ACTE

Heat exchangers
design & manufacturing

GAP 30-3-2 Recuperator/Economizer

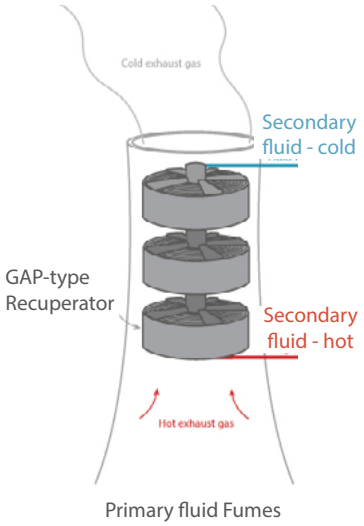
TECHNICAL DATASHEET

Exchanger type :
- Gas to Compressed air
- Gas to Liquid
- Compatible with phase change

Recovered thermal power from **50 to 300 kW**
Exhaust gas from 200°C to 700°C
Flow range from **250 to 2500 Nm³/h**
Local pressure resistance up to 16 bars at 250°C

GAP 30-3-2: where the heat exchange surface and external volume are optimised

The GAP 30-3-2 waste heat recuperator has been designed to answer heat recovery needs for applications that require highly effective exchange within a small volume. The 2 mm space between the plates let clean or slighty dusty fumes flow. The GAP 30-3-2 has been specially designed to fit within DN300 (12") chimney ducts.



WHY THE **GAP** HEAT RECUPERATORS

The ACTE GAP-type heat recuperators are at the cutting edge of small-size waste heat boiler technology. Thanks to the combination of performance, reliability and compactness, the GAP-type heat recuperators make waste heat recovery within reach of all industrial processes.

Size and weight: the combination of plates and pipes

Plate exchangers are much smaller and lighter than pipe exchangers. ACTE's GAP exchangers are manufactured using a clever mix of pipes and plates, allowing a closed volume in which a liquid can flow, providing a much larger surface area for the same length: the doublet.

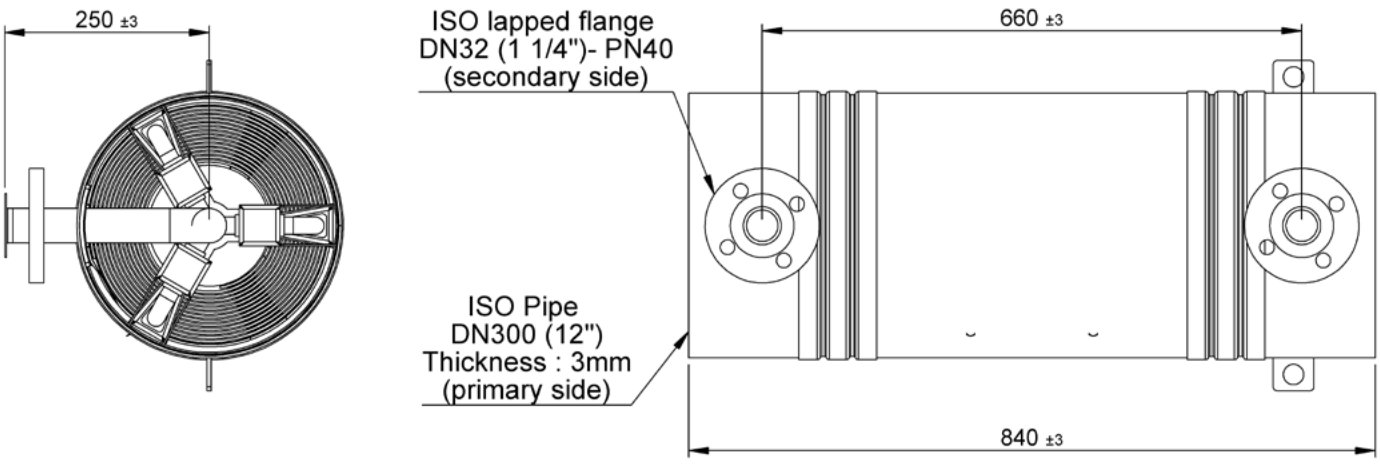
» Exchange surface of a 1" pipe: 0.08 m^2 per m
» Exchange surface of a doublet: 0.8 m^2 per m

Thanks to this, GAP recuperators allow energy optimisation on smaller size processes for which casual solutions are not suitable.

