HPC KAESER COMPRESSORS®


# Pill*Aerator*
# Magnetic Bearing Turbo Blowers

**150 kW and 300 kW**

Flow rate up to 267 m³/min, 16,000 m³/h, Pressure differential 0.3 to 1.3 bar

**www.hpccompressors.co.uk**

PillAerator magnetic bearing turbo blowers

# The undisputed master of process air

Efficient, reliable and flexible – PillAerator turbo blowers from KAESER are compact units developed specifically with aeration applications in mind. Equipped with contact-free magnetic bearings that require no lubrication, they guarantee a completely wear-free operation which renders oil and bearing changes unnecessary. Turbo blowers are used wherever process air is required in the low pressure range – such as wastewater treatment, aerobic fermentation and flue gas desulphurisation applications.

## Maximum energy efficiency

The direct-drive magnetic bearing rotor, coupled with an intelligent controller, ensures remarkably efficient operation. Operating at a polytropic efficiency level of 84 %, these state-of-the-art machines can save up to 25 % of the energy costs associated with conventional technologies. During intermittent operation, magnetic bearing turbos offer the advantage that they do not negatively affect frequent start-stop operations. This, coupled with an uncommonly broad control range, serves to avoid the expensive blow-off functions in an enforced idle operation that are often a feature of machines equipped with pneumatic bearings.

## Economical operation

The integrated controller ensures reliable and efficient operation at all times, whilst the standard-equipped frequency converter adjusts blower speed in order to match the flow rate to the actual air demand of the process in question. Furthermore, a fully automated Anti-Surge System prevents the machine from operating in unfavourable control ranges.

## Oil-free and quiet

With a sound pressure level below 76 dB(A), PillAerator turbo blowers are incredibly quiet. Contact-free magnetic bearings requiring no lubrication guarantee a completely vibration-free operation. An optional silencer reduces the sound pressure level in the compressed air lines even further. The entire machine contains no oil, making it remarkably simple to operate and completely maintenance-free.

## Reliable and safe

A range of sensors continuously monitor pressure, temperature and speed so as to ensure reliable operation of the blower and to allow remote monitoring and visualisation of the operating status. A sophisticated safety design guarantees a gentle, wear-free shutdown in the event of a power failure, whereby the magnetic bearings remain active and fully functional. Continuously monitored back-up safety bearings provide an additional level of protection.

## Simple installation

PillAerator turbo blowers are delivered from the factory as connection-ready complete systems, pre-prepared for integration into Industrie 4.0 environments, therefore guaranteeing quick and simple installation for the operator. Simply plug and play!

## Operating conditions

An integrated cooling system with internal water circuit ensures a smooth, trouble-free operation. The central core of the machine – the motor with its magnetic bearings – is kept free from any particulates. The combination of an air/water and a water/water-cooler means that accumulated heat is reliably removed, even under the toughest of conditions. The optional climate control guarantees safe operation of the turbo in ambient temperatures as high as +55 °C.

PillAerator magnetic bearing turbo blowers

# Wear-free operation with magnetic bearings

PillAerator turbo blowers feature an impeller mounted directly atop a vertically-arrayed drive shaft, which is suspended contact-free within a magnetic field generated by a ring of permanent magnets and electromagnets. The magnetic bearings feature an electronic controller, which only allows movement around the rotational axis. This means that components are not subjected to any mechanical wear. The drive motor is airtight, so it cannot be contaminated by the ambient air – substantially increasing the machine's operational reliability, availability and service life.

## Benefits at a glance

- Oil-free
- Vibration-free
- Frictionless
- Wear-free
- Maintenance-free

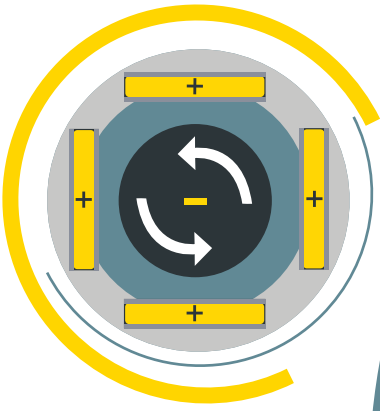
The benefits of using magnetic bearings are clear to see: The shaft rotates permanently around its centre of gravity, making it vibration-free. As it remains free from any physical contact, no lubrication is required. Even frequent start-stop processes are completely wear-free. During shutdown, the shaft is brought to a standstill within the magnetic field. In the unlikely event of a failure of the magnetic bearing controller, the safety bearings will bring the shaft gently to a halt.

