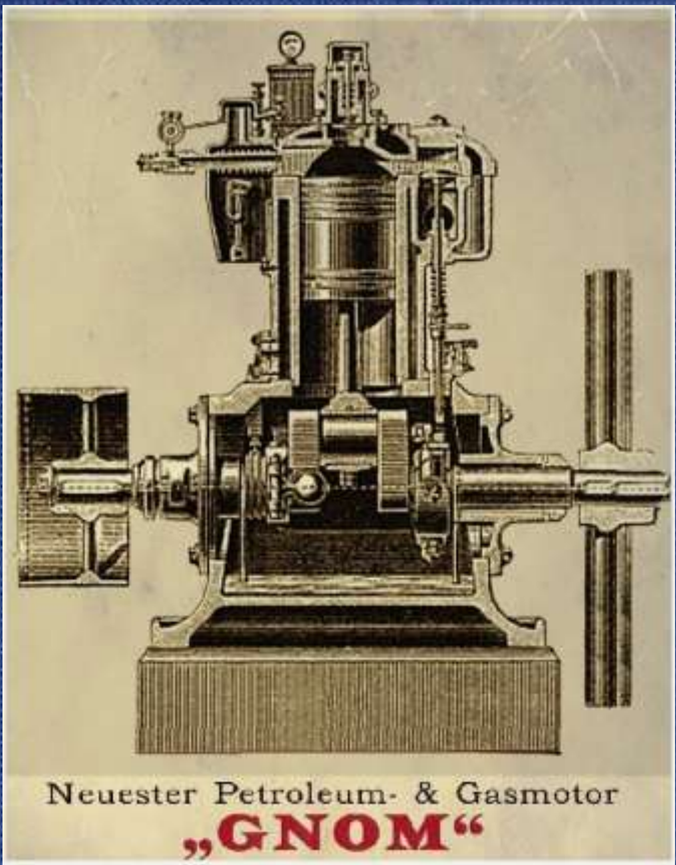
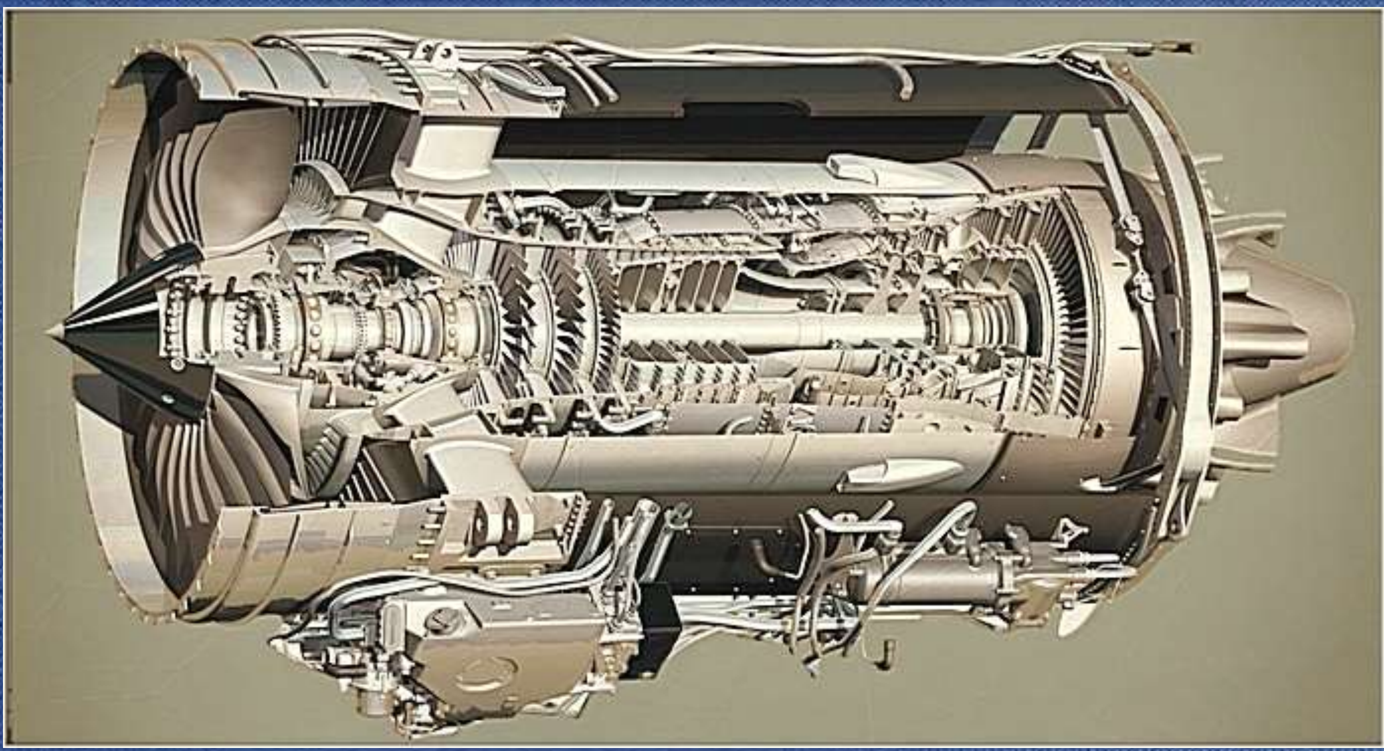
Museum Guide



From
the stationary engine
to the turbofan jet engine

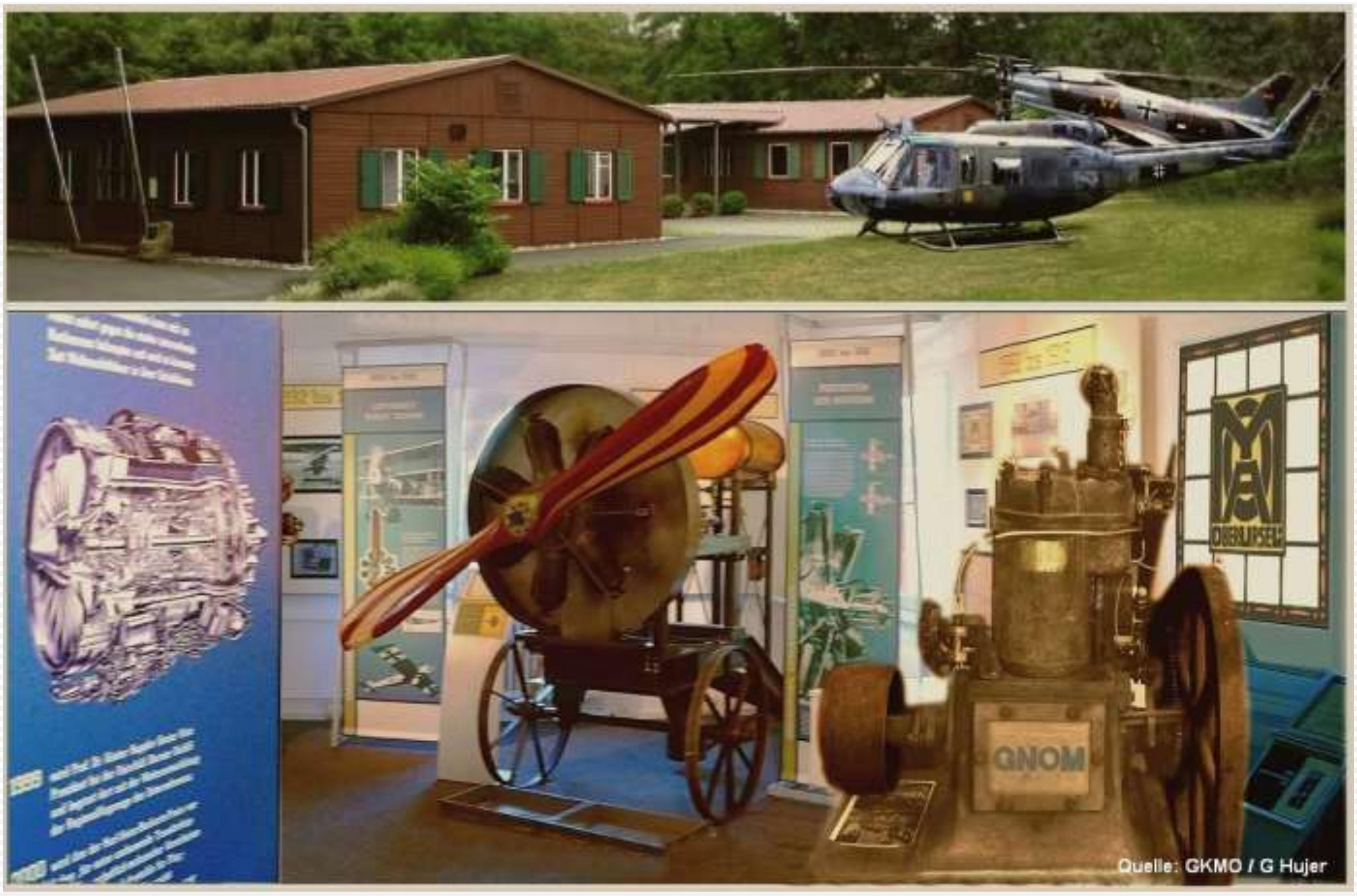
A journey of discovery
through the industrial history of the
Motorenfabrik Oberursel at the
Rolls-Royce Deutschland
company museum.



A museum guide of the Motorenfabrik Oberursel,
presented by the Historical Circle of the Motorenfabrik Oberursel

Welcome to the company museum

Motorenfabrik Oberursel



This guide, based on the most part on original exhibits, sets out to inform the visitor of the long and interesting history of this historic industrial location and the products manufactured here.

For more information, visit our website www.gkmo.net

Please enjoy your journey!

The long history of this industrial location at Rolls-Royce Deutschland's Oberursel site is presented on information boards in the entrance area of the museum

The museum is named the "Prof. Dr. Günter-Kappler-Haus" (house)

Prof. Dr. Günter Kappler was one of the pioneers and founding directors of BMW Rolls-Royce AeroEngines, established in 1990, renamed to Rolls-Royce Deutschland in 2000. From 1990 to 1999, he led the development of the first series-built civil aviation turbine engine in Germany.

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A brief overview of the history of the Oberursel Motorenfabrik

The Motorenfabrik Oberursel has always been one of the largest industrial companies and employers in Oberursel. Founded in 1892, the Motorenfabrik, renamed Rolls-Royce Deutschland in 2000, is considered to be the oldest still active aircraft engine factory in the world. It goes back to a factory, built in 1882, for the manufacture of grain milling machines and was the first mechanical engineering factory in Oberursel at the time. Its development continued with the stationary engine "Gnom", and at the beginning of the 20th century became the second largest manufacturer of motor locomotives in Germany. The Oberursel radial engines, built during the First World War, equipped the first German fighter aircraft, the most famous of which was the Fokker triplane of the "Red Baron".

Company logos from the beginning to the present day

Between 1922 and 1932, almost 20.000 diesel two-stroke Deutz engines were produced here. From 1934 until the end of the Second World War, a total of about 60,000 water-cooled, high-speed 4-stroke Deutz diesel engines were also produced here. These engines were built into Deutz tractors and into tractors of other manufacturers.

Additionally, work commenced from 1941 onwards on the development of large-scale aircraft engines. After World War II, the factory became a victim of reparations dismantling. The U.S. Army used it as a repair depot for 11 years. At the beginning of the 1960s, the construction of aero engines with various license productions and in-house developments moved back into the factory. The repair and maintenance of these engines and those in operation today is also one of the tasks at the site.

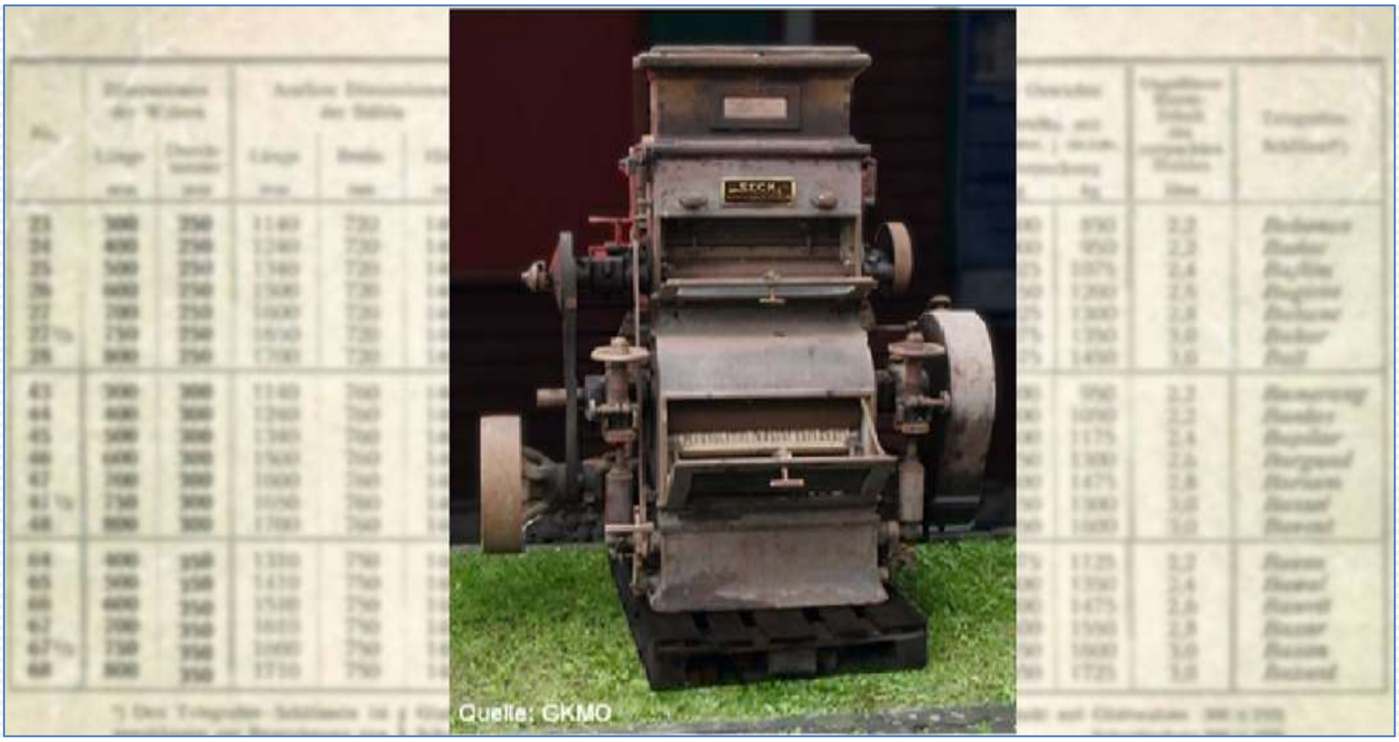
In 1990, a new era began with the BMW Rolls-Royce AeroEngines and the development of the BR700 thrust engines for regional and business jets. After the transition to Rolls-Royce Deutschland, the plant developed into a centre of excellence for rotating engine components, especially for compressor drums, compressor wheels in BLISK design and for turbine discs.

1882 - A grain mill brings industrial mechanical engineering to Oberursel

Technical data

Type: Double-roller grain mill, Model M
Manufacturer: Dresdener Mühlenbauan-stalt Seck Brothers
Year of manufacture: 1917
Serial No.: 17477
Weight: Approx. 1,000 kg
Footprint: ca. 70 x 70 cm
Number of rollers: 2 chilled cast rollers

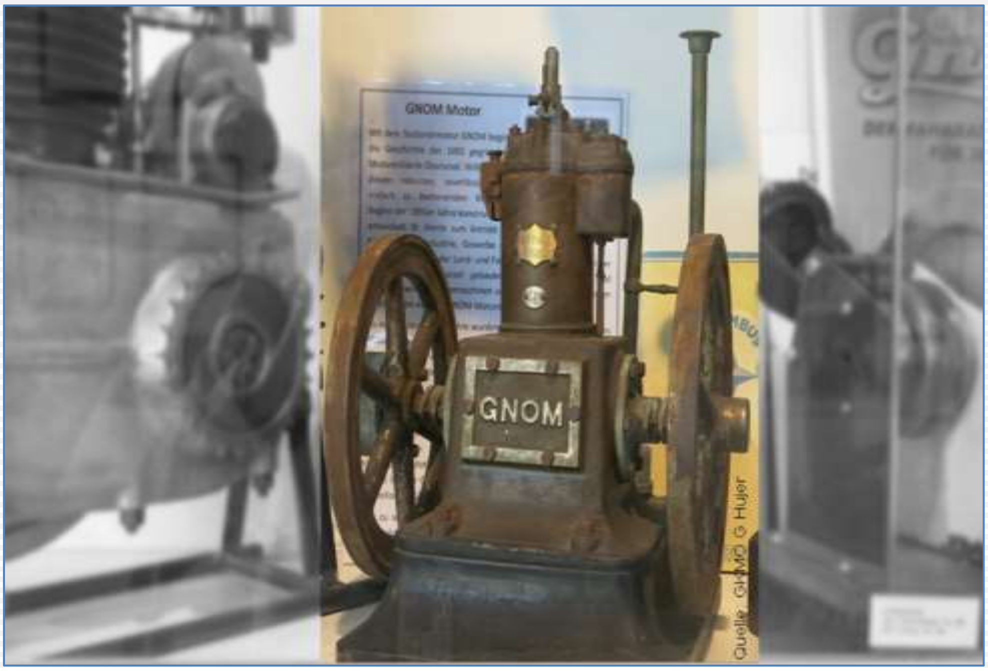
What does a grain mill have to do with the Motorenfabrik Oberursel? Quite a lot actually, because without Wilhelm Seck's grain mills there would be no engine factory in Oberursel! Wilhelm Seck acquired the Wiemers-mühle (Wiemers water-driven grain mill) in 1882 and expanded it into an engineering factory in order to produce modern grain mills. In the last third of the 19th century, mechanical grain mills replaced the grinding methods that had been common up until then. The grains were broken up more rationally between rotating rollers and crushed into grits and flour replacing the traditional method of crushing the grain between grinding stones. Willy Seck's son completed the development of his stationary engine GNOM here in the Oberursel branch of the Bokkenheimer Mühlenbauanstalt (Mill Construction Institute; Bockenheim is now a district of Frankfurt) This led to the foundation in January 1892 of the Motorenfabrik Oberursel, still in existence today. We were unable to find an original 19th-century mechanical grain mill, but we did find a direct descendent. This exhibit, acquired in 2014, can be seen as being representatively reminiscent of the history of the Motorenfabrik Oberursel. When restoration work is completed, we want to exhibit this grain mill in the outdoor area of the museum.



The stationary engine GNOM –
The foundation of the Motorenfabrik in Oberursel in 1892.

The history of the Motorenfabrik Oberursel (MO) begins with the stationary engine, Gnom, which Willy Seck developed from 1890 in his father's factory in Oberursel. The designation of this robust, reliable and easy-to-use single-cylinder stationary engine was derived from the fable character "Gnome". Such engines were initially used primarily to drive machines in arts and crafts as well as in agricultural and forestry areas. The model of a GNOM stationary motor exhibited in the museum was probably used for sales activities.

The engine, which was particularly popular in agriculture and by small business, sold well. By 1896, 1000 Gnome engines were produced, the first "Locomobiles", and GNOM-powered ship winches soon followed. In 1898, the designer of the GNOM left the company when it was converted into the Motorenfabrik Oberursel. The development and production of motor locomotives began in 1900, which were used widely as pit, shunting, factory, field railway and army field locomotives. By 1922, about 2,000 units had been built, making the MO the second largest engine locomotive manufacturer in Germany. The factory buildings were expanded ever further to meet the demands of new products and the growing business. In 1911, the construction of a new factory complex began and the "Diesel engine hall" was put into operation in 1912. The "Air Engine Hall" followed in 1913. Until 1918, further wings and the impressive administration building were added. This ensemble of buildings, which still shapes the image of the engine factory today, was declared a cultural monument in 1980.




Motorenfabrik Oberursel
Akt.-Ges.
Oberursel bei Frankfurt am Main

Anleitung
zur Bedienung des Motors „Gnom"
für den Betrieb mit Benzin, Benzol oder Spiritus, oder Gas (bei Ausführung mit elektrischer Zündung)

The stationary engine GNOM in the museum

The GNOM in the restoration workshop

By the early 1920s, several thousand such stationary engines were built. One of the very few surviving engines was purchased for the Motorenfabrik in 2012 and is still undergoing restoration. This 1200 kg spirit engine with about 6 to 7 horse power and carrying the serial number 4184, was built in 1904 in the Motorenfabrik Oberursel and delivered to a grain mill in Ineu, Hungary (since 1920 Romania). The engine was supposedly operated there until about 1970. Later, a Hungarian engine collector saved it from scrapping, and the history circle was able to bring this historic engine home to its place of manufacture.

