luftmeister

ALL JUST WARM AIR?

Efficiency for process air and waste heat

Our innovations have won us numerous awards that we are proud of:

PERPETUUM 2019 Energieeffizienzpreis

Top 10 in the competition DENEFF Perpetuum 2019

GERMAN DESIGN AWARD WINNER 2017

1st winner of the German Design Award in the Energy category

UMWELT TECHNIKPREIS BADEN-WÜRTTEMBERG 2019 1. PLATZ KATEGORIE 4 MESS-, STEUER- & REGELTECHNIK, INDUSTRIE 4.0

1st winner of the Environmental Technology Award Baden-Wurttemberg in the category measurement technology/Industry 4.0

FREIBURGER INNOVATIONS PREIS 2021

1st winner of the Freiburg innovation award

Luftmeister® –
an award-winning pioneer

Founded in 2016, Luftmeister has provided efficient ventilation solutions in over 600 projects:

- through a unique, **patented sensor solution** that delivers precision in volume flow detection even in difficult installation situations
- through the "**air energy meter**", which is also patented and measures both air flow and heat flow
- through our expertise, with which we develop the perfect solution for your ventilation processes and implement it technically on site

Top-class **awards** reflect this success.

Why are volume and heat flow in air/flue gas central **efficiency levers**?

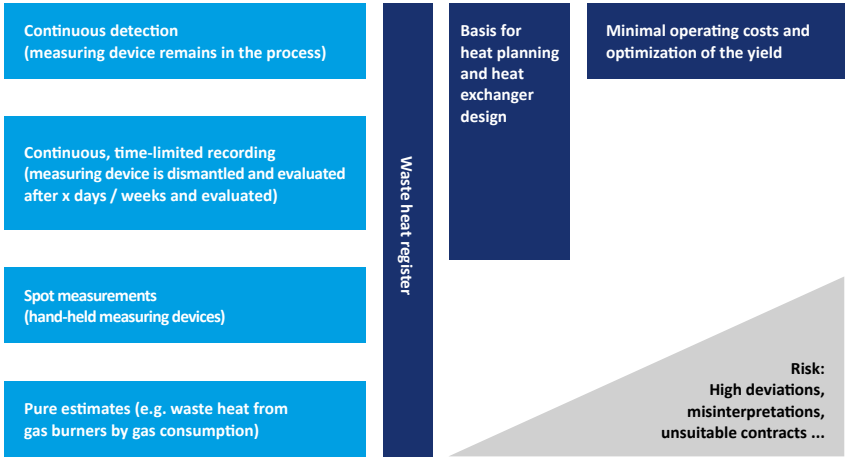
If process air systems are operated or waste air or flue gas flows are are emitted, considerable **operating costs** are usually incurred for their ventilation and filtering. At the same time, the heat also represents commercially useable values, the **yield** of which must be **maximized**. This cost minimization and maximizing the heat yield is a central concern of the responsible operators.

The decisive cost and benefit multiplier here is the flow rate, whether as volume flow, standard volume flow, dry/wet mass flow or as heat flow.

Dealing efficiently with waste heat –
Registering waste heat and worthwhile follow-up steps

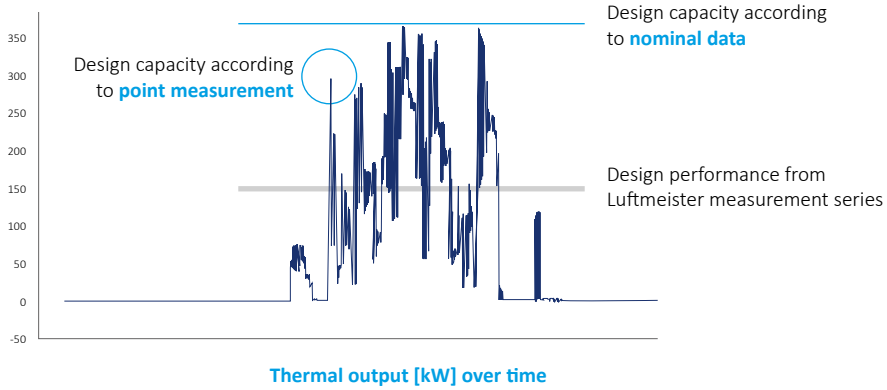
The use of waste heat is a central component of the energetic transition. The **Energy Efficiency Act** obliges companies that emit a relevant amount of waste heat to declare their waste heat potential. The aim is to fill in a so-called "**waste heat register**".

