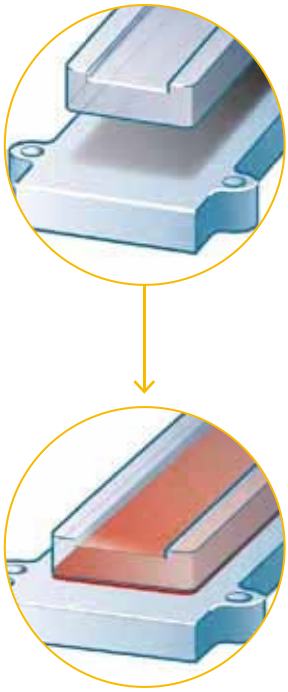
Structural Bonding
For Demanding Requirements



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

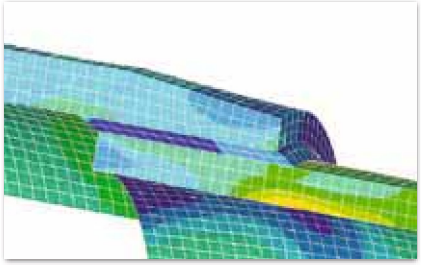
Butt joint, cleavage loading and peel loading.

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 – Epoxies
Product Table

What is your focus?

	General bonding		Fast curing
	High viscosity	Flowable	Clear
Solution	**LOCTITE EA 3423**	**LOCTITE EA 9483**	**LOCTITE EA 3430**
			
Description	2K Epoxy	2K Epoxy	2K Epoxy
Mix ratio by volume (A:B)	1:1	2:1	1:1
Mix ratio by weight (A:B)	100:70	100:46	1:1
Working life	45 min.	30 min.	7 min.
Fixture time	180 min.	210 min.	15 min.
Colour	Grey	Ultra clear	Ultra clear
Viscosity	300 Pa·s	7 Pa·s	23 Pa·s
Shear strength (GBMS)	17 N/mm²	23 N/mm²	22 N/mm²
Peel strength (GBMS)	2.7 N/mm	1.5 N/mm	3 N/mm
Service temperature range	-55°C to +120°C	-55°C to +150°C	-55°C to +100°C

LOCTITE EA 3423
- Non-sag paste
- Medium working life
- Excellent chemical resistance

LOCTITE EA 3423 is a general purpose 2K epoxy adhesive, suitable for gap filling and vertical applications. Ideal for bonding metal components.

LOCTITE EA 9483
- Flowable
- Ultra-clear
- Low moisture absorption

LOCTITE EA 9483 is a general purpose 2K epoxy adhesive, suitable for bonding and potting where optical clarity and high strength are required. Ideal for bonding decorative panels and displays.

LOCTITE EA 3430
- Medium viscosity
- Ultra-clear
- Toughened
- Water resistant

LOCTITE EA 3430 is a five minute 2K epoxy adhesive suitable for applications requiring an optically clear bond line. Ideal for bonding glass, decorative panels and displays, and general repair.

* Gel time at +120°C
** Cure time at +120°C or higher: see technical data sheet

Food contact

Food approved

LOCTITE EA 9480

2K Epoxy
2:1
100:46.5
110 min.
270 min.
Off-white
8.7 Pa·s
24 N/mm²
0.4 N/mm
-55°C to +120°C

LOCTITE EA 9480
- Good chemical resistance
- Toughened
- Good adhesion on stainless steel

LOCTITE EA 9480 is a food approved 2K epoxy adhesive suitable for bonding metals and most plastic parts in and around food processing areas.

KTW approval for potable water, Fraunhofer approval for incidental food contact

High technical performance

Toughened

LOCTITE EA 9466

2K Epoxy
2:1
100:50
60 min.
180 min.
Yellowish
35 Pa·s
37 N/mm²
8 N/mm
-55°C to +120°C

LOCTITE EA 9466
- Medium viscosity
- Low density – SG = 1.0
- High strength

LOCTITE EA 9466 is a toughened 2K epoxy adhesive suitable for multi-purpose applications requiring a long open time and high bonding strength. Ideal for a wide variety of substrates such as metals, ceramics and most plastics.

High temperature resistant

LOCTITE EA 9514

1K Epoxy
–
–
5 min.*
30 min.**
Grey
45 Pa·s
46 N/mm²
9.5 N/mm
-55°C to +200°C

LOCTITE EA 9514
- Suitable for induction curing
- High shear and peel strength
- Excellent chemical resistance
- High temperature resistance (+200°C)

LOCTITE EA 9514 is a toughened 1K epoxy adhesive suitable for gap filling and resistant to high operating temperatures. Ideal for applications requiring toughness such as filter and magnet bonding.

LOCTITE EA 9497

2K Epoxy
2:1
100:50
3 hr
8 hr
Grey
12 Pa·s
20 N/mm²
–
-55°C to +180°C

LOCTITE EA 9497
- Medium viscosity
- High thermal conductivity
- High compressive strength
- High temperature resistance (+180°C)

LOCTITE EA 9497 is a thermally conductive 2K epoxy adhesive for high temperature filling and bonding applications. Ideal for heat dissipation.

