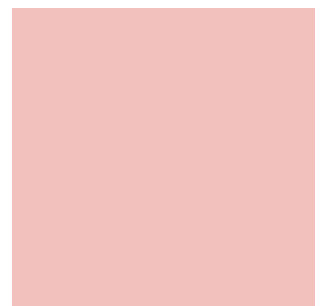
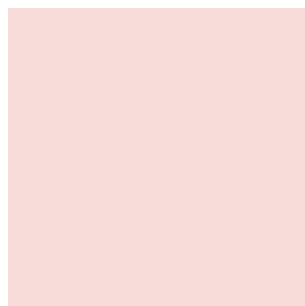




## Standard Components for Plastic Joining



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An ever increasing variety of models and variants, new designs and materials as well as decreasing development times and product cycles lead to manifold tasks that require new and versatile joining solutions. FRIMO provides a wide range of technologies for the joining of plastic materials. The portfolio includes almost all welding and riveting processes as well as combined edgefolding and gluing equipment. FRIMO customers benefit from bundled joining know-how and a technology-neutral consultation. This results in technically and economically optimized solutions, depending on customer- and project-specific requirements.

FRIMO's ultrasonic standard components, standard welding and riveting units can be supplied promptly and easily integrated into all common types of equipment and even complex production lines.

## FRIMO Digital Ultrasonic Generators



Type FG  
440 / 840 / 1530 / 1522 /  
1520 / 2220 / 2222

### Menu Guidance:

- Frequency indication
- Power indication
- Combined indication
- Amplitude control
- Timer mode
- Energy mode
- Power monitoring
- Time monitoring
- Part counter
- Contrast
- Background lighting
- Password

Based on digitally controlled process-relevant parameters, FG ultrasonic generators guarantee maximum precision and stability. The generators are available with frequencies of 20, 30 and 40 kHz and with performances ranging from 400 to 4000 watt. Sophisticated protective systems ensure high operational reliability and an efficient protection of the connected ultrasonic oscillator systems. Due to the digital technology any negative influencing factors on the parameter settings such as temperature, component tolerances and aging have completely been eliminated. FRIMO generators provide perfected technology, a modular design and are robust and very easy to operate. As a result, users take benefit from high levels of convenience and serviceability without a compromise in regard to state of the art technology.

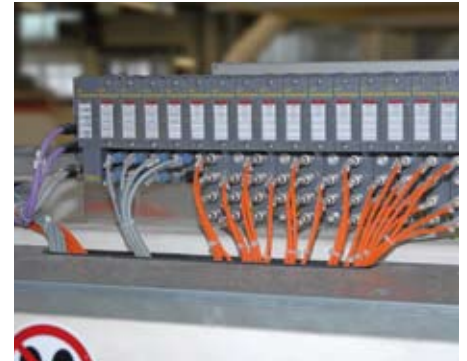


Type FG 440 B

### Characteristics

- Digital frequency generation
- Wide pull-in range of operation frequency
- Intelligent ventilator switching to prevent any unnecessary soiling
- High no-load operation safety
- Soft-start system for smooth oscillation build-up
- Large LCD graphics display
- Monitoring / storage of joining parameters
- Remote maintenance via modem; optional RS 232/485 interface

## Standard Components – prompt availability and flexibility of use



### Ultrasonic Converters

FRIMO ultrasonic converters transform high-frequency energy from the generator into mechanical energy by the use of piezoelectric elements. Subsequently, the sonotrodes introduce the mechanical energy into the joining area.

### Sonotrodes

Sonotrodes amplify the mechanical vibrations produced in the generator and in the converter and transmit them to the joining seam. The design and the shape of the sonotrodes depend upon the welding geometry and the material used. Sonotrodes should be aligned preferably in a vertical position with respect to the welding surface. Maximum diameters correspond to one third of the wave length. For larger diameters, web or block-type sonotrodes are used.

### High-Frequency Switches

In complex welding machines, FRIMO high-frequency switches are used as complete units to direct the high-frequency energy from the generators to various ultrasonic converters, depending on the applications to be handled. The entire unit can be fixed without the use of additional switch cabinets. The sonotrodes are activated by means of software. This improves flexibility and saves time and costs.

#### Characteristics

- High levels of efficiency of more than 95%
- Titanium final mass
- Possibility of repair
- Direct introduction of force from ultrasonic oscillator system into housing
- Special version provided with air cooling
- No cooling up to 60% duty cycle
- Low no-load power
- Compact design

#### Characteristics

- Available for all commonly used frequencies
- Easy assembly
- Amplitudes ranging between 15 and 50  $\mu\text{m}$
- Aluminium versions (for testing, small quantities, etc.)
- Titanium versions (for unfilled plastics, etc.)
- Steel versions (for reinforced plastics, etc.)