Einzelheiten des Spiritus- oder Gas-Motors „Gnom"

Normalleistung u. Größenbezeichnung PS.	2	3	4	5	6	8	10	12	15	20
Maximalleistung . . . . bis ca. PS.	3	4	5	6¼	7½	10	12	15	18	24
Drehzahl in der Minute	360	350	300	300	290	280	270	260	250	250
Höhe des Motors . . . cm	105	110	120	130	135	155	170	185	185	220
Breite des Motors (Richtung der Kurbelwelle) . cm	115	120	135	140	165	180	200	225	225	235
Länge (Tiefe) des Motors . . . cm	80	85	95	105	105	115	120	130	130	150
Schwungraddurchmesser bei Gewerbebetrieb . . cm	80	90	100	110	2 à 110	2 à 120	2 à 130	2 à 140	2 à 150	2 à 160
Schwungradkranzbreite bei Gewerbebetrieb . . cm	7	7½	8	8	8	8	9	10	10	12
Riemenscheiben-Durchmesser . . . cm	30	30	40	40	50	60	65	70	70	75
Riemenscheiben-Breite . . . cm	18	20	20	22	30	30	35	35	35	45
Bruttogewicht des Motors bei Gewerbebetrieb . ca. kg	875	1000	1290	1360	1900	2400	2650	3300	3850	4300
Nettogewicht des Motors bei Gewerbebetrieb . ca. kg	690	775	1020	1090	1540	2000	2270	2800	3300	3800
Durchmesser der Schwungräder für Lichtbetrieb . . cm	80	90	100	110	120	130	150	160	160	170
Kranzbreite der Schwungräder für Lichtbetrieb . . cm	7	7½	8	8	9	10	11	12	13	14

Für Lichtbetrieb erhielten alle Motoren zwei extra schwere Schwungräder und kam die Riemenscheibe dabei in Wegfall.

Bei Verwendung von 87 %igem Spiritus mit bis zu 20 % Benzol vermischt beträgt der Brennstoffverbrauch der Spiritusmotoren bei voller Ausnutzung pro Stunde und Pferdestärke 0,4 bis 0,6 kg je nach Größe der Maschine.

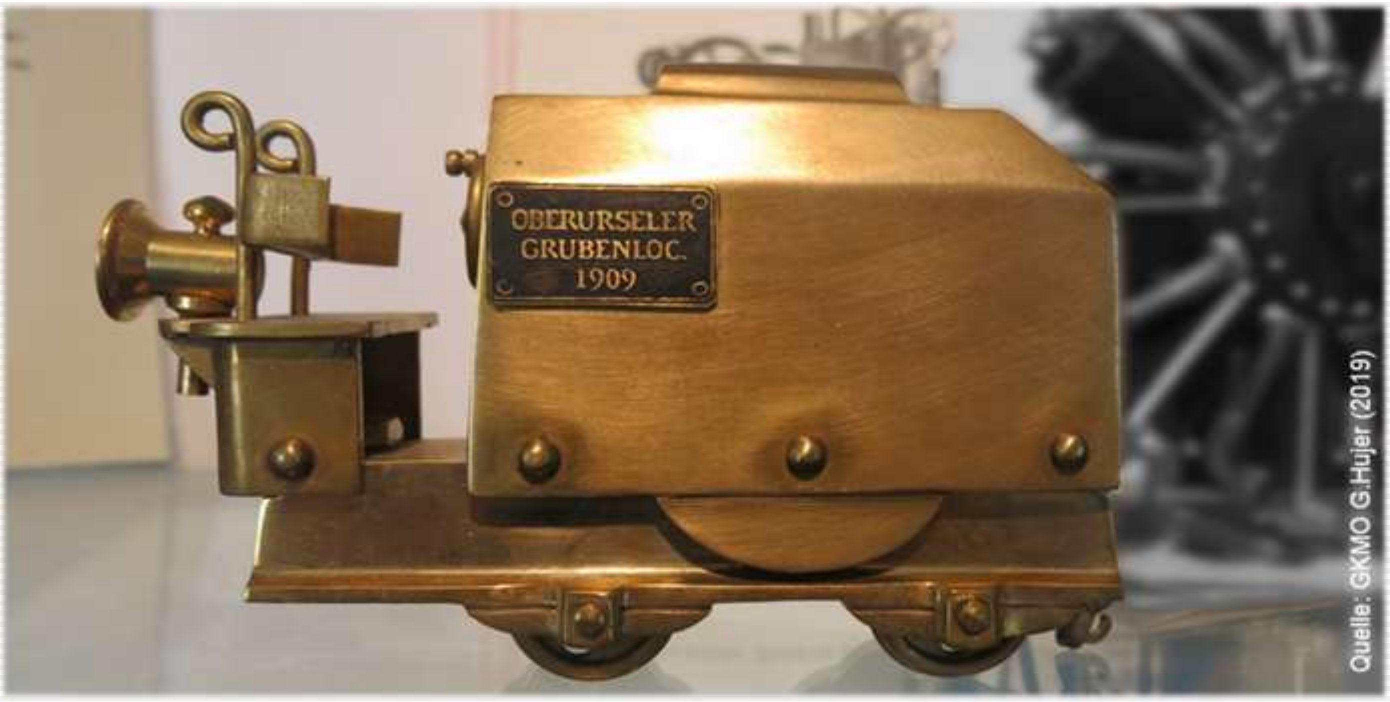
Der Verbrauch bei Gasmotoren stellt sich bei voller Ausnutzung pro Stunde und Pferdekraft auf 0,5 bis 0,9 cbm je nach Größe der Maschine und dem Heizwert des zur Verwendung kommenden Gases.

The Locomotives from Oberursel

In 1900, the engine factory began the construction of locomotives, which would soon make a name for themselves in tunnelling projects in the Austrian Alps. They were also widely used as pit, shunting, factory and field railway locomotives. About seven hundred Army field locomotives were produced during the First World War alone. With a total of about two thousand units built by 1922, the engine factory became the second largest manufacturer in Germany, after the Deutz Motorenfabrik.

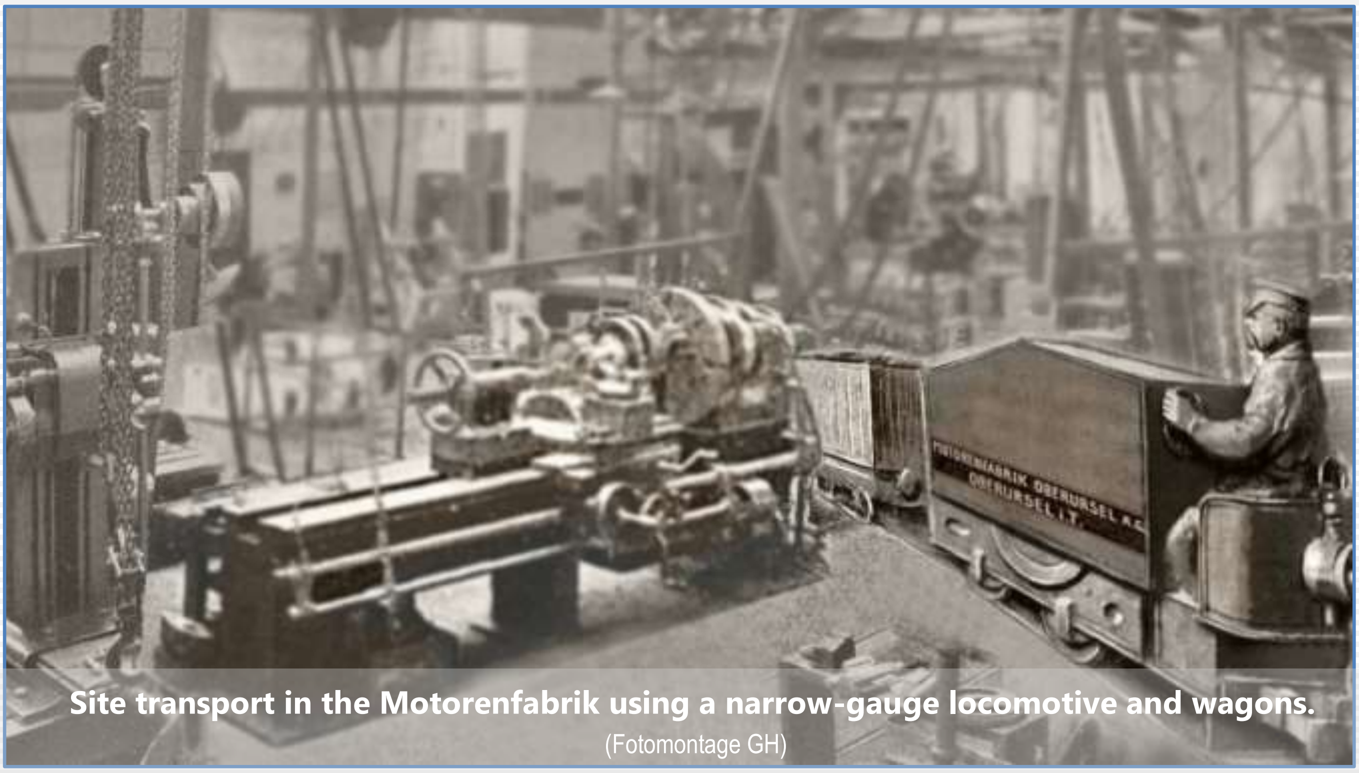
Initially, many of these locomotives were equipped with spirit engines, with which the Oberursel engine factory had taken a pioneering role in Germany from 1899.

Our museum can only exhibit a model of an Oberursel mine locomotive. Of the four locomotives from Oberursel still known to be in existence, only one is currently operational and can be viewed at the Frankfurt Feldbahnmuseum (Frankfurt narrow-gauge railway museum).



The model of a "Oberurseler Grubenlocomotive" (Oberursel mine locomotive) in a showcase

Transport-Wagon



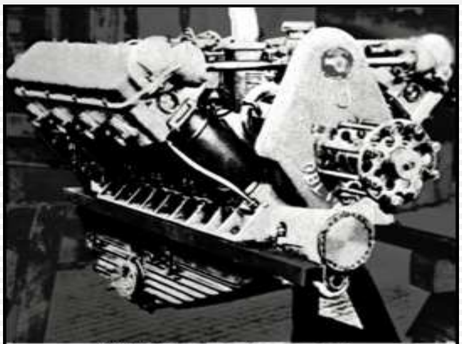
Site transport in the Motorenfabrik using a narrow-gauge locomotive and wagons.
(Fotomontage GH)

The engine locomotives built in the Motorenfabrik Oberursel from 1900 were used all over the world, but also at the factory in Oberursel itself. A rail network at the time spread through the entire plant as such wagons were used for internal transport.

One of these wagons was discovered during construction work on the factory site in the 1990s, and restored by employees of the Kranichstein Railway Museum. It is now located in the outdoor area of the museum

1914 to 1918 - Aircraft engines from Oberursel in the First World War 1914 bis

In April 1913, the Motorenfabrik Oberursel was able to acquire a license to reproduce and market the successful French Gnome radial engine from the Société des Moteurs Gnome of the Seguin brothers in France. One of the Seguin brothers owed the upswing of his company, founded in 1895, to the construction of the Gnom engines licensed by Seck. The rapid development of military aviation during the First World War led to a profound change in the Motorenfabrik Oberursel. By the end of 1918, about three thousand Oberursel radial engines were produced here. These engines were further developments of the French Gnome engines. The nine-cylinder engine UR-II was best known in the Fokker triplane, Dr I. With this triplane Manfred Freiherr von Richthofen, the most successful German fighter pilot in the First World War, won 19 of his 80 air victories until he himself was shot down over the Somme on 21 April 1918.



220 PS-Flugmotor Oberursel U IV

Quelle: Bruno Lange; Das Buch der Deutschen Luftfahrttechnik; Verlag Dieter Hoffmann, Mainz; 1970

In addition to the approximately three thousand newly built engines, an even larger number was overhauled at the plant. Nearly five thousand soldiers attended the engine school at the factory, where they were trained in the operation and repair of the Oberursel aircraft engines in a four-week course. A newly developed eight-cylinder V-engine U IV with 220 hp did not achieve series production.

Training course for airborn rotary engines

The seven cylinder Oberursel rotary engine, Type U0

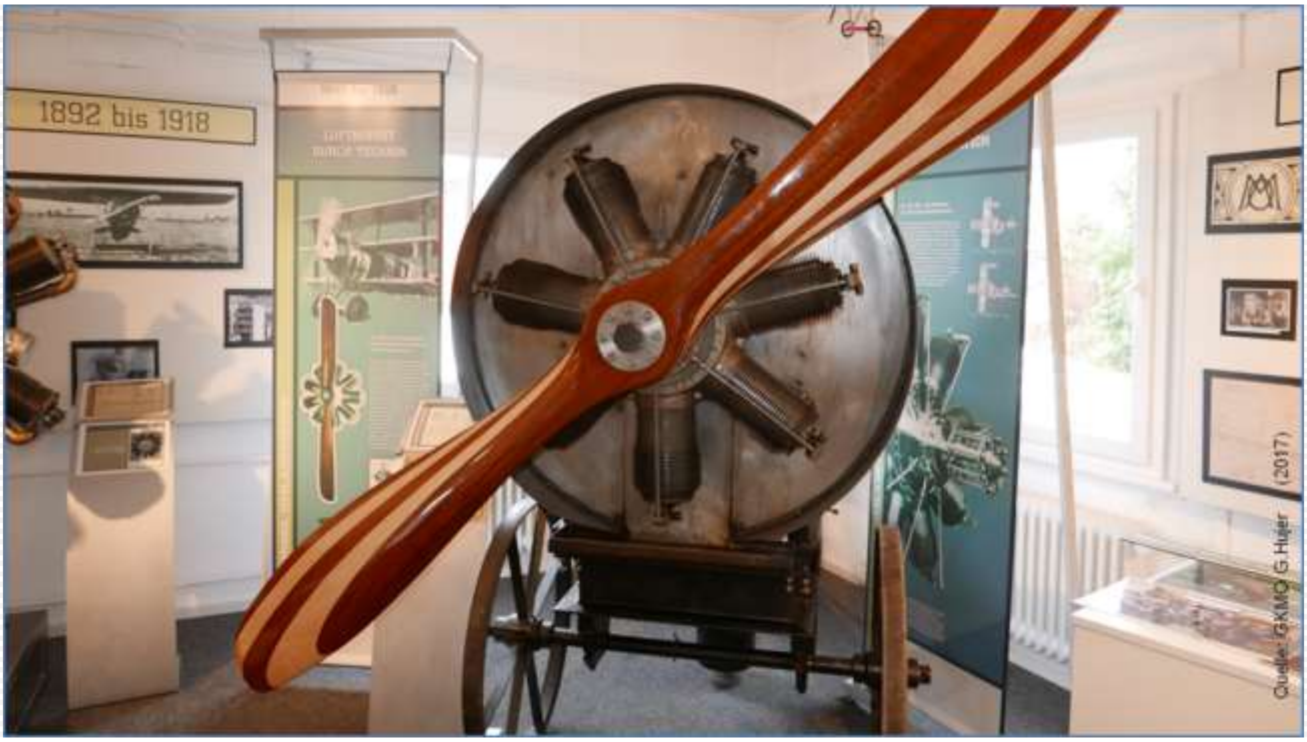
The Gnome rotary engine was developed in France in 1908 by the Seguin brothers. In a radial engine, the motor housing and cylinders rotate around a fixed crankshaft; the propeller is attached to the motor housing. This type of engine was very popular with aircraft designers at the time, due to its low weight and smooth running. The French Société des Moteurs Gnome issued several licences in 1913 to the Motorenfabrik Oberursel. The first to be released was the 7-cylinder engine, named U0 with a power output of 80 hp and was given the title by the very interested military as the “Oberurseler Umlaufmotor” (Oberursel Radial Engine).

Technical data *Oberursel U 0*

Engine:	7 cylinder rotary engine
Cubic capacity:	8.3 litres
Power:	80 hp
Tare weight:	94 kg
Year of manufacture:	1914 or 1915
Restored:	2011 to 2013

Pfalz E.1 with a rotary engine from Oberursel.

The fully functional 7-cylinder engine exhibited in the museum was restored by our trainees under the direction of Erich Auersch and installed in a replica test frame. The first run took place at the museum in August 2013 on the occasion of the 100 year anniversary of aircraft engine production at Oberursel.



The working 7-cylinder rotary engine U0 in the museum

The rotary engine, type URIII


Fokker D.VIII, the "flying razor" of the German air force in 1918

The 11-cylinder engine UR III was an independent Oberursel development. A comparable engine was not initiated in France until the end of 1918. After the promising use of the 9-cylinder engine UR II in the new Fokker triplane, Dr I, the factory began the development of an 11-cylinder version of this engine with 160 hp rated power in August 1917. This engine with the type designation UR III was intended to drive the single wing E V, which was later renamed D VIII, the last aircraft built by Fokker in significant numbers. In the comparison flight in Berlin-Adlershof, the D VIII variant 28 received the radial engine Oberursel UR III (145 hp) and Goebel Goe III (160 hp). This variant with the rotary engine was able to achieve the performance of the fastest Allied fighters due to the low air resistance. However, only 85 of these monoplanes came to the front and whether those with the new Oberursel UR III engine were among them is uncertain.
The exhibit in the museum, on loan from the Vienna Technical Museum, is a "St 160" engine manufactured in Steyr, Austria under licence from the Motorenfabrik Oberursel.

Fokker triplane Dr I as a Model – The aircraft of the legendary „Red Baron“

During the First World War, Anthony Fokker brought out a variety of reconnaissance and fighter aircraft in his Schwerin aircraft factories, including the first ever German fighter aircraft, the Fokker E I with a rigidly installed machine gun. Like most Fokker aircraft, it was powered by an Oberursel radial engine.

The legendary Fokker triplane Dr I, which was first used on the front in late summer 1917 and powered by an Oberursel UR II rotary engine, was flown by Baron Manfred von Richthofen. This most successful fighter pilot of the First World War won 19 of his 80 air victories in some partially, others totally red-painted Fokker triplanes, which retrospectively earned him the name the "Red Baron".

Of the 322 Fokker Dr I built, none have been preserved. In addition to some airworthy replicas, 1:1 replicas can be visited in numerous museums. A small model of this aircraft in our Motorenfabrik is reminiscent of the successful production of about 3000 radial engines in Oberursel during the First World War.

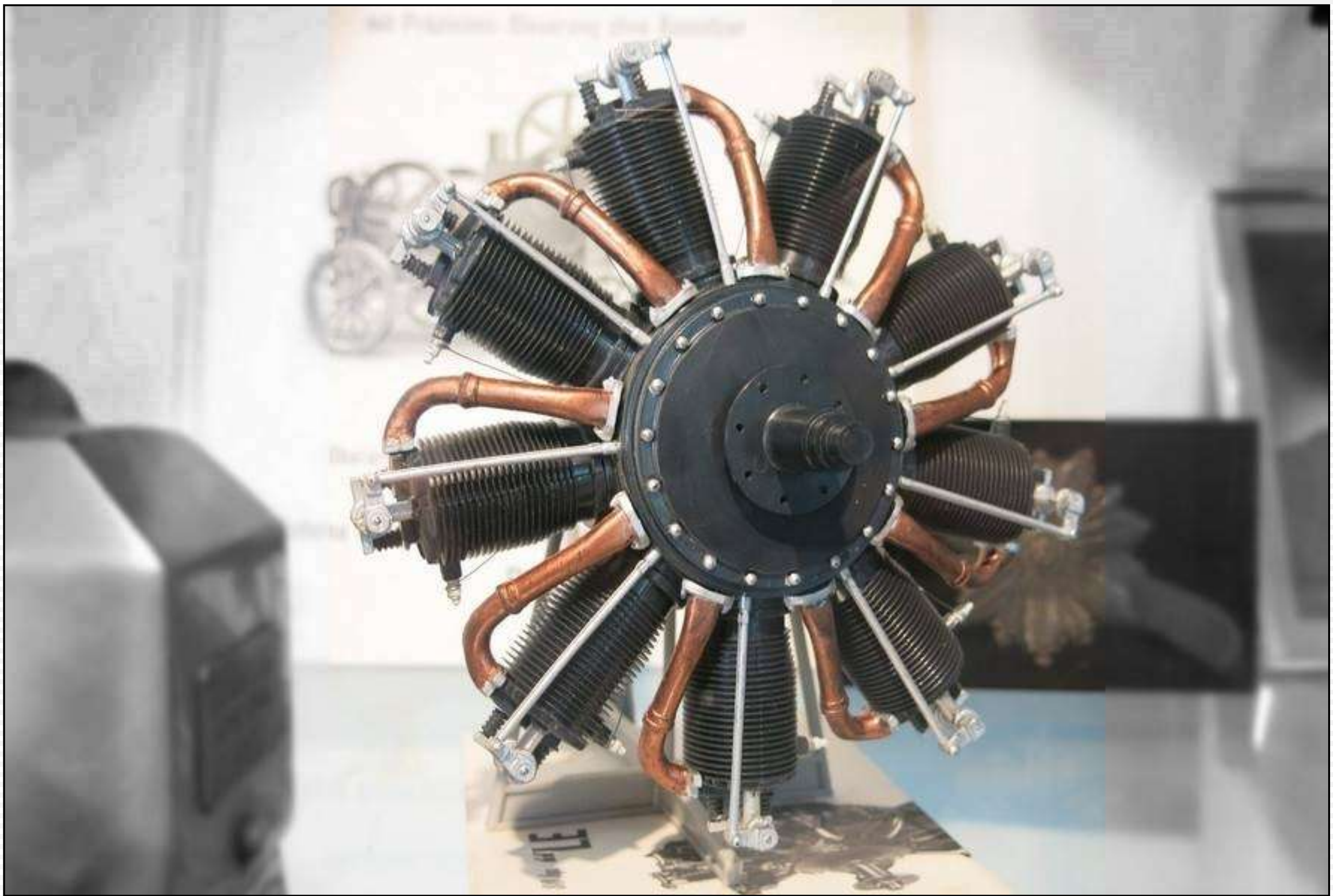
Quelle: GKMO G.Hujer (2016)

Model of the radial engine, Type UR II – Engine of the legendary Fokker triplane, Dr I

Technical data: (Original aircraft)

Length	5.75 m
Wingspan (above)	7.20 m
Height	2.95 m
Payload	203 kg
Take-off weight	585 kg
Maximum speed:	160 km/h in 2,800 m
Ascending rate to 1000 m altitude:	2 min 54 sec
Maximum range	6,500 m
Flight duration	1h 30 min

Engine: 9-cylinder Oberursel rotary engine URII
Armament 2 MG 08/15



View into the showcase: Model of an Oberursel UR II 9-cylinder rotary engine.