## Impeller

Compression of the inlet air takes place in the impeller, which is constructed from a single piece of aircraft-grade aluminium. Its low mass enables swift acceleration and deceleration, resulting in highly dynamic control characteristics. This, in combination with a patented housing design, provides a broad control range at extremely high levels of efficiency. The availability of three different versions – L, M and H – ensures that the best match for any level of air demand can always be selected.

## Magnetic bearings

For best possible levels of unit availability, the magnetic bearings are oil-free and completely maintenance-free. The smart controller, with its integrated power failure protection system, recognises imbalances and sudden load shocks and compensates for them – rendering additional components such as buffer batteries and UPS devices unnecessary. When it comes to the safe and efficient generation of process air, the advantages associated with magnetic bearings make them the state-of-the-art solution in comparison with both mechanical and pneumatic bearings.




## Canned motor

In a canned motor, rotor and stator are separated by a cylindrical tube. This allows an absolute hermetic sealing, which means that contaminants are reliably prevented from reaching the most sensitive parts of the machine.

## Cooling

Cooling takes place via an internal water circuit, so as to ensure operating conditions are consistently optimised. In addition to achieving constant temperatures for the motor and frequency converter via its speed-controlled fan, this allows the control cabinet to remain hermetically sealed. Accumulated exhaust heat can all be absorbed by the cooling water, thereby rendering expensive exhaust air ducting superfluous.


KAESER
PillAerator
HP 4000

PillAerator magnetic bearing turbo blowers

# Design is in the details


PillAerator turbo blowers are delivered as complete machines, ready for connection, with perfectly matched mechanical and electrical components. Thanks to an integrated inlet filter and a cleverly designed cooling system, they are exceptionally compact machines – as a general rule, no additional cooling air ducting is required.

**Image:** KAESER PillAerator HP 4000 turbo blower

## Durable shell and tube heat exchanger

The option of connecting to an external water-cooling system guarantees trouble-free operation when ambient temperatures are high. A shell and tube heat exchanger serves to ensure that the internal cooling circuit runs in the optimal temperature range, even under the toughest of conditions. Thanks to its robust construction, low-quality water can be used for cooling purposes.


## Variable air intake

Turbo blowers are extremely flexible when it comes to installation. Inlet air can be drawn in either from the side or the top of the unit. Hermetic sealing of the motor and, optionally, of the control cabinet prevents the ingress of any dirt or particulates into the machine.

