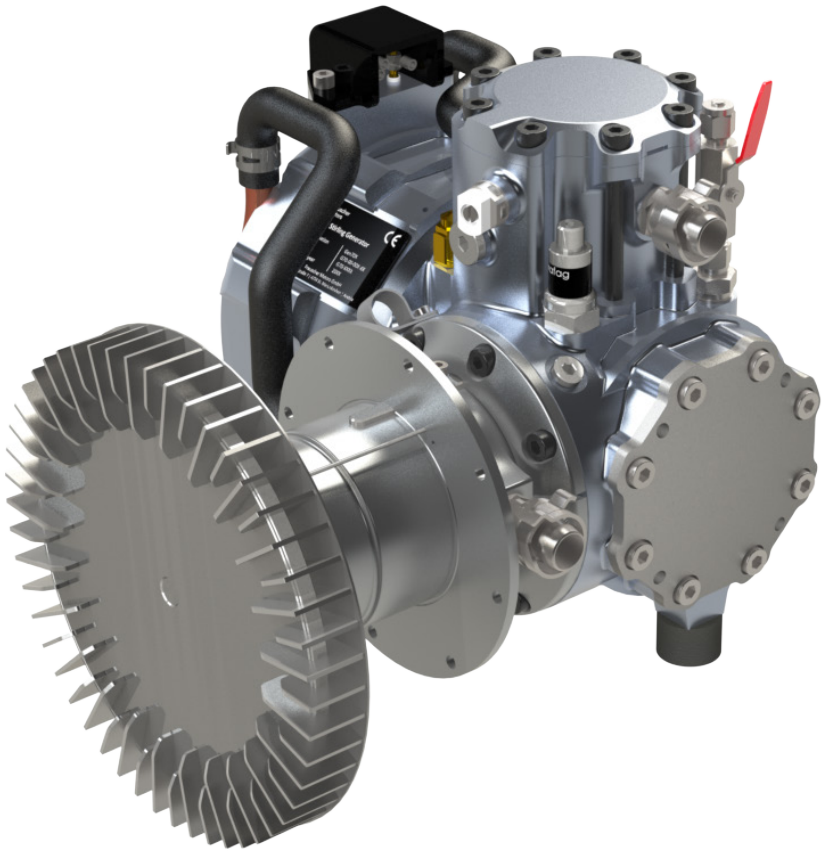

Figure 1: View of the Gen70DR Stirling generator

Introduction

The Gen70DR Stirling generator is a highly efficient alphagamma® Stirling generator with a maximum DC power output of 1200 watts. It converts heat energy into electrical energy in the simplest possible way. The disk-shaped heat exchanger was specially developed for operation with combustion gases from solid biomass. Typical examples are pellet, wood chip and pyrolysis gas furnaces. The module was developed for customers in the biomass boiler industry and can be integrated into existing solutions in many cases.

A central element is the new heat exchanger with its disk-like shape. This design is able to receive a high proportion of the radiant energy from the furnace. The rest of the heat transfer occurs through convection of the flue gases, which are directed over the fins arranged on the edge. (Figure 1)

Intensive research and development

The design of the heat exchanger is the result of many years of development. This led to the realization that the convective transfer of heat energy into the heater head of a Stirling engine requires a high heat exchanger surface. The reason for this is the low heat capacity of the hot flue gases, which only allow sufficient heat input via fine rib structures. However, such designs fail due to the ash residues in the flue gas, which cause rapid clogging. The patent-pending design of the heat exchanger increases the proportion of heat transfer by radiation to such an extent that only a small amount of heat needs to be transferred by convection. This is done by the radially arranged fins at the edge of the heat exchanger. A generous structure was deliberately chosen for the distribution of the fins to allow easy cleaning when necessary. Picture 2 shows an installation example in which the heat exchanger is aligned at the end of the burnout zone in the direction of the ember bed. (Figure 2)