Structural Bonding – Epoxies

Product List

Product	Technology	Colour mix	Mixed viscosity	Mix ratio by volume	Working life	Fixture time	Service temperature range
LOCTITE EA Double Bubble	2K Epoxy	Clear	35 Pa·s	1:1	3 min.	5 min.	-55°C to +100°C
LOCTITE EA 3032	2K Epoxy	Grey	80 Pa·s	1:1	120 min.	480 min.	-55°C to +80°C
LOCTITE EA 3421	2K Epoxy	Clear amber	37 Pa·s	1:1	30 – 150 min.	240 min.	-55°C to +120°C
LOCTITE EA 3423	2K Epoxy	Grey	300 Pa·s	1:1	30 – 60 min.	180 min.	-55°C to +120°C
LOCTITE EA 3425	2K Epoxy	Yellow/white	1350 Pa·s	1:1	55 – 105 min.	240 min.	-55°C to +120°C
LOCTITE EA 3430	2K Epoxy	Ultra-clear	23 Pa·s	1:1	5 – 10 min.	15 min.	-55°C to +100°C
LOCTITE EA 3450	2K Epoxy	Grey	35 Pa·s	1:1	4 – 6 min.	15 min.	-55°C to +100°C
LOCTITE EA 3455	2K Epoxy	Grey	Pasty	1:1	40 min.	120 min.	-55°C to +100°C
LOCTITE EA 4108	1K Epoxy	Silver	170 Pa·s	–	–	Heat curing	-55°C to +180°C
LOCTITE EA 9250	2K Epoxy	White	45 Pa·s	3:1	9 min.	12 min.	-55°C to +150°C
LOCTITE EA 9450	2K Epoxy	Translucent	200 Pa·s	1:1	2 – 7 min.	13 min.	-55°C to +100°C
LOCTITE EA 9461	2K Epoxy	Grey	72 Pa·s	1:1	40 min.	240 min.	-55°C to +120°C
LOCTITE EA 9464	2K Epoxy	Grey	96 Pa·s	1:1	10 – 20 min.	180 min.	-55°C to +120°C
LOCTITE EA 9466	2K Epoxy	Yellowish	35 Pa·s	2:1	60 min.	180 min.	-55°C to +120°C
LOCTITE EA 9480	2K Epoxy	Off-white	8.7 Pa·s	2:1	110 – 190 min.	270 min.	-55°C to +120°C
LOCTITE EA 9483	2K Epoxy	Ultra-clear	7 Pa·s	2:1	25 – 60 min.	210 min.	-55°C to +150°C
LOCTITE EA 9489	2K Epoxy	Grey	45 Pa·s	1:1	60 – 120 min.	300 min.	-55°C to +120°C
LOCTITE EA 9492	2K Epoxy	White	30 Pa·s	2:1	15 min.	75 min.	-55°C to +180°C
LOCTITE EA 9497	2K Epoxy	Grey	12 Pa·s	2:1	165 – 255 min.	480 min.	-55°C to +180°C
LOCTITE EA 9514	1K Epoxy	Grey	45 Pa·s	–	–	Heat curing	-55°C to +200°C
TEROSON EP 5055	2K Epoxy	Grey	A: 145 Pa·s; B: 75 Pa·s	1:1	75 min.	270 min.	-55°C to +100°C

	Tensile strength	Peel strength	Pack sizes	Comments
	–	–	3g	For small and quick repairs, fast curing
	–	–	Not available in the U.K.	Multiple purpose bonder, suitable for contact with potable water (approved to the Waters Byelaws Scheme)
	28 N/mm^2	2 – 3 N/mm	50ml, 200ml, 1kg	Structural adhesive, general purpose, long open time
	24 N/mm^2	2 – 3 N/mm	50ml, 1kg	Multiple purpose bonder, excellent for metals, good humidity resistance
	27 N/mm^2	1.5 – 2.5 N/mm	50ml, 200ml	Multiple purpose bonder, excellent for metals, for large surfaces, thixotropic
	36 N/mm^2	3 N/mm	24ml, 50ml, 200ml	Multiple purpose bonder, fast cure, ultra-clear
	–	–	25ml	Structural adhesive, fast cure, ideal for metal repair
	–	–	Not available in the U.K.	Structural adhesive, fast cure, high viscosity
	–	–	Not available in the U.K.	Free flowing, high chemical resistance, looks like silver solder
	–	–	Not available in the U.K.	Thixotropic, high temperature resistance, good chemical resistance, cream coloured, fast set
	17 N/mm^2	0.6 N/mm	50ml, 200ml, 1kg	Multiple purpose bonder, fast cure (5 min.), gap filling, translucent
	30 N/mm^2	10 N/mm	50ml, 400ml, 20kg	Structural adhesive, toughened, gap filling
	–	7 – 10 N/mm	50ml, 400ml	Structural adhesive, toughened, gap filling, fast cure
	32 N/mm^2	8 N/mm	50ml, 400ml, 1kg	Toughened multiple purpose bonder, high bond strength for all substrates
	47 N/mm^2	0.4 N/mm	50ml, 400ml	Multiple purpose bonder, approved for incidental food contact and potable water
	47 N/mm^2	1.5 N/mm	50ml, 400ml, 1kg	Multiple purpose bonder, ultra-clear, excellent for panels and displays
	14 N/mm^2	2.2 N/mm	50ml	Structural adhesive, general purpose, extended working life
	31 N/mm^2	1.6 N/mm	50ml, 400ml	High temperature resistance, high chemical resistance
	52.6 N/mm^2	–	50ml, 400ml	High temperature resistance, thermally conductive, excellent for bonding metal components (thixotropic)
	44 N/mm^2	9.5 N/mm	300ml, 1kg	High temperature resistance, heat resistant bonding, toughened, high mechanical resistance
	23 N/mm^2	4 N/mm	250ml	Crash resistant structural bonder for car panels