



## Research, Development & Engineering

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# Technical Data Sheet Metal Set/Aqua Set

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### Product description

LOCTITE METAL SET and AQUA SET are two-part filled epoxy resins which are ideal for the repair and recovery of worn and damaged machinery.

They have been developed for easy and convenient use in the workshop or for on-site maintenance. All have a 1:1 mixing ratio with very low shrinkage properties. They will not rust and cure at room temperature.

### Typical applications

Repairing worn parts including shafts, housings, keyways and flanges as well as broken or damaged parts such as castings, pipes or fabrications. They can be used for jobs as varied as filling cavities, levelling machinery, repairing cast-steel plates, making core moulds, applying a sacrificial coating or sealing leaking pipes. Users can select which METAL SET or AQUA SET epoxy most suits their requirements from the table below:

**Product range** • all have a 1:1 mixing ratio.

METAL SET A1:	An aluminium-filled epoxy putty, which has a finer texture and lighter weight than steel filled epoxies.
METAL SET BR1:	Bronze filled epoxy putty for repair of bronze parts and castings.
METAL SET C1	A ceramic filled epoxy putty. Use it when hard wearing surfaces or sacrificial coatings are required.
METAL SET HTA:	An aluminium filled epoxy putty which will withstand continuous temperatures up to 190°C.
METAL SET M:	A mineral filled epoxy putty which forms a self-lubricating surface to reduce sliding wear on moving parts. It is highly wear resistant.
METAL SET SI:	A steel filled epoxy material in putty form for all general repairs.
METAL SET S2:	Similar to SI, but in liquid form for easy pouring and moulding.
METAL SET S3:	A fast-curing steel filled epoxy putty for quick repairs.
METAL SET SS1:	A stainless steel filled epoxy putty. Especially useful where hygiene is of prime importance.
METAL SET STRIP:	A tape comprising an outer layer of filled epoxy based putty with an inner core of hardener which are mixed by hand-kneading. Fast curing
METAL SET SYRINGE	A mineral filled epoxy formulated for easy application from a small hand-held dual syringe. For rapid, small-scale repairs.
AQUA SET UW1:	An epoxy putty suitable for use in damp or underwater conditions.

Property	Catalogue reference											
	A1	BR1	CR1	HTA	M	S1	S2	S3	SS1	Strip	Syringe	UW1
Putty	•	•	•	•	•	•		•	•	•		•
Liquid							•				•	
High temperature				•								
High wear					•							
Humidity/damp												•
Rapid cure								•		•	•	
Aluminium	•			•								
Bronze		•										
Ceramic			•									
Steel						•	•	•		•	•	
Stainless steel									•			

Mixing - • 1: 1 ratio LOCTITE METAL SET and AQUA SET products are supplied in two parts: resin and hardener. Both parts are formulated for easy stirring and mixing. For best results, it is important that mixing is carried out correctly. Each part should be stirred separately and then equal quantities of each part taken and mixed thoroughly together for up to two minutes, depending upon the quantity taken. A slight skin may form over the hardener of METAL SET 'S3' during storage. This should be removed before the product is used. AQUA SET should be mixed in air before use.

**Note — correct proportions:**

Equal proportions can generally be judged by eye to within 10% accuracy, which is sufficient. Outside these limits, excess resin will cause slow curing, while excess hardener will cause a deterioration in cured properties. Do not attempt to obtain a faster cure by using excess hardener.

**Pot life**

Pot life, the time available for application after mixing the two components, is shown for each grade in the table. Different figures for 10, 20 and 30°C indicate the importance of temperature.

**Cure time**

Once functional strength has been achieved, the material can be worked with normal hand tools. Full strength continues to develop for some time after this.

**Application**

Surfaces to be bonded or filled should be clean and free of grease, rust or loose particles. Use of a cleaning agent such as LOCTITE SUPER CLEAN SOLVENT 706 is recommended.

The mixed material should be pressed firmly into place, taking care to eliminate voids and air gaps. Where large areas have to be filled, a reinforcement or backing may be used such as glass fibre matting or a metal mesh.

If METAL SET is being used for moulding, a suitable release agent (wax, grease or silicone) will generally be necessary to prevent adhesion to the mould.

**Solvent resistance:**

Like most epoxy resin based materials, Metal Set and Aqua Set have excellent resistance to many liquids and solvents. The following information may be used as a guide.

