Tech Tip 11

Converting Mix Ratios

What >
Mix ratio by weight to mix ratio by volume

Why >
Large errors can occur when mix ratios are not calculated properly

Converting Mix Ratio by Weight to Mix Ratio by Volume for Two Component Epoxies

1. What Is Mix Ratio?

Mix ratio of a two part epoxy is extremely important in achieving a proper cure. Epoxies use a chemical reaction between a resin and hardener which have a stoichiometric ratio that determines the relative proportions in which the two substances react for this reaction. This ratio can vary from product to product and is reported on each Technical Data Sheet.

2. Why Is It Important?

Although different chemistries have different tolerances for mixing, an error of no more than +/- 5% from the mix ratio is a good guideline. Larger errors in the mix ratio can allow un-reacted components to remain within the epoxy and may lead to an increase in outgassing, a decrease in Tg and decreased resistance to chemicals and moisture.

3. Where Do I Find It?

Epoxy Technology lists the mix ratio for all two part epoxies by weight on the Technical Data Sheet. For some processes, however, a customer may find it more convenient to measure and mix by volume rather than weight. Using the reported mix ratio by weight to mix by volume can cause products not to cure properly.

4. How To Convert

The volumetric mix ratio can easily be determined from the weight mix ratio by using the specific gravities of each component also reported on each data sheet. Specific gravity is a unit-less quantity defined as the ratio of the density of a material to the density of water. Because water has a density of approximately 1 g/cc, the specific gravity can be considered the density in units of g/cc for the purpose of these calculations.

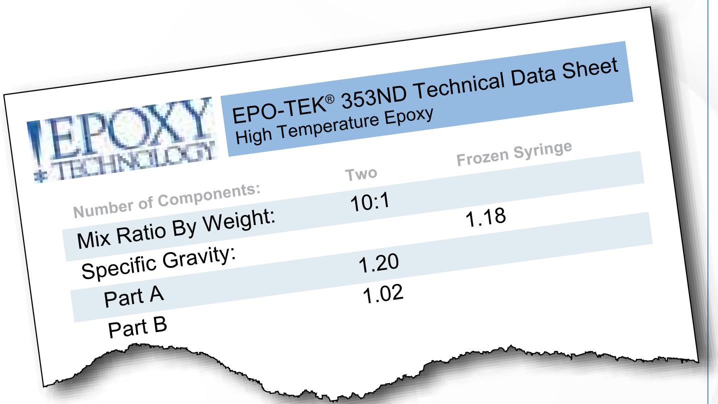
EPOXY TECHNOLOGY
Innovative Epoxy Adhesive Solutions for Over 40 Years™

Epoxy Technology Inc. • 14 Fortune Drive • Billerica, MA 01821
phone 978-667-3805 fax 978-663-9782 Toll Free 800-227-2201 techserv@epotek.com

Example One:

EPO-TEK 353ND

Consider EPO-TEK 353ND where the mix ratio by weight is 10:1, and specific gravities are 1.20 for Part A and 1.02 for Part B.



EPO-TEK® 353ND Technical Data Sheet
High Temperature Epoxy

	Two	Frozen Syringe
Number of Components:		
Mix Ratio By Weight:	10:1	
Specific Gravity:		1.18
Part A	1.20	
Part B	1.02	

Divide the number of weight parts by the respective density:

$$\frac{\text{weight parts Part A}}{\text{density Part A}} = \frac{10\text{ g}}{1.20\text{ g/cc}} = 8.33\text{ cc}$$

$$\frac{\text{weight parts Part B}}{\text{density Part B}} = \frac{1\text{ g}}{1.02\text{ g/cc}} = 0.98\text{ cc}$$

This yields a volumetric mix ratio of 8.33 : 0.98, which can then be normalized to a more convenient ratio. To create a ratio in the form of 100:b, divide the volume parts of Part B by the volume parts of Part A and multiply the result by 100.

$$\frac{\text{volume parts Part B}}{\text{volume parts Part A}} \text{ X100} = \frac{0.98\text{ cc}}{8.33\text{ cc}} \text{ X100} = 11.8$$

This yields a volumetric mix ratio of 100 : 11.8 The ratio can also be normalized to the form a:1 by dividing the volume parts of Part A by the volume parts of Part B.

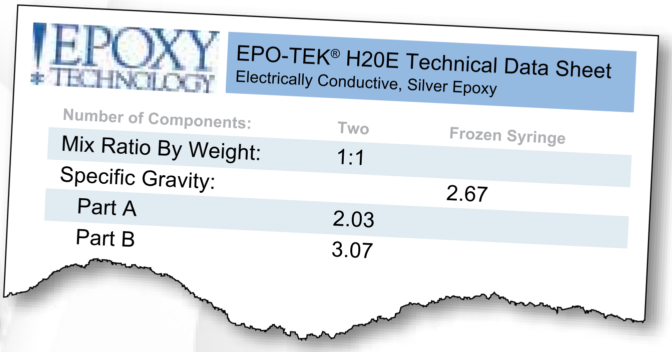
$$\frac{\text{volume parts Part A}}{\text{volume parts Part B}} = \frac{8.33\text{ cc}}{0.98\text{ cc}} = 8.50$$

This yields a volumetric mix ratio of 8.5 : 1

Example Two:

EPO-TEK H20E

Consider another example using EPO-TEK H20E which has a mix ratio by weight of 1:1, and specific gravities of 2.03 for Part A and 3.07 for Part B.



EPO-TEK® H20E Technical Data Sheet
Electrically Conductive, Silver Epoxy

	Two	Frozen Syringe
Number of Components:		
Mix Ratio By Weight:	1:1	
Specific Gravity:		2.67
Part A	2.03	
Part B	3.07	

Divide the number of weight parts by the respective density:

$$\frac{\text{weight parts Part A}}{\text{density Part A}} = \frac{1\text{ g}}{2.03\text{ g/cc}} = 0.493\text{ cc}$$

$$\frac{\text{weight parts Part B}}{\text{density Part B}} = \frac{1\text{ g}}{3.07\text{ g/cc}} = 0.326\text{ cc}$$

This yields a volumetric mix ratio of 0.493 : 0.326, which, just as before, can then be normalized to a the form of 100:b by dividing the volume parts of Part B by the volume parts of Part A and multiplying the result by 100.

$$\frac{\text{volume parts Part B}}{\text{volume parts Part A}} \text{ X100} = \frac{0.326\text{ cc}}{0.493\text{ cc}} \text{ X100} = 66.1$$

This yields a volumetric mix ratio of 100 : 66.1. Normalizing instead to the form a:1 by dividing the volume parts of Part A by the volume parts of Part B gives:

$$\frac{\text{volume parts Part A}}{\text{volume parts Part B}} = \frac{0.493\text{ cc}}{0.326\text{ cc}} = 1.51$$

This yields a volumetric mix ratio of 1.51 : 1

For other useful tips, please visit **epotek.com** and click our **technical info tab.**

ISO 9001 RoHS COMPLIANT 2002/95/EC REACH COMPLIANCE

EPOXY TECHNOLOGY
Innovative Epoxy Adhesive Solutions for Over 40 Years™

Epoxy Technology Inc. • 14 Fortune Drive • Billerica, MA 01821
phone 978-667-3805 fax 978-663-9782 Toll Free 800-227-2201 techserv@epotek.com