

commonly reported energy performance as the center-of-glass R-value.

U-factors differ depending on the temperature at which the measurements are made. These differences can be significant because of the thermodynamics of heat flow through windows. With a large difference in temperature across a window (*delta-T* in engineering parlance), convec-

tion currents form in an insulating glass unit (IGU), and proportionally more heat loss will occur via convection compared with conduction and radiation. American window energy performance testing and modeling assume a *delta-T* of 70°F (0° outside and 70° inside). In Europe, however, a much lower *delta-T* is assumed for window energy performance model-

ing: just 35°F. Even in a reasonably cold Northern European climate, this much more closely reflects the average *delta-T* during the heating season.

American windows are designed to perform well with a 70°F *delta-T*, and European windows are designed to perform well with a 35°F *delta-T*. This difference in assumptions

## European High-Performance Windows Available in North America

This table lists a number of the leading European windows that have entered the U.S. market in recent years, driven largely by the growing interest in Passive House buildings. This is not a comprehensive list, and the U.S. distribution of these windows is developing.

Product/Manufacturer	Country of Origin	U.S. or North American Distributor	Product Description
Bieber Windows	France	Bieber Architectural Windows Newport Beach, California <a href="http://www.bieberusa.com">www.bieberusa.com</a>	Bieber produces finely crafted, triple-glazed, FSC-certified wood windows. Aluminum or bronze cladding is available. Passivhaus windows are marketed both through Bieber directly and through Optiwin (see below).
Drewexim Windows	Poland	Fenestrations Plus Bangor, Maine <a href="http://www.fenplus.com">www.fenplus.com</a>	Drewexim makes wood and aluminum-clad wood windows, including triple-glazed models that carry Passivhaus certification. FSC-certified wood is available. Both tilt-turn and outward-opening casement options are available.
Energate	Germany	H Window Ashland, Wisconsin <a href="http://www.passivehwindow.com">www.passivehwindow.com</a>	Energate is a line of German triple-glazed windows available in wood, aluminum-clad wood, and PVC. The company expects to set up a manufacturing facility in the U.S.
Intus Windows	Lithuania	Intus Windows Washington, D.C. <a href="http://www.intuswindows.com">www.intuswindows.com</a>	Intus offers German-engineered triple-glazed windows. The highest-performing model, the Premier Passiv 78, is certified by the Passivhaus Institute and available in PVC or wood with aluminum or bronze cladding.
Optiwin	Germany	Optiwin Windows - U.S. Minneapolis-Watertown, Minnesota <a href="http://www.optiwin-usa.com">www.optiwin-usa.com</a>	Finely crafted German wood windows. The company's 3Wood window was the first wood window to achieve Passivhaus certification. The spruce/fir or larch frames include cork to reduce thermal bridging. Aluminum cladding is available.
Pazen Enersign Windows	Germany	QPlus Oakland, California <a href="http://www.qplus-llc.com">www.qplus-llc.com</a>	Pazen ENERsign windows combine wood interiors with fiberglass exteriors for durability. Pazen windows carry Passivhaus certification. The windows can be outfitted with integral exterior louvered blinds that hide away when not in use.
Rieder KG	Austria	Cembra Accord, New York <a href="http://www.cembra.us">www.cembra.us</a>	Rieder KG manufactures Passivhaus-certified wood and vinyl windows, both available with aluminum cladding. Spruce, larch, and oak frames are common, and other species are available on request.
Schüco	Czech Republic	European Architectural Supply Lincoln, Massachusetts <a href="http://www.eas-usa.com">www.eas-usa.com</a>	Schüco is a leading manufacturer of aluminum commercial windows and vinyl residential windows. The vinyl windows are Passivhaus-certified and designed in Germany but manufactured in the Czech Republic.
Silber Windows	Australia	Portofino Fine Doors and Windows Santa Barbara, California <a href="http://www.portofinodoors.com">www.portofinodoors.com</a> <a href="http://www.silberfenster.at/en">www.silberfenster.at/en</a>	Silber produces high-performance triple-glazed, wood and aluminum-clad wood windows. Passivhaus-certified models include insulation in the frame to minimize heat loss. A wide variety of woods is available.
Sorpetaler Windows	Germany	Sorpetaler USA Greenwich, Connecticut <a href="http://www.sorpetalerusa.com">www.sorpetalerusa.com</a>	Sorpetaler makes high-end wood and aluminum-clad wood windows, including triple-glazed models. Inward-opening is standard, but outward-opening casements can also be ordered. Integral screens and exterior roller shutters are also available, as is FSC-certified wood.
UniLux	Germany	New England Fenestration Stratham, New Hampshire <a href="http://www.nefenestration.com">www.nefenestration.com</a>	Unilux is Europe's largest window manufacturer, producing wood, aluminum-clad wood, and vinyl windows, including high-performance, triple-glazed models. The highest-performing models include low-conductivity materials in the frame to improve performance.
Zola	Poland	Zola Windows Louisville, Colorado <a href="http://www.zolawindows.com">www.zolawindows.com</a>	Zola is a U.S. company that uses German and Austrian technology to custom-fabricate top-performing windows in Poland. The company's top-performing ThermoPlus Clad window has a unit U-factor of 0.123. Zola is reputed to offer the lowest-priced Passivhaus windows.