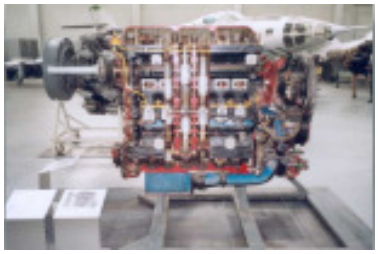
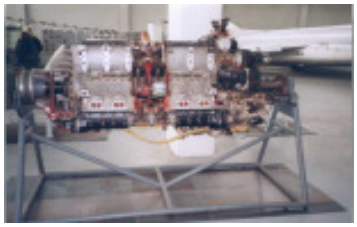
Junkers

Engine construction

(Exhibition guide)





Förderverein Technikmuseum „Hugo Junkers“ Dessau e.V.
Kühnauer Str. 161a, 06847 Dessau-Roßlau
Tel.: 0340 6611982
Fax: 0340 6611193
E-mail: technikmuseum-dessau@online.de
Internet: www.technikmuseum-dessau.de

Preface

Junkers gained his theoretical knowledge in the universities of Karlsruhe, Aachen and Berlin-Charlottenburg. He studied traditional machine construction as well as electronic engineering and heat technology.
This knowledge helped him in his work at *Deutsche Continental Gasgesellschaft* in Dessau. In 1892, he used the principle of opposed pistons in the gas engine for the first time. This was followed by decades of development work in the field of engine technology.

Having become independent from von Oechelhaeuser and his gas engine construction, Junkers concentrated himself on the development of large oil engines, i.e. “heavy-oil engines running according to diesel principle”. He thought oil engines would have better chances in the future. Junkers helped to get this working principle generally accepted and his engines were widely spread. As for the construction of aircraft engines, he developed and built both diesel and more powerful petrol engines. Even nowadays, some constructors are trying to develop a diesel engine without valves taking into account the current emission norms.

Summary of Junkers' achievements and technical developments in the field of engineering

1888 – Recommended by Prof. Slaby Junkers started his work at *Deutsche Continental Gasgesellschaft.*

1889 – Experimental station for gas engines *Versuchstation für Gasmotoren von Oechelhäuser und Junkers*

1892 – The first 100-HP gas engine with opposed pistons was manufactured in Dessau.

1897/98 – Development of a 1,000-HP gas engine

1902 – Experimental institute of oil engines (*Versuchsanstalt für Ölmotoren*) was founded in Aachen. Its task was to develop a large oil engine.

1905 – Development and construction of a one-cylinder experimental engine with dual pistons M12

1907 – Patent on diesel engine with two working pistons moving in opposite directions in the same cylinder

1913 – Foundation of the company *Junkers Motorenbau Magdeburg GmbH*

1919 – Production of stationary engines with domed pistons (HK series) first in Dessau and later in Chemnitz

1922 – First petrol 85-HP aircraft engine L1

1923 – Foundation of the engine factory *Junkers-Motorenwerke Dessau (JUMO)*

1929 – The 700-HP aircraft engine L88, since 1932 called JUMO 204, was installed in G38.

1931 – Foundation of the engine factory *Junkerskraftmaschinen GmbH Chemnitz*

1932/33 – A great number of JUMO 205 was used in air traffic and in the German Air Force.

1933 – JUMO 210 – aircraft petrol engine of 750 HP

1934 – JUMO 211 – aircraft petrol engine of 1,200 HP

1940/41 – Construction of the jet engine JUMO 004

Some exhibits from the field of engine construction

Experimental engine M12

It is the first oil engine built according to the principle of dual pistons. It was used for experiments with various lubricants, experiments on fuel injection system, and for search of ways of increasing capacity. The second cylinder was installed later. This version, known as tandem engine, had a capacity of 2×100 HP.
As Diesel patent ended in 1907, Junkers began to produce stationary and mobile engines according to diesel principle. Engine factories were founded one after another in rapid succession.

Radial engine BMW 132

This nine-cylinder radial engine was normally used in Ju 52. This 660-HP engine with a weight of 430 kg had some advantages over Junkers diesel engines. As a petrol engine with an air cooling it was, in addition, equipped with an oil cooler. Every cylinder had got two sparking plugs with an ignition system for reliable ignition.

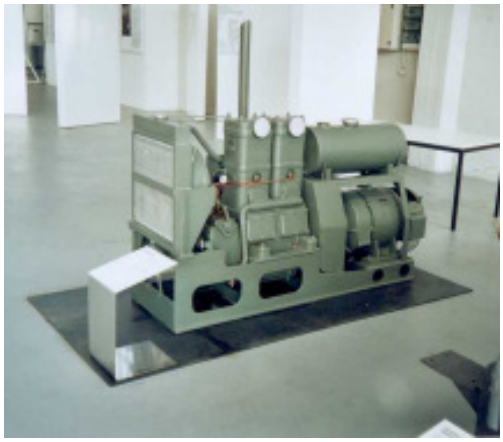
Propeller frame with airscrews

The shown airscrews are made of wood. These are fixed pitch propellers with predetermined angle of blades. Variable pitch propellers with wooden airscrews were used later, too. The airscrews are made of tropical timber, the sheets of wood were glued together in layers. *Heine* company from Berlin supplied Junkers workshops with wood plates. Metal airscrews (aluminium) were also developed and manufactured by Junkers.