The Oberursel Gnom – A built-in bicycle engine for everyone

Technical data „Oberursel Gnom“	
Type:	Bicycle engine Model 39 Single cylinder, 4-stroke engine
Manufacturer:	Motorenfabrik Oberursel
Year of manufacture:	1921
Power:	1 hp at 2,500 U/min
Cubic capacity:	63 cm³
Consumption:	0.9 litre petrol per hour
Weight:	8 kg
Number produced:	Unknown

The main business with aircraft engines and field railway locomotives had been lost and the other pre-war products were technically outdated. The Motorenfabrik Oberursel, therefore, had to develop new products out of necessity. One hoped that a bicycle engine developed from 1919 onwards would bring success.
The design of this small four-stroke single-cylinder engine was the responsibility of senior engineer Eduard Freise, who had previously led the aircraft engine design. At the beginning of 1921, the "Oberurseler Gnom, the bicycle-mounted engine for everyone" was launched as "the simplest, best and most economical built-in motor suitable for any bicycle". The engine should also "give the less well-off man the opportunity to purchase a motorcycle". The power was soon increased to 1 hp at 2,500 rpm. This enabled a speed of up to 30 km/h and to overcome gradients comfortably of up to 10%. October 30, 1921 became a triumph for the little gnome, when the bikes driven by it won the 1st and 2nd place in the mountain race on the Großer Feldberg*. Despite all this, the economic success failed to materialise and the engine

was taken out of production in February 1922. Its designer, Eduard Freise, left the MO at the same time and founded the Columbus Motorenbau in Oberursel. There, he produced and sold the micro-engine under the name "Columbus". Freise also completed the development of a 250 cm3 four-stroke engine, which was installed in the first Horex motorcycles. Thus, the small bicycle motor Gnom became practically the forefather of the engines of the legendary Horex motorcycles and lived on in them.

* *Großer Feldberg, or greater Feldberg, is the highest peak in the Taunus hills behind Oberursel, some 800 meters high.*

1919 to 1945 - The engines almost forgotten

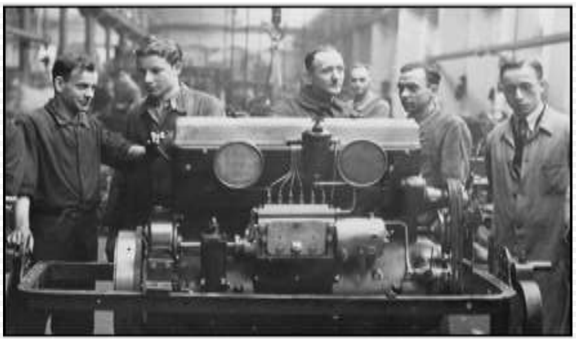
With the end of orders for arms after the First World War, the Motorenfabrik Oberursel plunged into a serious crisis, and it was not able to build with civilian products on the earlier successes. Various new engine constructions – including a small bicycle built-in engine – did not bring the hoped-for upturn. Only the four-cylinder in-line engine Model 35, developed in 1920/1921, was later successful and it is considered the forefather of the high-speed vehicle engines from Deutz.

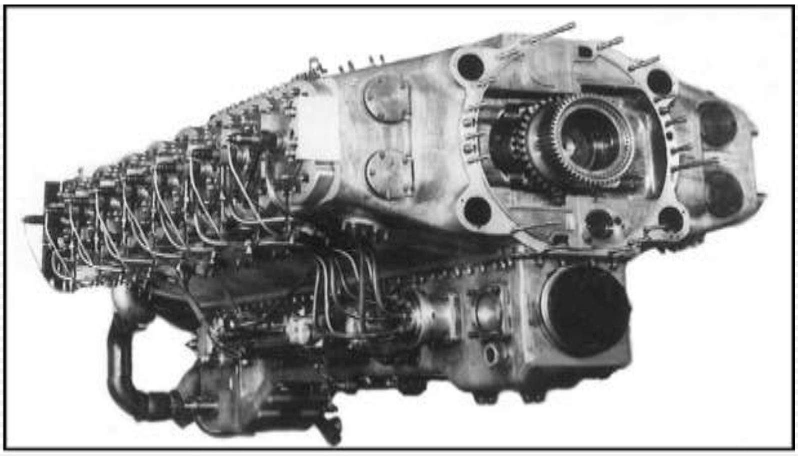
At the end of 1921, the economic problems forced the Oberursel Motorenfabrik into forming a syndicate with the Gasmotorenfabrik Deutz in Cologne. From 1922, the production of engines in Oberursel was made up almost entirely of smaller diesel two-stroke Deutz engines.

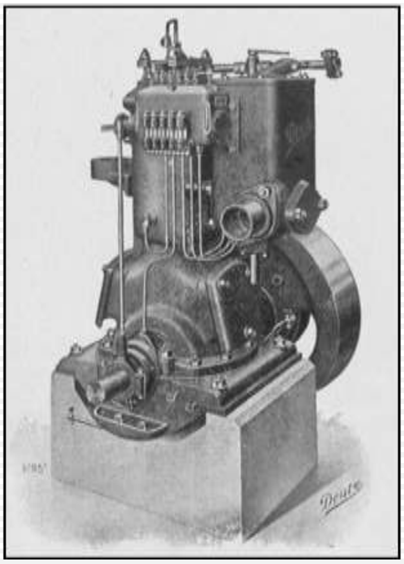
Production was moved to Cologne as a result of the Great Depression after about 20,000 engines were built and the plant in Oberursel was shut down at the beginning of 1932.

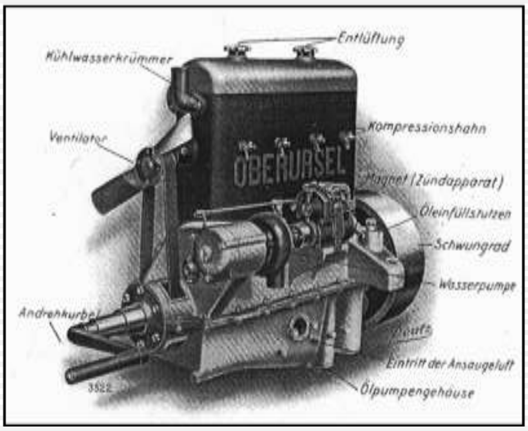
The plant was re-opened in the spring of 1934. Now water-cooled, high-speed 4-stroke diesel engines with one, two and three cylinders went into production. A total of about 60,000 units were produced here until the relocation to Cologne in 1943. These engines were used primarily to equip the Deutz tractor and those of various other tractor manufacturers.

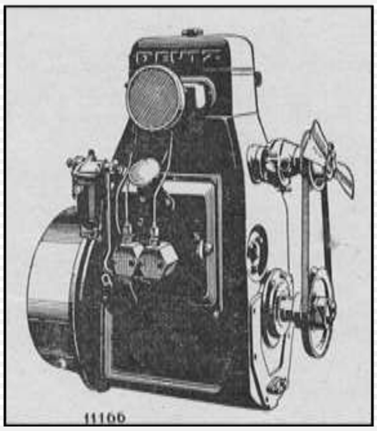
The Dz 710 aircraft engines, which were developed here in Oberursel from 1941, are among the engines almost forgotten – but more on this later.











The engine MO Model 35 – A pioneer of lorry motorisation

The high-speed four-cylinder vehicle engine Model 35 was clearly one of the most promising of the engines, whose development filled the space left by the end of orders after the First World War! This four-stroke engine, developed by chief engineer Kurt Thomas, with an output of 45 hp at 1,450 rpm, could be driven either by benzene, gasoline, spirits or petroleum. The development of smaller variants with 20, 28 or 35 hp was intended. The engines were advertised as the motorisation for trucks, boats, locomotives and tractors. The development of this very modern engine was already so advanced and mature that it was able to be installed and tested successfully at the end of 1920 into trucks of the "Deutsche Lastautomobilfabrik (DAAG)".

The machinery available from the production of aircraft engines was well suited for the production of the Model 35. However, this engine, which was still at the beginning of its market launch, could not halt the economic decline of the factory. Never the less, it survived as the only product the Motorenfabrik Oberursel AG brought into the syndicate with the gas engine factory Deutz AG at the end of 1921. This type of engine developed here, renamed meanwhile the LM 116, was to become through further intermediate steps the forefather of the high-speed Deutz aggregate and vehicle engines. A total of 200 of these engines were built in Oberursel, very few of which were preserved.

The engine on display here, one of the rare examples, was donated by the Deutz company and the Friends of the Deutz Engine Collection Association on the occasion of the 125th anniversary of the founding of the Oberursel Motorenfabrik in 2017.

Technical data

Type: Vehicle engine, model 35 (LM116)
4 cylinder, 4-stroke Otto engine
Manufacturer: Motorenfabrik Oberursel

Year of manufacture:	1922
Power:	45 hp
Cubic capacity:	4.500 cm³
Weight:	525 kg
Number produced: (Model 35 and LM)	Approx. 2,500

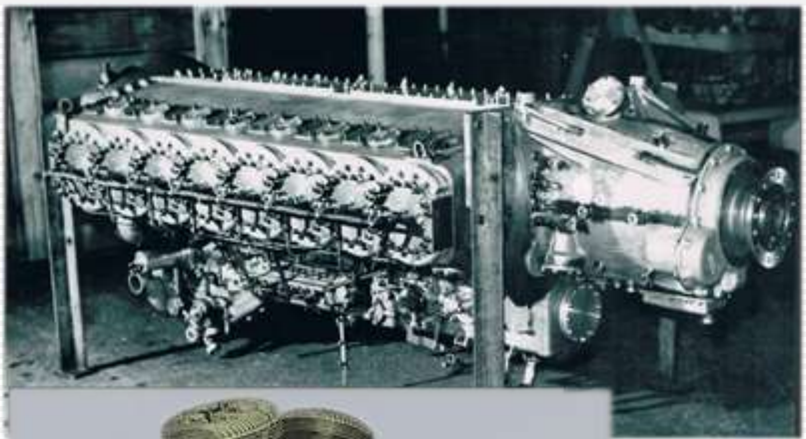
Motor model 35 (LM116) in the factory museum and as a generator drive in the old waterworks in Hattersheim

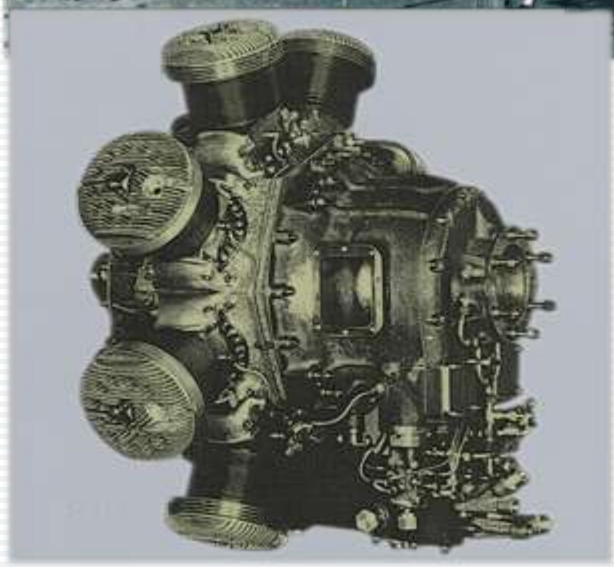
1941 to 1945 - The aircraft engine development centre of KHD AG

In 1941, Klöckner-Humboldt-Deutz moved its aircraft engine development, which began in Cologne in 1935, to its plant in Oberursel. The entire factory was extensively modernised and expanded into a modern aircraft engine development centre. Highlighted are the diverse test facilities and buildings for engine testing and the extensive material laboratory.

Work was carried out until March 1945 on the design and testing of two-stroke boxer engines, first for gasoline and later for diesel operation. Numerous single- and two-cylinder engines were built and tested for basic investigations, as well as 12-cylinder boxer engines. Two 16-cylinder Dz 710 engines were also completed and tested on the test bench in the “tower” test facility. By March 1945, about 150 running hours had been achieved, with a proved power output of 2360 hp.

The U.S. Army requisitioned these two Dz 710 test engines after occupying the plant at the end of March 1945 and transferred them to the United States for comparative investigations. The Dz 710 engines were far from ready for series production, and further development was no longer carried out. The demand for large-scale aircraft engines had been drastically reduced, and the emerging technology of the jet engines had a higher performance potential. The two experimental engines that were shipped to the United States cannot be found and are presumed lost.





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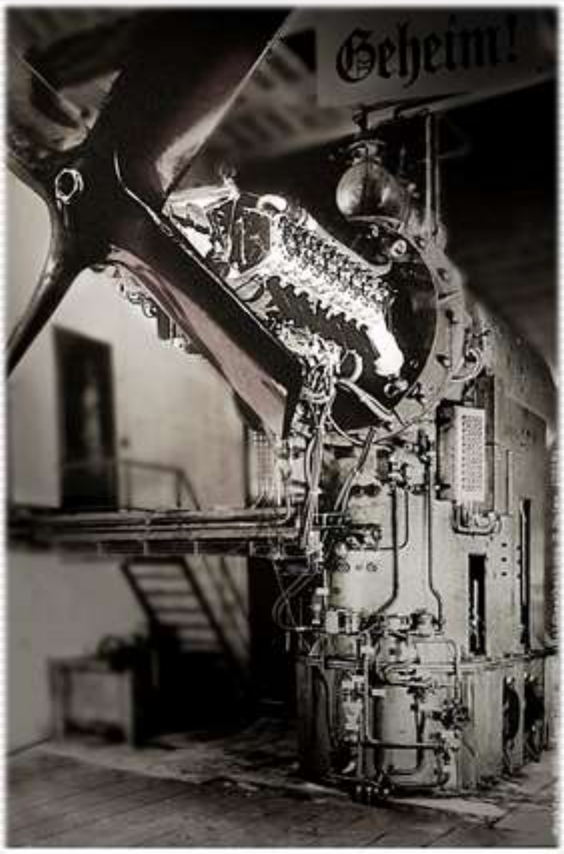
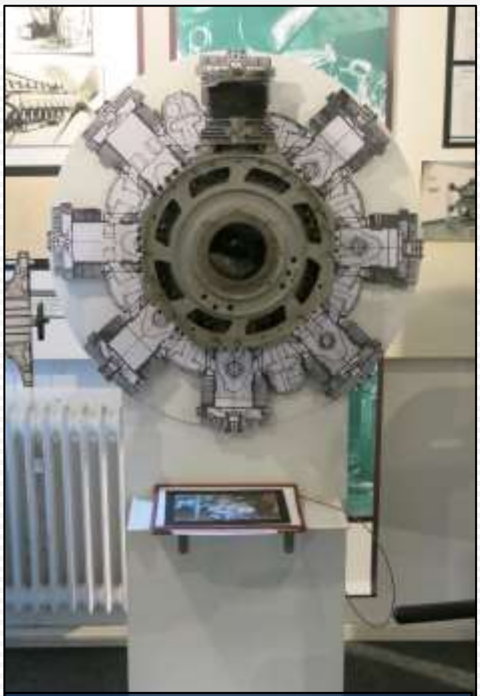
Dz 700
Aircraft engine



1944 - Aircraft engine Dz 710
on the test bed at Oberursel.

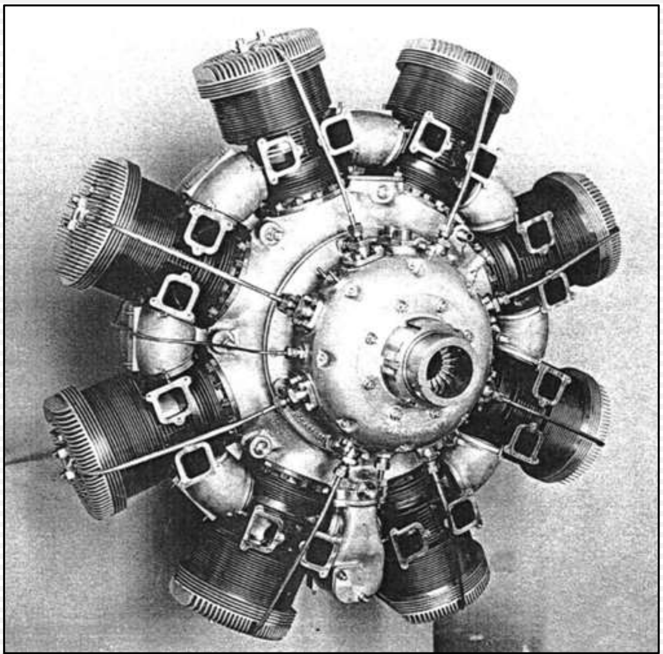
The aircraft engine, Dz 700 – A radial engine for light aircraft

In 1935 an aircraft engine group was established in Cologne in the development area of the then Humboldt-Deutzmotoren (from 1938: KHD), the management of which was transferred in mid-1936 to Dr. Adolf Schnürle. Initially, work focused on an 8-cylinder radial engine called the Dz 700, which was intended as a propulsion system for a military training aircraft. In 1938, a 6-cylinder experimental engine was built in an effort to make the engine cheaper and more reliable. Development work on the Dz 700 engines was discontinued in 1939 without any flight testing or pre-series production. The more powerful boxer engines with the designation Dz 710 were now more important. With the relocation of the aircraft engine development from Cologne in 1941, the radial engines Dz 700, already developed, were also transferred to Oberursel and were tested here on the test bed. At least one of these functional 8-cylinder engines was moved to the United States after the war where, under circumstances not entirely clear, it appeared at a scrap dealer in Missouri in 1964. The engine was taken to a private museum in the USA in 1968 and from there to a collector in Germany.



The exhibited engine was supplemented with the rest of an excavation find

The exhibit shows components of the 8-cylinder engine that were found during construction work on the factory premises in 1996.



The development at KHD started in 1935 with these eight-cylinder Dz 700 radial engines

Technical description

Deutz diesel aircraft engine.

Air-cooled, 2-stroke radial engine.
First implementation (1937)
8 cylinder radial engine (80 mm in dia., 100 mm stroke), cubic capacity 4 litres

Second implementation (1938/39) 6 cylinder radial engine
(90 mm dia., 100 mm stroke), cubic capacity 3.8 litres

Continuous power 90 hp
Peak power, short time 105 hp at n = 2,500 rpm
This power was required.
Possible peak power, short time 160 hp at n = 2,700 rpm

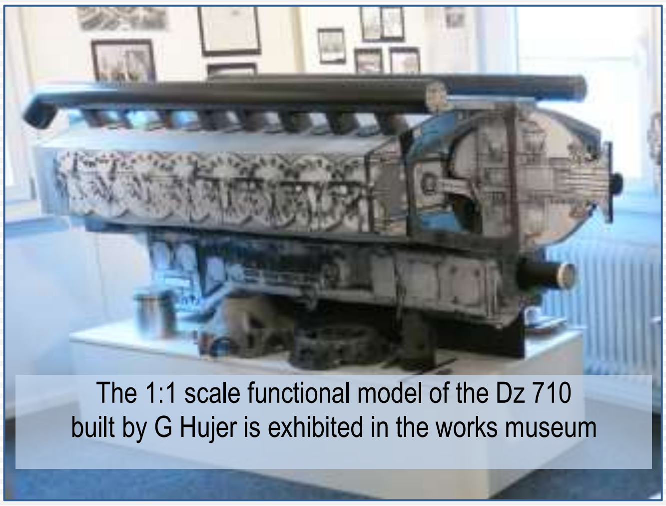
The aircraft was for training purposes and carried no load.
Flushing by a mechanically driven centrifugal blower. Direct injection. Schnürle loop scavenging.
The engines were extensively trialled and developed, but were discontinued in favour of the larger engine, the Dz 710.

Dz 710 – A 16 cylinder engine for large aircraft

Aircraft engines with more than 2000 hp were required for planned large-scale transporters such as the Ju 90 and for heavy bombers such as the He177. The aircraft engine activities, started in Cologne in 1935, were moved in 1941 to the KHD plant in Oberursel, where the development of large-scale aircraft engines with more than 2000 hp was continued under the direction of Dr. Schnürle. This led to the 16-cylinder boxer engine Dz 710. Two of these Dz 710 test engines were completed and tested on the tower test bench. By March 1945, about 150 running hours had been achieved, with a proven output of 2360 hp.

After occupying the plant at the end of March 1945, the U.S. Army requisitioned these two Dz 710 test engines and moved them to the United States for comparative investigations. The Dz 710 engines were far from ready for series production, and further development was no longer carried out. The demand for large-scale aircraft engines had been drastically reduced, and the emerging technology of the jet engines had a higher performance potential. The two experimental engines that were shipped to the United States are presumed to be lost.

The exhibited full-scale model is intended to show the dimensions of the engine as well as the operating principle of the two-stroke diesel engine.