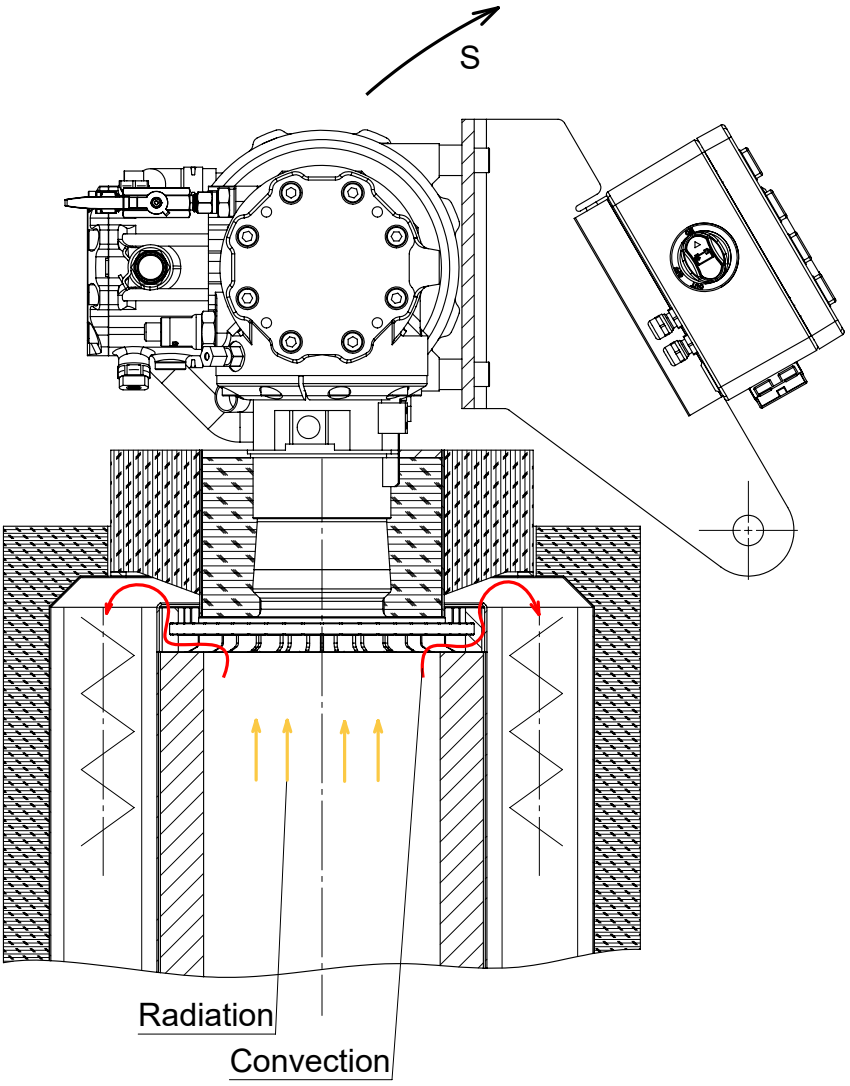

Fig. 2: Example of the arrangement of the unit after the burn-out zone of a pellet furnace. The swivel device should allow the machine to be easily folded up for cleaning purposes.

Available all year round: heating and emergency power supply

The high efficiency of the unit can be increased even further if the flue gases leaving the heat exchanger are at least partially used to preheat the combustion air, in particular to increase the temperature of the secondary air. The sum of these measures opens a new dimension in heating technology: the use of the boiler from “only for heating” to “only as a generator”, along with all the operating modes in between. For example, a pellet heating system achieves a considerable added value in that it cannot only continue to operate without interruption during a power outage but can also take over the supply of consumers in the house or apartment. In summer operation, only the cooling heat needs to be dissipated to the outside.

Easy entry with the Experimental Edition Set

Frauscher Motors supports its customers in integrating the generator module into a biomass furnace and shares its experience from more than two decades of research and development. When implementing an efficient biomass CHP plant, a number of design guidelines must be taken into account when designing the furnace and combustion chamber. A discretely constructed control module is available for the adaptation and test phase. This unit has the necessary functions to start the Stirling module when heat is supplied, for example, and to ensure that the batteries are charged. In addition, all physical values are displayed, which helps to ensure that a project is implemented quickly. This initially saves the customer having to modify his boiler control system and he can decide whether to integrate the functions into his control system in the end. (Figure 3)

