

APPLICATION NOTE: Continuous laminating furnace for the production of laminated glass

Overview

- **Application:** Continuous laminating furnace for producing laminated glass. It is used in the automotive and construction industries thanks to its strength and safety features
- **Products:** Solid State Relay single-phase GRP series with integrated diagnostics analog and digital control

The process

Laminated glass or composite glass is a type of safety glass that, in the event of breakage, does not shatter completely, thereby reducing the risk of injury to people or damage to surrounding objects. This characteristic is typically achieved by placing a layer of polyvinyl butyral (PVB) between two glass sheets. Laminated safety glass is used in the automotive industry (car windshields) and increasingly in the construction sector (windows, flooring, or glass surfaces), where these products can also provide soundproofing properties and UV ray reduction.

The production process involves an initial phase of washing and drying the glass sheets, followed by the application of the PVB layer in a climate-controlled chamber. The sheets are then subjected to heat treatment with a thermal profile inside a continuous oven, where the bonding between the glass and the PVB takes place.



Figure 1 – Example of laminated product

The challenge

In the glass lamination process, the most critical phase after bonding the sheets with the PVB film is the thermal treatment of the glass. In this stage, the treatment temperature, combined with the action of compression rollers, ensures full adhesion of the various layers and the elimination of any air bubbles.

The lamination oven can be heated either by infrared radiation (using IR lamps) or by convection (using heating elements).

In the case of uncoated glass, radiation heating (IR) is the most effective method, as the radiant energy is efficiently transferred through the glass directly to the PVB film, which heats up accordingly, ensuring proper bonding with the glass sheets.

In the case of coated glass (e.g., low-emissivity insulating glass), this effect is reduced because much of the radiant energy is reflected, meaning that heat can only penetrate the PVB film to a limited extent, if at all. In such cases, convection heating using resistive elements is the most effective method of heat transfer, as the energy is not reflected but efficiently transferred to the glass and subsequently to the PVB film. To ensure the appropriate thermal gradient and temperature uniformity, continuous lamination ovens are divided into several heating zones, each controlled individually or in groups of heaters. Fast and accurate diagnostics of the proper functioning of each heating element is essential to ensure high-quality production without waste or costly rework.

Product benefits

Solid State Relay (SSR) GRP-H

- Single-phase solid state relay
- Current from 15A to 120A
- Partial load break alarm (1/8)
- Trigger modes
 - ZC / BF / HSC / PA
- Control commands
 - Analog / Logic
- Digital output alarm
- IO-Link communication
- Configuration
 - NFC App / PC / IO-Link

Solution

Optimized control

The GRP-H series offers all the control and diagnostic functionalities necessary to ensure proper and effective heating management, whether using linear electric resistors or IR lamps.

- Optimized installation in electrical panels thanks to **extremely compact size** of all current ratings, from 15A to 120A.
- In installations using groups of heating elements, where it is necessary to detect the loss of a single branch even at limited power, the GRP series allows for **partial load failure diagnostics with an accuracy of 1/8 of the total load**. This is made possible by ratiometric measurement technology, which compensates for possible variations in line voltage.
- IR lamps are particularly sensitive heating elements, especially during start-up at low temperatures. Power control during this phase ensures their long-term optimal operation. GRP-H devices allow configuration of a **Soft Start** ramp, which can be optimized for different types of IR lamps or lamination oven configurations.
- IR heating is particularly fast and precise. To fully exploit these characteristics, the most suitable control mode for each specific installation can be selected between **Half Single Cycle (HSC)** and **Phase Angle (PA)**.
- Even configuring simple devices such as SSRs can be complex, especially when identical configurations are needed across multiple units or in emergency situations. To address these challenges, the GRP-H series can be easily **configured** via a simple and intuitive **app with NFC technology**, available for both Android and Apple devices.
 - Fully **graphical** interface
 - **“Clone”** function for fast and secure multiple device setup
 - Configuration possible even without power supply
 - **Diagnostic** data reading (e.g., operating hours, temperature or current peaks, energy consumption, etc.)
 - **SSR configuration sharing via email** with support service for quick troubleshooting in case of issues or malfunctions

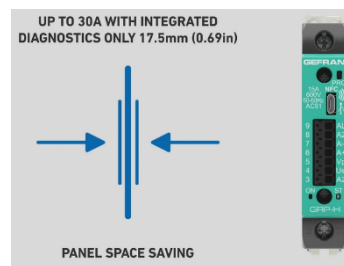


Figure 2 – Compact size

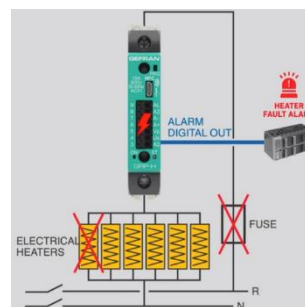


Figure 3 – HB partial load break alarm

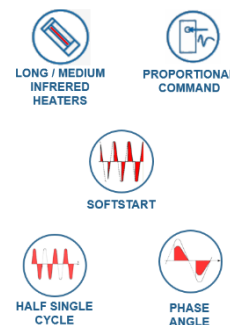


Figure 4 – Configurable control features



Figure 5 – Configuration with APP NFC connection

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