Luftmeister supports industrial companies in efficiently **quantifying the waste heat potentials** by using **four "recording levels"**:



As shown in the diagram, each "level" has its justification, also with regard to the increasing costs from bottom to top. For a rough determination of the waste heat potential, it may be sufficient to measure temperature, humidity and flow rate using hand-held measuring devices.

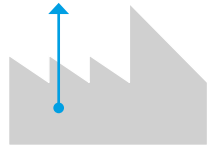
However, most thermal processes are discontinuous, i.e. they emit diverse heat capacities over the course of time. As the following diagram shows, such a "point measurement" (and even more so an "interpretation" according to nominal data) can provide incorrect values in such cases.



Thermal output [kW] over time

The two upper levels (measurement series and permanent recording) are mandatory if it is not "just" a matter of a cadastral report, but if the use of waste heat is being seriously considered. Further information is provided on the following two pages.

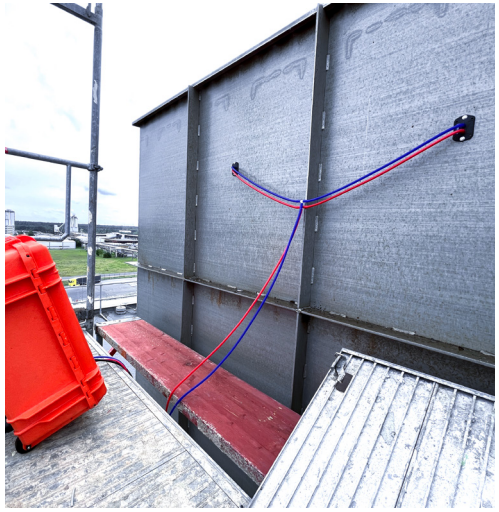
Worthwhile follow-up steps: Once promising waste heat potentials have been identified, it is important to carry out **heat planning**, taking into account all sources and sinks (e.g. by a pinch analysis) and to **technically implement** suitable **waste heat utilization** (heat pump, ORC, storage, absorption cooling, etc.), whether through in-house investment or an energy service provider. Luftmeister is happy to support you with recommendations from its "waste heat network".



Waste heat recording as a series of measurements over a suitable period of time

Many waste heat potentials have a **discontinuous** heat flow curve. If production cycles are repeated, it is usually sufficient to record some of these cycles to enable an extrapolation (for the whole year).

For these cases, Luftmeister offers the use of **measuring cases** (with IP67 protection, the air energy meter and suitable sensors), with which the data is recorded over a period of time and evaluated after dismantling and return. With the help of these measurement series even a large number of discontinuous waste heat potentials (example: 25 exhaust air stacks of a paper mill) as well as a complex recording (example: large exhaust air ducts of a malting plant) are determined **economically and precisely**.



Efficient, continuous waste heat extraction operation

If a waste **heat extraction system** is being planned or an existing one needs to be monitored, permanently recording Luftmeister measuring systems are used. If the **design of a suitable heat exchanger** is required, this measuring point provides all the necessary data. – This is also the basis for further **heat planning**.

Once the heat exchanger has been installed and the waste heat extraction is in operation, the Luftmeister measuring device, which records data continuously, helps to minimize operating costs.

If you compare the air or flue gas side in relation to the secondary-side outputs (water, steam, ...), the **degree of utilization** can be recorded and optimized.