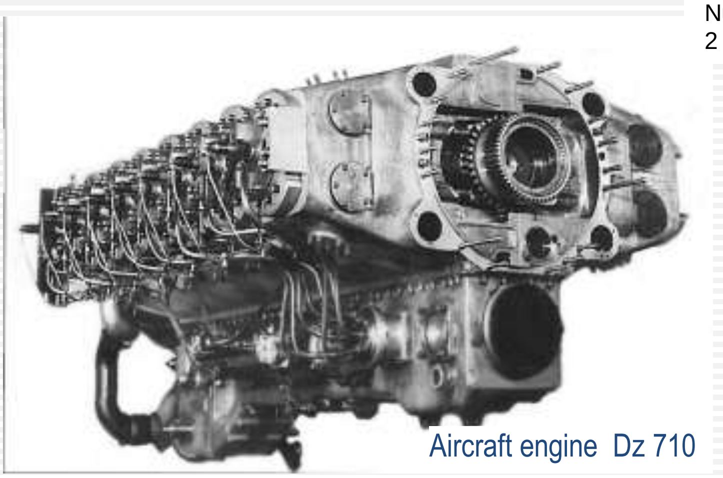

The 1:1 scale functional model of the Dz 710 built by G Hujer is exhibited in the works museum

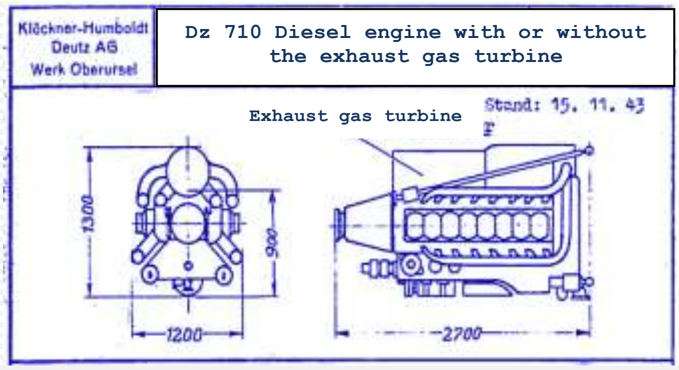
Technical data

16 cylinder, 2.stroke engine, horizontal V-engine (with a cylinder angle of 180°), diesel direct injection, Schnürle loop scavenge, exhaust gas turbo charger, liquid cooled and a flush blower.

Number of cylinders	16
Bore/stroke	160 mm/160 mm
Capacity per cylinder	3.22 litres
Capacity in total	51,5 litres
Compression ratio	15
Cylinder distance	200 mm
Starting power without the exhaust gas turbine	2,300 hp
Starting power with the exhaust gas turbine	2,700 hp
Fuel consumption (cruising flight)	150 to 160 gr/hp/h
Weight without the exhaust gas turbine	1,300 kg
Weight with the exhaust gas turbine	1,450 kg
Width/height/length	135/100/240 cm

Number produced:
2 completed test engines, further engines in production.

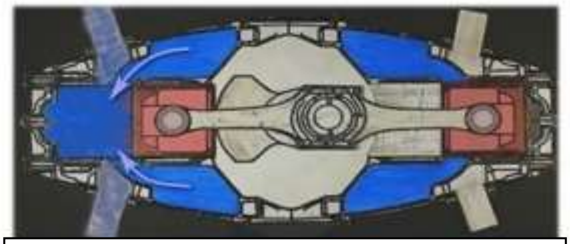

Aircraft engine Dz 710



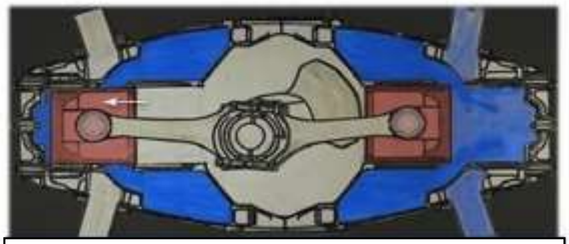
Excursus: Description and function of the Dz 710 two-stroke diesel engine

.Horizontal 16-cylinder two-stroke boxer engine [1] with the Schnürle reverse loop scavenge, diesel direct injection, exhaust turbocharger, liquid cooling and flushing blower. The shape of the boxer engine with the patented two-stroke reverse loop scavenge allows very short dimensions from cylinder head to cylinder head due to the lack of valve control and a good mutual balance of the gas and mass forces, since the piston and connecting rods are caught at each end of the stroke by the compression or the combustion. The horizontal boxer engine allows for the same conditions of cooling and lubrication for all cylinders, all injection nozzles are easily accessible. The two crankcase halves, containing also the flushing air supply channels, provide the housing with high torsional and bend rigidity. The two-stroke engine is easy and cost-effective to manufacture due to the absence of the usual control devices; it enables increased operational reliability with reduced maintenance.

Stroke 1 (The explanations apply to the cylinder on the left).

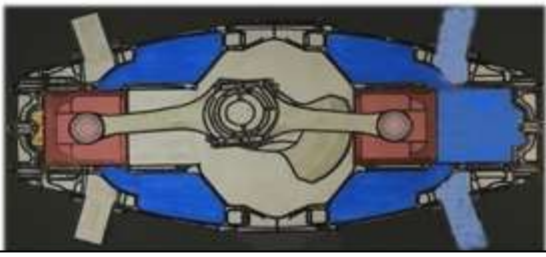


Piston on the BDC*: Cylinder is filled with fresh air.



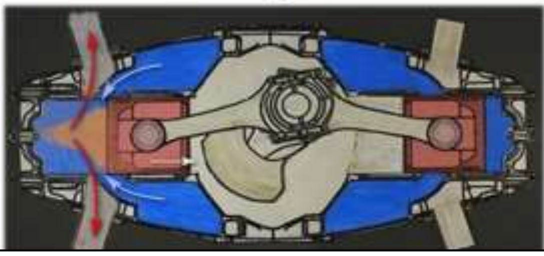
Piston travels toward the TDC*: The fresh air is compressed.

Stroke 2 (The explanations apply to the cylinder on the left).



Piston just before the TDC: Fuel (Diesel) ist injected into the combustion area, the hot compressed air ignites the gas mixture and burns abruptly.

Piston travels back toward the BDC: The hot gas expands and presses onto the cylinder, the gas cools and heat ist transferred into mechanical energy.



Flushing: Piston moves toward BDC: The exhaust gas flows out via the vent slots and is displaced by the venting system

[1] Strictly speaking not a boxer, but a V-engine with a cylinder angle at 180° | * BDC = Bottom Dead Centre; TDC = Top Dead Centre.

1945 to 1958 - Starting from scratch, moving up slowly



On March 30, 1945, U.S. troops occupied the factory and used it as a barracks, for vehicle maintenance and as a vehicle fleet for their military intelligence services. In addition, by decision of the Allied Control Council, all machines and many of the facilities were dismantled and removed for reparation purposes. It was not until the spring of 1948 that a modest component production in a small area of the factory could be started. This area was able to move to the tower test building the following year. Components for the Cologne and Ulm engines were produced under very cramped conditions here, and despite these difficult conditions, apprentices were trained again as early as 1951.
In mid-1956, the U.S. Army moved out and KHD regained full use of the factory again, theoretically at least. It would take about a further two years before the decommissioned buildings and facilities were repaired and work could be resumed there. In November 1958, the development and production of exhaust gas turbochargers and industrial small gas turbines, which had begun five years earlier in Cologne, moved to the Oberursel plant. This marked the beginning of the era of fluid flow engines and gas turbines in Oberursel.



Installation of a rotor assembly into an exhaust gas turbo charger.

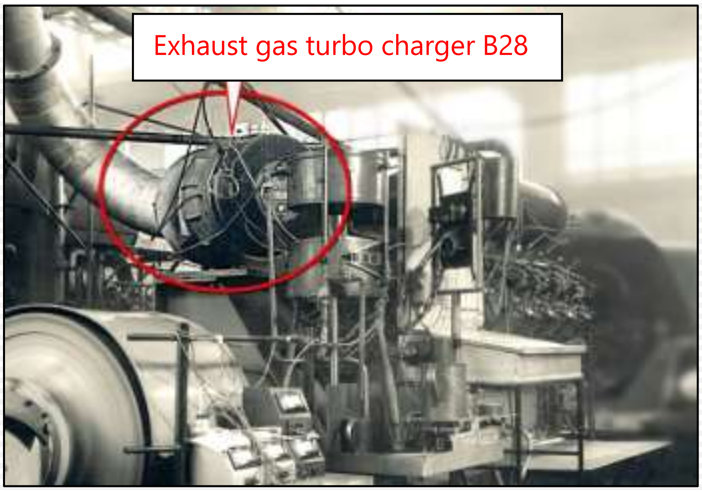
Multiple milling of inlet wheels.

The Turbocharger B28 – The run-up to turbine development

The energy contained in the exhaust gases of internal combustion engines can significantly improve their engine performance and efficiency. A turbocharger is a flow engine with an air compressor driven by the exhaust turbine. In the early 1950s, KHD began developing exhaust gas turbochargers for its diesel engines from 200 to 800 hp basic power. The turbine group set up for this purpose in Cologne was moved to Oberursel in 1958, where it became the nucleus of the new gas turbine development and the future direction of the site.

Of the five power ranges, only the B 14 and B 28 chargers were produced, in total about 150 units until 1971. The type exhibited, B 28, was intended to increase the basic power of an 800 hp two-stroke engine to about 1,500 hp

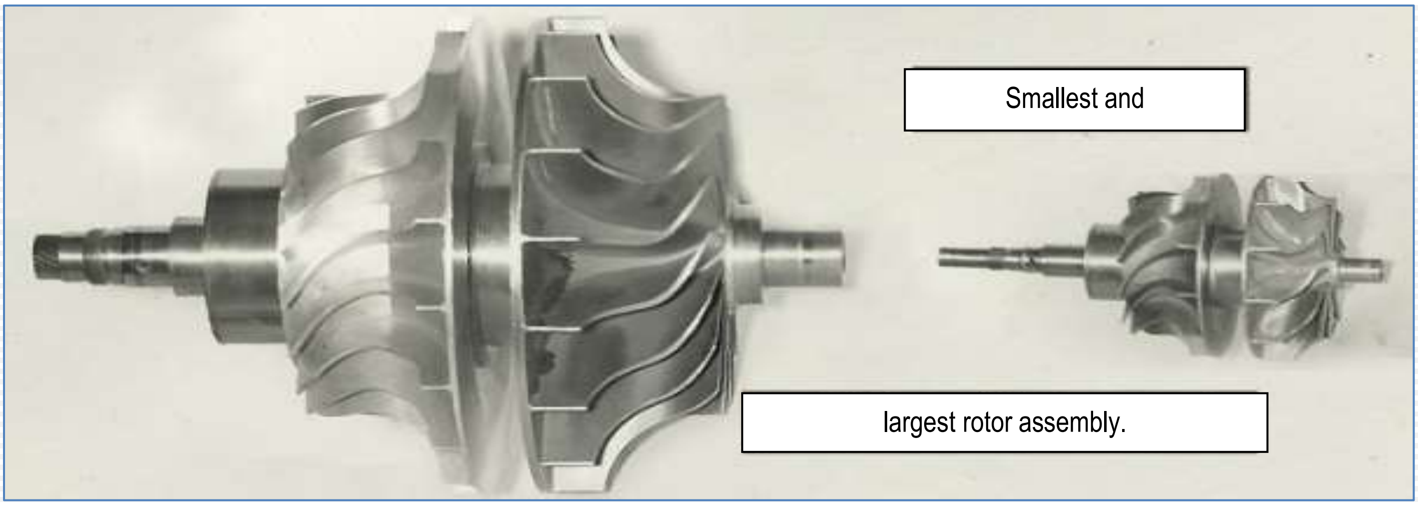
The exhibit pictured here is in the Technikum of the Deutz company in Cologne-Porz.



Technical data:

Throughput:	1.5 – 3,0 kg/sec
Pressure ratioo:	1.5 – 1,8
Rotational Speed:	20,000 / min
Weight:	120 kg

Usage: To load 2-stroke engines from 368 to 1,100 kW)

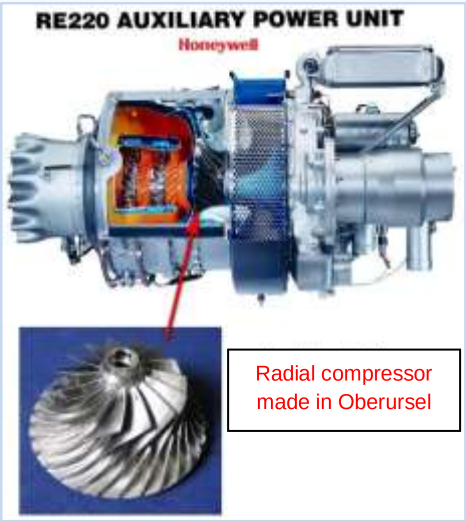


Smallest and largest rotor assembly.

1958 to 1990 - The gas turbine factory of KHD

The arrival of the turbine group at the Oberursel plant of Klöckner-Humboldt-Deutz hailed in the era of gas turbines and began with the development, production and support of small gas turbines for industrial, vehicle and aviation use, as well as aircraft drives under license and co-operation programmes.
At the outset the development of the T16 industrial gas turbine in Oberursel, which began at KHD's main plant in Cologne, continued. In 1964 the development of the Auxiliary Gas Turbine T112 for the vertical take-off VAK 191B began, at first together with Bristol Siddeley, then later Rolls Royce. In 1966, the development of the T212 as an air delivery turbine for a reconnaissance platform followed, and at the end of 1969 the activities began on the Secondary Power System for the Tornado aircraft, consisting of the auxiliary gas turbine T312 and the G119 gearboxes. In the mid-1970s followed the T117, a small jet engine to power a reconnaissance drone.

In parallel, numerous project studies and preliminary developments on small gas turbines were carried out, and Oberursel became a leader in the field of radial compressor technology. Project-related material development was carried out on the material side.



The industrial gas turbine T216 was produced in series from 1963 onwards, the units of the Secondary Power System Tornado from 1977 and the T117 jet engine as a propulsion system for the CL-289 reconnaissance drone from 1988.

The entry into the production and support of aeronautical engines began in 1959 with the manufacture of the Orpheus jet engine under license. In 1966 the T53 helicopter engine followed, in 1971 the production of parts for the helicopter engine T64 and then in 1977 the Franco-German production of the turbofan engine Larzac in co-operation. The company entered the civil engine sector in 1987 participating in the production of the CFM 56 engines.

Technical and logistical support:
Technical and logistical support of the equipment manufactured was established parallel to the series production. This included the supply of spare parts and the repair and overhaul of the equipment at the site. This was not limited to the equipment produced here, but incorporated also "foreign" engines such as the Rolls-Royce helicopter engines GNOME H1400 and GEM and the propeller engine T56-A-14.

Truck- and industrial gas turbines - An overview

Klöckner-Humboldt-Deutz, the world's oldest internal combustion engine manufacturer, worked since 1962 on gas turbines as alternative drive units for stationary systems and for heavy vehicles. In 1964, the first pump system was installed. In 1966, the trial operation of a turbo diesel locomotive began and in 1967 the first generator system. From 1966 the company turned to vehicle gas turbines, which led to the development of the GT601 truck gas turbine in 1973.
In 1977, a hover ferry was fitted with industrial gas turbines. Engineers from development and customer service as well as assembly fitters from Oberursel were involved in all these programs. In 1986, the Industrial Gas Turbines business segment was merged into MWM, a company that joined the KHD Group.

Lycoming gas turbine TF 40 | Vehicle gas turbine GT 601 | Lycoming gas turbine TF 40

The T216 small gas turbine - The entry into gas turbine technology

The age of gas turbines began in Oberursel with the arrival of the Cologne Gasturbinengruppe (Gas Turbine Group) in 1958. Here, the development already initiated of the approximately 80 hp simple and robust industrial gas turbine T16 was continued successfully and soon led to the T216 version, which was increased to 100 hp. The engines were used as a propulsion unit for pumps, compressors and generators as well as ship propulsion units or for training purposes in technical institutes.

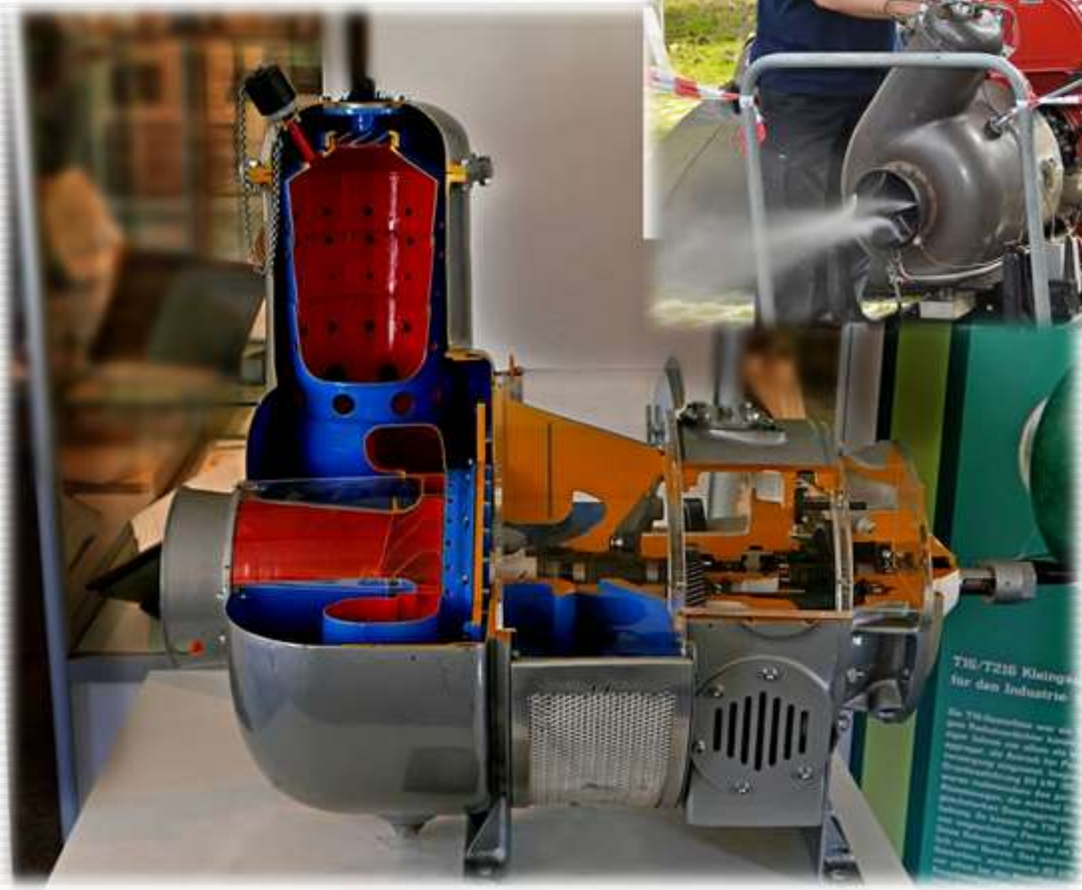
By the mid-1970s, about 500 of these T16 and T216 gas turbines were produced, the last of which were sold in 1990.

Technical data T216

Design: Single shaft turbine with a single stage radial compressor as well as a spiral form collector and a can type reverse flow combustion chamber.

Power: 100 hp (74 kW) at 50,000 rpm.

Fuel: Diesel, Fuel oil EL, Petroleum, Kerosene, Petrol.
Fuel consumption Approx. 63 kg per hour
Dimensions: Length 83 cm; Height 82 cm; Width 62 cm
Mass / Dry weight: Approx. 80 kg



Picture above:
T216 portabel pump in use with the company fire brigade.

Left picture:
The functional cut-away model in the factory museum.

The Orpheus jet engine – with a license into the aviation business

In 1959, the production of aeronautical engines under license began with the preparatory work for the Orpheus jet engine of the British company, Bristol Siddeley Engines. The company was purchased by Rolls-Royce in 1966. The engine was used as the power unit in the Bundeswehr's Light Fighter Bomber and Reconnaissance Aircraft Fiat G-91 R/3. A total of 358 Orpheus engines were built in Oberursel by 1966.
The Fiat G-91 remained in service with the Bundeswehr until 1982, accumulating a total of about 600,000 flight hours. For the subsequent use of the Condor flight service, some engines were repaired in Oberursel, and with the last test run in November 1983 and after 3,044 overhauled, repaired or converted Orpheus engines an era in Oberursel came to an end.

Fighter-bomber and reconnaissance aircraft Fiat G-91

Technical data:

The Orpheus 803 D-11 is an axial flow, single spool turbo jet comprising a seven-stage axial compressor, can-annular combustion chambers consisting of 7 flame tubes and a single-stage axial turbine. The engine is started by means of a starter cartridge.
Max. thrust: 22,240 Newton (2,270 kp / 5,000 lbs). Length approx. 192 cm, diameter approx. 83 cm. Weight (dry) approx. 380 kg

Cut-away model of the Orpheus 803 D11

Work clothes / Overalls

Nowadays, it is common for the company to provide work clothes. That way occupational and health protection requirements for work clothes are met and at the same time achieving a uniform appearance (corporate identity).

It former times this was different. Normally, the worker had to procure and maintain his "Blue Man", blue work suits made of sturdy fabric. Only in certain areas, such as electroplating and test benches, did the company provide work clothes.

The overall on display here dates back to the 1960s and was worn by Erich Auersch during his working time at the engine test beds.

