



SITGroup

NEW
patent pending

991 AEROTECH HM (HIGH MODULATION)



CONTROL SYSTEM FOR PREMIX GAS BURNER

Application

Fan-assisted gas-fired appliance with premix burner.

The system is particularly suitable for modulating condensing combi-boilers.

Main features

High modulating power range.

Advanced gas/air mixing system.

Compact dimensions with an extremely straightforward integration onto the fan.

Easy upgrade of existing pneumatic gas/air design.



THE SYSTEM

Figure 1 shows the schematics of the 991 AEROTECH HM. The fan provides the airflow needed for the combustion; the gas-air valve provides the gas flow as a given function of the airflow. The air restrictor is realised to get two different openings:

- the first SA1, larger, allows to have the maximum air flow suitable for the combustion at the maximum power;
- the second SA2, smaller, guarantees a good air signal pressure useful to operate the gas-air valve at minimum flow rate.

To ensure that the mixture has always the same gas-air ratio, the air restrictor is operated simultaneously with the gas restrictor (SG1 and SG2).

With this mechanism, the mixing system has two predetermined stages: HIGH, to get modulation between maximum and intermediate power, LOW to modulate the burner power from this intermediate value down to the minimum.

To avoid continuous switching of the system, when an intermediate power level is required, there is an overlap between the modulating range of the HIGH and LOW modes, see Figure 2.

The air restrictor SA and the gas restrictor SG are adjustable.

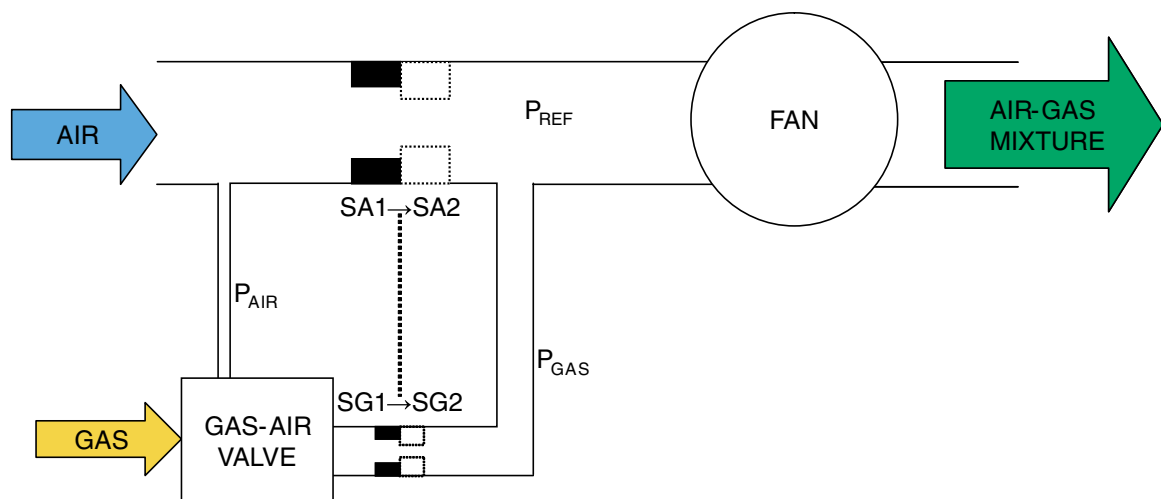
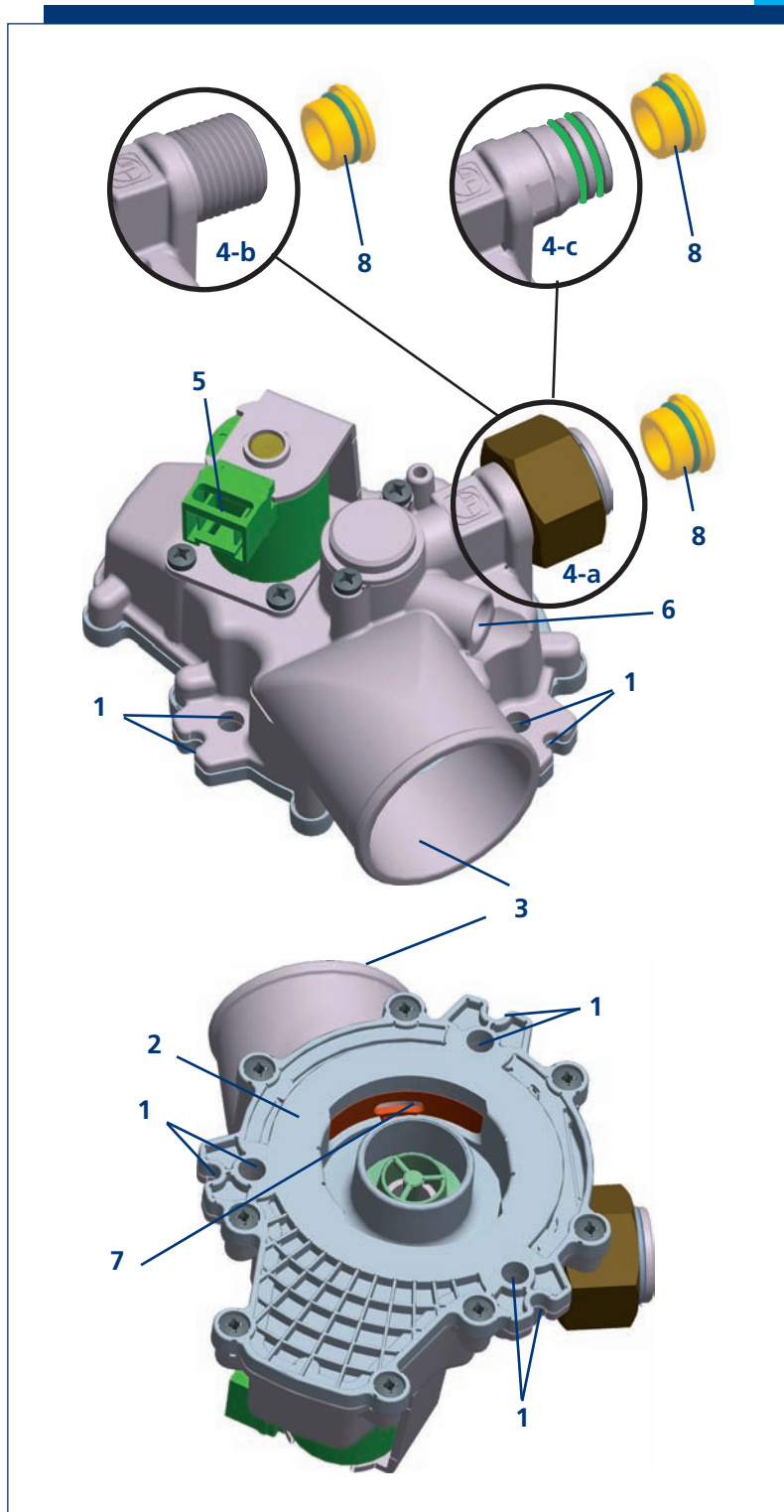