In addition, a drop in the performance quotient shows when the optimum cleaning time should be selected. This minimizes operating costs – and brings about optimum yield.

Thermal output:

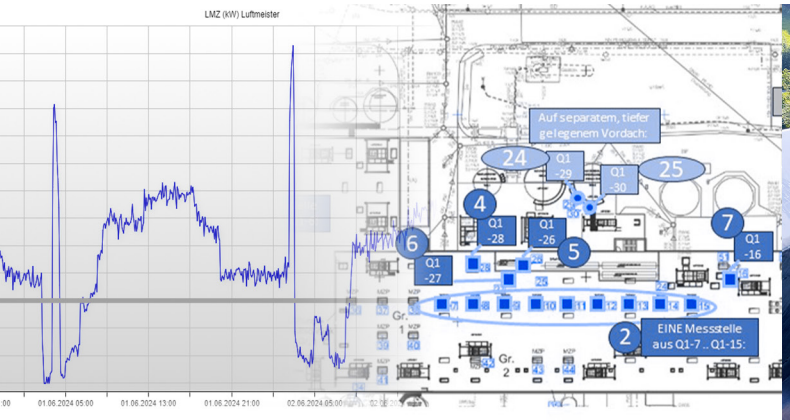
Exhaust air before HR	Q1 = m * h1
Exhaust air after HR	Q1 = m * h2
Primary output HR	Q1 = m * (h2-h1)

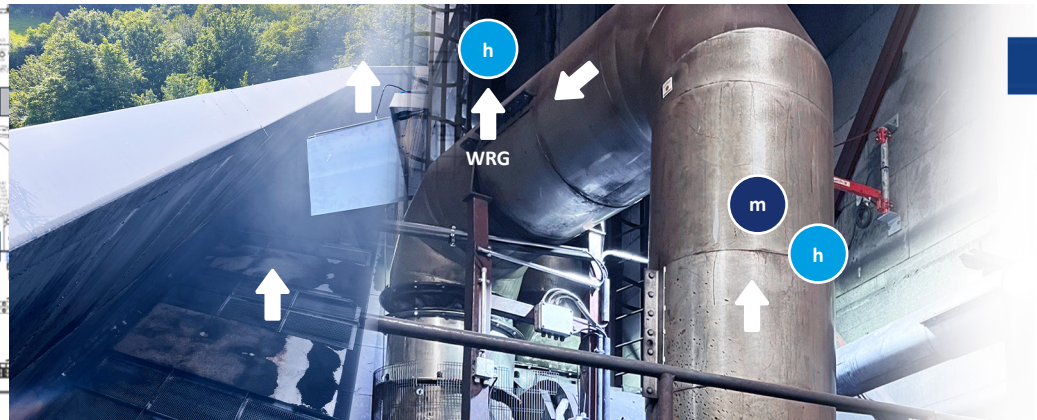
Utilization ratio
(→ Optimization HR)

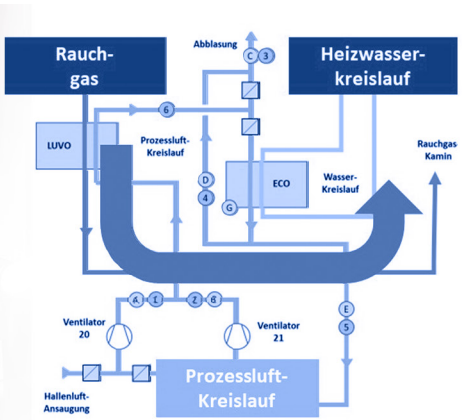
$$\frac{\text{Primary output HR}}{\text{Exhaust air before HR}}$$

Maintenance indicator (→ Operating costs)

$$\frac{\text{Secondary extraction (water, oil, ...)}}{\text{Exhaust air before HR}}$$







Using internal heat sources efficiently, optimize heat recovery

Heat flows in air or flue gas do not only play a central role in waste heat utilization. In numerous process engineering processes and industries, hot air flows or flue gas flows are used to **make use of internal heat sources to their own sinks**.