Pressure drops and particles: the benefits from the «gap» between plates

The bright idea reagarding the GAP technology is the space offered between each turn of plate. Thanks to this, the fumes path goes easily through the heat exchanger and the heat recovery is made with low impact on the industrial process.

Heat exchanger overview



Mechanical features:

Size and weight:

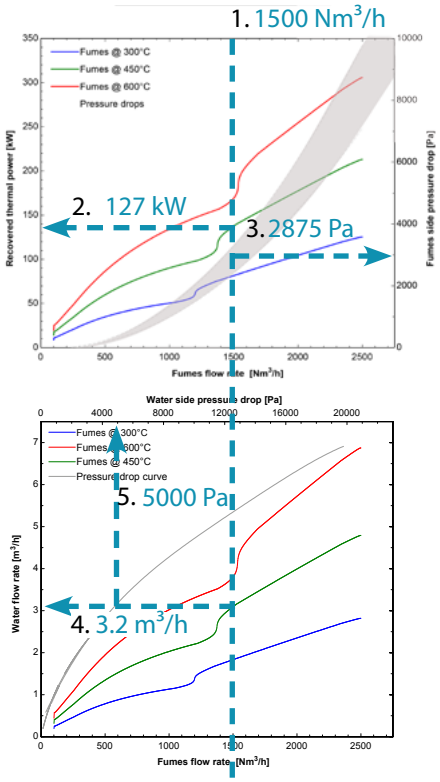
Duct connexion on the Primary side: DN300
Duct connexion on the Secondary side: DN32
Overall dimensions: Ø323.9 x 840 mm
Weight: 50 kg

Primary exchange surface:

Projected surface: 5.87 m^2
Gap between plates: 2 mm

Technical features:

To estimate your recuperator performances, please apply the following steps. First of all, please refer to the column corresponding to the chosen coolant (water or thermal oil).



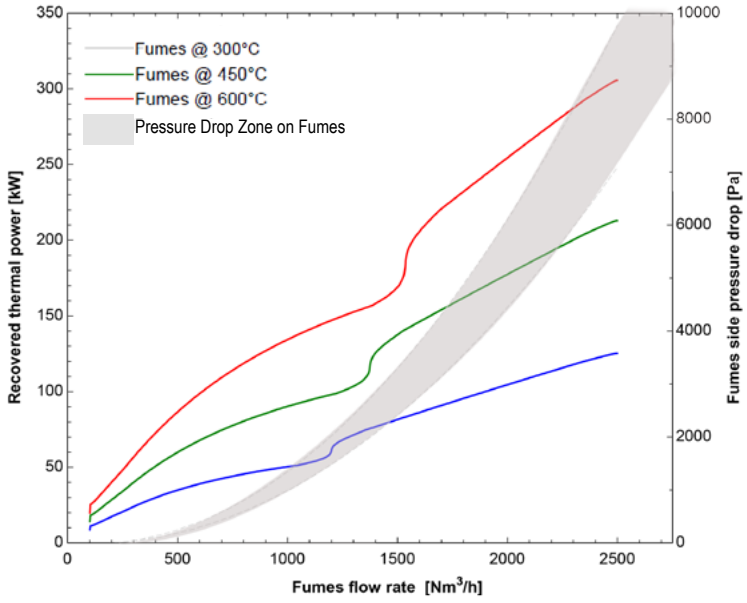
Then apply the 5-stages procedure below:

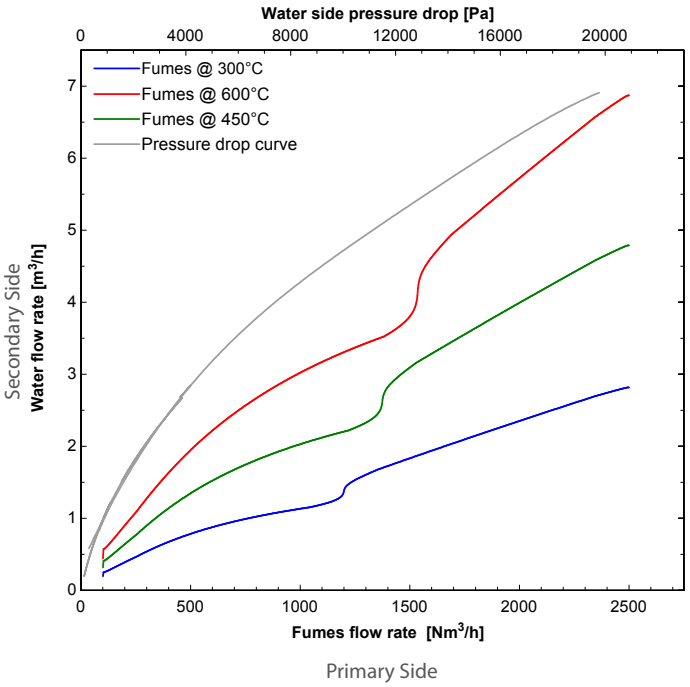
1. Trace a vertical straight line through the two graphs corresponding to the available gas (fumes) flow rate.
2. Depending on the temperature of the fumes, read the thermal power recovered on the left axis.
3. Read the pressure drop on the gases (fumes) from the grey zone[(1)] and the right axis.
4. On the bottom graph, read the water flow rate on the left axis from the curve corresponding to the temperature of the gases (fumes).
5. Read the pressure drop on the water side on the top axis from the blue curve (pressure drop).