**Type of liquid/solvent**

Water, dilute acids, salt solution.  
10% caustic soda.  
Gasoline/petrol, hydrocarbon fuels and lubricants.  
Chlorinated solvents.

Methanol, acetone, MEK

**Metal Set/Aqua Set performance**

Excellent. Some surface discoloration may occur.  
Excellent (except METAL SET A1 and HTA)  
Excellent  
Good resistance but not recommended for continuous long term contact.  
Poor resistance.

Note: This information refers to fully cured METAL SET and AQUA SET material. Incomplete cure or inadequate mixing will adversely affect solvent resistance. AQUA SET UW1 is also suitable for high humidity and underwater repairs.

**Storage**

For best results, METAL SET and AQUA SET should be stored between 15 and 30°C. Epoxy resins which have been exposed to low temperatures for extended periods will not mix efficiently and full performance will not be achieved.

Unmixed material should be protected from humidity. Keep containers tightly closed when not in use.

Resin and hardener must not be allowed to contact each other prior to mixing for use.

**Caution**

All epoxy resins and hardeners contain irritant material. Skin and eye contact should be avoided. Wash hands thoroughly after use. Keep out of reach of children.

**Special note:** AQUA SET UW1 hardener and METAL SET HTA hardener are respectively, toxic and corrosive in contact with skin and if swallowed. Appropriate safety precautions should therefore be taken.

**No liability** is accepted for any injury, loss or damage arising directly or indirectly from the use of the Company's products or from the use of information given in our publications - which are intended to serve as a guide only. Customers should satisfy themselves by appropriate trials that the product is suitable for their intended use.

**Non-warranty:** The above suggestions and test data are based upon work done in our laboratories and actual field tests by independent companies. However, we make no warranty of any kind concerning this data. As the storage, handling, and application of these products are beyond our control, we cannot accept liability for the results obtained. For further information, please contact your local Loctite Technical Services Department.

## TYPICAL PROPERTIES

	A1	BR1	CR1	HTA	M	S1	S2	S3	SS1	Strip	Syringe	UW1
Mix ratio (weight or volume)	1 : 1	1 : 1	1 : 1	1 : 1	1 : 1	1 : 1	1 : 1	1 : 1	1 : 1	—	1 : 1	1 : 1
Consistency	Putty	Putty	Putty	Putty	Putty	Putty	Liquid	Putty	Putty	Putty	Liquid	Putty
Pot life minutes at 30°C	40	40	40	35	40	40	40	4	40	10*	3	35
at 20°C	60	50	50	45	60	60	60	8	50	5	4	45
at 10°C	180	120	120	135	180	180	180	15	135	10*	10	90
Functional strength at 20°C	12hr	12hr	12hr	12hr	12hr	12hr	12hr	30min	12hr	30min	30min	12hr
at 10°C	24hr	24hr	24hr	24hr	24hr	24hr	24hr	3hr	24hr	3hr	3hr	24hr

\*Application not later than 5 minutes.

## TYPICAL PROPERTIES AFTER CURING (7 DAYS AT 23°C)

	A1	BR1	CR1	HTA	M	S1	S2	S3	SS1	Strip	Syringe	UW1
Hardness (Shore D) —(ASTM D1706)	85	80	85	85	85	85	85	85	80	75	85	85
Shrinkage on cure %	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	—	—	0.1
Adhesive strength N/mm <sup>2</sup> —(ASTM D1002) on steel	20	18	18	20	20	20	25	20	18	7	17	16
on aluminium	15	16	17	22	12	20	20	12	16	5	15	16
Compressive strength (1cm thick film) N/mm <sup>2</sup> —(ASTM 695)	70	80	80	90	70	70	70	60	85	40	80	80
Tensile strength N/mm <sup>2</sup> —(ASTM D638)	50	45	45	60	45	60	65	45	50	13	15	50
Young's Modulus N/mm <sup>2</sup> × 10 <sup>3</sup> —(ASTM 695)	7	5	5	6	10	5	6	5	5	2	—	3
Temperature range† —minimum °C —maximum °C	−20 +120*	−20 +120*	−20 +120*	−20 +190	−20 +120*	−20 +120*	−20 +120*	−20 +120*	−20 +120*	−20 +120*	−20 +120*	−20 +100
Colour when cured	Grey	Bronze	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey

†All temperatures shown are for continuous exposure.

\*Will withstand occasional temperatures up to 150°C.