In the **ceramics industry**, for example, large heat flows are used from the kiln to the dryer. In addition hot air flows are taken specifically from individual kiln zones, to ensure that kiln operation is effecient (even with changing products and partial loads).

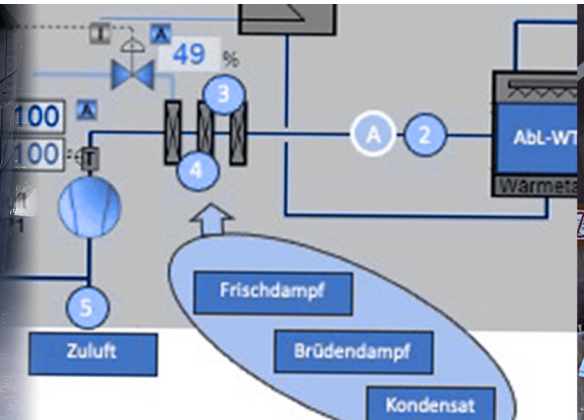
In the **paper industry**, it is important to dehumidify efficiently – taking into account the hood balance (balanced mass flows for the pre-drying and post-drying sections). Here, as in other industrial sectors, heat recovery (HR) should also be optimized.

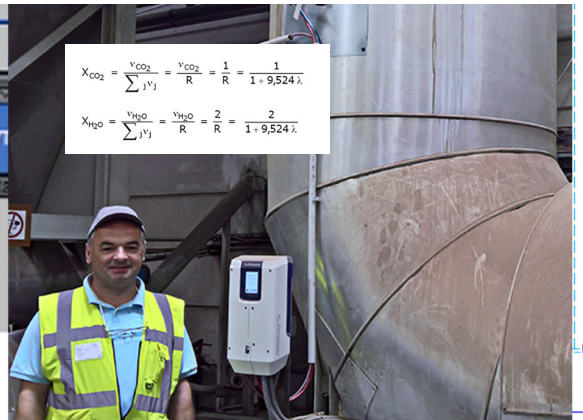
With the mass flow (dry or humid) and the heat flow, Luftmeister provides the central measurement parameters, so that in addition to monitoring a continuous control is enabled.

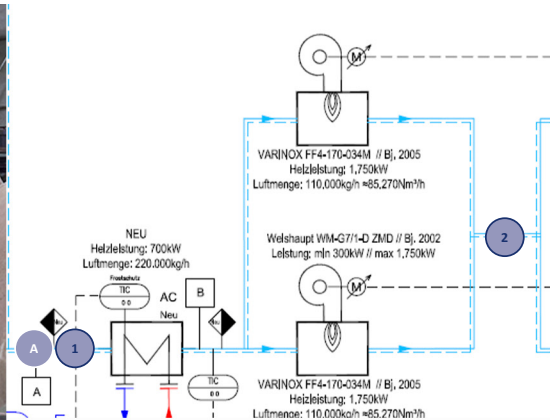
If the medium is flue gas, Luftmeister ensures with its “flue gas module” that the thermodynamic properties (which differ from air) are taken into account appropriately. For this purpose the volume proportions of CO2, H2O and other components are parameterized – usually these can be taken from emission measurement protocols.

Replacement of primary energy heat sources through connection to a heating network

If an industrial company is in the vicinity of a heating grid, there is the possibility of replacing primary energy heat sources (e.g. gas burners) with a grid coupling. The decisive factor for **heat exchanger dimensioning** and **contract design** is the knowledge of the actual heat output curves over a longer period of time. Once the switch to grid supply has been made the Luftmeister measurement solution continues to help with optimization, by determining the degree of utilization (useful heat flow to feed-in heat flow) is known at all times.