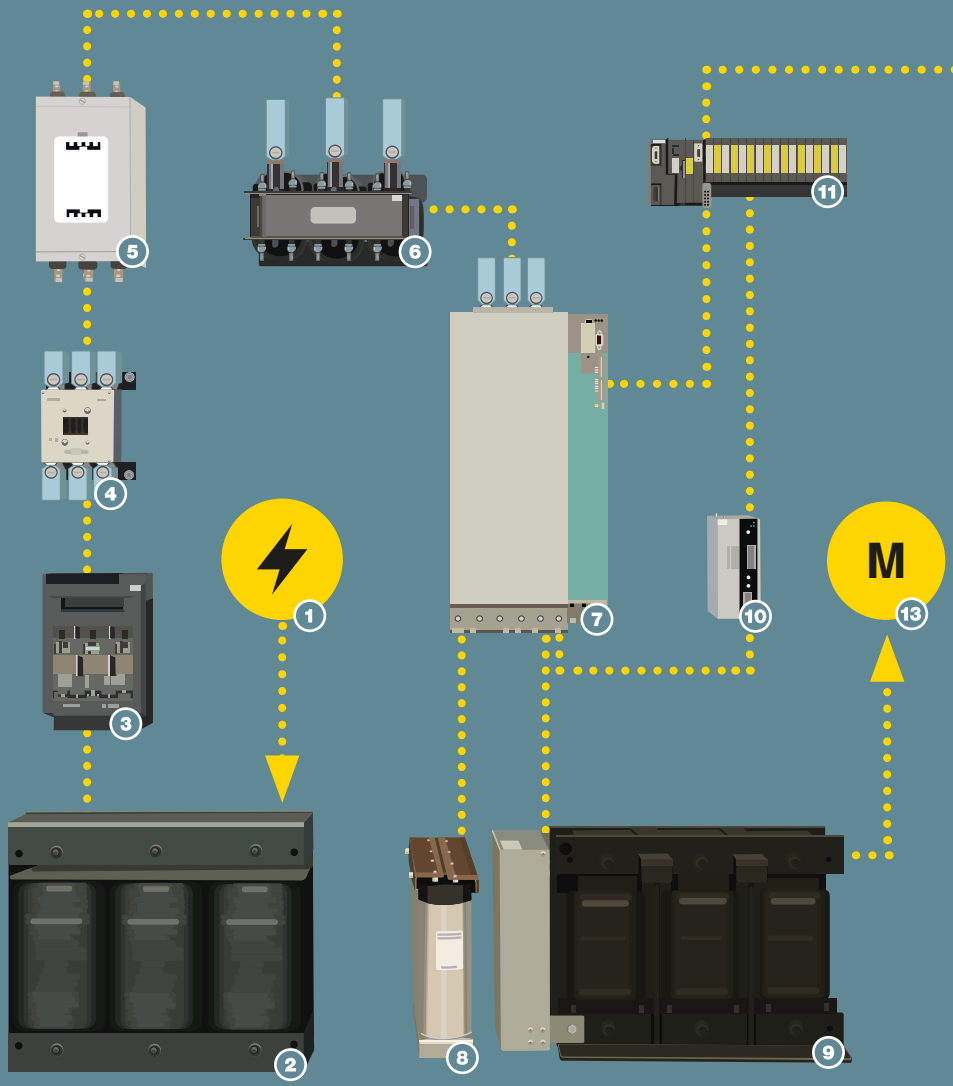


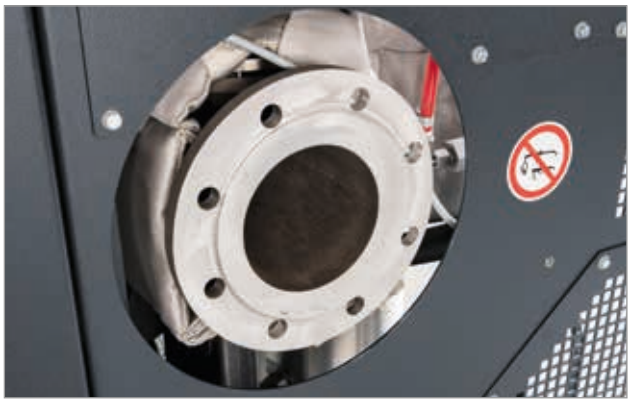

Image: Elements, electronics side

## How it works

(1) Power supply
(2) Transformer
(3) Fusing
(4) Main contactor
(5) Mains filter
(6) Commutation throttle
(7) Frequency converter
(8) Condenser, intermediate circuit
(9) Sinusoidal filter
(10) Magnetic bearing controller
(11) Controller
(12) Control panel
(13) Motor

### Integrated inlet filter

In order to prevent particles from contaminating the process air, PillAerator turbo blowers are equipped with an integrated inlet filter featuring a high load capacity. This ensures that any intake of dirt and coarse particles is reliably avoided. The filter elements are simple and inexpensive to replace.



### Flexible, side-mounted blower air outlet

To prevent pressure losses from being incurred due to deflections of the process air, machines are fitted with a side-mounted connection flange. This also considerably reduces the installation costs.

Smart controller

# Intelligent control for even more energy savings




The controller fitted to PillAerator turbo blowers plays an important role when it comes to saving energy. Not only does it allow operation to be perfectly matched to the process in question, it also reacts swiftly to changing conditions.

Thanks to state-of-the-art measuring equipment and perfect interplay between all components, motor output can be modulated as needed, from 15 % up to 100 %. Continuous, internal measurement of the air mass flow allows the flow rate to be precisely matched to the changing air demand of the process, whilst integrated control algorithms guarantee immediate adjustments to the air flow as and when required. Not only does this allow the process to operate seamlessly, but it also reliably prevents energy losses due to over-aeration.

Furthermore, the controller ensures that the machine always operates exclusively in the permissible control range, thereby actively protecting the pump.

