

PHILIPS VALVO WORKS, HAMBURG  
HAMMERWERKE (Valve Works), MINDEN  
C. H. MÜLLER A.G. (X-Ray Tube Factory)  
HAMBURG

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BRITISH INTELLIGENCE OBJECTIVES  
SUB-COMMITTEE

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BRITISH INTELLIGENCE OBJECTIVES SUB-COMMITTEE  
32 Bryanston Square, London, W.1.

BIOS FINAL REPORT NO. 65

entitled

"PHILIPS VALVE WORKS, HAMBURG  
HAMMERWERKE (Valve Works), MINDEN  
C. H. MÜLLER A. G. (X-Ray Tube Factory)  
HAMBURG."

A D D E N D U M

The documents referred to on page 10 of the report  
have now been lodged with :-

The Board of Trade,  
German Division (Documents Unit),  
Lansdowne House,  
Berkeley Square, W.1.

Telephone : Grosvenor 4060  
Ext. 2923

The BIOS Reference Number G.B.1. 684 should be quoted on  
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*Sumant in:-  
TKS 101/223.*

PHILIPS VALVO WORKS, HAMBURG.  
HAMMERWERKE (VALVE WORKS), MINDEN.  
C.H. MÜLLER A.G. (X-RAY TUBE FACTORY), HAMBURG

Reported by

W/Comdr. G.L. HUNT

CIOS Black List Item No. 1

Radar

Target Nos. 1/132(d), C-1/480 & 1/132(e)

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## 1. Introduction

The Philips Factories were visited in the following order:-

1. Hammerwerke, Minden.
2. Philips Valvo Works, Hamburg, including Studiengesellschaft, Stellingen and subsidiary factory at Horneburg.
3. C. H. Muller A.G., Hamburg.

The first plant was visited in the 20th August, 1945, and the second on August 22nd to 24th inclusive, and the last on the 25th August, 1945.

At Minden, the only technical representative who was interrogated was Mr. Gosen, a Dutchman, who was looking after the Philips' interest.

At Valvo Works at Hamburg, the principal personnel interrogated were P. Eitersberger (Acting Director in place of Dr. G. Jobst who had been suspended by Philips), G. Oertel, P. Gogl and O. Saalman, the last named acting as interpreter.

At C. H. Muller, Dr. Fehr and Mr. Weigel were interrogated.

## 2. Hammerwerke at Minden

### 2.1 General

A brief description of this target has already been given in CIOS Report "Electronic Valve (Tube) Factories, Helmbrechts and Minden" File No. XXIV - 26,27 and the examination made by this Mission was to some extent superficial, since it was expected that very similar plant would be seen at Hamburg.

Briefly, the Minden Factory is built inside a mountain some three or four miles south of Minden and provides about 95,000 square feet of floor space in the form of relatively narrow galleries divided over nine floors.

About 1,200 girls were employed in the factory, these girls being Jewish and the labour, forced labour. Operators worked twelve hours a day for seven days a week but the production figures never reached more than 1,000 valves per day and the factory was in operation only six weeks or so before the Allied occupation of Minden.

Only one type of valve was produced in any quantity, this being the RV 2,4 P700. The production of the RV 12 P2000 was also planned but never took place.

## 2.2 Equipment

The factory was adequately ventilated but very damp and all the equipment had rusted although it had been subsequently cleaned and oiled. Under instructions from the S.S. all tools had been removed from the machines and, in some cases, the equipment had been damaged and appeared to be considerably out of adjustment.

The factory was equipped with six pump units and the necessary assembly and finishing equipment to go with them. The component manufacturing equipment appeared to be capable of supplying many more parts than were likely to be required by the six units installed.

There was a large and very well equipped tool room containing some thirty-five to forty modern machine tools. For the production of a wide range of small parts made from wire and metal strip, there were roller feed and dial feed presses, a number of small vertical multi-slide presses and four large multi-slide presses. The principles on which these machines operated are well known but, in some cases, the design was novel. In addition to these power driven presses, there were many fly presses, foot presses and small hand presses.