Figure 1: schematics of the 991 AEROTECH HM

DESCRIPTION

- 1 Mounting holes to the fan
- 2 Fan interface area
- 3 Air inlet
- 4-a Gas inlet female nut connection
- 4-b Gas inlet male threaded connection
- 4-c Gas inlet fast connection
- 5 HI-LO actuator electric terminal
- 6 Minimum setting screw
- 7 Plastic air inflow adjusting ring
- 8 Gas injector (optional)



ELECTRICAL DATA

	Voltage (Vdc)	Power (W)
HI-LO Actuator	24	6.5



CHARACTERISTICS

MODULATING RANGE

Given that a modulation range $C1$ (see Fig. 2) is 5 (ratio between the maximum and minimum power) with a pressure differential of 10 mbar at the maximum power, to get a minimum power of 1/5 of the maximum the differential pressure shall 0.4 mbar. The input power and therefore the flow is in square root relation with the differential pressure.

$$Q \approx S \sqrt{D}$$

If an increased modulating range up to 10 to 1 is required, with the same maximum power then the minimum differential pressure would go down to 0.1 mbar. This value, however, is unacceptable for the correct and reliable working operation of the pneumatic valve of the system.

In case that the supply surface areas are halved, for instance:

$$SA2 = 1/2 SA1$$

$$SG2 = 1/2 SG1$$

the ratios between the flows are kept constant (and therefore the combustion process parameters remain optimized) but the achieved thermal power is halved. Maintaining a minimum differential pressure of 0.4 mbar it is possible to get 1/2 of the power related to the modulating range $C1$, resulting in an overall increased modulating range C .

