, 600ml	General purpose
3 min.	26 – 32 N/mm ²	+120°C	300ml	Glass bonding
1 – 1.5 min.	15 – 30 N/mm ²	+180°C	300ml	High temperature
–	22 N/mm ²	+120°C	Not available in the U.K.	Additional UV cure
15 min.	15 N/mm ²	+120°C	50ml	Composite/plastic bonding
3 min.	21 N/mm ²	+80°C	50ml	Clear bond line