Grid winding was carried out in a room containing twenty-three Philips' type Grid Lathes.

For glass working, there were single head hand operated machines for pressing button-stems and single head hand operated machines for tubulating bulbs. A number of 12 head Philips' type stem pinching machines were in the factory but had not been installed. In the assembly section, provision was made for about thirty operators per pump and welding plant had been assembled accordingly.

The sealing-in machines were of conventional type and were either of a 16 head type mounted alongside a 15 head pump or a 9 head pattern self-contained.

The pumps were of the 30 head type, all using mercury diffusion pumps which rotated with the table. The backing side of the pumps was connected to the vacuum system which went round the factory.

In the heater and cathode section of the factory, there were ball mills, annealing ovens, two extrusion machines and six spirallising machines. These last machines were of very good construction; four of them were of a 4 head type and two 6 head machines. In addition to these machines there were a number of hand operated re-entrant spiral machines.

For heater coating there was a spray booth and also two cathaphoresis tables. There was also a rotary machine for spraying cathodes and a number of rotary swaging machines and semi-automatic machines for welding the connectors to the ends of the cathodes.

In addition to the valve equipment described above, the factory contained complete equipment for the manufacture and drawing of molybdenum and tungsten wire from the powdered metal.

### 3. Philips Valvo Werke, G.m.b.H.

#### 3.1 General

The factory is situated at Hamburg-Lokstedt 1, Stresemannallee 101, and consists of two large two storey buildings together with a number of smaller buildings such as stores and mechanical workshops, and an administrative block, giving a total area of 32,000 square metres. The factory was twice bombed, once in July, 1943, and again in June, 1944, but the damage sustained in these raids had been completely repaired and the buildings were in good order. In addition to the main factory at Lokstedt, Philips had made use of the small leather factory situated in the village of Horneburg, some fifteen miles or so from Hamburg on the other side of the Elbe and a small assembly unit had been installed in the Hotel Zur Haake in the village of Hausbruck about half way between Hamburg and Horneburg. The main features of the factory organisation are shown in Appendix I.

#### 3.2 Types of Valve Manufactured

Until the middle of 1943, the manufacture of valves for domestic purposes continued on a diminishing scale. From 1939 the production of Wehrmacht valves grew, slowly at first and increasing more rapidly after 1943. The principal types of Wehrmacht valves which were made were:-

RV 2 P 800; RV 12 P 4000; RV 2,4 P 700; RV 12 P 2000;  
 RL 2 T 2; RL 12 T 2; RL 12 P 10; RL 12 T 15; RL 2 P 3;  
 RL 12 P 50; RL 12 P 35; LS 50; RK 12 SS 1; RK 12 SS 2:

#### 3.3 Factory Equipment

Most of the equipment in the factory was dismantled and disorganised. The factory had been visited a little while earlier by an R.A.F. Disarmament Section who had issued instructions that all Wehrmacht equipment was to be segregated for removal. The firm had interpreted this instruction to mean that they were to segregate all plant which had been used for the manufacture of Wehrmacht valve types with the result that most of the factory equipment was crowded together in considerable disorder in one part of the factory. Generally speaking, the equipment at Hamburg was the same or older than that at Minden. The equipment of greatest interest was as follows:-

### 3.3.1 Grid Lathes

The lathes at Hamburg were the same as those seen at Minden and are heavy machines about 11 ft. long, capable of producing strips of grids up to about 4ft. 6 in. long. The winding head which is quite massive can operate up to a speed of 600 rp.m. and carries a large hollow centre helix wire spool centrally, and in front of the nicking and swaging rollers. The support wires are pulled through the head from large spools at the end of the machine. The winding noses are of tungsten carbide and are reputed to last three or four months. The support wires are pulled by a carriage which is driven by a  $1\frac{1}{8}$ " diameter lead screw which is, in turn, driven by a train of gears from a back shaft which is itself driven by a train of gears from the head. A large cam on the tail end of the back shaft enables variable pitch, close end turns or open gap turns to be produced

### 3.3.2 Heater Spiraling Machines

A number of gapping spiraling machines of Bruckner manufacture were seen which were of two types, one for heavy wire coils and the other for light wire coils. These machines possessed novel features and were extremely well made. No machines of this type are in existence in the U.K. and arrangements were made for four of them to be removed from the factory and sent to Farnborough.