Graph of Figure 2 shows the modulation characteristic (power vs. fan speed) for the range $C1$ and $C2$ (achieved with $SA1$ and $SG1$ and with $SA2$ and $SG2$ respectively).

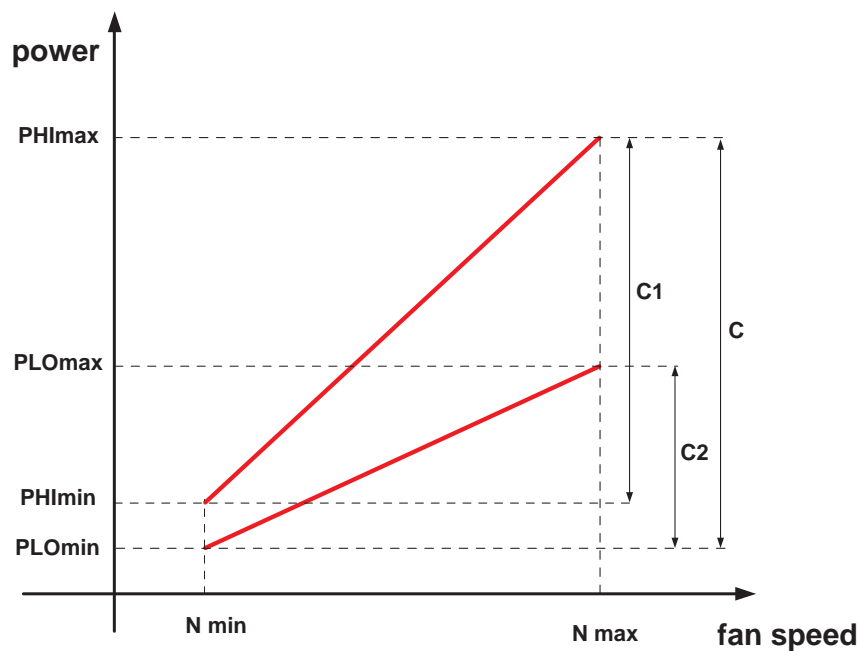
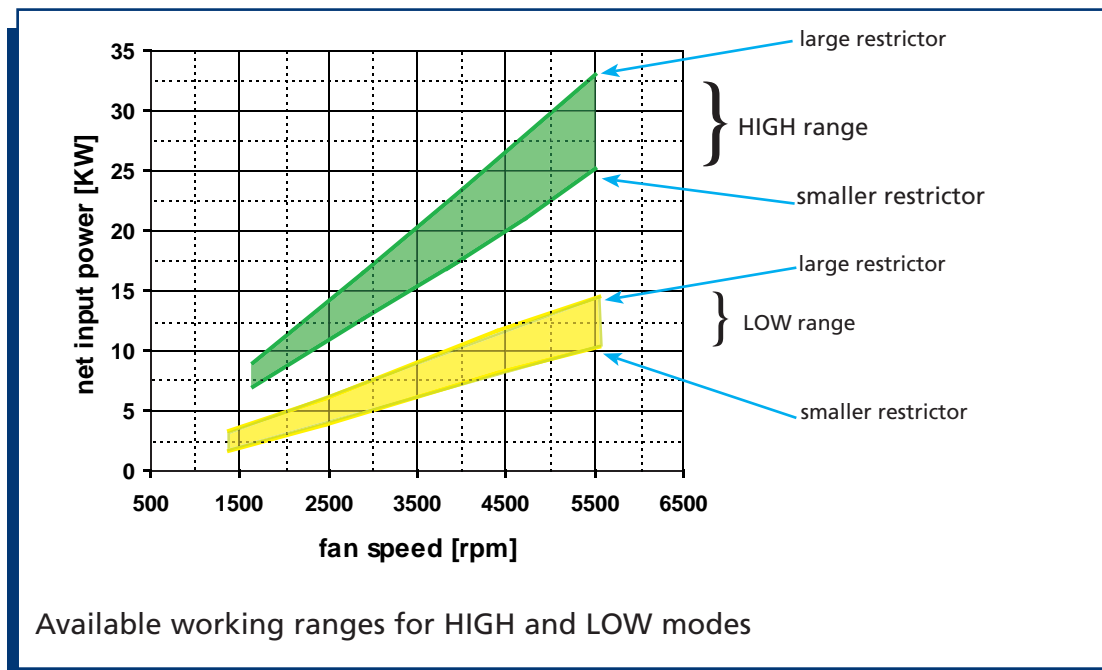


