



E-FAST system prototype.

# E-FAST electric fastening

## Process for the rapid curing of adhesives

In industrial production involving adhesives, methods for rapid curing of adhesives are becoming increasingly important. Special interest is focused on rapid curing processes in which heat is applied only locally to the components to be joined. This allows for short curing times that range from several minutes to just a few seconds, while neighboring structures, some of which may be temperature-sensitive, are left unaffected.

### E-FAST process

The E-FAST process makes it possible to cure adhesives in just seconds, reliably and with little energy consumption. A combined heating/sensor element is integrated into the adhesive, where it heats the adhesive layer to the necessary curing temperature. It also allows for direct measurement of the temperature within the adhesive layer, in order to control the curing process with high precision.

### Your benefits at a glance

Because the E-FAST process creates a single unit out of the adhesive and heating/sensor element, it makes it possible for components to be joined together very quickly without sacrificing reliability. Component costs are pushed up slightly by including the additional heating/sensor element, but this is more than offset by the reduced investment in equipment, lower energy costs, and faster cycle times.

- Heating with high power density and low energy consumption
- Integrated temperature measurement for reproducible process engineering
- Reliable adhesive curing in a matter of seconds



Left: Bolt with pre-applied adhesive and heating element.

Right: Joined bolt.

### Temperature control

Precise temperature control during the process is essential for the reliable rapid curing of adhesives. If the optimum curing temperature is not reached, the adhesive bond is weaker and less durable. On the other hand, if the adhesive layer is overheated, it can suffer direct thermal damage. Since rapid curing entails high rates of heating and cooling, major temperature gradients arise between the adhesive and the components. As a result, the temperature in the adhesive can no longer be assumed to be equal to the components' temperature measured externally.

Because it measures temperature inside the adhesive layer, the E-FAST process offers a decisive advantage over conventional processes in which the temperature is measured from the outside.

### Process description

The heating/sensor element, placed in the middle of the adhesive layer, is a thin metal foil that heats up when an electrical current is applied. Since the heat goes directly into the adhesive from the heating element, the process takes place at maximum efficiency. Once curing is complete, the heating element must by necessity remain in the bond line. However, tests have shown that this causes no appreciable reduction in the adhesive strength of the bond.

### Industrial implementation

Developed by Fraunhofer IFAM, which has filed a patent for it, the E-FAST process can be easily adapted to a wide range of applications. Fraunhofer IFAM can provide both the necessary know-how for engineering the process as well as customized adhesives.

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