The helicopter engine T 53 - Collaboration with the Bundeswehr is strengthening

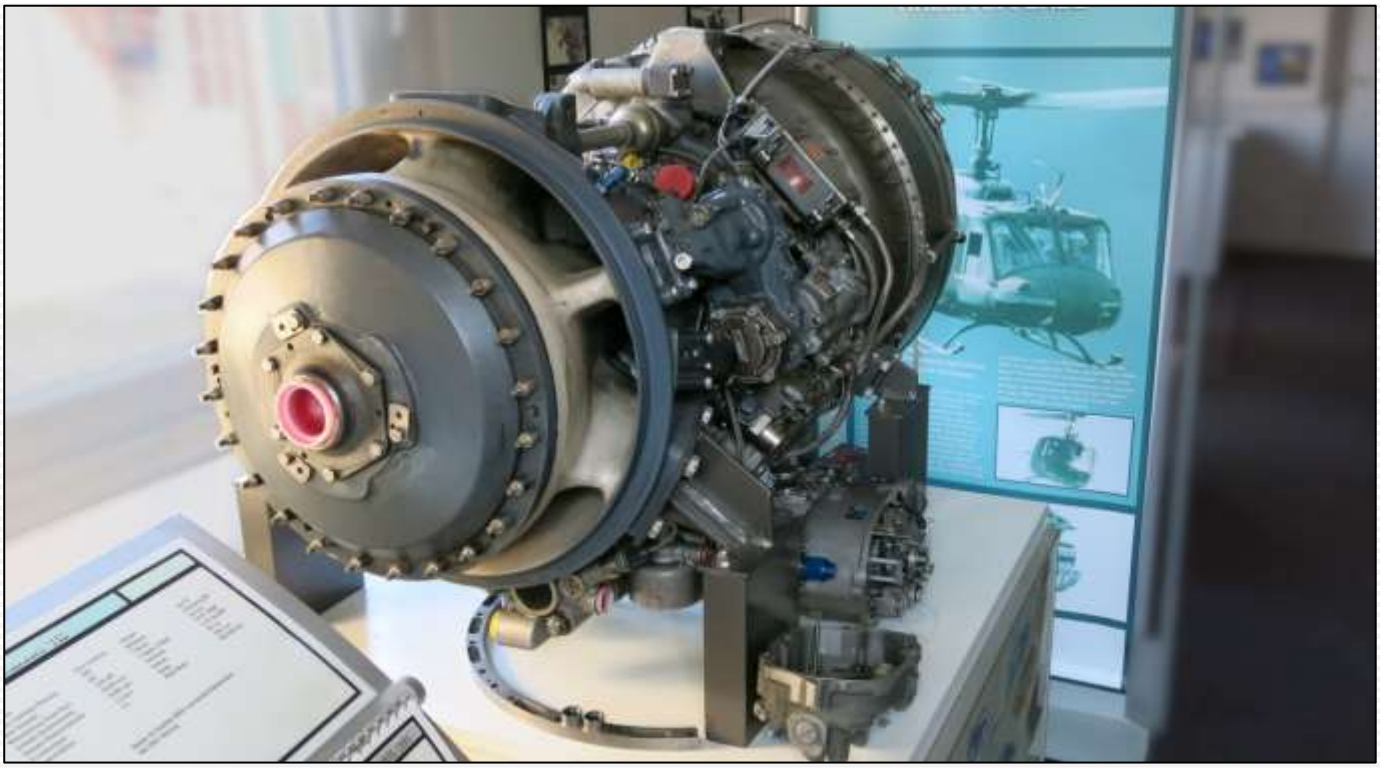
The T53 shaft power engine was developed from the beginning of the 1950s by the US manufacturer Lycoming under the direction of Dr. Anselm Franz. At Junkers, Dr. Franz had led the development of the Jumo 004 jet engine, the world's first jet engine ready for series production. The T53 engines powered the Bell UH-1 multi-purpose helicopter, which was manufactured under licence in Germany by Dornier. From 1966 to 1972, a total of 520 of these T53 engines were produced under license at the KHD plant in Oberursel, 494 of which were produced for the Bundeswehr and the Federal Border Guard (BGS). Some of the new technologies came to the site at the time, such as electron beam welding, vacuum soldering and plasma coating.

Technical data T53-L-13

Manufacturer:	KHD Oberursel, (under license from Lycoming)
Year of manufacture:	from 1966 on
Power (Start/cont.):	1,044 kW/932 kW
Drive shaft speed:	6,534 rpm
Spec. fuel consumption:	0.353 g/kWh
Mass air flow:	5.6 kg/sec.
Weight (dry):	246 kg


The helicopter Bell UH 1D in service

Up until 2012 extensive technical-logistical support services for the Bundeswehr and the BGS were provided for this engine in Oberursel, including the repair and complete overhaul of more than 2,400 engines. In addition, from the mid-1980s to 2013, a total of 278 T53 engines of various versions were repaired and overhauled for other civilian and military customers around the world.



The auxiliary gas turbine T112 - The first in-house development of an aero engine

Vertical Take off Aircraft VFW VAK 191 B

In 1966, KHD won the tender for the development of an auxiliary gas turbine for the German vertical aircraft VAK 191 B. In the aviation sector, such an auxiliary gas turbine is called the Auxiliary Power Unit or APU for short. This APU was designed to supply the aircraft with electrical and hydraulic energy as well as compressed air. Initially, the British company Bristol Siddeley Engines (purchased by Rolls-Royce in 1966) was involved in the development, manufacturing the hot parts comprising the combustion chamber, fuel injection, turbine wheels and guide vanes. KHD took over the compressor area of the gas turbine and the transmission module. The first run of this first aero component to be developed again in Oberursel, took place on 25 September 1967. By 1972, ten prototype engines had been delivered. The first flight of the vertical starter VAK 191 B on September 10, 1971 was completed with the P008.
The development of the vertical starter was abandoned at the end of 1972. By then, the six trial and the ten prototype engines had completed a total of over 4,900 operating hours and over 10,500 launches. The T 212 air delivery engine for a reconnaissance platform was derived from the T112, and soon after, the development of the T312 auxiliary gas turbine for the secondary power system of the tri-national multi-role Tornado fighter aircraft began.

Technical description:
Single-shaft turbine with an equivalent continuous output of about 96 kW / 130 hp (Bleed air power and 40 kW residual shaft power)

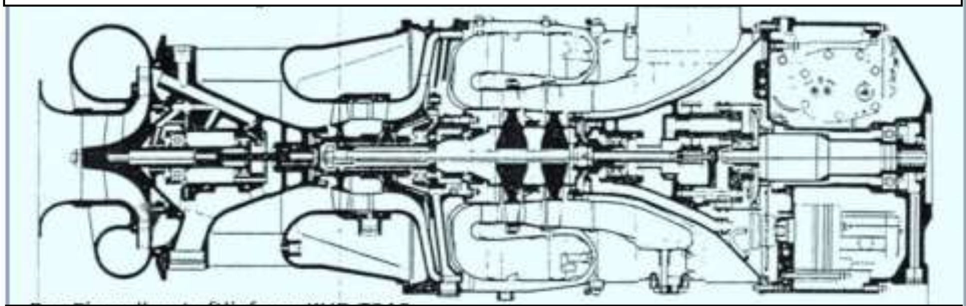
Design features:
Two-stage compressor with radial compressor and upstream transonic axial compressor, two-point bleed air device, ring combustion chamber with reverse flow and evaporator, two-stage axial turbine, planetary gearbox in the output train and intermediate gearbox with two rear output shafts. Starting achieved by means of an electric starter.

The air supplier T212 – A family of engines is created

In 1968, the Bundeswehr tasked KHD to develop and manufacture five test and prototypes of an air supply gas turbine. The core engine was the same as that of the APU T112, which at the time was under development, while on the other hand an additional radial compressor was installed at the front as an air supplier. This was to drive the rotor of the reconnaissance platform "Kiebitz Do 34" developed by Dornier by means of a tip driven rotor. The three prototype engines T 212 ordered were delivered in 1971, and the first flight of a Kiebitz took place on 25 May 1973. Dornier, however, had to switch to the more powerful Allison 250-C20 engine in mid-1972 in order to cope with the platform's increased payload to 140 kilograms.

Reconnaissance System Kiebitz

Air delivery performance 0.64 kg/s at 2.82 bar. Mass dry Approx. 48 kg. Compressor pressure ratio 4.88, Mass air flow 0.89 kg/s. Length 930 mm, width 322 mm, height 345 mm


The single-shaft air producer KHD 212.

The Secondary Power System Tornado – A formidable challenge

The Tornado is a twin-engine, two-seat multi-role swing wing fighter. The on-board secondary power system (SPS) renders the Tornado independent of ground supply facilities during start-up and maintenance.

The chief tasks of the SPS are to start the main engines and to supply electrical, mechanical and hydraulic energy to the aircraft on the ground and during flight. The main devices of the SPS are two gearboxes and the auxiliary power unit T312.

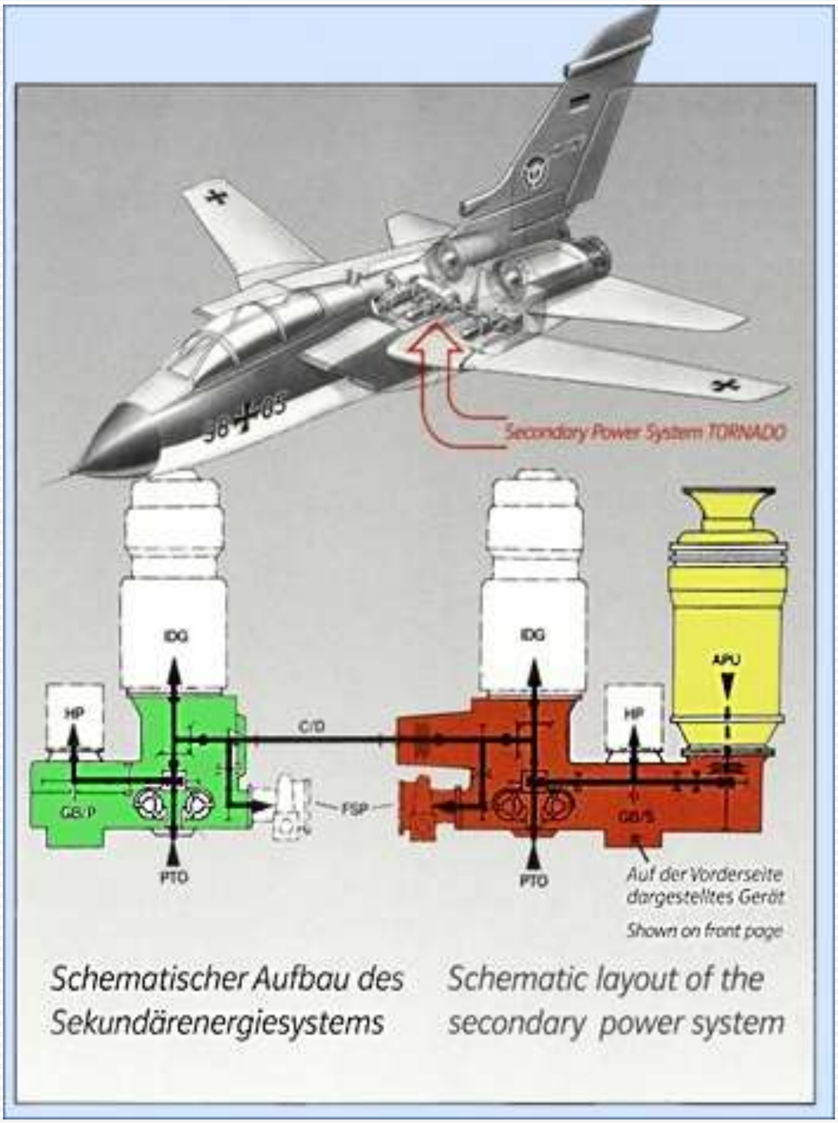
The main units of the SPS were developed and produced in series at the Oberursel factory of KHD (Rolls-Royce Deutschland since 2000). More than 1250 sets of the SPS were delivered from 1977 to 1997. RRD not only produced the system, but continues to support it technically and logistically, supplying spare parts and carrying out repair and overhaul to the present day.

Multi Role Combat Aircraft Tornado

The functional model of the Secondary Power System Tornado in the factory museum

Tornado - Ready to go under all conditions

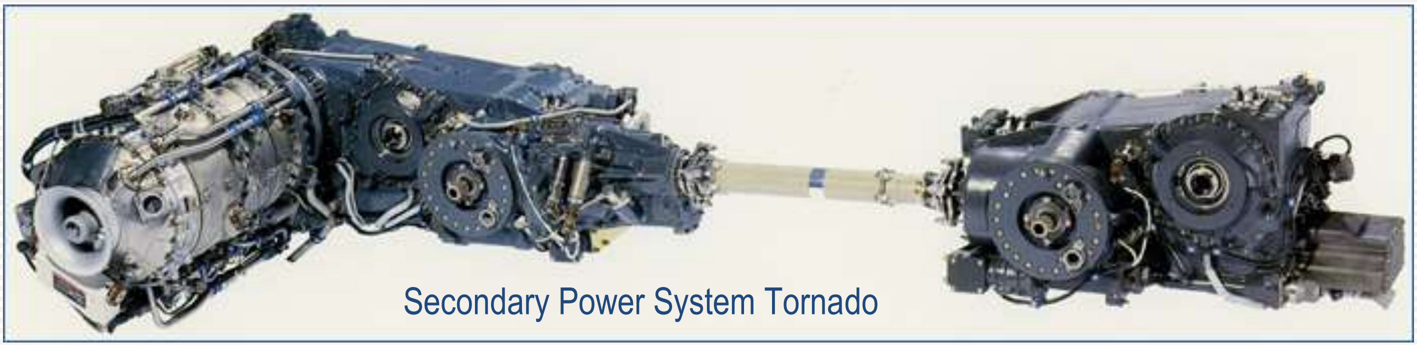
The on-board secondary power system (SPS) makes the Tornado largely independent of ground equipment. It supplies the aircraft with electrical, mechanical and hydraulic energy also during ground operation, and it starts the two main engines. The auxiliary gas turbine (APU) T312, attached to the RH gearbox, supplies the drive to the gearboxes. It is started electrically on the ground. The power is first transferred to the right gearbox via a clutch. A further clutch, mounted on the RH gearbox, provides drive to the LH gearbox via a cross-drive shaft (CD-Shaft).



Schematischer Aufbau des Sekundärenergiesystems

Schematic layout of the secondary power system

An electric generator, a hydraulic pump and the fuel pre-pressure pump for the oil cooling system are attached to both gearboxes and the shaft connection to the engines is activated via a torque converter to provide transmission to start the respective main engine. As soon as one of the main engines is running, the APU is automatically disconnected and switched off. The control of the components of the SPS during operation is controlled by the SPS control unit.

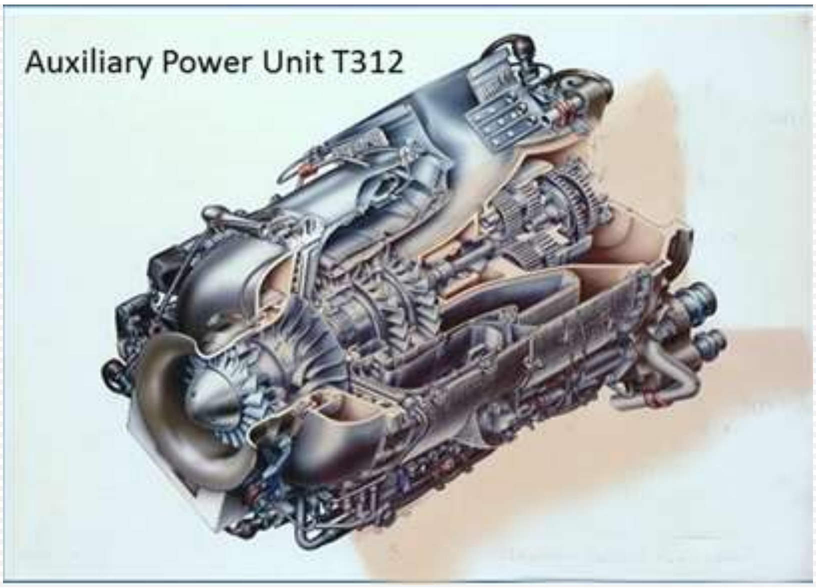


Secondary Power System Tornado

The auxiliary gas turbine T312 - The "starter" for the Tornado fighter aircraft

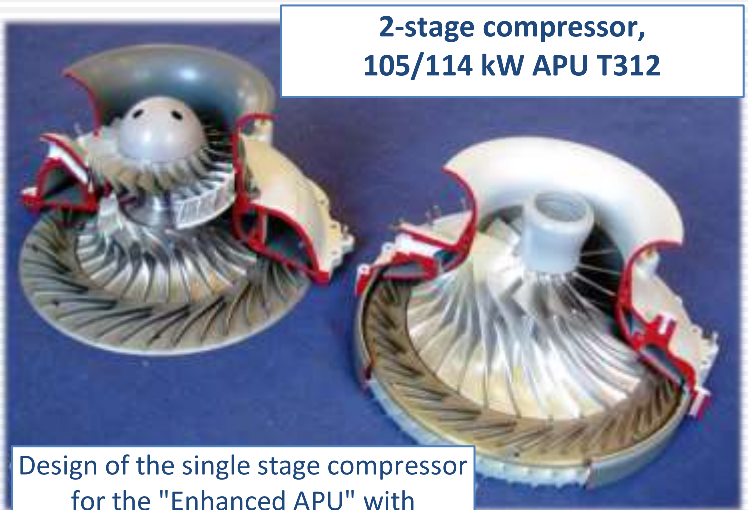
The fact that KHD was awarded the contract for the development of an APU (Auxiliary Power Unit) for the MRCA (Multi Role Combat Aircraft) in 1970 was due to the successful history of its ancestor, the APU T112 for the vertical starter VAK 191 B. Launched from its own electric starter, the APU T312 delivers its shaft power via a clutch to the starboard gearbox of the SPS. Its design characteristics correspond to those of the T112, the essential technical data are attached to the figure.

The APU completed its first run on the test bench on 29 January 1972. During the development phase, 5 units were built for their own development, as well as another 31 for the development and testing of the aircraft. Series production began in August 1976 with a pre-contract, and 1,350 units were produced by 1997.



Technical data

	APU T312	T312-E
Continous power	105	127 kW
Peak power	114	136 kW
Turbine speed	64,000	64,000 /min
Drive shaft speed	8,000	8,000 /min
Spec. fuel consumption.	< 0,62	< 0,60 kg/kWh
Mass air flow	0.872	0.975 kg/s
Weight (Dry)	40.0	40.7 kg



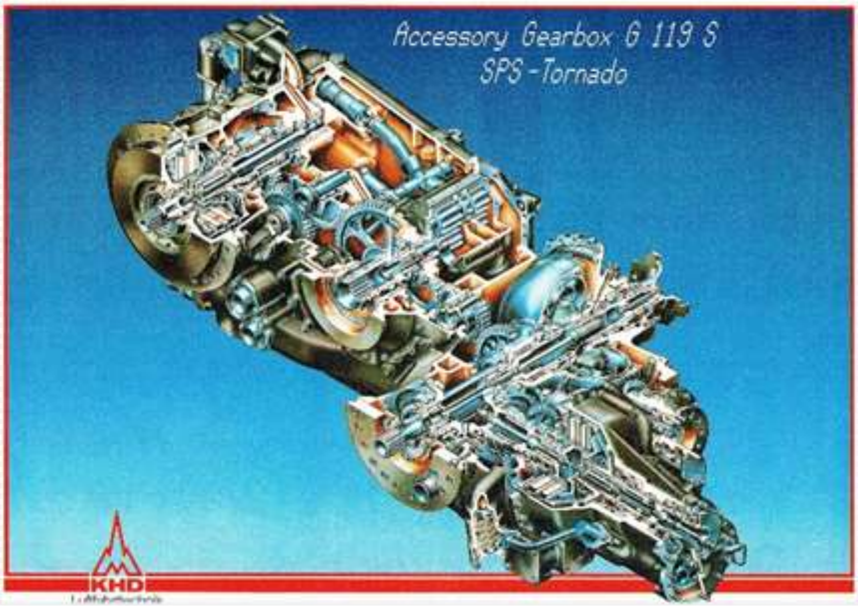
2-stage compressor, 105/114 kW APU T312

Design of the single stage compressor for the "Enhanced APU" with 127/136 kW

The performance enhancement of the APU, derived from the T112, from 114 to 136 kW peak power, was already required at the beginning of the programme, but took about twenty years to realise. From the mid-1990s, the conversion to the "Enhanced-APU" was finally made, and the permissible operating time until an overhaul (TBO) was able to be doubled to 4,000 starts. The increase in performance of approximately 20% was mainly achieved in the compressor section. A radial compressor impeller with backward curved blades replaced the previous radial compressor impeller with the front axial compressor, resulting in a higher pressure ratio and a higher mass air flow rate.

The Gearboxes G119 – Complex hydro-mechanical gearing

In addition to the APU, the principle assemblies, which form the SPS, are two gearboxes, starboard (GB-S) and port (GB-P), named the G119, the connecting shaft between these two gearboxes and the SPS control unit. The development of these five units began with the preliminary contract signed in October 1970 and one was tied to the still uncompleted initial designs taken over from the Bremen Vereinigten Flugtechnischen Werke. The number of units used in the development phase so essential for the function of the aircraft: 6 GB-S and 5 GB-P for their own development, as well as 34 GB-S and 28 GB-P for the development and testing of the aircraft speaks for their complexity.