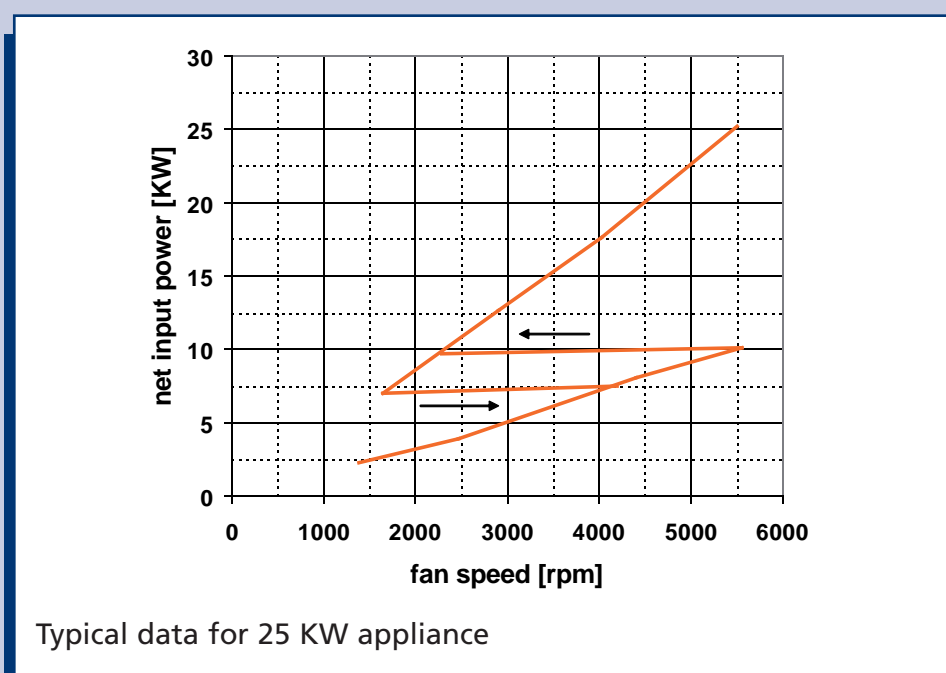
Figure 2: modulating range

The maximum and minimum heat inputs are strictly related to the appliance characteristics. Different plastic air inflow rings (air restrictors) are available to set the appliance power.

The following graph gives the input power modulating range with the HIGH and LOW mode respectively, using commonly available brushless fan.



The following graph gives the input power range using a Giannoni Isothermic (3+1 coils) heat exchanger equipped with a cylindrical premix burner. The airflow for the combustion is provided by a EVB 30P brushless fan. With the HM Aerotech in HIGH mode, the input power varies between 25 and 7 kW and between 10 and 2.5 kW in LOW mode.