### 3.4 Organisation and Manufacturing Methods

Appendix I gives in tabular form, the annual production figures and number of employees and a graph is also given which shows the monthly production rates and number of employees for the last two years of the War. At first sight, the efficiency of production appears to have dropped away badly during the War but a number of factors must not be overlooked. The air raid in 1943 closed the factory down for two months and it was not until early in 1944 that the rate of production had been built up to its proper value again.

Shortly after this condition had been reached, the second air raid took place and, although its effect on production was not so serious as the first, it was not until the latter half of 1944 that the production rate reached its normal value once again. Although the direct effect of the air raids, in terms of building and equipment damage, was relatively small, the indirect effects were fairly serious. Supplies of gas, electricity and water were interrupted and there was a steady loss of labour due to damage to their homes and other reasons.

In 1943, the manufacture of valves for domestic purposes ceased and the Wehrmacht types, the production of which was stepped up, were certainly more difficult to make than the domestic types. It will be seen that in 1939 a very large proportion of the output was rectifier valves, i.e. types which were relatively simple to make.



The monthly average production in 1939 was round about 275,000 valves per month and the highest monthly average reached subsequently was about 280,000 valves per month early in 1945. Thus the same monthly output was achieved in spite of the difficulties due to air raids etc. and the manufacture of more complicated valves, with a labour force between two and three times as large.

The curve showing the average direct labour force shows a marked upward trend after the second air raid in 1944 and it is safe to assume that a fair proportion of the extra operators were comparatively unskilled. This was confirmed by the factory management who stated that on the Valve Type F700, which was made at a rate of up to 60,000 per month and was one of the two largest production types, it was necessary to use sixty assemblers and thirty-eight girls on subsequent operations up to and including test, to achieve a rate of 300 per hour pumped.

The rejection rate on this type was about 24% of which faults, due to air leaks caused by bad copper clad wire, accounted for a 10% shrinkage rate.

The operators were paid on the Beddoes System and, in normal times, there is a two years' general training for girl operators who are taken on at the age of fifteen. The girls who had been trained on this system were used as charge hands, etc. during the War.

### 3.5 Relations with German Government Departments

Philips Valvo Works, in common with all other German Radio Valve Factories, was part of an elaborate production organisation at the head of which was Speer. Under Speer the most important Committee dealing with Radio Equipment was the Hauptausschuss Elektrotechnik, the leader of this being Dr. Läschen of Siemens and Halske (now dead). Under this Committee, the spare parts position was dealt with by a ring known as the Sonderring, the Chairman of which was Dr. Leifer also of Siemens (also dead). Under the Sonderring there were other rings, one of which dealt with radio valves. This was the Rohrenring the Chairman of which was Dr. Mey of Telefunken. Dr. Zickermann also of Telefunken, was the Secretary of the Rohrenring. The main function of the valve ring was to decide the valve types which a factory should make. It did not specify the quantities which were required; the firm received instructions on this point from the appropriate Ministry. The ring was composed of industrial and Service people. Apart from the specified responsibility described above, the Rohrenring acted as a general intermediary between the Wehrmacht and Industry.

When firms were in need of specialists they made application to the Sonderring and this ring was also responsible for dealing with problems arising from the supply of material, machinery, power or personnel. Dr. Mey did not always agree with the rulings of Dr. Leifer of the Sonderring and Leifer gradually took upon himself many of the duties of the Rohrenring.

The three Wehrmacht parts, the Railways and the Post Office, were represented by General Fellgebel who was succeeded by General Theile. Both these officers were shot and the Service representation on the ring devolved upon a Colonel Grube of G.B.N. who started on a policy of restricting the number of valve types. A preferred list was worked out for future equipment development and was first published in the spring of 1943.