Series production began within the framework of a preliminary contract dated August 1976. Until 1997 1,291 GB-S and 1,246 GB-P were produced. The connecting shaft and the SPS control unit were developed and built by subcontractors. The gearboxes are of an extreme lightweight design, recognizable by the filigree gears with longitudinal and high-crowned convex tooth flanks, by shafts made of the light metal titanium, the drive connections by means of spline shafts, as well as structural housings and covers made from the light metal magnesium with long and branched internal cast channels for the oil flow. The torque converters for the start of the engines, the two multi-disc clutches installed in the GB-S coupled with the oil system of the APU and the generator IDG, which is attached to each gearbox, lead to a very complex hydraulic system, which had to ensure the start of an engine even at minus 40 Celsius.


Clearly visible: the cast-in channels

The model of the gearbox-S for exhibition purposes under construction.

Drone engine T117 - The first German series production jet engine after 1945

The T 117 jet engine, a very small engine with a thrust of 1,000 Newton, became the first aircraft engine to be developed in Germany after 1945 that went into series production. The T117 was installed in the German-French reconnaissance drone, CL289.

Cutaway model T117 and Compressor/Turbine group in the museum

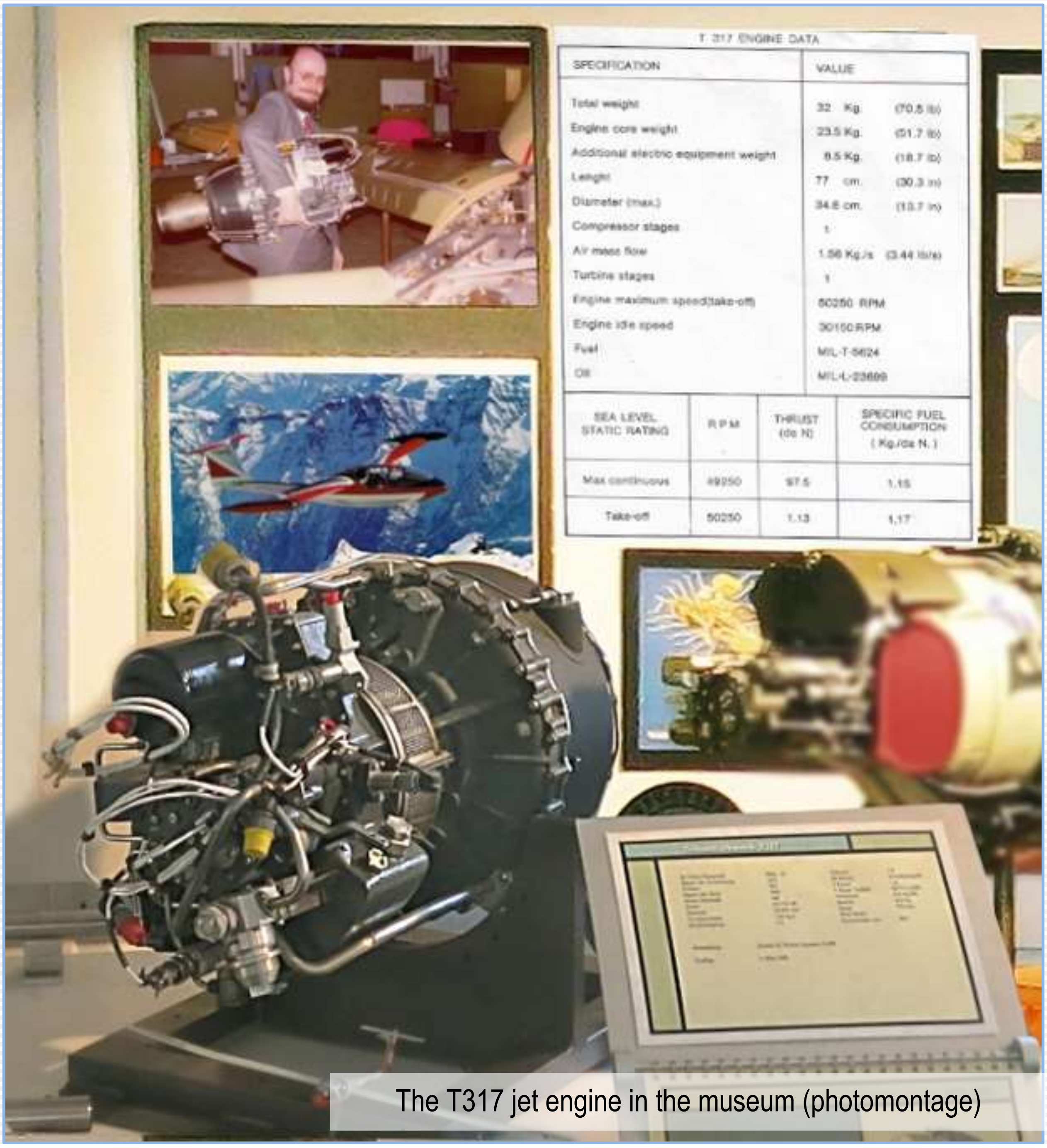
The basic development of the engine began in 1976 after two years of preliminary work. The first run took place on 12 October 1977. At the end of 1978, the first of a total of 30 engines was delivered to the Canadian system company Canadair to complete testing of the complete drone system there. The manufacture of the 288 production engines ordered a full ten years later was completed by the beginning of 1993.

The CL289 drone system was designed to reconnoitre the military operating area up to a range of 170 kilometres. The missile was launched from a truck using a solid-fuel rocket. The preprogrammed flight distance was up to 400 kilometres at altitudes between 125 and 3,000 meters, the flight velocity was about 740 km/h. The CL289 drones formed the backbone of the reconnaissance of NATO forces during the French and German IFOR and KFOR operations over the Balkans from 1996 to 1999. The engine was comprehensively maintained technically and logistically in Oberursel until the end of the system's operation in 2009, 785 engines had been repaired and overhauled by then.

The jet engine T317 – Thrust for a manned jet trainer?

Based on the core of the T117 engine, further turbojet, turbofan and turboprop engines as well as various auxiliary gas turbines were designed as early as the mid-1970s for anticipated but also for concrete needs.

The project of a small jet trainer from the traditional Italian company Caproni with the name C-22J seemed very promising. The jet engine, the T317, completed its first run in 1979, and was on the verge of aviation approval in 1983 after a successful 150-hour endurance run. But then, with Augusta's takeover of Caproni, the project folded. One of the two test engines was secured for the Motorenfabrik museum.



The T317 jet engine in the museum (photomontage)

Turbo engines for cruise missiles - From turbojet T128 to the polyphem power unit LCT85

In addition to the development of the T117 turbojet and related projects, KHD was involved from the beginning of the 1980s in various study and development projects with turbo-engines for cruise missiles, also known as guided missiles.

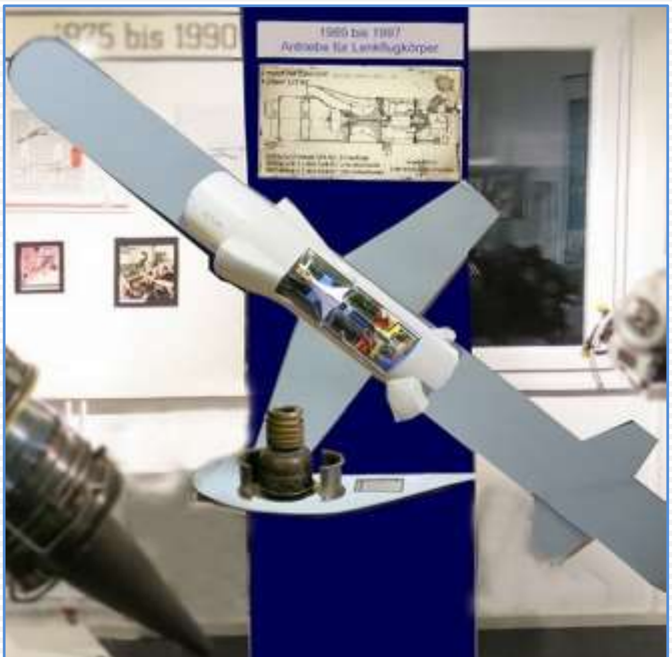
The technology demonstrator KHD T128 X, built in 1986

These projects included:

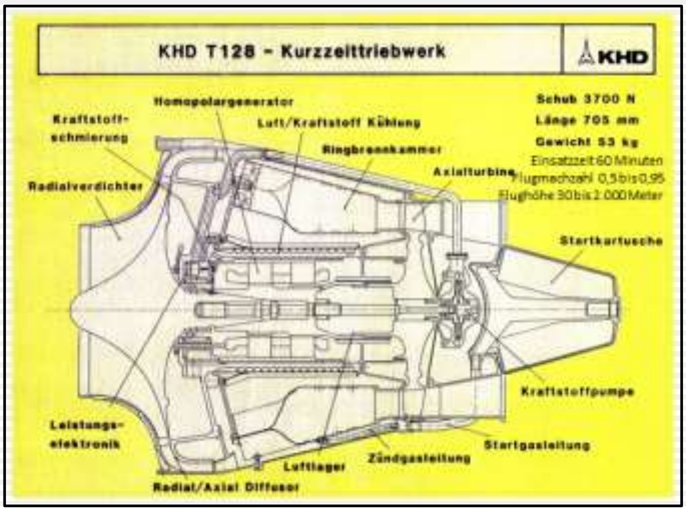
• Turbojet T128 with 3,700 N thrust. Development from 1980 and the first test bed run 1986, discontinuation of the project 1992. Comparative study 1984/1985 to an alternative turbofan engine with 3,500 N thrust.

• Propulsion of the multinational guided missile "Polyphem": (a) concept study LCT30 (low cost turbine with 30 dN thrust) 1989/1990 and, from 1991 together with Williams International (USA), the adaptation and further development of the Williams engine WJ119-2; the first flight was in December 1993, the first mission flight in April 1997.

(b) From 1994, together with Microturbo, the design and pre-development of the 850 N thrust engine LCT85; Tender for series production and production of 20,000 engines at the end of 1994. The U.S. company, Teledyne, won the competition. (The Polyphem project was discontinued in 2003).



1: 1 model of the LCT85 and components of the Williams WJ119-2 engine in the museum

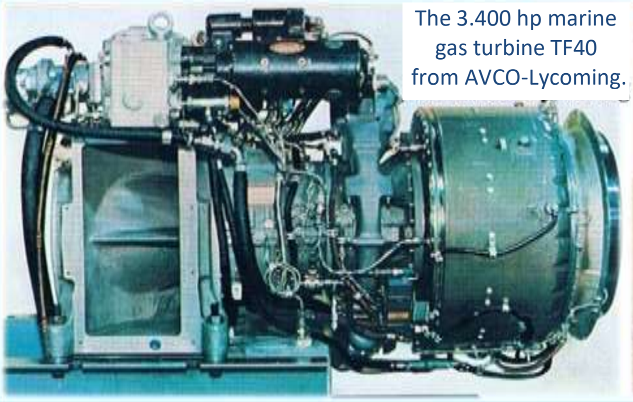


The activities taken over from KHD at BMW Rolls-Royce of such turbo jets ended in 1994 with Germany's withdrawal from the Polyphem programme.

30 Years industrial gas turbines in Oberursel

The exhibit of the KHD T009 turbine is representative of the history of industrial gas turbines. After the successful entry with the small gas turbine T16, several other development projects remained unsuccessful. The KHD 75 family of small gas turbines, introduced in 1971, with variants of 15, 30 and 60 kW of power, is highlighted.
However, KHD AG had been dealing since 1962 with industrial plants which were to be powered by gas turbines from British or US manufacturers. Projects realized:

- **1964** pipeline pumping station in Lingen, with 4200 hp Proteus engine from Bristol Siddeley Engines
- **1967** the 3 MW Proteus power plant
- **1973** two mobile 4.2 MW power plants, with Avco-Lycoming TF35 industrial gas turbines
- In **1975** and **1976** two stationary power plants TF35
- **1977** the hover ferry SEDAM N500, with two lifting and three propulsion engines Avco-Lycoming TF-40 with 2,535 kW power, and two T216 gas turbines for the generator units


The 3.400 hp marine gas turbine TF40 from AVCO-Lycoming.

The hovercraft ferry SEDAM N500-02 during an inspection in 1978 in Boulogne.

The business management of these projects was carried out by KHD in Cologne, but the practical commissioning of plants and their operational support were provided by a customer service group in Oberursel. After the takeover of Mannheim Motorenwerke by KHD in 1985, the business with all activities went to the new MWM Diesel- und Gastechnik GmbH in Mannheim.

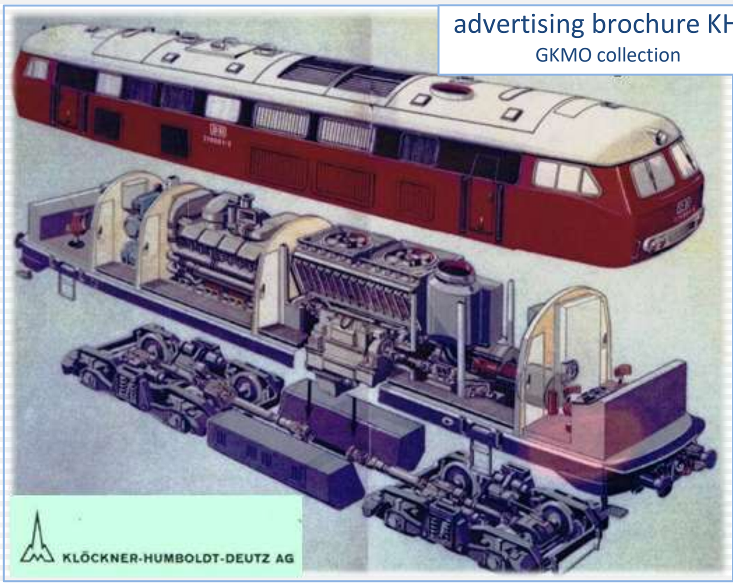
The T009 small gas turbine

In 1988, KHD Luftfahrttechnik made a fresh attempt at industrial gas turbines. The aim was to increase the single-shaft Kawasaki S5-02 turbine from 23 to 32 kW of power in order to be in a position to offer it for some military applications. However, the output turbine proved to be unreliable and the project was discontinued in the early 1990s.

Locomotive power units – Interesting trial projects with the Bundesbahn

From the 1960s onwards, various railway operators also dealt with the possibilities of additional (booster) or sole propulsion of rail vehicles with gas turbines.

The Deutsche Bundesbahn (German Federal Railway) pursued three projects with KHD:

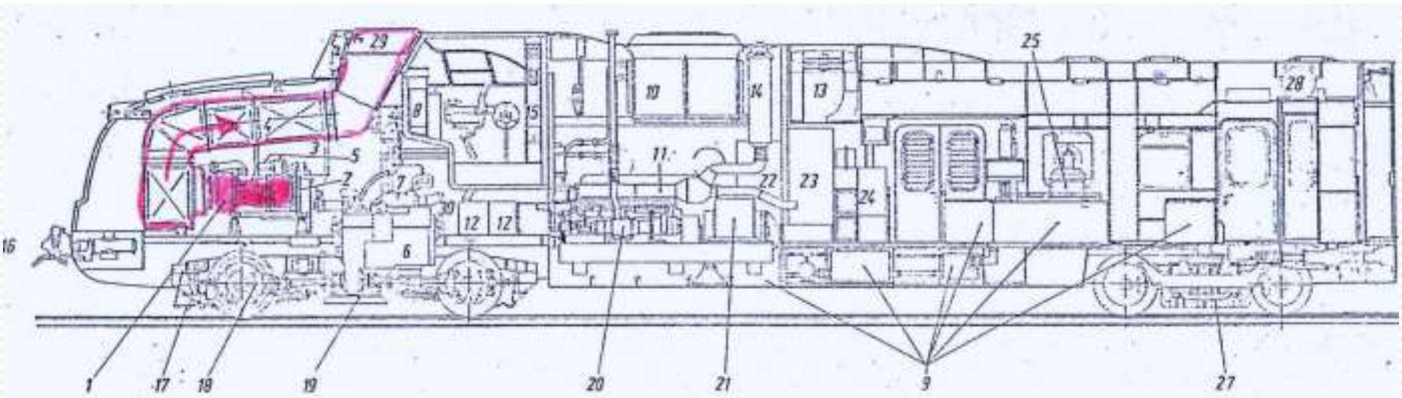


advertising brochure KHD
GKMO collection

• **1965** - The turbo diesel locomotive 219 001: booster drive with 900 hp gas turbine LM 100 from GE; Testing program 1965 to 1974 with 712,899 operating hours

• **1970** - Eight db-Class 210 turbodiesel locomotives: booster drive with an 845 kW gas turbine T53-L-13 produced in Oberursel; Used on the Allgäu line from 1970 to 1979, with 2,800 to 4,200 operating hours with the ten gas turbines used.

• **1972** - Four gas turbine railcars VT 602: complete drive with 1,620 kW gas turbines TF 35 from Lycoming. After extensive testing used for intercity traffic from 1974 to 1979



The Bundesbahn and KHD entered new technical territory and gained a lot of experience during a total of 13 years of testing and operation. The gas turbine operation could not prevail. These projects are remembered at the Company Museum with the presentation of documents only.

The vehicle gas turbine GT601 - A transatlantic programme

The weighty exhibit GT601 is reminiscent of the era of vehicle gas turbines under the direction of the Cologne-based Klöckner-Humboldt-Deutz AG.

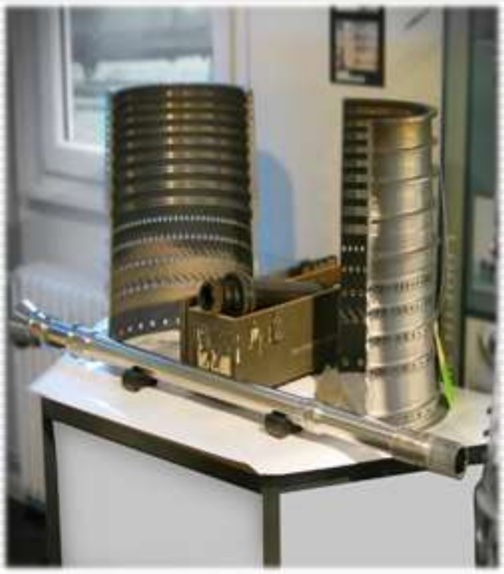
As early as 1966, the design of a 450 hp truck turbine with heat exchanger was presented in Oberursel. However, a ST6 gas turbine available from PWC was procured for a test programme in the Magirus lorry. The road trials from 1968 to 1972 produced positive results. In 1972, the ITI consortium with Garrett, Mack Trucks and Volvo joined the GT601 joint programme. The first run of the two-shaft 550 hp turbine, which had two radial compressor wheels, a can combustion chamber, an axial gas generator and a power turbine wheel and a recuperator for the use of exhaust heat, took place in April 1977. The road testing programme began in February 1978 and ran until 1986. The three turbine trucks used were driven about 100,000 km, while the test with various armoured vehicles was again about 10,000 km.

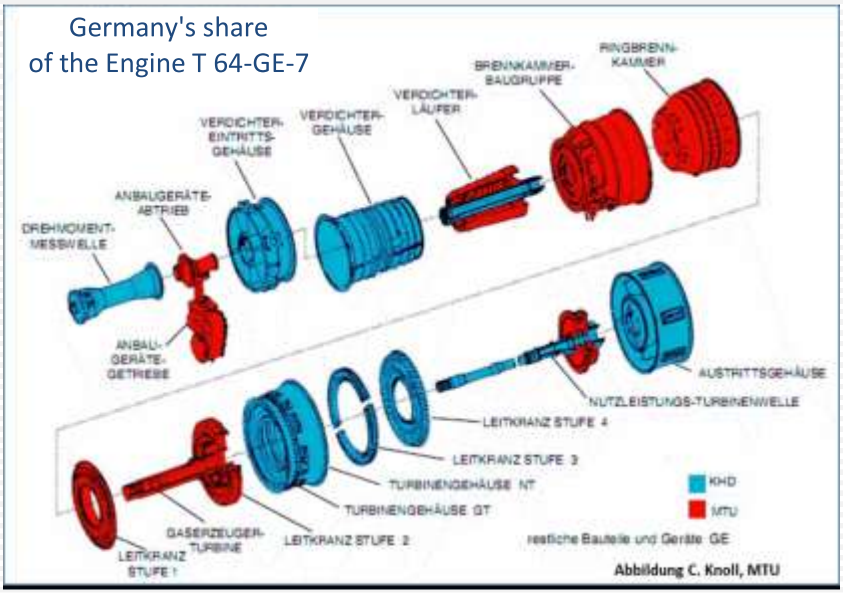
The T64 helicopter engine - parts production with new technologies

KHD supplied as a subcontractor to MTU essential components of the General Electric T 64-GE-7 engine, built under license for the Bundeswehr CH-53 helicopter. From the start of production in 1971 to October 1974, a total of 232 parts were delivered. Not a large number of items, but this programme was important for the further development of manufacturing technologies in Oberursel.