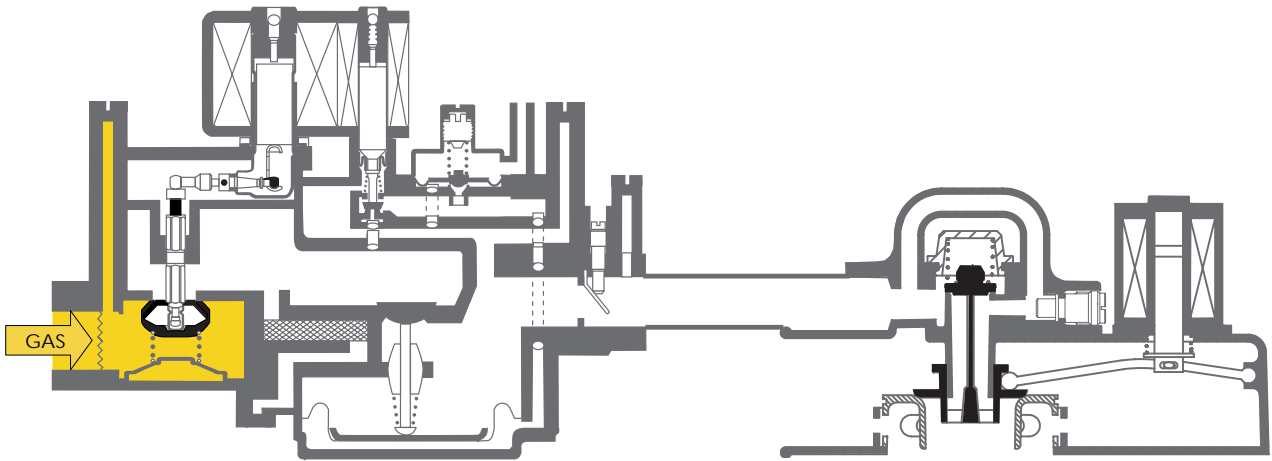




OPERATION

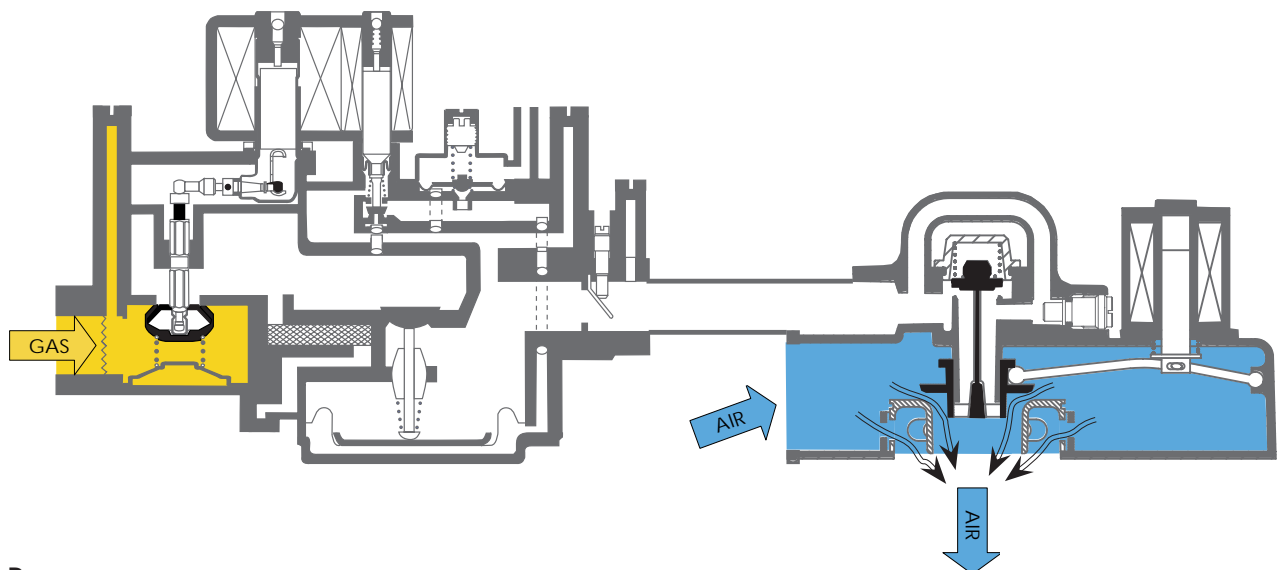
The following diagrams show the operation of the 991 AEROTECH HM together with 848 SIGMA.

Standby - With the appliance in standby there is no air flow through the 991 AEROTECH HM and the gas flow is blocked by the multifunctional gas/air control.



