



Luftmeister

A BREATH OF FRESH AIR FOR YOUR PROPERTY

Consumption-based Air Conditioning (AC) cost allocation

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



Top 10 in the DENEFF Perpetuum 2019 competition



1. winner of the Baden-Württemberg Environmental Technology Award in the category Measurement Technology/Industry 4.0



1. winner of the German Design Award in the energy category



1. winner of the Innovation Award at the Interclima trade fair for air-conditioning technology in Paris

Luftmeister® – An award-winning pioneer

With more than one hundred satisfied customers, Luftmeister GmbH from Germany is a pioneer in air consumption measurement technology:

- For the first time, Luftmeister makes it possible to precisely measure **air flow in ducts** with many elbows – the usual situation in real-world applications.
- For the first time, Luftmeister makes it possible to measure the **heat and cold delivered by the air supply**.
- For the first time, Luftmeister provides the basis for **legally secure** billing of **air consumption** – based on a calibration licence.

Why record air consumption for AC systems?

The air delivered by air conditioning (AC) systems is one of the most expensive media in any building. However, until now, this aspect of operating costs has not been calculated based on consumption.

Air conditioning charges are currently based on the area of the rental space, regardless of its level of consumption. No solution for consumption-based billing has been available – until now. The list (right) presents the key reasons for switching to consumption-based billing using approved calibrated meters for the medium “conditioned air”.

Medium	Water, electricity, heat	Air
Individual billing by consumption	✓	✗
Fair billing	✓	✗
Legal certainty	✓	✗
Incentive to save energy	✓	✗

Until now, **consumption-based billing** has not been technically or legally possible. Furthermore, there is a lack of transparency regarding the quantity (volume flow) and qualities (temperature, humidity) of the air that is delivered to each rental zone: No **air delivery monitoring system** is available.

Luftmeister® Technology

Measuring and recording the volume of air consumed – as well as the heat and cold supplied by the air – is a very challenging task since air ducts are very rarely straight. Bends and elbows create asymmetrical flow distributions across the cross-section of the ducts.

m/s	Pt.	1	2	3	4	5	6	7	8	9	10
Pt.	Gap	21.85	65.55	109.25	152.95	196.65	240.35	284.05	327.75	371.45	415.15
1	19	-0.8	-0.7	-0.6	-0.5	-0.7	-0.5	-0.7	-0.5	-0.6	-0.8
2	57	-0.6	0.6	0.2	0.2	0.6	-0.6	-0.7	-0.7	-0.5	-0.7
3	94	-0.6	0.4	0.7	0.2	0.4	-0.6	-0.4	-0.4	-0.6	-0.6
4	132	-0.8	0.5	1.7	1.9	1.6	0.5	-0.5	-0.7	-0.5	-0.6
5	170	-0.8	0.9	2.2	3.2	3.7	2.9	0.3	-0.6	-0.5	-0.4
6	207	0.5	1.3	2.1	3.3	3.9	4.3	2.1	0.3	-0.4	-0.3
7	245	0.1	1.9	1.6	4.0	3.9	4.4	2.5	1.2	-0.4	-0.2
8	283	0.1	1.7	1.0	3.5	3.9	3.9	2.4	1.0	-0.2	0.1
9	320	0.0	0.7	1.4	3.4	4.0	2.6	1.4	0.5	0.1	0.3
10	358	0.4	0.1	1.2	2.2	2.9	2.8	1.6	0.7	0.3	0.1