In the matter of specifications, the general situation seems to be rather confused. The Army had a set of specifications and they seem to have led the field in this respect but, about a year or two ago, the Luftwaffe, which had previously made use of the Army Specifications, decided to issue its own.

The Army specifications were supplied by the Heres Waffernamt, the Supply Organisation for the Army, whose representatives frequently visited Valvo. The Army Inspection Organisation resembled the A.I.D. in many respects. The Headquarters for the Hamburg production was in Hanover but an Inspector was located in Hamburg. This Inspector covered a number of factories of which Valvo was one. He did his checking in the valve stores and made use of a special factory test board. This inspection system was common throughout Germany.

The Philips' organisation was treated as a single entity when discussion took place at the Rohrenring and they had in their own organisation a distributing centre for valve orders. This was known as the Rohren Centrale and was in charge of a Dr. Hupman. The Rohren Centrale nominated the Philips' representative on the Rohrenring. The Rohren Centrale did not include the production activities of Eindhoven but included the Philips Factories at Hamburg, Vienna, Prague and Warsaw. At Vienna the output was 60 or 70% of that at Hamburg with the production centred on P800, P2000, a range of telegraph repeater valves and a range of valves for the German Welfare Set.

At Prague, civilian types formed the main part of the programme and the production was about 30% of that at Hamburg and at Warsaw, again, the types manufactured were mainly for civilian use and the production 20 to 25% of the Hamburg output.

#### 4. Studiengesellschaft for Electronen Gerät

This laboratory was situated at Vogt K8lln St. 30, Stellingen and covered the development and pre-production activities for the main valve works at Lockstedt. For certain types of valves, where the production requirement was very limited, all the valves required would be made in the laboratory. This applied to the small Argon filled AC.50 and the Helium filled BC.50. The EFF.51 was also being made in the small quantity at the laboratory.

When the supply of pressed glass bases from the Philips Glass Works at Weisswasser failed, due to the occupation of that part of Germany by the Russians, the laboratory attempted to develop the manufacture of equivalent bases from coarse glass powder. The intention was to melt this powder with the pins in position, in carbon moulds, using Eddy current heating.

The experiment was not very successful but, with the end of the War in sight, it was never carried to conclusion.

The plant in these laboratories was of an extremely good quality and considerable expense seems to have been incurred in equipping them. The buildings had twice been damaged by air raids but had been rebuilt and, when seen, were in very good order. From the technical point of view, none of the apparatus was of outstanding interest.

#### 5. C. H. Muller, A.G., Hamburg.

Dr. Ritz was formerly Director of this X-Ray Tube Factory but had been discharged by the British Military Government as being a prominent member of the Nazi Party. His place had been taken by a Dr. Fehr who answered all enquiries with the assistance of Weigel, the Works Manager.

Before the War, the factory operated with about 500 people producing X-Ray Tubes and high voltage and X-ray apparatus for Diagnostic and Therapy purposes. During the War, their production increased from 5,000 to 8,000 tubes and valves per year but no appreciable production of new types was undertaken. What new developments there were, centred chiefly in the production of a 160 kv Rotalix tube in hard glass with oil immersed operation and a 100 kv tube of similar characteristics, but this development accounted for only 10% of the total production.

In 1943, the firm started the development and manufacture of high voltage Generators for Nuclear Physics work. This apparatus provided up to  $1\frac{1}{2}$  to 2 million volts for cyclotrons and two or three of these had been delivered to various Universities. This side of Muller's work had already been investigated by U.S.A. and British experts.

From a valve point of view, there was not a great deal of interest in this target. The methods used for making large glass to metal seals was seen in operation and was interesting. The materials used are either chrome iron in conjunction with Osram 00 lead glass, Fernico in conjunction with Philips G40 glass, or silver with Osram 424 D glass.