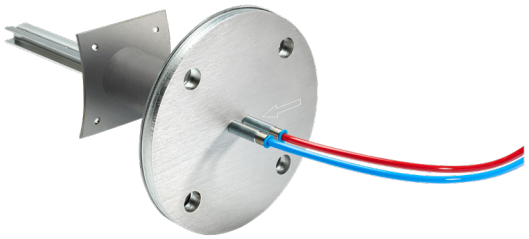




Luftmeister® –
Patented technology...

In practice, there are numerous challenges to overcome when measuring the air flow or heat flow. For example, many air ducts or pipes only have short straight sections. As a result, the flow is distributed unevenly across the cross-section; experts speak of **asymmetrical flow profiles**.

Luftmeister has patented several inventions that meet this challenge. Firstly, flow probes have been developed whose geometry ensures that all flow vectors along the length of the probe are taken into account. This was implemented in the robust "**Luftmeister Freiburg**" dynamic pressure probe in such a way that the flow rates at low or high temperatures, with pipe diameters between 80 mm and over
2,000 mm and even with polluted exhaust air can be recorded with long-term stability. Various process connections and special versions up to 1,150°C and with Halar coating (for aggressive exhaust air up to 200°C) are available.




Bundesrepublik Deutschland

Urkunde

über die Erteilung des
Patents Nr. 10 2019 117 151

... for the detection of **flow and heat** heat flow in **air** or **flue gas**

The "Luftmeister Freiburg" probe is installed on site in the customer's application, mounted at a suitable point via the customer's nozzle, as well as a suitable temperature, absolute pressure and, if necessary, humidity sensors for enthalpy and density. The aforementioned variables can also be read from existing customer measuring points.

Luftmeister has patented a calibration procedure in which velocity values are recorded at the measuring point over several measuring axes (see photo and illustration below). On this basis, the asymmetrical flow profile is recorded and corrected.

m/s	Pkt.	1	2	3	4	5	6
Pkt.	Abst.	21,85	65,55	109,25	152,95	196,65	240,35
1	19	-0,8	-0,7	-0,6	-0,5	-0,7	-0,5
2	57	-0,6	0,6	0,2	0,2	0,6	-0,6
3	94	-0,6	0,4	0,7	0,2	0,4	-0,6
4	132	-0,8	0,5	1,7	1,9	1,6	0,5
5	170	-0,8	0,9	2,2	3,2	3,7	2,9
6	207	0,5	1,3	2,1	3,3	3,9	4,3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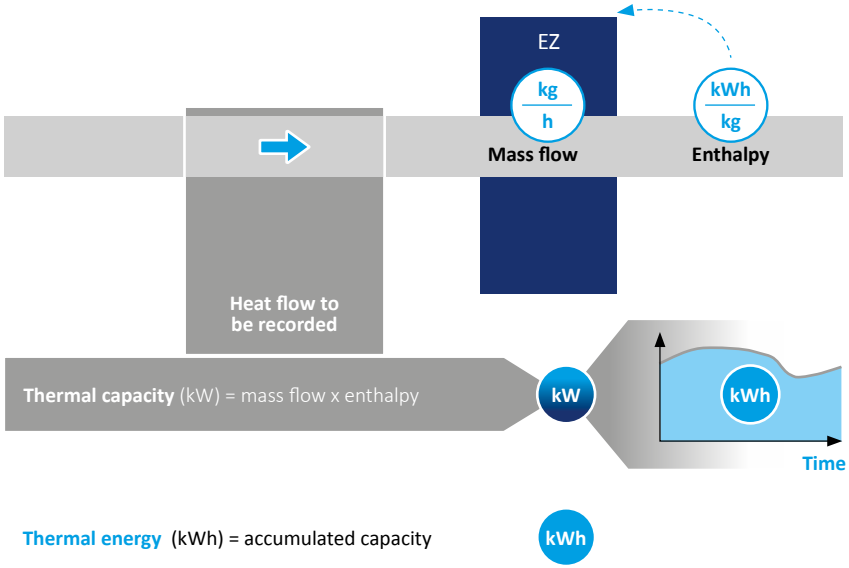
The air energy meter –
the professional measuring solution ...