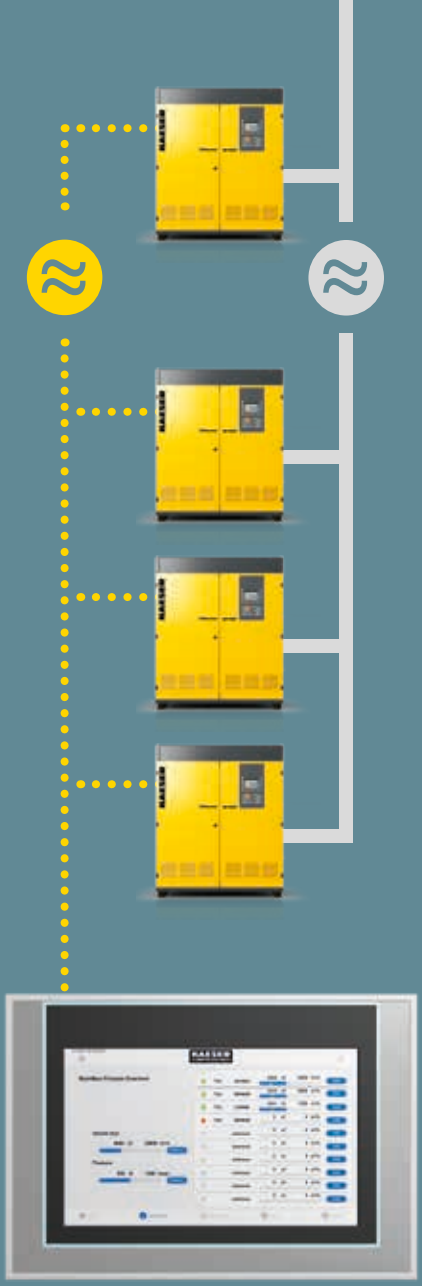
# Everything under control

All operating parameters can be read off quickly and easily in situ. The blower can communicate with and receive direction from a control centre either via digital network or analogue signals. The following values are constantly monitored:

- Flow rate
- Pressure increase
- Shaft power
- Temperatures
- Operating hours counter
- Pressure differential at inlet filter
- System check

## Stay connected

PillAerator turbo blowers can communicate with a system's control centre via Profibus DP, Profinet, EtherNet/IP or Modbus TCP. Other remote communications connections are also available as an option.



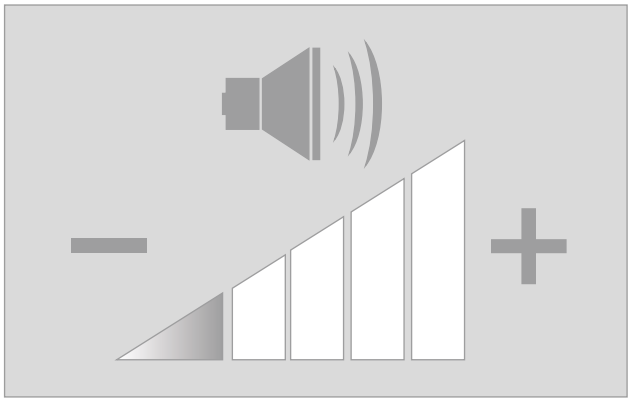
# Master controller

Up to 10 turbo blowers can be connected using a multi-blower controller, which serves to ensure that the optimum combination of blowers is in operation at any one time. Not only are individual units switched on and off as needed according to the actual air demand of the application, but the master controller also adjusts each machine automatically so as to achieve the best possible overall efficiency level. All the machines discharge air into a common pipeline, thus ensuring the perfect combination of power, energy efficiency and flexibility.

# Options and accessories

## Effective compensator

Compensators serve to reduce mechanical tension, insulate machine noise and vibrations, absorb thermal expansion or building settlement and balance out installation tolerances.



## Highly effective silencers

With a maximum sound pressure level of 76 dB(A), PillAerator turbo blowers are incredibly quiet. An additional silencer at the compressed air outlet ensures a low-noise operation, allowing work to be conducted directly in the immediate vicinity of the machine.