Standby

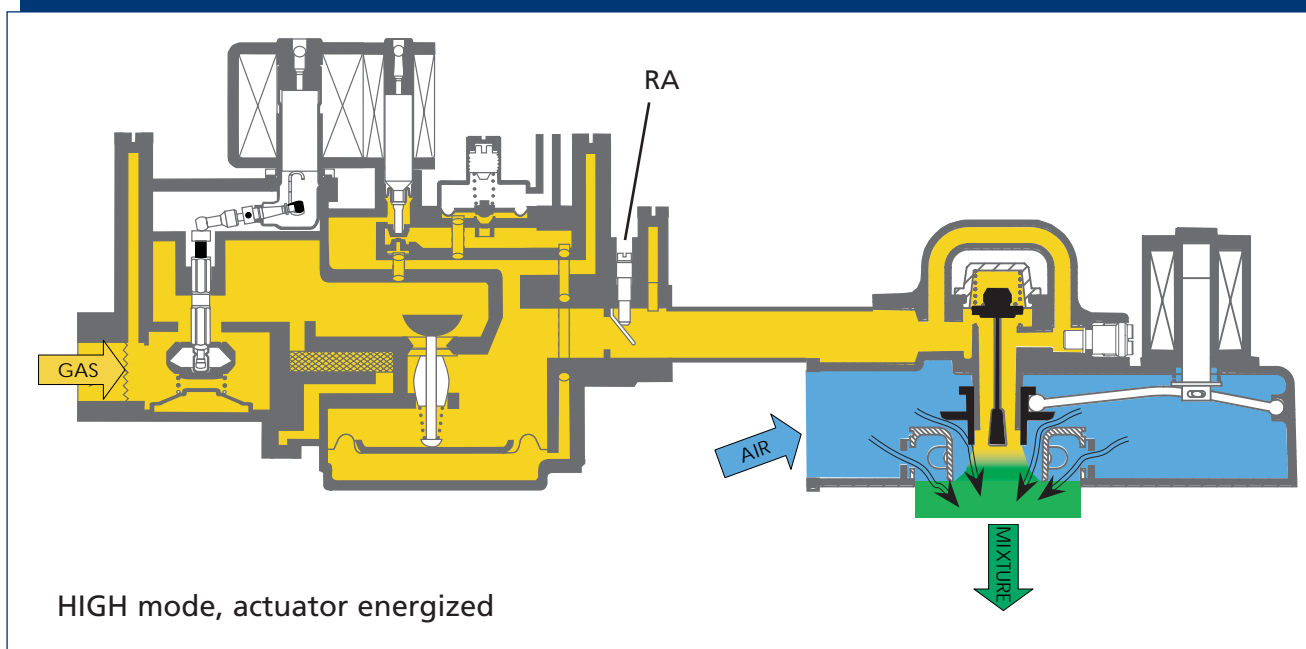
Pre-purge - In pre-purge conditions the maximum air flow through the 991 AEROTECH HM is enabled (HIGH mode).



Pre-purge

HIGH mode operation - Both the automatic shut-off valves are open. The gas flows from the gas control to the 991 AEROTECH HM in high modulating range. Air flows to the fan through both openings. The gas/air mixture then flows to the burner.

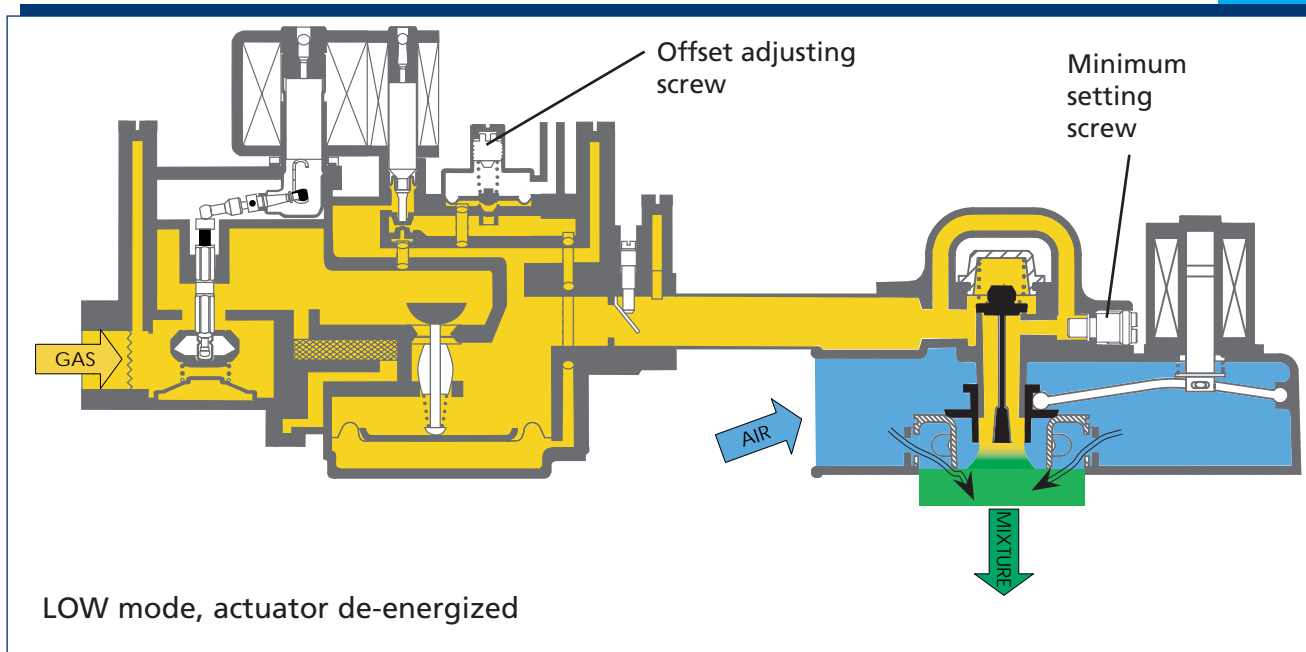
At maximum fan speed (maximum power, HIGH mode), the CO₂ level of the appliance combination process can be set by the RA of the gas valve.