#### Characteristics

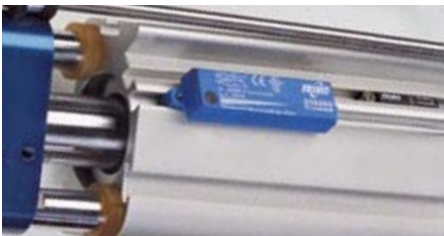
- Can be connected to all commonly used industrial bus systems
- Available in modular configurations according to application
- Easy spare parts management
- Easy operation
- Possibility of remote maintenance
- PLC software packages (optional)
- High-frequency switching units are exclusively offered by FRIMO

## For all types of equipment



### Feed Units (Actuators)

Pneumatic feed units are used to move the sonotrodes without distortion to the joining surface and to apply the joining pressure needed. A contactless position measuring system developed by FRIMO with a measuring range of 40mm ensures high levels of repetitive accuracy.



#### Characteristics

- Chokes, position sensor systems, limit switches can be connected
- Flexible mounting due to air connections provided laterally or on top
- Versatile fastening notches
- Length versions from 50 to 250mm stroke
- Damper (optional)
- PLC software packages (optional)



Hand welding gun with pistol grip

### Hand Welding Guns

FRIMO ultrasonic hand welding guns are ideal for use in flexible applications, such as the manufacture of prototypes, repairs or joining operations in small-series production.



Rod-shaped hand welding device



#### Characteristics

- Ergonomically shaped handle
- Light-weight and impact-resistant aluminum housing
- 3.5m or 5m system cable

### Benefits

- Easy to operate component design
- Cost saving
- High quality for long product life
- Perfected technology

### FRIMO Service

-  Customer Training / Production Support
-  Inspection / Maintenance
-  Spare Parts Management
-  Breakdown and Repair Service
-  Retrofit / Modernization
-  Relocation of machines and plants



Detailed view of hot-plate welding unit

## Hot-plate Welding

As a low-temperature and high-temperature welding process hot-plate welding is particularly suitable for joining thermoplastic components with two "good" sides. Extremely low gap dimensions (tending to zero) as well as high strength and gas tightness of the seams can be realized.

FRIMO hot-plate welding machines are particularly suitable for welding large surface areas. They feature a number of technical advantages to simplify and accelerate the process. A quick-change system for preheated tools allows a fully automatic tool change in just three minutes.



Basic hot-air riveting unit

## Hot-Air Riveting

The heat stake to be formed is subjected to non-contact heating via hot air. The air is heated by means of an air stream heater, separately for each heat stake. The parameters for each heat stake (energy / air volume) can be adjusted separately. After the heat-up time, a cold rivet header is used to form the heat stake (pneumatically).

Based on a physically perfect separation of the heating and forming processes, the hot-air riveting process provides extremely strong joints with no play between the joined materials.

Basically, this technology can be used for processing all kinds of thermoplastics.



Basic heat staking unit

## Heat staking

This method has been technically improved by FRIMO. For specified applications, it is a comparatively cost-effective alternative to ultrasonic riveting.

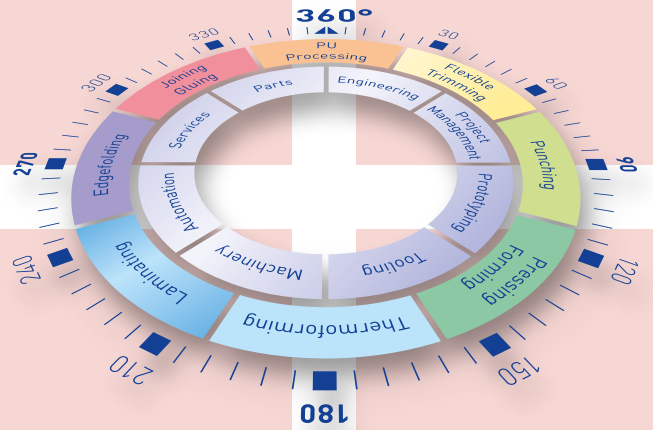
This process is an efficient way of joining different compound materials from metal or plastics with the use of thermoplastic rivet pins (e.g., from polypropylene, polyamide 6, ABS or POM). It can also be used for joining sheet-metal and plastic materials in safety-relevant applications, such as airbags for the automotive industry.

An electronic control system ensures a backlash-free fit of the parts to be joined. High strength of the rivet joint and gentle processing are features making this process highly attractive, especially for components with first-class surfaces.





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