## Control cabinet climate control

With the optional climate control, safe operation of the turbo blower is guaranteed in ambient temperatures up to +55 °C. This feature operates by sealing off the inside of the cabinet from the ambient air and circulating the air within, thereby preventing any negative influence from outside environmental factors such as dust particles, or corrosion due to high humidity levels, and ensuring that the interior temperature remains in the optimal range.

## Add-on diffuser

The kinetic energy introduced into the air as it increases in speed is efficiently converted into pressure energy by the diffuser, thereby optimising the usability of the energy contained within the compressed air.


**Image:** KAESER PillAerator HP 4000 turbo blower with climate control, diffuser, compensator and non-return flap

## Dependable non-return flap

Non-return flaps reliably prevent the blower air from flowing in the wrong direction. The spring-loaded flap remains closed in one direction, whilst opening freely in the other direction under pressure from the blower air flow. The flap can be set to a specific stop limit position if required. However, should a pressure arise in the direction of passage that threatens to overwhelm the spring's tolerances, the sealing element will be withdrawn and the air permitted to flow through freely.

## High-efficiency plate-type heat exchanger

Should a particularly efficient recovery of the heat from motor and frequency converter be required, an integrated plate-type heat exchanger can be optionally specified in place of the standard-fit shell and tube heat exchanger.

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# Applications

## Always the best choice

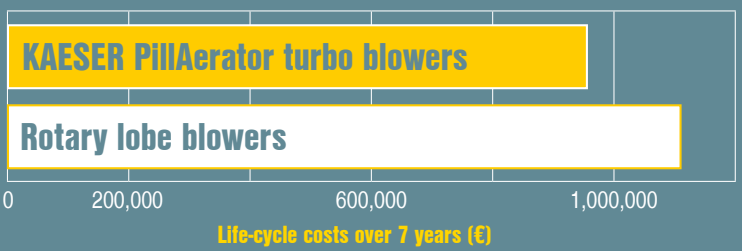
Whether for water treatment applications, yeast production or for use in bioreactors; as an air knife in steel strip manufacture or for the purposes of flotation – PillAerator turbo blowers stand out on account of their reliability, efficiency and ease of maintenance. Their total absence of oil also makes these robust turbos suitable for use in sensitive processes, such as in the food industry.

$CO_2$ footprint

# Save energy - protect the environment

When it comes to technical applications, high energy consumption means that process air is always a significant cost factor. However, installing KAESER blowers can reduce both a company's energy consumption and its $CO_2$ emissions. Efficient, low-maintenance and quiet, they guarantee a reliable supply of compressed air for a wide variety of applications.

Now, in addition to efficient OMEGA rotary lobe blowers and energy-saving SIGMA rotary screw blowers, with the PillAerator KAESER has expanded its product portfolio to include high-performance turbo blowers. By using turbo blowers in place of conventional low-pressure compressors, the life-cycle costs of a typical process air application can be reduced enormously – and, boasting a polytropic efficiency of 84 %, PillAerator turbo blowers are especially efficient. As a replacement for an old rotary lobe blower, the associated energy savings alone mean that the investment pays for itself in under a year.




Example:

The difference in total costs over a 7-year life-cycle – assuming an energy consumption of 120 kW, 20 hours' daily operation and an electricity cost of € 0.12 – amounts to over € 200,000 (life-cycle costs for a PillAerator turbo blower € 960,000, rotary lobe blower € 1,170,000). The associated energy cost savings include not only a reduction in a company's electricity costs, but also a reduction in its $CO_2$ footprint.

# Technical specifications

| Model | Permissible gauge working pressure<br>bar | Flow rate *)<br>Complete system at gauge working pressure<br>m³/min | Flow rate *)<br>Complete system at gauge working pressure<br>m³/h | Speed<br>rpm | Drive motor rated power<br>kW | Dimensions<br>W x D x H<br>mm | Compressed air connection ***) | Maximum sound pressure level **)<br>dB(A) | Mass<br>kg |
|---|---|---|---|---|---|---|---|---|---|
| **HP 4000** | 0.4 – 1.3 | 16 – 83 | 950 – 5000 | 30,000 | 150 | 1800 x 1525 x 2125 | DN200/PN10 | 74 | 1815 |
| **MP 6000** | 0.3 – 1.1 | 25 – 108 | 1500 – 6500 | 30,000 | 150 | 1800 x 1525 x 2125 | DN200/PN10 | 75 | 1815 |
| **LP 8000** | 0.3 – 0.9 | 25 – 133 | 1500 – 8000 | 30,000 | 150 | 1800 x 1525 x 2125 | DN200/PN10 | 76 | 1815 |
| **HP 9000** | 0.4 – 1.3 | 42 – 183 | 2500 – 11,000 | 22,000 | 300 | 2930 x 2125 x 2155 | DN400/PN10 | 75 | 3785 |
| **MP 12000** | 0.3 – 1.1 | 50 – 233 | 3000 – 14,000 | 22,000 | 300 | 2930 x 2125 x 2155 | DN400/PN10 | 75 | 3785 |
| **LP 14000** | 0.3 – 0.9 | 75 – 267 | 4500 – 16,000 | 22,000 | 300 | 2930 x 2125 x 2155 | DN400/PN10 | 75 | 3785 |