Asymmetrical flow distributions – typical for most air ducts

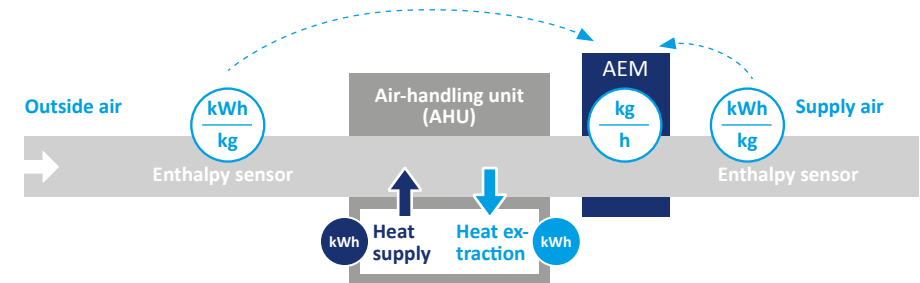
Luftmeister GmbH has developed a **patented sensor system** that ensures a high degree of precision in this real-world situation. It records **volume flow and thermal output** across a wide range from 0.5 to >10 m/s with outstanding accuracy. Even when – after elbows and other “upstream disturbances” – there are only straight inlet sections of just three times the diameter! Previous sensor technologies required at least five times the diameter, could not detect flows below 1.5 m/s and were less accurate by a factor of 3-4!

The patented “double sword” technology ensures that the flow is recorded precisely even if it is unevenly distributed across the cross-section. The pressure taps on all sides, a staggered differential pressure cascade and density compensation also support this concept.



This **precision** has been proven in many practical applications and laboratory tests – above all during calibration approval by the PTB (Germany’s national metrology institute). All requirements of the DIN 94701 manufacturing standard were fulfilled – confirming its suitability for use in **billing operating costs**.

Patented Air Energy Metering (AEM) is another ground-breaking Luftmeister technology. In addition to the precise flow rate value, it measures the enthalpy (heat load of the air) in the outside air and supply air. As well as the thermal power, this also provides information about the **amount of heat and cooling** delivered via the air supply. For accurate and fair consumption-based billing!



$$\text{Power (kW)} = \text{Mass flow} \left(\frac{\text{kg}}{\text{h}} \right) \times \text{Enthalpy difference } \Delta h \left(\frac{\text{kWh}}{\text{kg}} \right) \text{ minus } \left(\frac{\text{kWh}}{\text{kg}} \right)$$

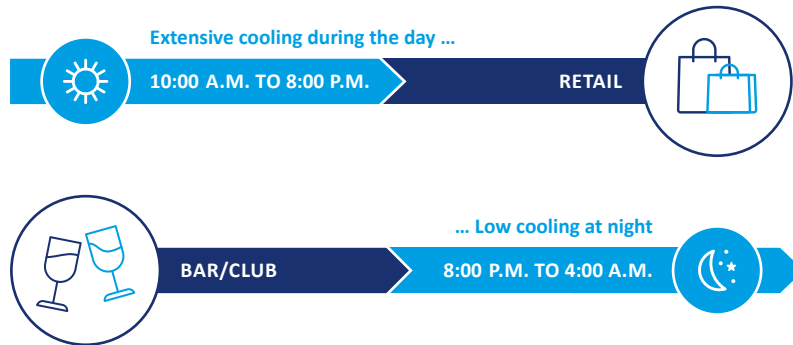
At $\Delta h > 0$: **Heat supply**
 At $\Delta h < 0$: **Cold supply**

Operating principle of the Air Energy Meter (AEM)



A shared air conditioning system, two very different user profiles, rental spaces of equal size: a retailer draws conditioned air during the day, the neighbouring bar only later in the evenings and at night. Using the principle of billing by area, both these “air consumers” would be charged the same amount.

But let’s take a look at the cooling of the premises as an example. It is much more expensive to cool the space to a desired temperature during the day than it is at night. The Air Energy Meter takes account of this fairly by basing the **consumption bill on the actual amount of cooling supplied per tenant.**



Air Energy Meters help to reduce costs over **the entire life cycle** of the property:

- Air Energy Meters allow the air conditioning to be provided by a **few larger, central air-handling units instead of many small** ones. This results in immense savings in planning, construction and operation
- With consumption-based metering and billing, vacancy costs are no longer borne solely by the owner or operator
- If the property is **re-let or re-purposed**, only the meters need to be re-assigned – there is no need to clear entire floors of sheet metal ducts and re-build them





Luftmeister® is digital and traceable

Individual tenants or “air users” must be able to track consumption and consumption costs. At the same time, they want to ensure that “their” expensively conditioned air is delivered in the specified quantity (volume flow) and quality (temperature, humidity) at all times. All values are continuously available digitally via suitable interfaces.

