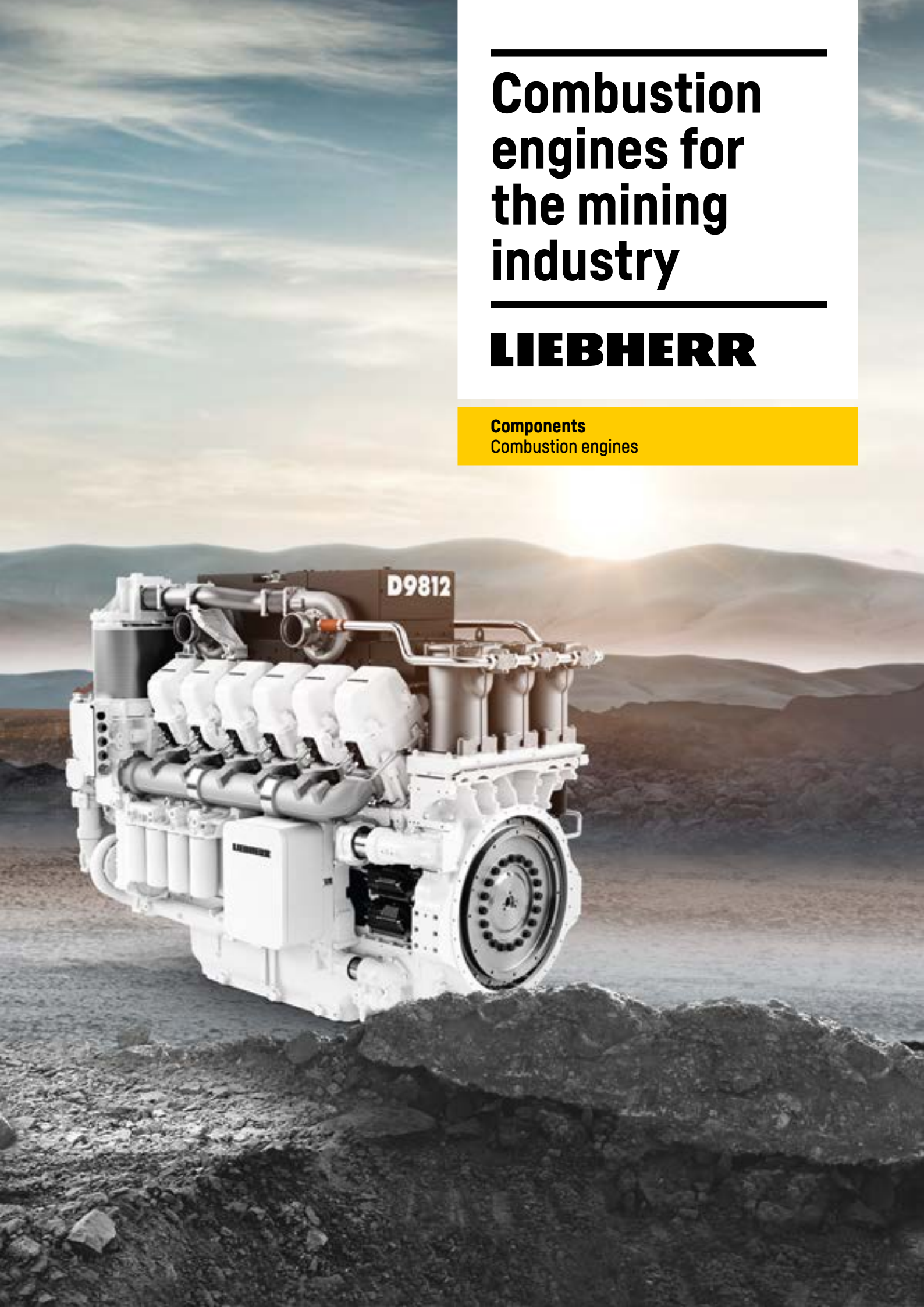
Combustion engines for the mining industry