Hubschrauber CH53 auf der KHD Wiese gelandet (Sept. 1989)

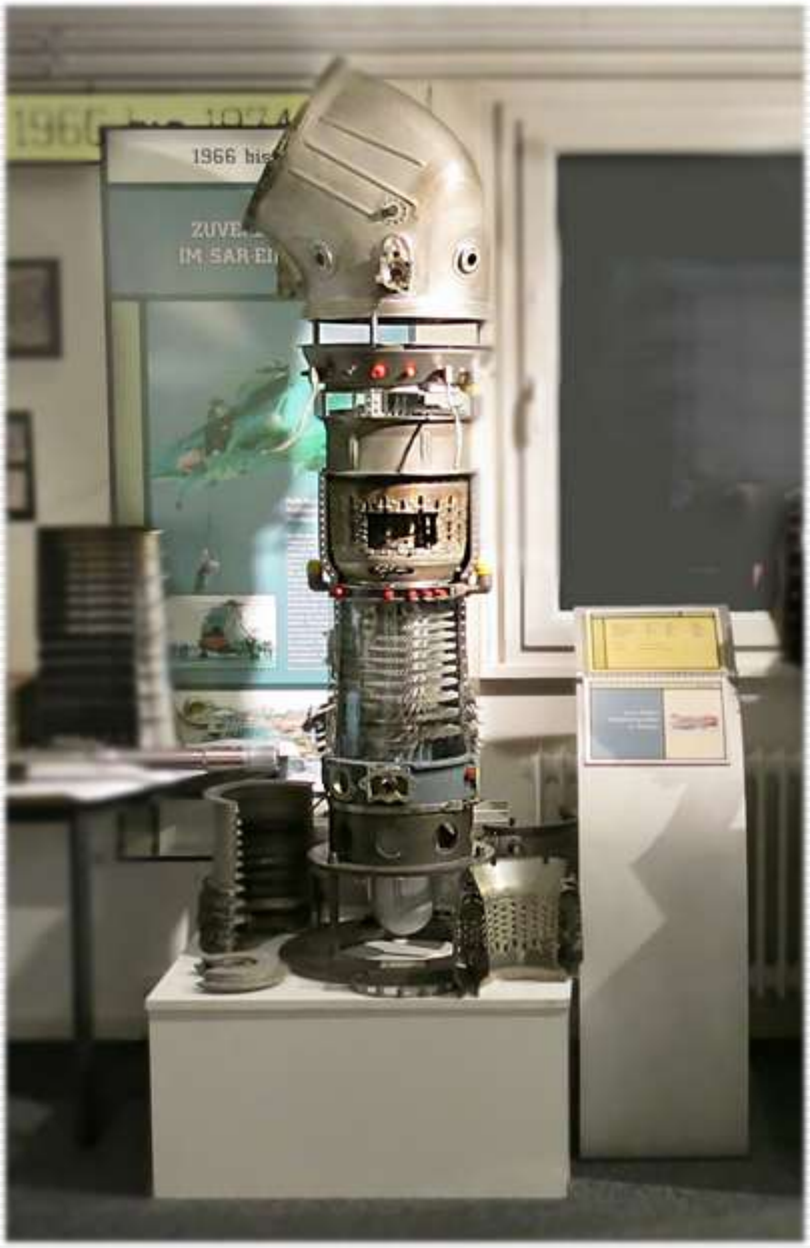
This is because significant experience going beyond the previous programmes have been gained in the processing of titanium, high-temperature nickel and cobalt-based alloys as well as with vacuum soldering, plasma coatings and other special processes. Above all, this programme introduced the new machining technology with "NC machines" (numerically controlled machine tools) in 1971.





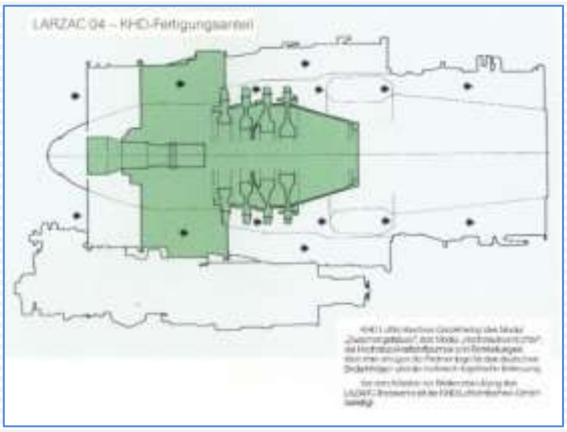
The helicopter engine Gnome H1400 – On board with the Bundesmarine and Rolls-Royce

Oberursel provides technical-logistical support services for the helicopter engine Gnome H1400-1 for the Sea King rescue helicopter, flown by the Bundesmarine (Federal German Navy) since 1974. By the end of 2018, a total of 850 Gnome engines for the Bundeswehr had been repaired or overhauled and a further 903 engines on behalf of Rolls-Royce for their customers in various countries. Since 2009 Oberursel is now the sole repairer for this engine, although support began in 1992 initially as a stop-gap measure.



Technical details: The Gnome H1400-1 is a shaft power turbine engine featuring a 10-stage axial compressor, a ring combustion chamber with 16 fuel nozzles, a two-stage gas generator turbine and a single-stage free-running power turbine. The shaft drive is provided through the gas outlet housing. The entry guide vanes as well as the guide vanes of the first three compressor stages are adjustable. The engine's continuous power is about 929 kW (1,263 hp), the one-hour power is 1,141 kW (1,550 hp). The dry weight with starter and control unit is 170 kg

The Turbofan Engine Larzac 04 - Practiced German-French co-operation



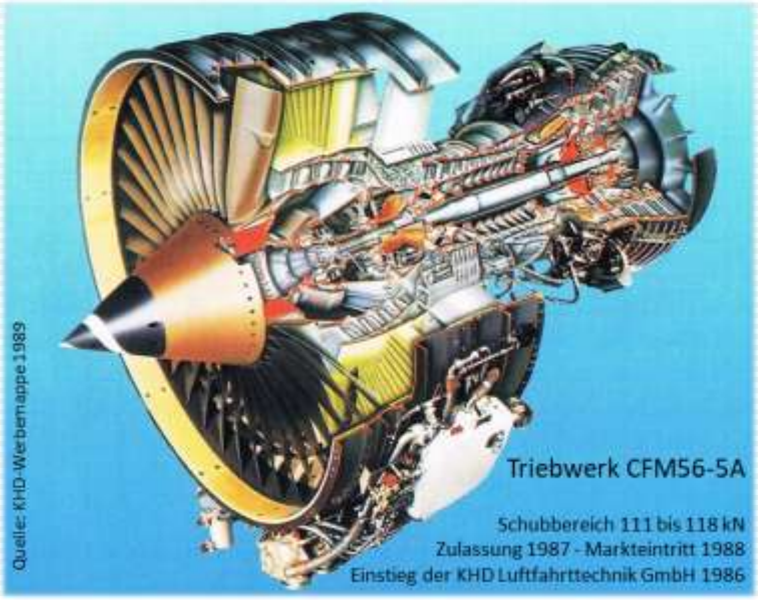
The production and utilisation of the AlphaJet weapon system and its Larzac 04 engine is the off-spring of the German-French policy of reconciliation. The modular Larzac 04 turbofan engine was developed in 1969 by the French consortium Groupement Turboméca-SNECMA (GRTS) and selected in 1972 as the engine for the German-French training and ground combat aircraft AlphaJet. Series production, which began in 1977, was divided between the four co-operating companies SNECMA, Turbomeca, KHD (marked in green) and MTU, each as separate suppliers for specific parts/modules. This still applies to spare parts production today, including RRD. The final assembly and acceptance test of all 420 engines for the Bundeswehr took place at KHD in Oberursel until mid-1981. Extensive technical-logistical and developmental support services were provided in Oberursel until the decommissioning of the weapons system by the Bundeswehr in 1994. Until then, 568 engines were also repaired in Oberursel, 251 due to the conversion to the performance-enhanced version C20, and 1,360 modules.

Oberursel then supported the Bundeswehr's efforts to sell its AlphaJet and engines to third-party operators, including the use of Larzac 04 engines in BASF's turbo extinguisher.

Technology: The Larzac 04 engine is an axial flow two-shaft engine with a two-stage fan, a four-stage high-pressure compressor, a ring combustion chamber and a high and a low-pressure turbine wheel.
Static thrust: 13.19 kN (C6) 14.12 kN (C20)
Mass (dry): 302 kg
Length: approx. 119 cm
Outer diameter: 60.2 cm
Inner diameter fan: 45.2 cm

The CFM56 turbofan engine - The entry into civil aviation

In 1974, two engine companies, General Electric and Snecma (now Safran), met on an equal footing in the CFM International co-operation for the development of the CFM56 engine family. Thousands of aircraft, particularly the Boeing 737, members of the Airbus A320 family and the A340, rely on CFM56 engines. The different engine types cover a thrust range of 87 to 150 kN.

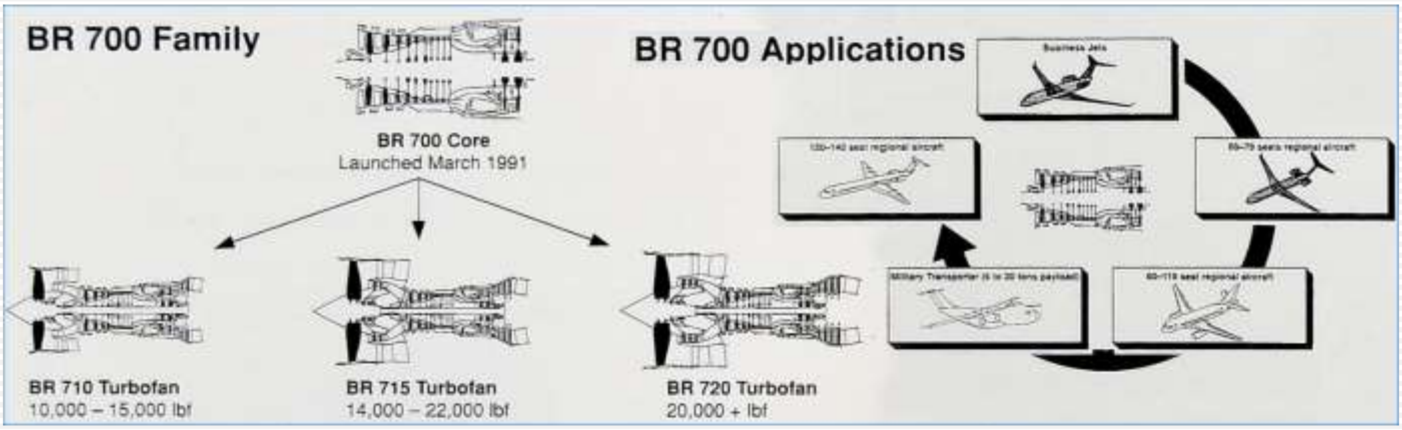


In 1986, the then KHD Luftfahrttechnik entered into the production of CFM56 components with a first package as a "risk and revenue sharing partner" of Snecma. This was followed by three more packages for newer engine variants in 1989, 1990 and 1994. Spare parts requirements will still have to be met for decades to come, even if the series production expires in 2022.

In addition to the direct business outcome, this programme was of considerable importance, as KHD, as a supplier to Snecma, had to meet virtually all relevant conditions and procedural requirements of the US Federal Aviation Administration (FAA). This later made KHD Luftfahrttechnik GmbH attractive to BMW as the basis for its intended re-entry into aircraft engine construction.

1990 - A new era with BMW and Rolls-Royce

In 1990, BMW, which was established in 1916 as an aircraft engine manufacturer, took over the business of KHD Luftfahrttechnik, the Oberursel site of Klöckner-Humboldt-Deutz, which had fallen into turmoil. At the same time, BMW and the British engine manufacturer Rolls-Royce formed a joint-venture and founded the new company BMW Rolls-Royce AeroEngines (BRR) based in Oberursel.
Immediately after its foundation, BRR began activities for a new family of turbofan engines with the types BR 710, BR 715 and BR 720 in the thrust range of 45 – 90+ kN, i.e. 10,000 to 20,000+ pounds.




Core Engine Montage

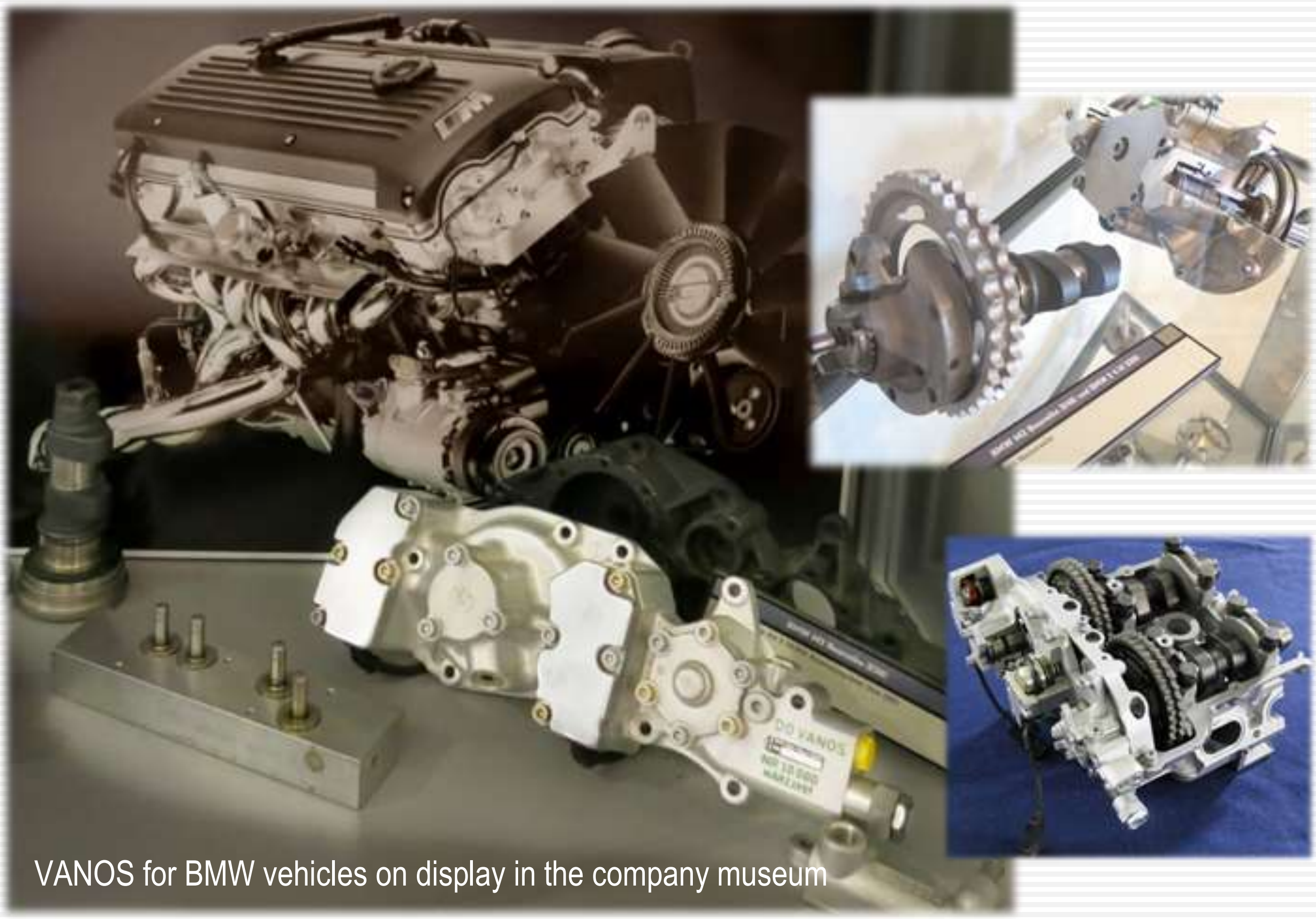
In March 1991, the development of the core engine for the BR 700 family began; the first run of the core engine took place in August 1993. A development and assembly centre, built on a field, was opened in Dahlewitz (near Berlin), and the development departments were merged there in the autumn of 1993, and immediately afterwards, the engine assembly and acceptance tests, administration and customer service were progressively established there.

The plant in Oberursel was fundamentally restructured, modernized, expanded and, with many new machines and facilities for its production capabilities during the course of the 1990s orientated for the production of complex components, primarily for its own engines.

BMW-VANOS: An object for education at Oberursel

BMW aimed to increase the specific power and torque in the lower speed range of certain high-performance engines with VANOS variable camshaft controls, while at the same time reducing fuel consumption in their sporty vehicles.

Oberursel took over the manufacture of variable camshaft controls from 1991in order to utilise production capacity, but above all to build on experience in the fabrication of components in flexible production islands. By 2008, more than 234,000 units of the various types were produced in the factory in the successfully operated production island VANOS, and then another seven thousand units of pre-produced individual parts were assembled and delivered.



VANOS for BMW vehicles on display in the company museum

The BR710 turbofan engine - A new engine for large business jets

The first engine type developed and produced by BMW Rolls-Royce AeroEngines was the BR710. The first customers for this engine were Gulfstream and Bombardier, which set new standards with their long-haul business jets G V and Global Express. The engine, developed in Dahlewitz in Brandenburg, received its type approval in 1996. It is the first ever commercial aircraft engine with international approval developed in Germany and built in series.

Key programme milestones:

- First run of the BR700 core engine built in Oberursel on 14 August 1993
- First run of the BR710 engine on 1 Sept. 1994
- First flight in a GV on 28 November 1995
- Type-approval by the European regulatory authority JAA on 14 August 1996
- Delivery of the first 16 production engines in 1996

Many of the key components for this type of engine were manufactured in Oberursel.

Technical data

Type:	BR700-710A1-10
Manufacturer:	BMW Rolls-Royce AeroEngines
Year of manufacture:	1996
Dry weight:	1.851 kg
Thrust weight:	28,5 kg/kN
Spec. fuel consumption:	59.04 kg/kNh
Start thrust:	66 kN

Number of engines:
over 3,500 (3/2020, still in production)

Built in: Gulfstream GV, Bombardier Global-Express, Nimrod

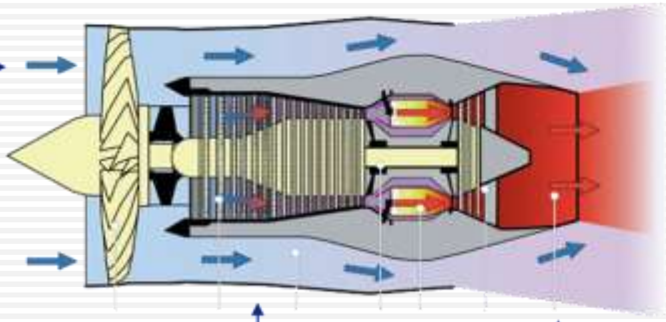
Extensive tests were carried out in 1996 on the Gulfstream GV business jet with the BR710 flight test engine, SN 11105. This engine is on display in the company museum.

Excursus:

How a jet engine works

① The engine sucks in a large volume of air through the fan and compressor stages. (upto 1,2 tons/sec. during take off. It could empty a squash court in less than one second).

③ In the combustion chamber, fuel is mixed with air to produce the "bang" – the expansions which forces the air into the turbine. Inside the engine, the fuel burns in the combustion chamber at up to 2000° C. The temperature at which metals in this part of the engine start to melt is 1300° C, so advanced cooling techniques are used.



② The air is squeezed through a number of compression stages to 40 times atmospheric pressure.

④ The reaction of the expanded gas – the mixture of fuel and air – being forced through the turbine, drives the fan and compressor and blows out of the exhaust nozzle providing the thrust.

Quelle: Rolls-Royce Deutschland (2015)

See also:

https://www.rolls-royce.com/~/media/Files/R/Rolls-Royce/documents/country/deutschland/Poster/Poster%20A1%20-%20How%20does%20a%20jet%20engine%20work%20-%20English.pdf

The BR700-TP turboprop engine - Propulsion for the "Future Large Aircraft"

The 1:3 scale model exhibited at the museum is reminiscent of the offer made by BMW Rolls-Royce to Airbus Industries in December 1998 for the engine for the Future Large Aircraft project, known as BR700-TP. The core engine of this BR700-TP was based on the BR715 turbofan engine, which was supplemented by a propeller reduction transmission designed by Rolls-Royce-Allison.
Competing suppliers were Pratt & Whitney and a European consortium of Fiat Avio, ITP, MTU and Snecma. In July 2001, Rolls-Royce, ITP, MTU and Snecma founded the Aero Propulsion Alliance consortium, which was later replaced by Europrop International (EPI), in accordance with an All-European co-operation requested by the client. In May 2003, EPI was awarded the contract to develop the engine, known as the TP400-D6, which is one of the strongest engines of its kind delivering 11,000 shaft hp (8,203 kW).

In 2003, the contracting nations ordered the first 180 Aircraft A400M from Airbus, and with this began the development of the TP400 engine. The work scope assigned to Rolls-Royce (RRD) included engine integration, the design and development of the high-pressure compressor, the intermediate housing, the low-pressure shaft and the turbine intermediate housing. The components of the high-pressure compressor derived from the BR700 family, with the housings and the four Blisk stages (Blade Integrated Disk), were manufactured in Oberursel.


The 1:3 scale model BR700-TP

The maiden flight of the A400M military transporter took place on 11 December 2009.
The activities initially placed at RRD were later transferred to RR in Bristol.
After about ten years, the development assembly in Dahlewitz was disolved in the autumn of 2014, with the delivery of the last of 25 high-pressure compressors for the test program. In March 2016, the last of 331 high-pressure compressors was delivered to EPI partner MTU for series assembly of the TP400 after the work transfer to Rolls-Royce in Bristol had been completed. In Oberursel, the high-pressure compressor drums with the four blisk stages continue to be manufactured.