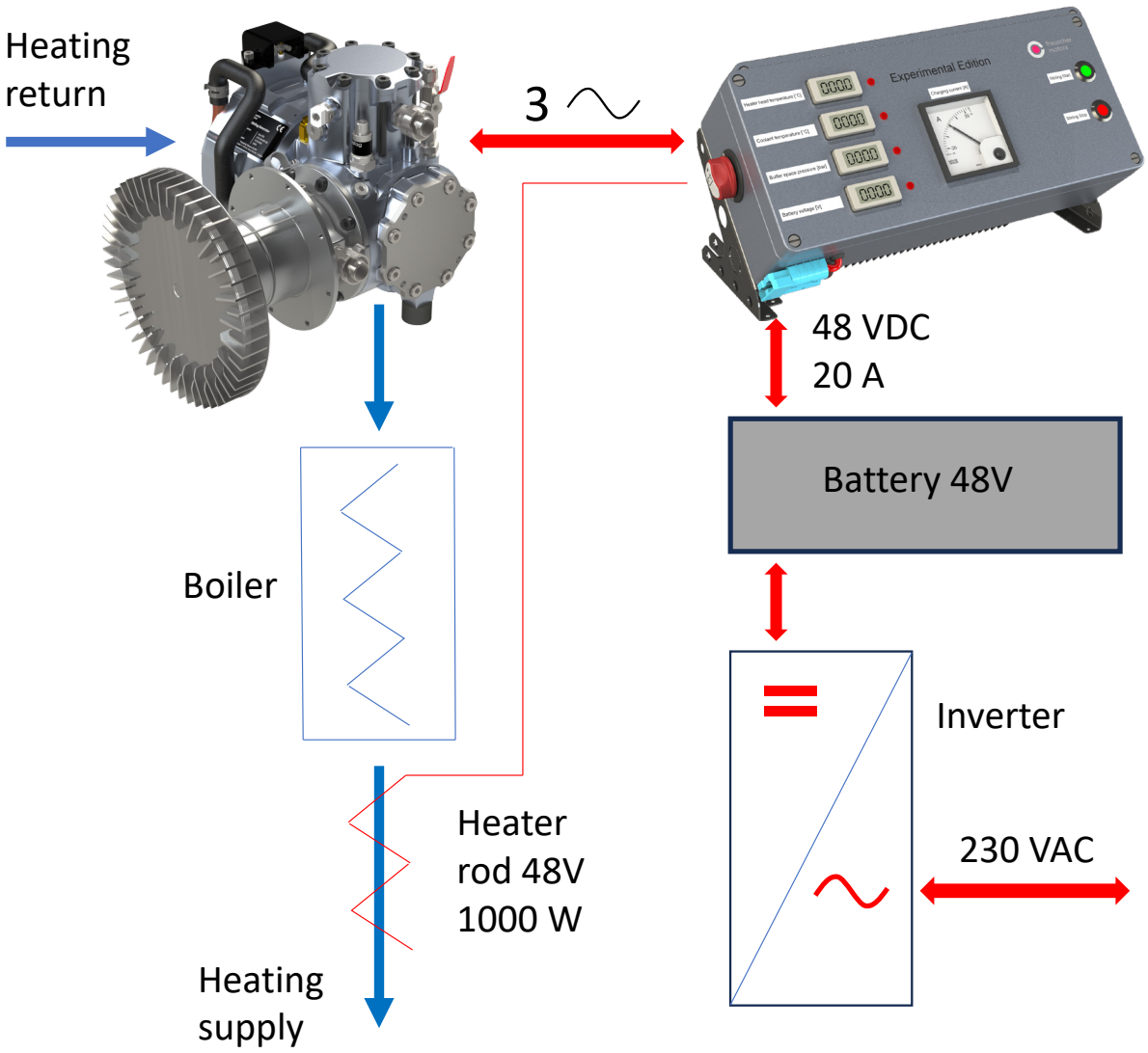

Figure 3: Simplified diagram of an experimental edition set for island power supply or grid connection
The heating rod is only required for charging control of the battery in stand-alone operation.

Good power yield even at partial load

Biomass furnaces are operated over long periods only in the partial load range. Since the Stirling generator draws off some heat, better utilization of the boiler can be achieved.
In addition, it is possible to cushion rapid heat requirements with electric heating rods, which are fed from the generator output and the storage battery. In addition, the Stirling generator offers a start/stop function to keep the heat exchanger at a high temperature level that promotes efficiency, even at the lowest partial loads. The 48-Volt DC technology provides the basis for many commercially available storage and inverter modules for connection to the building grid.

Sustainable and economical: the maintenance and service concept

Frauscher Motors has invested a great deal of effort in the reliability and durability of its aggregates. The target is a maintenance-free operating time of 10,000 hours in continuous operation, which is an excellent result for lubricant-free piston machines. The maintenance concept involves replacing the unit after the specified operating time, which is easy to do due to its low weight of just 29 kg. Since only the piston rings, piston guides and crankshaft bearings are subject to wear, the unit can be used again as a fully functional device after these parts have been replaced, thus conserving resources.

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