LIEBHERR

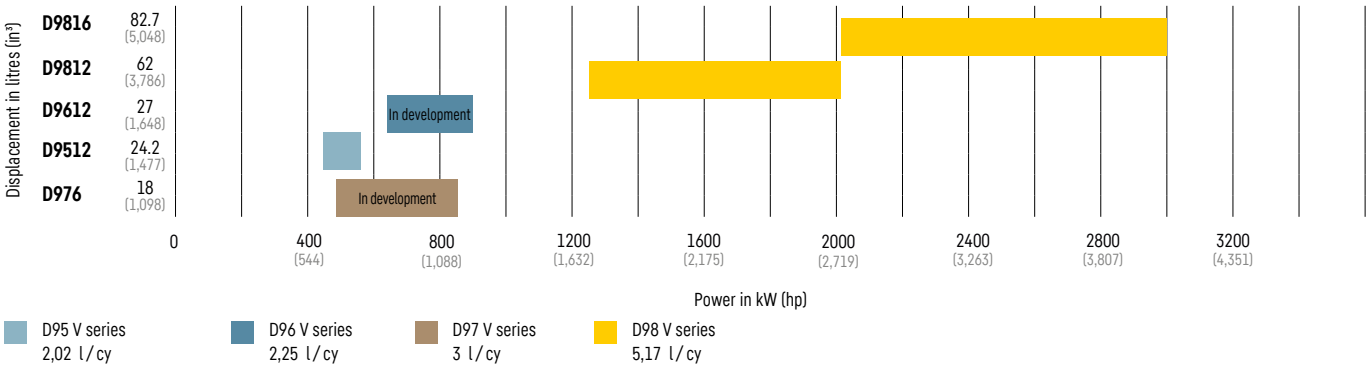
Components
Combustion engines



Combustion engines for the mining industry

Over the past 40 years, Liebherr has evolved from a captive engine manufacturer to an established and important market player. These decades of engine development knowledge, combined with extensive expertise in the mining industry and close collaboration with mining equipment owners and companies, enable the creation of a complete engine portfolio covering a power range from 565 kW (758 hp) up to 3,000 kW (4,023 hp).

Power range



High performance
Our mining engines have a highly responsive and reactive design, providing superior performance and the required horsepower for more productivity. As a result, your excavator will deliver faster cycle times and your truck will accelerate and climb faster on grade, which will enable you to move more tons per hour and to increase your productivity.

In addition, our engines deliver outstanding low fuel consumption by matching the exact engine subsystems from the highest competency of in-house developed key components such as the Liebherr engine control unit and common rail fuel system. Furthermore, 3 % to 5 % fuel savings can be achieved for the D9812 engine of the excavator thanks to a reduction of rated speed from 1,800 to 1,500 rpm.

Increased availability
Designed for extended maintenance intervals, Liebherr engines are carefully thought-out and their maintenance friendly design allows for quick and easy servicing. As a result, their overall scheduled downtime has been reduced, resulting in less maintenance downtime and more uptime in availability.

Our combustion engines have been designed with superior reliability in mind for the harshest mining environments, providing the highest operating capability for your machine. Additionally, down-speeding by up to 300 rpm results in a significant increase of lifetime. Overall, we are focusing on saving your time, increasing your equipment availability and optimizing your total operating costs, so the total cost of ownership does not exceed your expectations and forecasts.

From 510 – 2,700 kW

D976

Bore	mm (in)	148	5.8
Stroke	mm (in)	174	6.9
Displacement	l (in3)	18.0	1,098.4
Power rating	kW (hp)	510-620	684- 831
Rated speed	rpm (rpm)	1.900	1,900
Peak torque	Nm (lb-ft)	4.000 at 1.300 rpm	2,950 at 1,300 rpm
Dry weight	kg (lbs)	1,763	3,887
Dimensions (L x W x H)	mm (in)	1,546 x 1,057 x 1,284	60.9 x 41.6 x 50.6

D9512

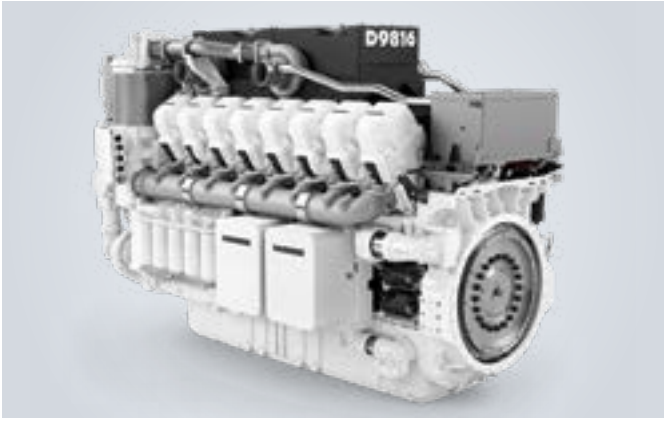
Bore	mm (in)	128	5.04
Stroke	mm (in)	157	6.18
Displacement	l (in3)	24,2	1,477
Power rating	kW (hp)	565	758
Rated speed	rpm (rpm)	1.900	1,900
Peak torque	Nm (lb-ft)	3.578 at 1.500 rpm	2,639 at 1,500 rpm
Dry weight	kg (lbs)	2.266	4,996
Dimensions (L x W x H)	mm (in)	1.969 x 1.381 x 1.285	77.5 x54.4.3 x50.6