Opposed piston engine 3 HK 65
Cutaway model of a truck engine

This diesel in-line engine with three cylinders was built in 1925 and installed in a truck. It is fitted out with a flywheel and a torsional vibration damper to improve imbalance. The engine was started with a battery. Cylinders and some other parts of the engine are shown in section.

Opposed piston engine 2HK 65 with a generating set

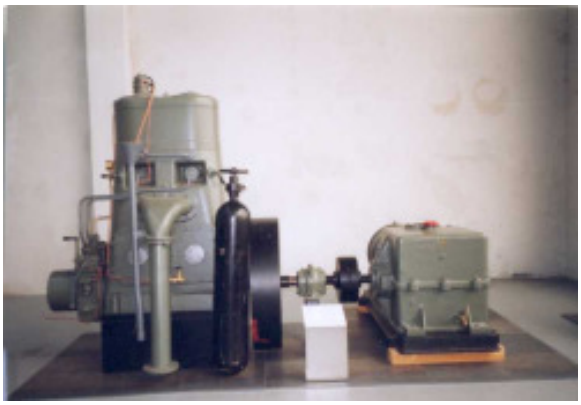


Till the beginning of 1960s engines with domed pistons from the HK-series were produced according to Junkers' patent, almost unchanged, at *VEB Dieselkraftmaschinenwerk Karl-Marx- Stadt*, the succession company of *Junkers Dieselkraftmaschinen GmbH Chemnitz*. This diesel engine was produced in 1957. It had two cylinders arranged in line. The engine was connected to FIMAG generator by means of an elastic connecting link. The engine was started electrically.

Opposed piston engine 4HK 108 with a generating set

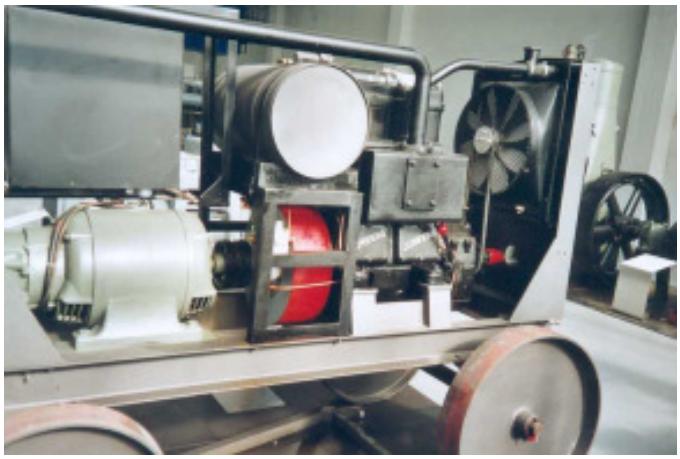
This in-line diesel engine with 4 cylinders was produced at the Junkers factory *Gesellschaft für Dieselkraftmaschinen* in Chemnitz around 1930. The generator was delivered by *Fa. Keiser* from Berlin. The engine and the generator are connected to one another by means of an elastic connecting link. This engine version is a ship engine. It was started by use of air compression in the cylinders. The engine you see was used at Dessau waterworks as an emergency generator.

Opposed piston engine 2HK 130 with angular gear and centrifugal pump



This set was produced at *Junkers-Motorenbau Dessau* around 1930. The engine was started with compressed air from the compressed air containers. There is a flexible spike coupling between the engine and gearbox.
The centrifugal pump is directly and fixedly added on the gearbox. The engine was at the waterworks Dessau.

Opposed piston engine 2HK 65 with generating set

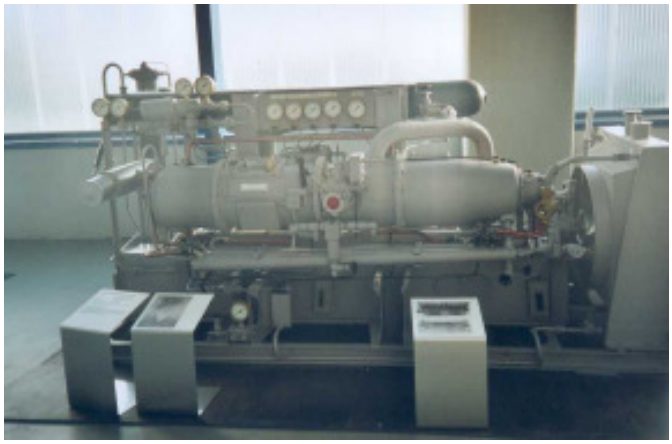


This is a two cylinders in-line diesel engine, built in Chemnitz in 1935. Engine and generator are installed on a chassis frame and served as electricity supplier in rural areas.
The efficiency of the generator is 19 KVA. The starting occurs electrically.