Example:
Let's consider the available fumes flow rate is 1500 Nm^3 per hour and the temperature is 450°C:

- The power recovered is therefore 127 kW
- The pressure drop on the fumes is around 2875 Pa
- The corresponding water flow rate is 3.2 m^3 per hour
- The pressure drop on the water side is 5000 Pa

Water with 20% glycol



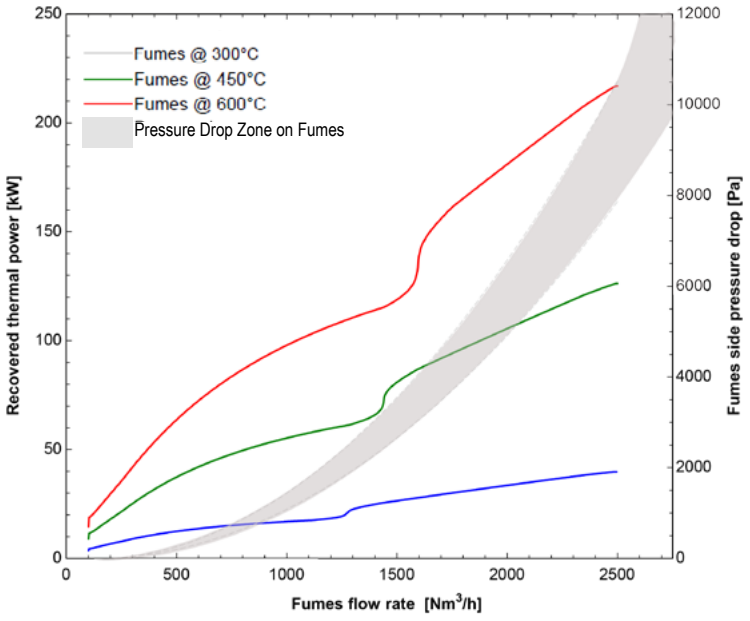


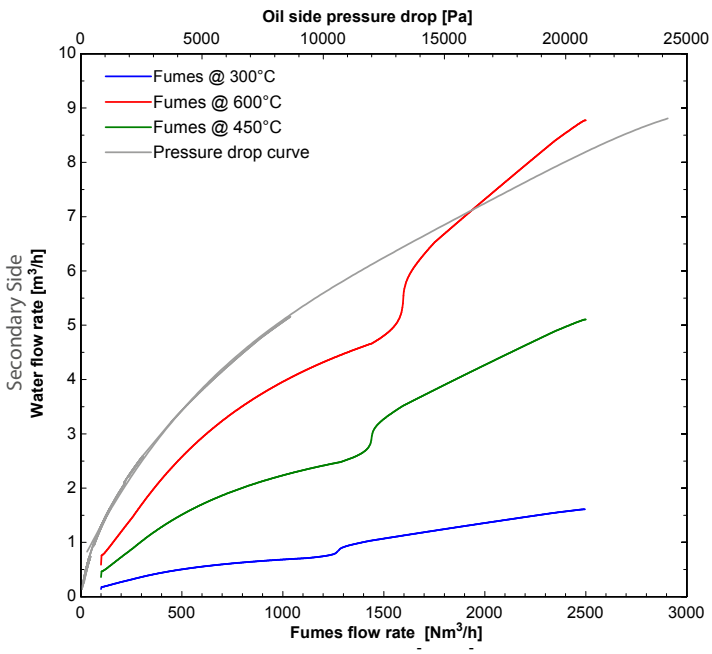
Primary Side

The flow rates given above have been calculated for a temperature difference of 40°C (temperature range : 50-90°C) on the water side.
For any other temperature difference, the corresponding water flow rate is obtained using the formula below. The corresponding pressure drop is then determined following the initial procedure.