D9612

Bore	mm (in)	135	5.3
Stroke	mm (in)	157	6.2
Displacement	l (in3)	27	1,647.6
Power rating	kW (hp)	650 - 850	872 - 1,140
Rated speed	rpm (rpm)	1.800	1,800
Peak torque	Nm (lb-ft)	5.600 at 1.400 rpm	4,130 at 1,400 rpm
Dry weight	kg (lbs)	2.350	5,181
Dimensions (L x W x H)	mm (in)	2.117 x 1.361 x 1.355	83.3 x 53.6 x 53.3

D9812

Bore	mm (in)	175	6.9
Stroke	mm (in)	215	8.5
Displacement	l (in3)	62,0	3,783
Power rating	kW (hp)	1.350 - 2.016	1,810 - 2,703
Rated speed	rpm (rpm)	1.500 - 1.800	1,500 - 1,800
Peak torque	Nm (lb-ft)	15.700 at 1.350 rpm	11,580 at 1,350 rpm
Dry weight	kg (lbs)	9.600	21,164
Dimensions (L x W x H)	mm (in)	2.661 x 1.753 x 2.126	104.8 x 69 x 83.7



D9816

Bore	mm (in)	175	6.9
Stroke	mm (in)	215	8.5
Displacement	l (in3)	83	5,065
Power rating	kW (hp)	2.700	3,620
Rated speed	rpm (rpm)	1.800	1,800
Peak torque	Nm (lb-ft)	16.114 at 1.600 rpm	11,885 at 1,600 rpm
Dry weight	kg (lbs)	11.800	24,917
Dimensions (L x W x H)	mm (in)	3.361 x 1.800 x 2.137	132.3 x 70.8 x 84.1

Vision 2030

The reduction of global greenhouse gases is one of the biggest challenges of our generation. Striving to reach zero emissions in the future, Liebherr works on alternative and zero-emission power train concepts. Thereby, the Liebherr team pursues an open-technology approach. In the field of combustion, the focus of the research and development activities lies on multiple solutions, depending on the needs different fields of application will show in the future.

Liebherr is convinced that internal combustion engines will remain an important solution for heavy-duty and off-highway vehicles and machines, while responding to the goal of carbon neutrality by 2050. We consider the combustion engine one of the most promising powertrains for high mechanical power under extreme operating conditions in the off-highway industry. In particular, harsh conditions, to which many heavy-duty vehicles are exposed to, challenge the development of climate-friendly, reliable and efficient powertrain solution. Internal combustion engines have met these challenges and requirements for decades, and will remain the primary powertrain in this sector – offering a sustainable solution to the market's demands.

In terms of exhaust emissions, the concern is not the combustion engine, but the fuel that is burned. The challenge then is to find the right fuel and to adapt the engine in a way to produce zero to near zero emissions.

Hydrogen is one of the options, since it is a promising, carbon-free energy and can be burned in the internal combustion engine without producing CO2 emissions. Hydrogen is colorless, odorless, can be produced from water using renewable electricity.

It holds a great potential in reaching the zero emissions destination. Liebherr has made a significant investment into the development of the hydrogen combustion engine and test facilities recently. Prototype engines are being tested since 2020 and are providing promising results in terms of performance and emissions. Injection technologies, such as port fuel injection (PFI) and direct injection (DI), are being further developed and tested. We have had prototype machines equipped and running with these hydrogen injection solutions since 2021.

On the road to zero emission, Liebherr is continuously investigating and looking for the best combustion technologies. Some additional solutions and research activities are already ongoing and should enable an even more stable combustion, resulting in very high power density.

Liebherr thinks globally when it comes to reducing emissions and examines different technologies and fuels. Hydrotreated Vegetable Oils (HVO) is particularly interesting because it is an already available, interim technology.
Liebherr's entire line of combustion engines are validated and approved for use with HVO fuels providing a simple and efficient alternative to diesel.

In older construction, machines with diesel engines, which are often in use even longer in many regions of the world emissions, can also be reduced significantly with HVO as a diesel admixture – a further contribution to reducing climate change.