Prior to filling, the edge of the Fernico is beaded with special "Fernico Wrapping Glass". When making the seals, a glass lathe of normal type is used. The chrome iron has no special treatment apart from degreasing and is brought up to a temperature estimated at 1,000°C. At this temperature, glass from a rod is run on the inside and outside of the edge to a length of 2 to 3 mms. and is made about .1 mm. thick. The edge of the chrome iron is then kept at about 700°C until the glass tube part is ready to be joined on. The joint is made, worked by moving backwards and forwards, and blown as required. The strain is then spread with a large fierce flame and the joint annealed with a big soft luminous flame. The process for making a joint about 2½" in diameter, which was observed, took about five minutes including setting up and annealing.

The factory was accommodated in a four storey building of modern design with approximately 70,000 sq.ft. of floor space. Next to it was the administrative building and the entire plant was completely undamaged.

On the instructions of the British Military Government, manufacture of X-Ray tubes and auxilliary apparatus had been recommenced in August, to relieve the acute shortage of this type of equipment which exists in Germany today.

#### 6. Documents etc. evacuated.

The following Documents were evacuated through normal Army channels.

##### A. From Minden

Works Chemist's Note book containing notes on filaments and cathode coating.

File containing standardising notices describing chemical processes.

B. From Hamburg.

Standardising notices giving manufacturing details on the following Wehrmacht valve types:-

RL12 P10, RL2 P3, P700, P2000, RV2 P800,  
RL2 T2, RL12 T15, RK12 SS1, RL12 P50, RL12 T2,  
LS50, RK12 SS2, RL12 P35, RV12 P4000.

Two files containing German Army Valve specifications.

The following general standardising notices relating to valve manufacturing processes.

VS.464 33.1

Recipe for use of Alumina powder for cataphoretic coating of heaters.

VS.464 34.0

Prescription for dissolving Moly core bifilar heaters.

R. 2-11-6

Barium and Strontium paste PK1 for cataphoretic coating.

R. 2-12-16

Preparation of Alundum paste for cataphoretic coating.

R. 2-12-14

Preparation of Barium Carbonate (with soda precipitation)

R. 2-11-10

Data on precipitation of triple carbonates.

VS.456 41.0

Preparation of Cataphoresis paste B11 for continuous coating of Tungsten wire.

VS.456 42.0

Preparation of concentrated solution for cataphoresis paste B11.

VS.456 43.0

Preparation of concentrated solution for cataphoresis paste W11.

VS.456 83.1 (Substitute for R 2-12-16)

Preparation of Alundum paste K1 for cataphoretic coating.

VS.457 34.0 (Substitute for R 2-13-14)

Process for silver plating.

VS.464 31.0

Equipment for testing continuous coating for coating diameter.

VS.464 32.0

Article on cataphoresis.

VS.456 38.0

Preparation of Triple Carbonate "Spritzpap" T1.

R 2-11-11 N11

Preparation of Triple Carbonate paste N11.

R 2-11-11

Preparation of Triple Carbonate paste.

VS.456 40.1

Manufacture of cataphoresis paste for continuous coating of W wire.

VS.456 87.4

Preparation of "Spritzpapp" VA4 for spiral heaters.

VS.476 32.0

Cleaning and annealing chrome iron pins.

List of suppliers of raw material etc.

List of places to which Philips Valvo Werke supplied valves.

Handbooks for the two types of Brückner spiralling machine being evacuated.