The air energy meter – also patented – is a **compact measuring solution** that combines all connected or integrated sensor data and outputs the flow rate and **heat flow** (thermal output). The flow can be determined either as operating or standard volume flow or as dry or wet **mass flow**.



In addition to the above-mentioned variables, all "auxiliary variables" such as temperature, humidity, absolute pressure, enthalpy, density, velocity are available.

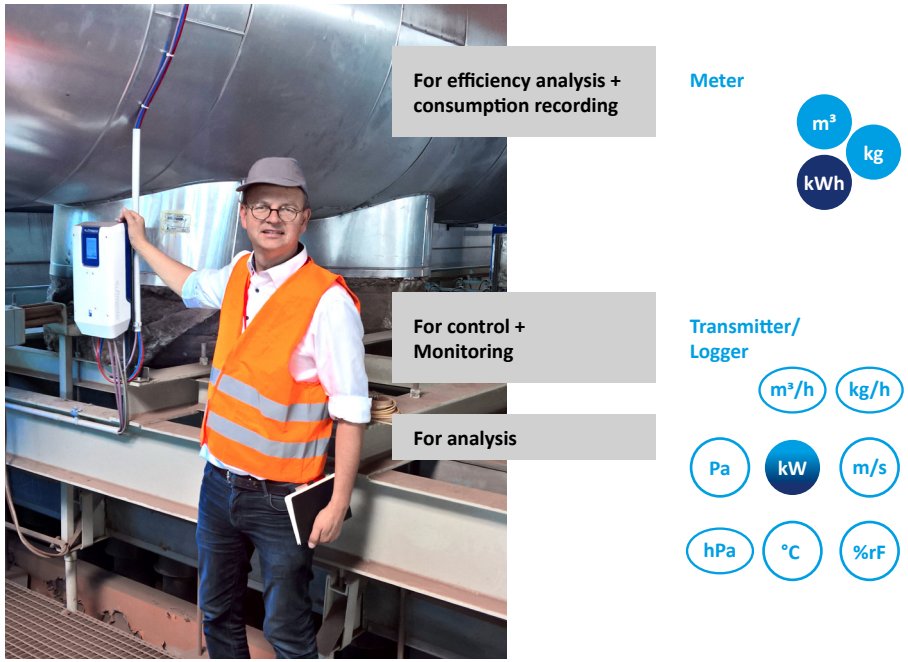
All measured values are optionally transmitted via **standard interfaces** such as Modbus RTU, M-Bus or up to 11 analog outputs or switching/pulse outputs, to superior systems (BMS, DCS, energy monitoring, SCADA, etc.). The air energy meter thus functions as a multi-channel measuring transducer for monitoring, analysis and continuous control and optimization.

... "All-in-one" as a multi-channel transducer, logger and meter

The air energy meter is an "all-in-one solution":
In addition to its function as a **multi-channel transducer**, it outputs all measurement data via an optional **touch display**, which can also be used to call up historical values.

In addition, the air energy meter provides a 9-channel **data logger** that can be easily read out to Excel via USB. This is particularly helpful if the meter is not (yet) connected to a superior system.

As its name suggests, the air energy meter is not least an energy meter: The flow rate and heat flow are added up over time, and the total values are used as air volume and (air-side) **heat meters** for efficiency analysis and consumption recording.



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Luftmeister®

- **MAKES PROCESS AIR OPERATION MORE EFFICIENT**
- **ACCURATELY DETECTS WASTE HEAT POTENTIALS**
- **MEASURES FLUE GAS HEAT FLOW PRECISELY**
- **PREPARES WASTE HEAT EXTRACTION AND HEAT GRID COUPLING PROFESSIONALLY**