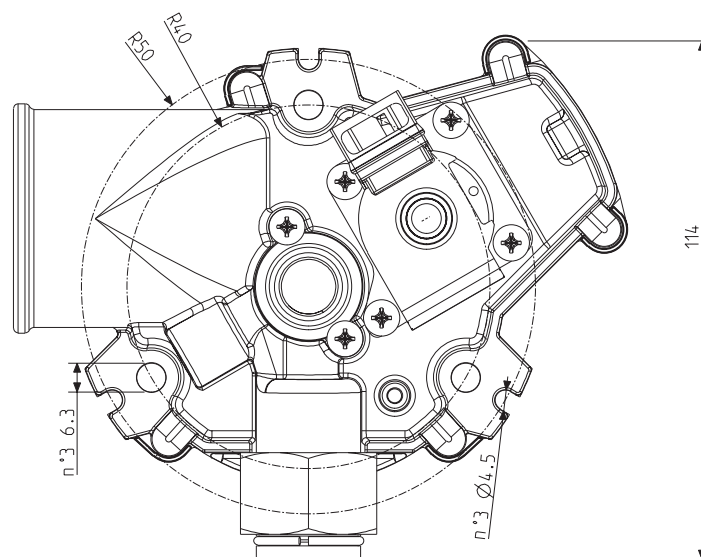
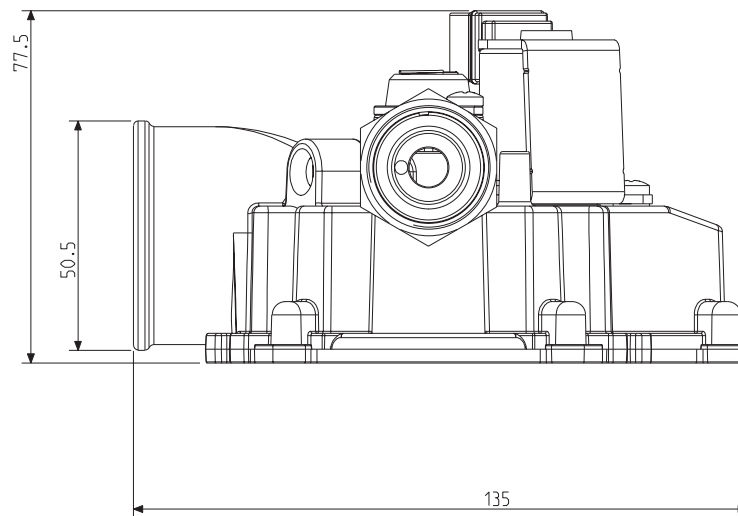
LOW mode operation - Both the automatic shut-off valves are open. The gas flows from the gas control to the 991 AEROTECH HM in low modulating range. Air flows to the fan through side openings only. The gas/air mixture then flows to the burner.

At maximum fan speed (maximum power, LOW mode), CO₂ can be set by the minimum setting screw of the 991 AEROTECH HM.

At minimum fan speed (minimum power LOW mode), CO₂ can be set by the offset screw of the gas valve.



DIMENSIONAL DRAWINGS



Fixing holes suitable for EVB30P brushless fan and other models

Dimensions in millimeters



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