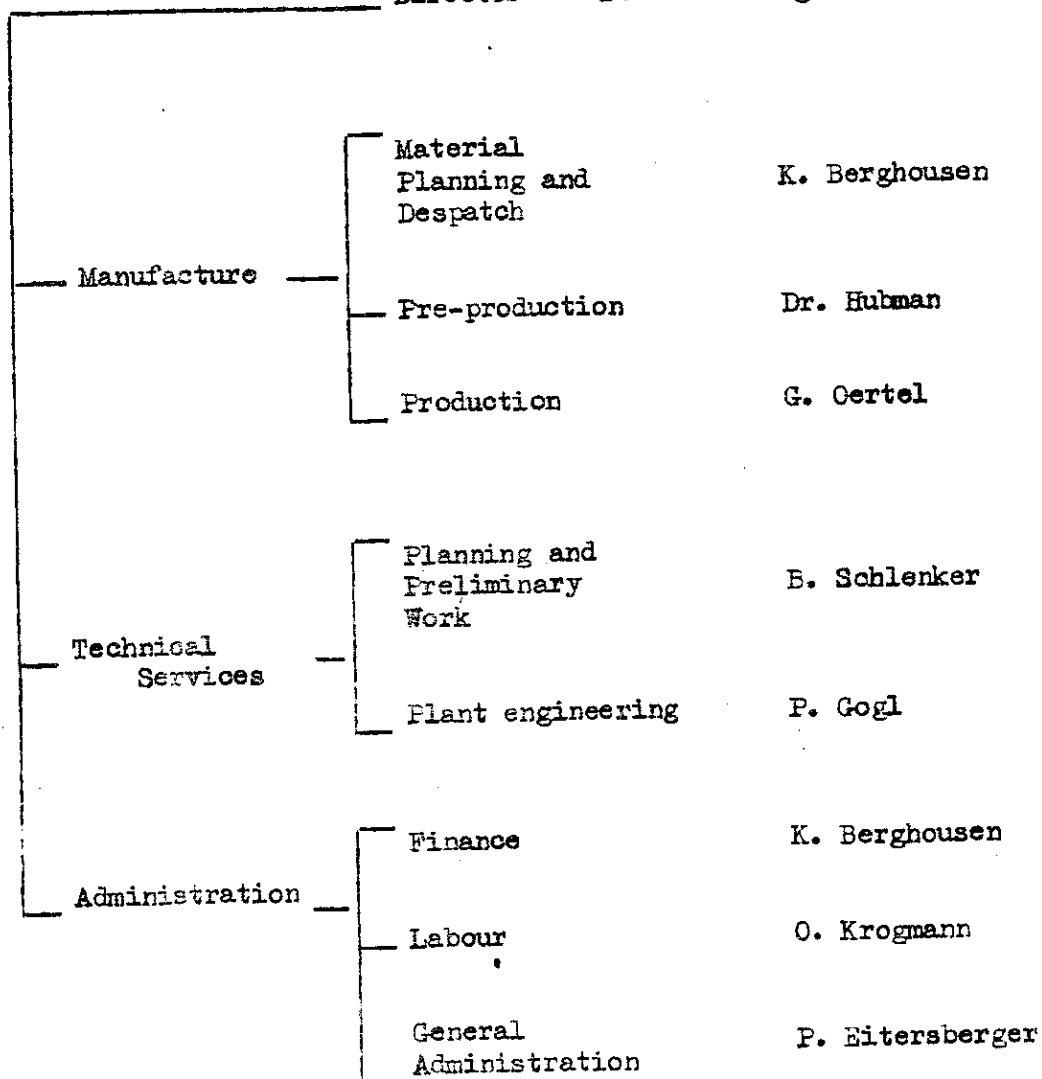
Miscellaneous papers dealing with the fabrication of pressed glass bases.

Drawings relating to head used in machine for pressing button stems.

APPENDIX I

## Organisation - Philips Valvo Werke, Hamburg

Director - P. Eitersberger.