The auxiliary gas turbine RE220 - A brief renaissance

After it became apparent that there was no suitable APU on the market for the two new business jets powered by BR710 engines, BRR, Kawasaki Heavy Industries, Alfa Romeo Avio and Singapore Aerospace, led by Allied Signal in Phoenix in 1993, joined forces to develop and build one. The type designation RE220 stood for regional and executive jets and for the performance class 220 kW.

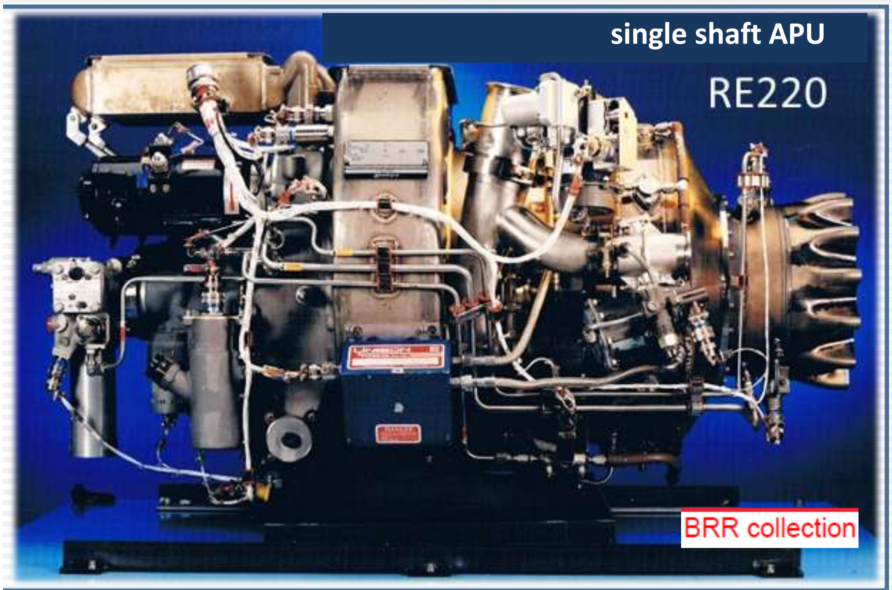
Radial compressor wheel of the APU RE220

Designed and built in Oberursel

BMW Rolls-Royce was responsible, among others, for the development of the compressor section, an area in which the former KHD aeronautical technology had a technological leading position in the world. Thus, one was able to draw on the extensive experience gained with the demonstrator engine T118-X. The first run of a complete turbine took place on July 29, 1994 in Phoenix/Arizona. A 600-hour continuous run in Oberursel within the framework of the development was successfully completed on May 31, 1995.

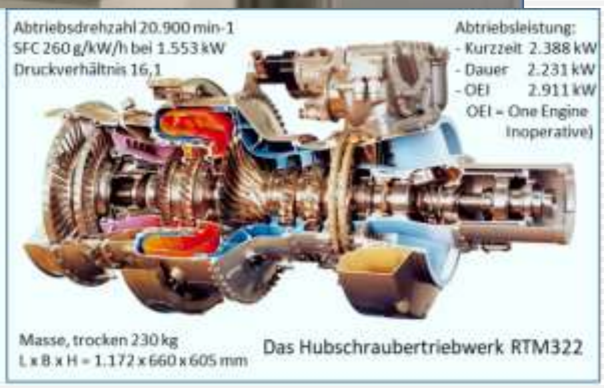
The first series APU was delivered to Gulfstream in February 1996. However, the RE220 components no longer fitted into the production at Oberursel, converted to the production of BR700 components, and therefore the cost targets could not met. BMW Rolls-Royce withdrew from the programme on 31 December 2000.

Single stage radial compressor
Reverse flow ring combustion chamber
2 axial turbine stages
Speed 45585 rpm
Dimensions (Lx B x H):
1,070 x 65 x 449 mm
Dry mass 110 kg
Compressor ratio 5.47
Mass air flow 3.28 kg/s
Generator drive power 45 kW
Air delivery 1.22 kg/s at 4.0 bar or 1.33 kg/s at 3.75 bar
Start capability up to 13,100 m altitude
Generator power up to 13,700 m altitude



The helicopter engine RTM 322

The RTM322 shaft turbine engine from Rolls-Royce Turbomeca was selected in 2000 as the engine for the NH90 multi-role helicopter in Germany, the Netherlands and France. The RRD production share in the delivery of the engines to the Bundeswehr amounted to about 23%. From 2002, certain individual components, the attachment gearbox and the module No. 5 were produced in Oberursel. The assembly and acceptance of the engines for the helicopters of the Bundeswehr were also part of RRD's production scope. In 2004, the first engines assembled in Oberursel were delivered, and the 100th engine delivered in September 2009. In April 2010, assembly and acceptance was transferred to the RR plant in Bristol. The production of components was also gradually relocated. The chapter RTM322 in Oberursel closed in 2016 after 838 parts sets and 105 complete engines as well as the relocation of the support activities were completed.



Description and technical data:

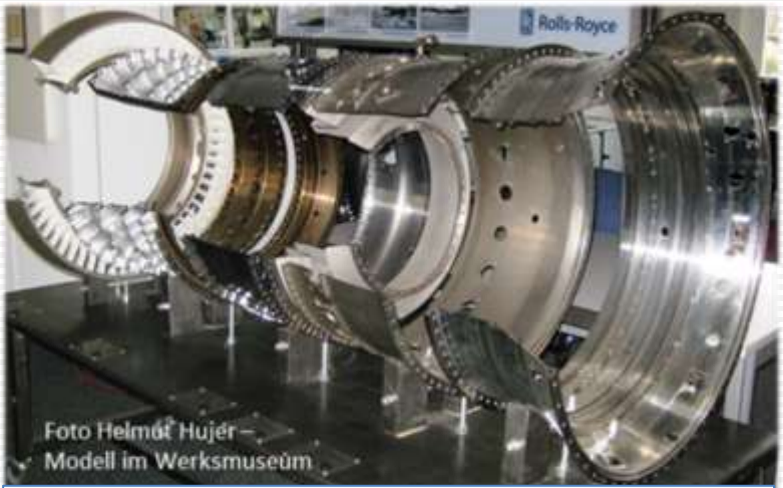
The RTM322 is a two- shaft engine with a two-stage low-pressure turbine to drive the output shaft, as well as a two-stage high-pressure turbine for driving the three-stage axial compressor and the single-stage radial compressor. FADEC control.

Drive shaft speed: 20,900 rpm | Spec. fuel consumption: 260 g/kW/h
Pressure ratio 16:1 | Dry weight 230 kg | L x B x H 1,172 x 660 x 605 mm
Drive shaft power: Peak 2,388 kW continuous 2,231 kW
(One Engine Inoperative 2,911 kW)

The production of BR700 components - The focus on our own engines

In line with the consolidation of the BMW Rolls-Royce AeroEngines product portfolio, the Oberursel plant was extensively restructured and modernised. The previously prevailing workshop principle was replaced by production islands with the greatest possible autonomy in the production of certain characteristic component families. Key components for the company's own BR700 engines are produced in the production islands for Rings & Seals, Casings, Discs & Drums as well as small parts for the components of the old programmes.

The exhibit "Casings", stationary components of the engine casing, as well as the compressor drum of the BR710 engine show in an impressive way the technological status achieved.



Housing components BR710 / 715 manufactured from 1995 to 2010

Rotating engine components – Oberursel as a centre of excellence at Rolls-Royce

2000: After BMW withdrew from the operating engine business, the production structure in the new company Rolls-Royce Deutschland, a 100% subsidiary of Rolls-Royce, changed. The plant was fully integrated into Rolls-Royce's production structure in a longer process and restructured into a centre of competence for rotating engine components. The focus of attention is the production of discs and compressor drums in Blade-Integrated Disk design (BLISK).

High-tech components for numerous Rolls-Royce engine programmes are manufactured here utilizing state-of-the-art manufacturing techniques as well as the assembly of engine modules.

Support and maintenance centre for aeronautical propulsion systems

From the very beginning of gas turbine production, the site was, and still is, the support and maintenance centre for gas turbines and aeronautical equipment. This includes technical and logistical support, spare parts supply as well as repair and overhaul of airborne equipment manufactured here, but also includes "foreign" engines such as the Rolls-Royce engines GNOME H1400, GEM and for the technical and logistical support on behalf of the Bundesmarine of the Rolls-Royce T56-A-14 propeller engine installed in the reconnaissance aircraft, P-3 Orion, including control of the repair and overhaul activities at the sub-contractor's site.

The salt in the soup - Short journeys of discovery

In addition to the large objects on display, several display cases show additional testimonies and numerous small exhibits on special projects and products, on manufacturing technologies or other technical features.

On social infrastructure - This is also what shapes a company

A social structure is fundamental in the operation of a company, at least in larger companies, supporting community institutions which promote co-operation and the functioning in the company business and, to some extent, to make it possible. These include the following facilities, some of which go back to the time of the foundation of the Oberursel Motorenfabrik:

- From workers' council to works council
- Company fire brigade and fire protection
- The circle of persons with a long service at the company
- The company sport
- From the factory canteen to the company restaurant
- Vocational training
- Occupational health and safety

Numerous small exhibits, documents, photographs and memorabilia inform about everyday life in the factory and in a changing presentation on the above-mentioned facilities.

Open day, 27.06.1998 - exhibition area	Employees' After Work Party	Turbo extinguisher using 2 Larzac jet engines

The four-engine Fw 200 Condor – Ahead of its time, consumed by war

The SAM 322 and Bramo 323 aircraft engines - How do they relate to the Oberursel site?

In addition to the development work on the Dz700 aircraft engines, KHD AG produced Bramo 323 aircraft engines in production to order at its plant in Hamburg until the end of 1940. These engines were used amongst others in the four-engine long-range Focke-Wulf Fw 200. The aircraft ordered by Lufthansa were converted immediately after its first flight in September 1937 into government aircraft and into military transporters after the start of the war. Designed as a commercial aircraft, the Fw200 was reconstructed for military use as a sea reconnaissance and long-range bomber and continued to be produced until the beginning of 1944. Of a total of about 275 built Fw200, only a few survived the end of the war in May 1945, and by 1947 the Fw 200 Condor disappeared from the aviation stage and ended up bit by bit in the scrap press.

This oil originates from the recovered Fw200-C3, which experienced an emergency landing in the Trondheimfjord in 1942

Starting with wreck salvage operations, an Fw 200 Condor is currently being reconstructed at Deutsche Lufthansa in Hamburg and Airbus in Bremen under the direction of the Deutsche Technikmuseum Berlin, in order to preserve this aircraft as a globally unique technical monument. Rolls-Royce Deutschland took over the "Bramo 323 Aircraft Engines" work package. However, the engines, submersed in seawater for decades, were too damaged to be salvaged. Never the less, three semi-complete engines were procured from collectors and other museums and restored. A fourth engine was assembled from original spare and remanufactured parts. The restoration work was carried out by Dahlewitz trainees and volunteers of the GKMO. The family tree of the Bramo 323 engine also includes the nine-cylinder radial engine SAM 322 of the former Siemens Apparate und Maschinen (SAM). Such an engine was found in October 2000 during earthworks at the Oberursel plant near the former engine test beds.

Handover of a BRAMO engine to the CONDOR team in Bremen.

SAM 322 engine found buried in the ground

The aircraft engine construction, spun off from Siemens & Halske in 1933 to SAM, was transferred in 1936 to Brandenburgische Motorenwerke (Bramo), founded in 1936, and went under the umbrella of BMW in 1939 as BMW-Flugmotorenwerke Brandenburg. It is not known how and when the SAM 322 engine, which can be considered a preliminary development for the later Bramo 323, arrived in Oberursel. It is possible that tests were carried out on the local engine test beds. The museum handed over the engine found in the ground, alien to Oberursel, to the Deutsches Technikmuseum Berlin.

The Museum

The Motorenfabrik stands on the historic site of the former stone mill, which was acquired in 1915 by the expanding Motorenfabrik. The two buildings were built in the 1960s as office barracks and today we show our small but fine exhibition here on an area of around 250 square meters.

An eye-catcher are the two aircraft installed outside the museum, the shell of the light fighter bomber and reconnaissance aircraft Fiat G-91 R/3 as well as an almost still functional transport helicopter Bell UH-1D. These objects represent the idea of presenting not only the engines manufactured in Oberursel, but also their intended use in the particular aircraft.

The outdoor area will be used on special occasions for demonstration runs of the Oberursel radial engine U0 and in future also for demonstrations of the GNOM static engine. A grain mill of the Seck brothers will is also be housed here. Furthermore, a railway freight wagon standing on a piece of narrow-gauge railway track has already found its place here, ... and there would also be room for the dream of an Oberursel narrow-gauge locomotive.

The light fighter bomber and reconnaissance Fiat G-91 R/3 - With our Orpheus engine

Developed in the mid-1950s, the Fiat G-91 R/3 light fighter bomber and reconnaissance aircraft was a single-engine and single-seat low-rise aircraft of an all-metal construction, designed for the sound limit range and contained a pressurized cabin and an ejection seat. It was powered by a cartridge-launched Orpheus 803 D-11 jet engine and was also able to operate from unpaved ground. The landing gears were hydraulically retractable and extendable. Nine tanks holding a total of 1,600 litres of fuel, and the optional additional tanks under the wings added a further 520 and 1,040 litres respectively. Three reconnaissance cameras could be accommodated at the front. On the front of the fuselage, a 30mm cannon was rigidly installed on both sides. In the mid-1960s, TACAN navigation devices could be optionally installed in place of the right-hand cannon, making the aircraft able to fly blind. To protect the pilot and on-board equipment, the G91 was armoured with steel plates on the underside. Bombs, missiles or additional fuel tanks could be carried at four wing locations.

The exhibition aircraft was produced in 1963 by the then Dornier company in Oberpfaffenhofen and then used until 1982 at the No. 50 Weapons School of the Bundes-Luftwaffe in Erding and Fürstenfeldbruck as 31+99, then until 1992 as 99+08 with the Condor Flugdienst (air service). Its last flight took it to Faßberg Air Base on 2 October 1992, where it was decommissioned. The Motorenfabrik was able to acquire this aircraft in May 2007 and, after extensive restoration work, presented it to the public for the first time on 31 August 2008.

Technical Data:

Overall width *8,56 m* **Length** *10,29 m* **Height** *4,00 m*

Unladen weight *3100 kg* **Take-off weight** *5500 kg* (2.270 kp, 5.000

Engine: An Orpheus 803 D-11; Thrust 22.240 Newton lbs)

Maximum speed *1075 km/h (Mach 0,88) near the ground, 1086 km/h (Mach 0,91) in 1500 m at altitude*

Cruising speed *850 km/h* **Flight ceiling** *13.100 m* **Flight range** *1.800 km*

The transport helicopter Bell UH-1D - With our engine T53-L-13

The UH-1 is a light multi-role helicopter developed by Bell Helicopter in the late 1950s for the U.S. Army, the first turbine-powered helicopter of the U.S. armed forces. No other type of helicopter has ever been built in such large numbers, with more than 16,000 units built world-wide. Of the 352 licensed models produced by Dornier for the Bundeswehr and the Federal Border Guard, some are still in use, the longest than any other aircraft system in Germany. Its propulsion system – the Lycoming T53 shaft power engine – was produced at the Oberursel plant of Klöckner-Humboldt-Deutz under license until 1972, with a total of 520 units.

Technical Data	
Engine:	Avco Lycoming T53-L-13
Power:	1.044 kW / 1.420 SP
Max. speed:	220 km/h
Cruising speed:	165 km/h
Range:	ca. 500 km
Flight ceiling:	4.145 m
Unladen weight:	2.140 kg
Take-off weight:	4.310 kg
Pilots: 1-2	Passengers: max 12
Length of hull:	12,77 m
Overall length:	17,41 m
Rotor diameter:	14.63 m

A total of 2,416 engine repairs and overhauls were carried out within the framework of technical-logistical support at Oberursel until 2012.

Our UH-1D, exhibited at the Motorenfabrik since 2012, was in service with the army from 1969 to 2007 and completed 8,162 flight hours. It reminds one of the importance for Oberusel of the production and support of the T53 engines here.

At the end of the tour – and perhaps at the beginning of further interest?

We hope you had a revealing and interesting foray through the history of the MO.

If you would like to learn more about this interesting industrial location then please refer to the brochure "125 Years of Motorenfabrik Oberursel – With Tradition into the Future" (GKMO 2017; available as a PDF on the GKMO website or as a brochure at the Motorenfabrik).

And if you want to know more details, we recommend the following book (in German only):

125 Jahre Motorenfabrik Oberursel - 1892 bis 2017 | Wandel gehört zum Leben

125 years of Motorenfabrik Oberursel - 1892 to 2017 Change is part of life

Helmut Hujer, who worked here at the Motorenfabrik from 1961 for more than fifty years, describes the eventful history of the company, which has lasted for well over 125 years. On 896 richly illustrated pages in A4 format is not only the chapter of the diverse but largely faded industrial history in Oberursel and in our region brought to life, but also considers the developments in the regional environment, which are important for the emergence and development of these industrial enterprises. The development of social and technical infrastructure in the Motorenfabrik is emphasised. The book can be viewed and purchased from the History Circle Motorenfabrik Oberursel in the Motorenfabrik Oberursel (nominal fee 50 €), as well as in the Vortaunusmuseum [2] in Oberursel.

The printed edition and/or as an e-book on CD can also be ordered directly from the author:
Helmut Hujer, Mobile: 0170 4375 178 Email: hujer.helmut@t-online.de

[2] Museum around the history of the town of Oberursel

Historical Circle Motorenfabrik Oberursel

The collection, preservation, research, exhibiting and conveying of testimonies of the industrial history of the Oberursel Motorenfabrik and all its successive companies are the tasks of the "Historical Circle Motorenfabrik Oberursel".

Our main activities are:

• Operation of the Motorenfabrik: at the museum, one can get a feeling of the history of the site on the basis of the exhibits developed and built here.

• Repair and restoration of exhibits for the Motorenfabrik.

• Research, description and mediation of the history of the Motorenfabrik.

• Carry out events: events relating to the occasion as well as regular meetings with a short lecture on a topic of the history, on the present, or on a glimpse into the future of the location. We meet afterwards for a social gathering in the museum where we also exchange thoughts and ideas.

• Participation in relevant activities of other organisers in the local environment: e.g. preliminary events, days of industrial culture Rhine-Main, etc.

Our members are predominantly former and active employees of this plant. Interested parties of the industrial history of Oberursel are also among its members.

Registered guests are also welcome to attend our regular meetings.

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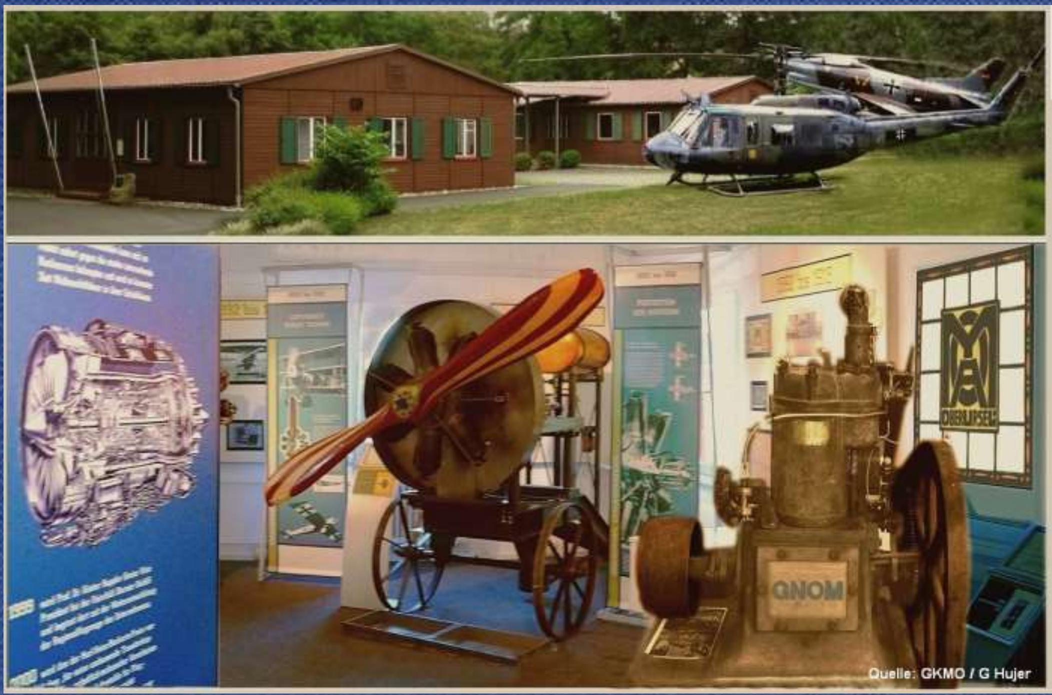

The Company Museum Motorenfabrik Oberursel

Prof. Günter-Kappler-House
on the site of Rolls-Royce Deutschland Ltd & Co KG

Willy-Seck-Straße 1, 61440 Oberursel

Normally open from January until November on the last Friday of each month from 15.00 to 18.00 hrs, closed on public holidays and bridging days.

Please observe the visitor regulations and refer to the instructions for visi-tors
on the Website, www.gkmo.net

Entrance fee: 2,50 € per Person, donations welcome!

Publications from the GKMO can also be acquired during the visit to the museum.

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