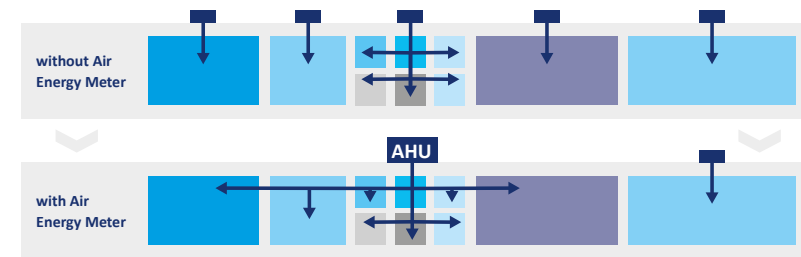
This “air delivery monitoring system” not only provides a convenient way for each tenant to check their data and ensure “peace in the building” based on hard facts and figures. It also provides the **foundation for achieving savings**. For example, by showing that the air supply starts up at 7:30 a.m. – although it is not needed until an hour later – tenants, operators and owners can quickly agree on ways to make effective savings.



Luftmeister® makes your property more sustainable

The Air Energy Meter also provides targeted support for improving the sustainability of property management:

- Consumption-based billing provides an immediate **incentive to make savings** and reduce consumption
- Air supply monitoring helps tenants and operators to identify further **potential savings**
- Buildings with many rental units (see below) can be **operated with fewer (but larger) central air-handling units (AHU)** instead of many smaller ones. This generates cost savings in planning, construction and operation as well as lowering disposal costs



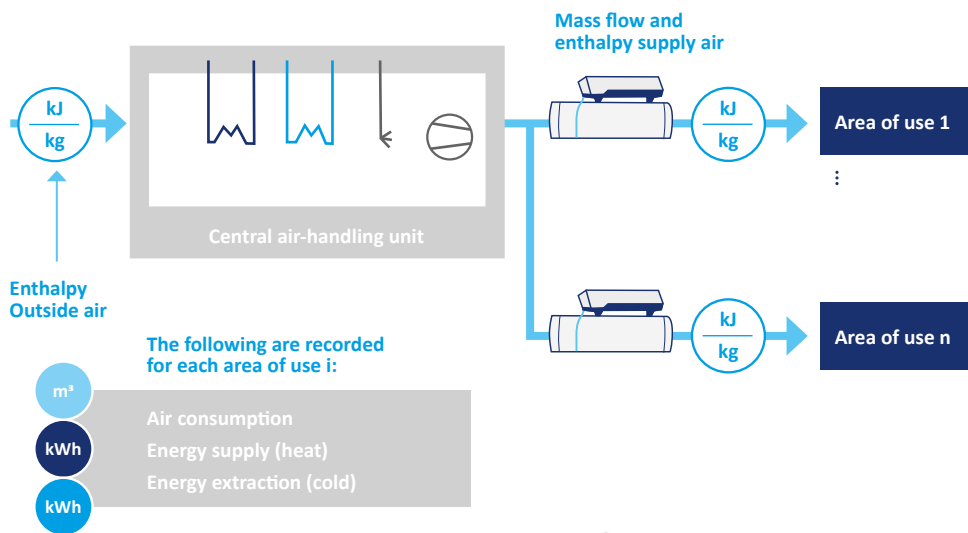
The use of Air Energy Meters in sustainability certification processes offers many advantages – not only in terms of ecological benefits, but also with regard to economical aspects.



Luftmeister® for legal certainty

The new calibration principle “air energy” and the „Air Energy Meter“ approved by the PTB (Physikalisch-Technische Bundesanstalt) enable property owners/operators to offer legally secure, consumption-based billing of air-conditioning services for the first time.

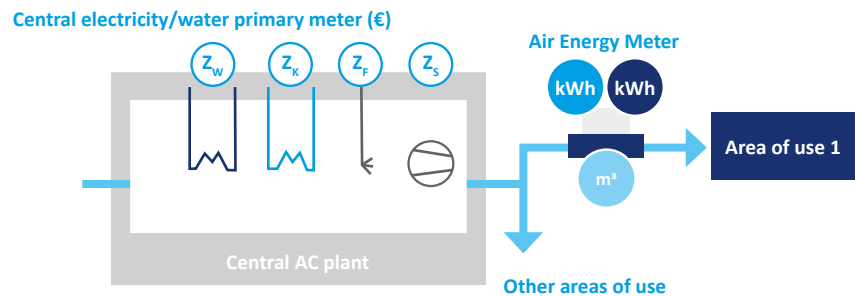
German directive VDI 2077 Sheet 4, which was published in 2019, is the valid user standard for consumption-based ventilation cost accounting. It identifies Air Energy Meters as state of the art – today the only calibration-approved meters for air-conditioning systems.