*) Flow rate, complete system as per ISO 5389:2005: absolute inlet pressure 1 bar(a), cooling and air inlet temperature +20 °C
**) Sound pressure level as per ISO 2151 and basic standard ISO 9614-2, tolerance: ± 3 dB (A) – dependent upon operating point
***) Compressed air connection (with add-on diffuser)

# Performance range

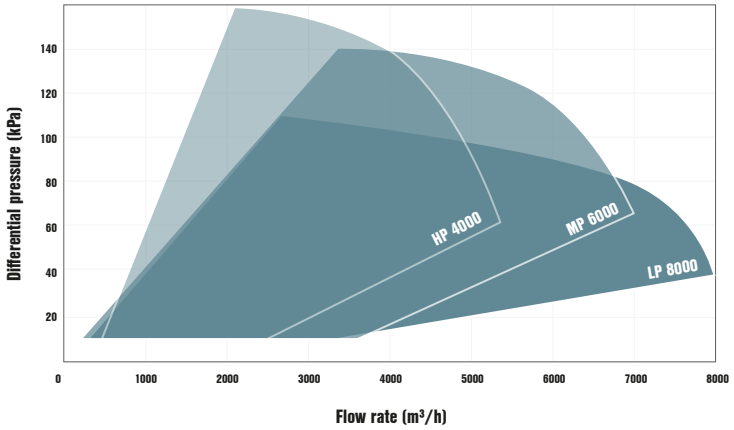



**Image:** Performance curves, 150 kW series

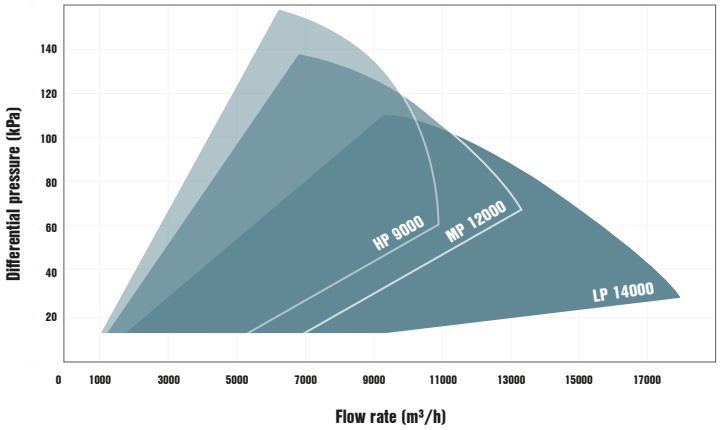



**Image:** Performance curves, 300 kW series

# Views

**PillAerator 150 kW series**

**PillAerator 300 kW series**

# The world is our home

As one of the world's largest compressed air system providers and compressor manufacturers, KAESER KOMPRESSOREN is represented throughout the world by a comprehensive network of branches, subsidiary companies and authorised partners in over 120 countries.

With innovative products and services, KAESER KOMPRESSOREN's experienced consultants and engineers help customers to enhance their competitive edge by working in close partnership to develop progressive system concepts that continuously push the boundaries of performance and compressed air efficiency.

Moreover, the decades of knowledge and expertise from this industry-leading system provider are made available to each and every customer via the KAESER group's global computer network.

These advantages, coupled with KAESER's worldwide service organisation, ensure that every product operates at the peak of its performance at all times and provides maximum availability.


HPC Compressed Air Systems

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