$$\frac{\text{Power [kW]}}{\text{15.0732e6 x } \Delta T\ [°C]} = \text{Water flow rate [m}^3\text{/h]}$$

Thermal oil





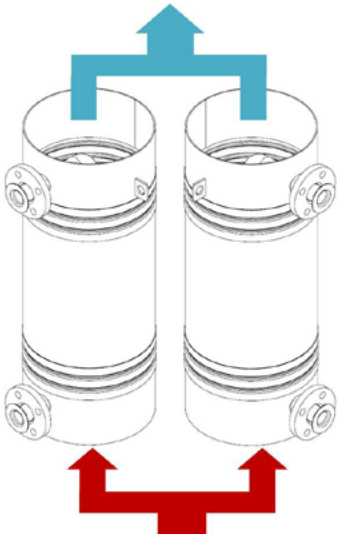
Primary Side

The flow rates given above have been calculated for a temperature difference of 50°C (temperature range : 200-250°C) on the oil side.
For any other temperature difference, the corresponding thermal oil flow rate is obtained using the formula below. The corresponding pressure drop is then determined following the initial procedure.

$$\frac{\text{Power [kW]}}{\text{6.4084e6 x } \Delta T\ [°C]} = \text{Oil flow rate [m}^3\text{/h]}$$

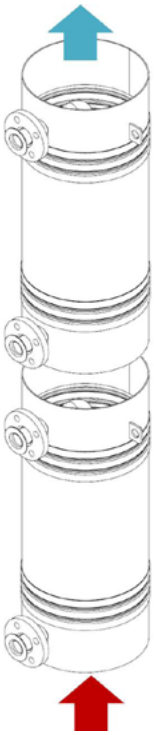
(1) Note: the grey zone corresponds to the pressure drop range for fumes from 300°C to 600°C. To read the pressure drop related to your design point on the fumes side, please consider that the higher the fumes temperature, the higher the pressure drop.

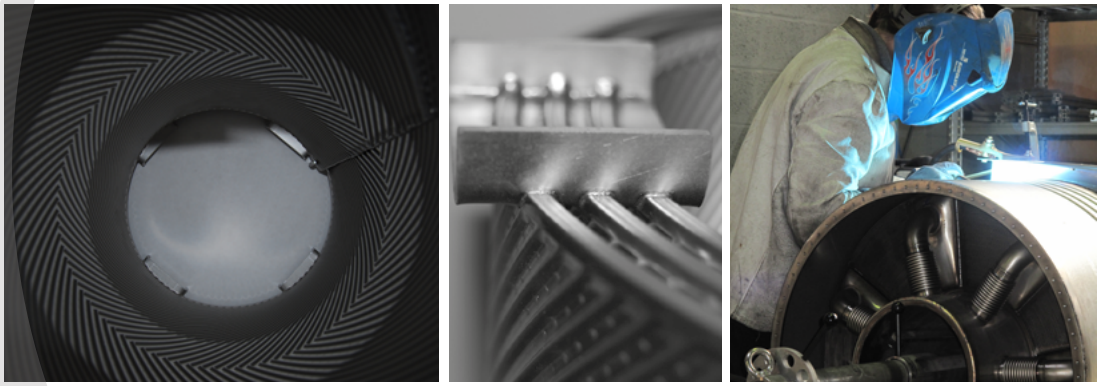
Exchangers in parallel:



If the drop in pressure on the fumes is too great, it is always possible to put two exchangers in parallel, which will have the effect of dividing the fume flow rate by two. The thermal power recovered then represents twice the power given by the graph. The liquid flow rate to be taken into account is also twice that given by the graph.

For instance: for a flow rate of 6000 Nm^3 per hour at 450°C, the graph indicates a pressure drop of 2840 Pa, which may be too high according to your specification. By putting two exchangers in parallel the fumes flow rate under consideration is then 3000 Nm^3 per hour with the result that the pressure drop is 780 Pa.





Exchangers in line:

If the drop in pressure on the fumes, calculated from the graph, is lower than the acceptable value for your system, it is then possible to recover more heat by using a second exchanger in line with the first one.
The pressure drop on the fumes is then double the initial value. In this case, please contact us for an estimate of other values.

Notes:

1. The graphs shown above give the possibility of drawing up an initial technical validation from the values of your thermal energy source. Please note that you are welcome to contact us for further technical details.

2. For any sizing where hot gas is used to reheat the air or for generating steam, please contact us directly.

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