Application concept in accordance with VDI 2077-4



An Air Energy Meter and an enthalpy sensor are installed in the supply air duct for each area of use. Another enthalpy sensor is mounted in the outside air. The Air Energy Meter can thus determine the air consumption (in m^3) during the billing period for each area of use. The system also records heat delivery/energy supply and cooling delivery/energy extraction (each in kWh).



Cost share of the area of use i:

$$K_i = (Z_w + Z_r) \frac{kWh}{\sum kWh} + (Z_r) \frac{kWh}{\sum kWh} + (Z_s) \frac{m^3}{\sum m^3}$$

Billing concept for air-conditioning costs in accordance with VDI 2077-4 (operating cost accounting)

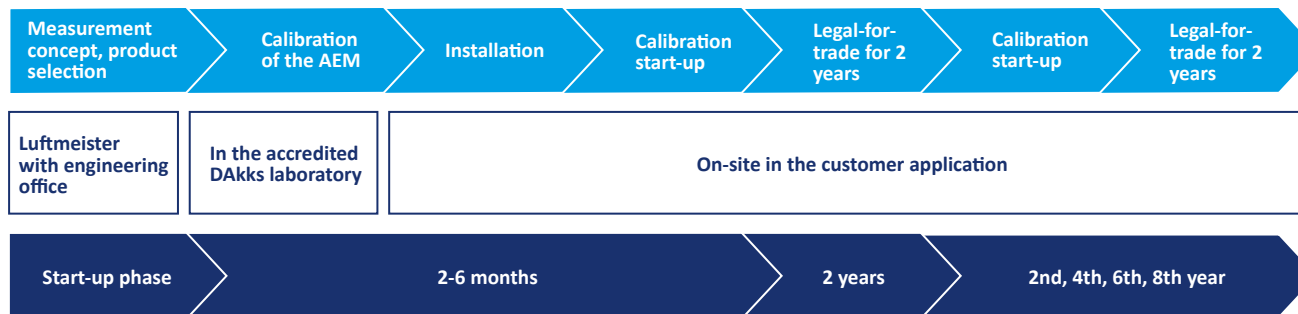
The first step in the billing process is to determine which costs must be allocated to the primary meters (electricity and heat meters, etc.). According to the formula shown above, the heating costs are first distributed incrementally based on the energy supply meters. Next, the cooling costs are allocated based on the energy extraction meters. Finally, the remaining costs are assigned using the air consumption meters. The result of this “submetering” is that all central AC costs are fully distributed to the individual users according to their individual levels of consumption!

Comprehensive care – throughout the life cycle

From the early planning phase of a building to design, installation and **calibration start-up** – to continuous support during **recalibration** and operation: Luftmeister provides comprehensive assistance for your building project from start to finish.

Luftmeister can also help you to **improve the efficiency of your air conditioning system**. At the same time, Luftmeister supports **building protection** and occupational **health and safety** by measuring the dew point distance of supply air.

Luftmeister technology makes **air conditioning contracting** possible for the first time. A contractor, comparable to the contracting of heat supply, is independently responsible for the air conditioning and can now charge users fairly and legally secure via calibrated Air Energy Meters using Luftmeister technology. Luftmeister will be happy to put you in touch with a suitable partner company for air-conditioning contracting or metering services in your property.



Air Energy Meter (AEM) in calibration cycle



Luftmeister

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Luftmeister® makes the provision and billing of air-conditioning

- ✓ **FAIR**
- ✓ **LEGALLY SECURE**
- ✓ **TRACEABLE**
- ✓ **SUSTAINABLE**
- ✓ **COST-SAVING**

and enables the implementation for every type of property.