Opposed piston engine 2HK 65 in the drive mechanism of a tractor

It was built as a tractor with a modified Junkers engine at *VEB IFA*, *Ingenieurbetrieb Hohenstein-Ernstthal,* after the Second World War.
The starting occurs electrically or by means of a crack. The tractor is still in working condition.

Stationary free piston compressor 8 K 200

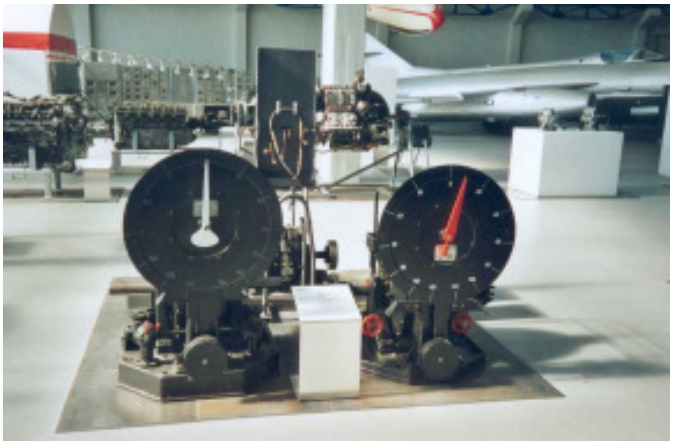


The opposed piston engine offered many applications due to its uncomplex construction.
Junkers took it as basis for his free piston compressor by placing compressor pistons at the ends of the working piston.
Six pressurised air containers with a volume of 50 litre served as pressure tanks. The compressor was produced for industry and ship use.

Compressor 2K 115 B

The compressor was built at the last company formation, *Junkers – Maschinen –und Metallbau* Munich-Allach, in 1958. It was used in road construction. It is a mobile free piston compressor with a two-cylinders diesel engine.

Water current brake E 4K



Type: Junkers
Producer: *FAMO Breslau* in 1922

The current brake served as power measurement for combustion engines when these are exposed to high loading.
The load of the engine is carried steeples out by means of a coupling. The inertia of the utilised water, which is important for the power transmission, produces a deceleration as well as a transmission ratio of the turning moment.
Die indication is shown by means of a leverage on a circular scale. Its efficiency could be directly read in HP.

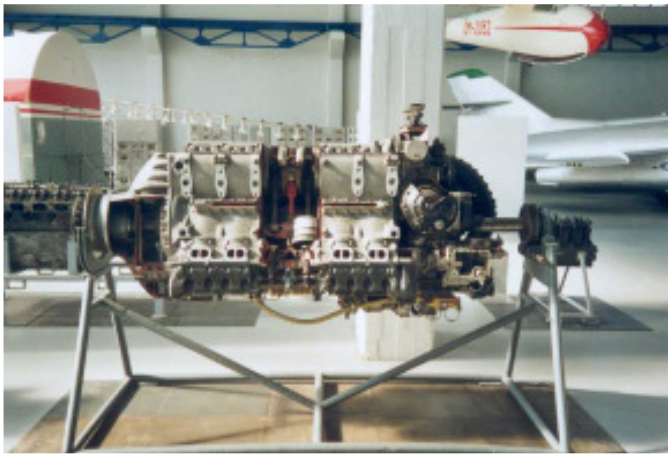
Opposed piston engine 2 HK 160

Junkers-Motorenbau GmbH was the producer of this two-cylinders in-line diesel engine of 1930. It was produced for industry and ship use. The flywheel is suited also for flat belt connection. The compressed air is annealed by means of a cylinder with compressed air container

JUMO 207 – cutaway model

This is an opposed piston aircraft engine with an efficiency of 680 HP. It was manufactured at *Junkers-Flugzeug und Motorenwerken Dessau* and used in the military planes Ju 86 and BV 138.
It was built in 1938.

JUMO 213A cutaway model



In contrary to heavy oil aircraft engine, high efficiency could be achieved with petrol engine.
JUMO 213A was used in various tactical aircrafts and bombers. It had an efficiency of 1,750 HP

Jet engine JUMO 004

The power unit was already developed in 1940/41. The B version was mass-produced with an eight-steeped axial compressor. It ran on kerosene and had an efficiency of 900 kp.
The jet engine was used among other things in the pursuit plane Me 262. A cutaway model from the A-production run is shown here.

List of references:

1. *Technikmuseum „Hugo Junkers“ Dessau*
2. The exhibits JUMO 207, JUMO 213 A, JUMO 004 are loan of *Militärisches Museum Dresden* (military historical museum Dresden)