The advantages that present HVO are numerous:
– The use of HVO requires no modification and is compliant with fuel system components.
– The HVO has a very good low temperature stability.
– HVO enables the reduction of Ad blue use.
– HVO decreases nitrogen oxides and soot particle emissions.
– HVO can be mixed with diesel for use in conventional internal combustion engines.

HVO fuels that comply with standard EN15940 with a base of hydrogenated vegetable oils can make a valuable contribution to reducing global emissions of greenhouse gases.
Of course, different technologies will exist or coexist in the future to achieve a long-term climate target. Liebherr will develop and propose multiple powertrain solutions in the future and select applications to support the customer's needs.

Digitalisation

Digitalisation has touched all aspects of our daily lives. Based on decades of experience in the development and production of drive components, Liebherr works on producing intelligent solutions in the field of engine condition monitoring and diagnostic. Monitoring the performance of engines is a critical part of every industry. By constantly monitoring and improving the components' current state, machine downtime can be reduced to a minimum. Using diagnostic tools allows customers to properly care for the engine system while maximising uptime and equipment availability.

To further support their customers with the engine performance and maintenance, Liebherr has developed a suite of data-driven digital products and services as part of its combustion engines product portfolio.

Liebherr's engine condition monitoring provides meaningful insights in form of various Key Performance Indicators (KPI) on the engine's current health, performance and maintenance; the KPIs can be delivered to a mobile device as an application or to the customer's backend through a web service (API).

LiDIA is an intuitive and user-friendly engine diagnostic tool, which requires no configuration and reduces the complexity of diagnostic procedures to the essentials. LiDIA offers a rapid overview of all information on the engine system status, error codes, active limitations and error reactions.

Service

Providing our customers with high quality product support and tailored assistance is what we strive for. Whether it is connecting you with a local service partner or assigning an urgent problem to a dedicated team of Liebherr experts, we are ready to assist you.

Our combustion engines are designed to support the highest level of serviceability.

Customer service & training center
Professional maintenance and repair make a significant contribution towards maximum exploitation of Liebherr components' lasting character. Comprehensive training courses prepare our customers' technicians to provide efficient customer support. Liebherr consequently offers hands-on basic and advanced training. In our training center the experienced trainers can also simulate extreme repair operations.

Maintenance and spare parts
Practically orientated maintenance and repair kits, such as packs of seals, facilitate combined ordering of parts that need to be replaced together and ensure a high level of repair quality.

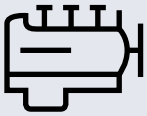
Remanufacturing/repowering
As your engine needs to be replaced several times during the overall lifetime of your machine, we are helping you to reduce your costs by offering you an alternative to a new engine. With our Reman program, we will transform your used engine by equipping it with new parts in accordance with industry standards. The program offers a financial benefit by helping businesses to cut costs whilst reducing environmental impacts through the various product's life cycle stages. Our second alternative is the repowering of your machine regardless of its brand and make. To improve reliability and fuel consumption, we can offer a complete repowering service and kit. Overall, we are focusing on saving your time, increasing your equipment availability and optimising your total operating costs so that your total costs of ownership meets or exceeds your expectations and forecasts.

Components

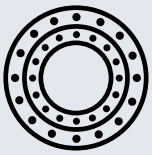
As a provider of a vast variety of products, the components product segment offers solutions in the area of mechanical, hydraulic, electric and electronic drive system and control technology. Our state-of-the-art components and systems of the highest quality are designed and manufactured at ten production sites worldwide. Representatives from each of our product segments are available to our customers at Liebherr-Components AG and the regional sales and distribution branches.

Liebherr is your partner for a joint success: from product idea to development, manufacture and commissioning right through to customer service solutions, such as remanufacturing.

components.liebherr.com

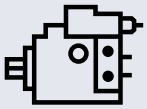

Engines


Fuel injection systems

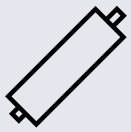

Slewing bearings


Gearboxes

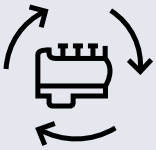

Winches

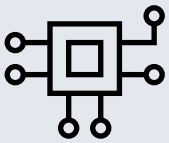

Hydraulic pumps and motors

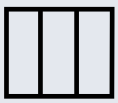

Hydraulic cylinders

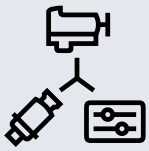

Piston accumulators


Electric machines


Remanufacturing


Industrial electronics


Electrical drive and control technology


Drive systems


Aerospace electronics


Fibre composite

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