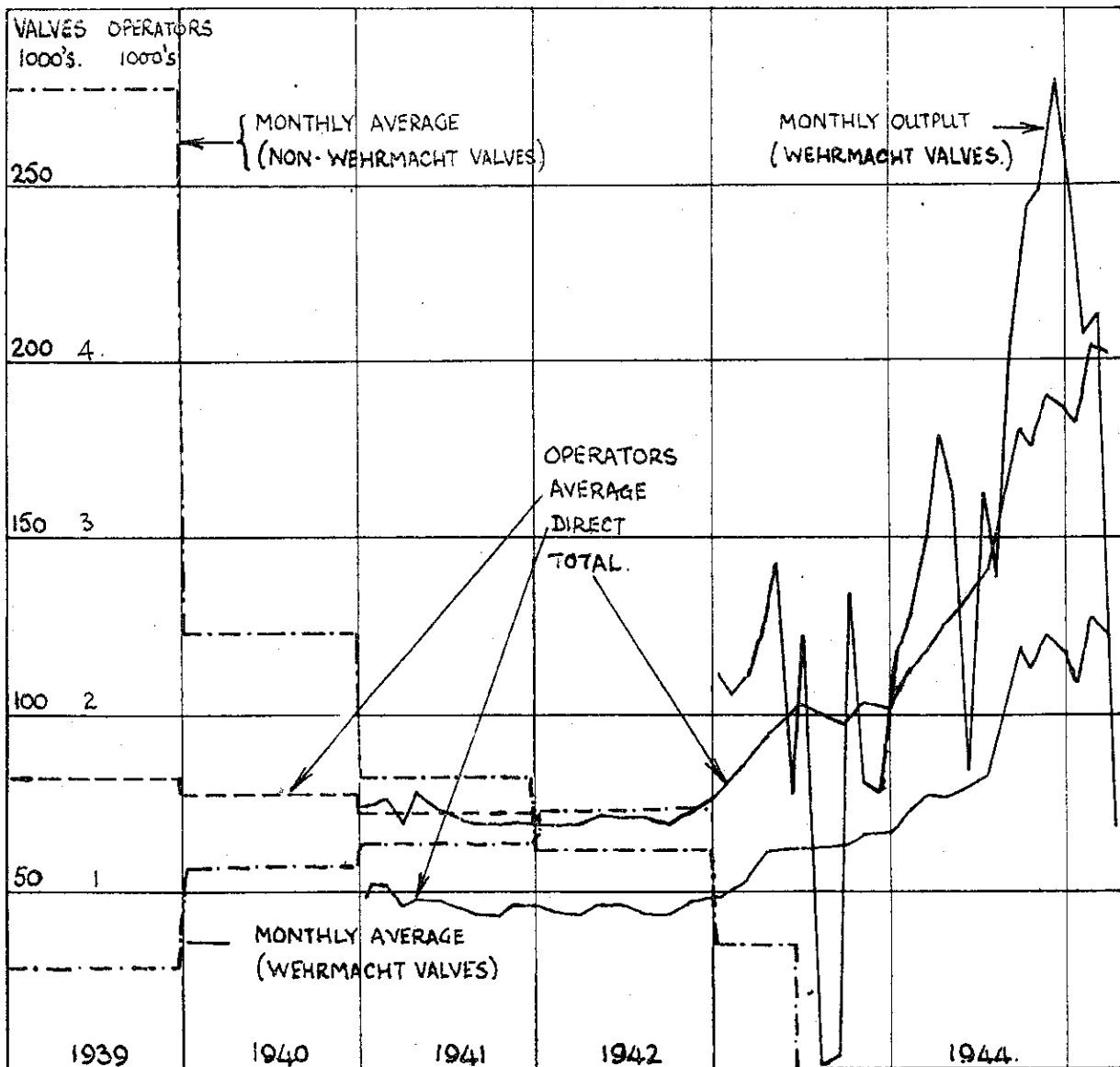




Philips Velvo Werke G.m.b.H., Hamburg.  
Annual Production 1939-1942

Year	Broadcast Valves		Cathode Ray Tubes	Amplifying Valves	Wehrmacht Types		Regulating and Stabilising Valves	Operators (average)
	Receiving	Rectified			Receiving	Transmitting		
1939	1,938,684	1,387,293	2,998	3,114	346,399	-	17,254	1,628
1940	1,037,038	449,850	4,829	5,412	673,036	-	11,295	1,544
1941	884,674	102,251	6,108	-	714,063	-	21,194	1,435
1942	651,866	87,133	14,207	-	812,352	40	30,267	1,409
1943	195,855	48,644	15,547	-	1,092,442	5,671	16,554	1,690
1944	-	-	19,459	-	2,116,498	32,020	7,846	2,608
* 1945			2,123	-	736,465	9,862	2,294	3,468

Production ceased in July.  
\* January - April.



Production - Labour Chart.