

An Overview of Enigma G's Wiring Data

Introduction

This is a new overview of the wiring data and existing knowledge of the Enigma G machines, also called Enigma G31. Similarly to the Enigma K, Enigma G was also developed as a commercial machine. It was mechanically a more complex machine than the Enigma K. The complete German description of Enigma G31 is *“Glühlampen-Chiffriermaschine mit Zählwerk und zwangsläufiger Walzen-Kupplung“*, which translates into English as: "Glow-lamp cipher machine with counter and driven rotor coupling." The driven rotor coupling, which was made possible because of the drive or transport system for the wheels being based on cog wheels, refers to the fact that the wheels and the counter could be driven any number of positions forward or backward in the ciphering cycle by the use of an external crank. This allowed for correcting errors or adding some text at previous locations without being forced to re-cipher everything from the beginning. It also opened the possibility of making illicit decipherment more difficult by moving the wheels forward in the ciphering cycle a predetermined number of steps after a given number of enciphered letters. Given the machine's multi-notched wheels, which resulted in a much more irregular wheel movement, the machine appeared to be more secure than the Enigma K.

The present overview is a new survey of the Enigma G machines, very similar to the compilation of Enigma G Wiring IDs prepared in 2019. That compilation, "Enigma G Wiring ID Notes" [Weierud 2019], tries to group the machines into their various wiring groups and to try to deduct from this the identity of the end user and his communication networks. The present overview is more serial number based, listing all the machines with known documentary references and presenting the most important data from these documents. To get a better overall view of these machines and their use it is helpful to also consult the "Enigma G Wiring ID Notes" compilation.

The main source for this data is the reference [TICOM 1945], the files from the Enigma firm Heimsoeth und Rinke (H&R). To try to identify the end users of some of the machines other TICOM documents mentioned in the reference section have been consulted. Furthermore, wheel wiring data from surviving machines in private and museum collections have been used to establish connections between machines, users and the wiring data given by H&R. This puzzle should be considered as ongoing research and new result will be offered if and when new data appears.

Known users and locations

- G 101 – G 124 — Hungary, (1931) (24)
- G 125 – G 127 — Germany, RKM/Chistelle, special wiring **U**, (02.10.1936) (3)
- G 131 – G 132 — Germany, RKM/Chistelle, special wiring **U**, (02.10.1936) (2)
 - G 131 — Germany, OKW/Chi, repair, (28.11.1940) (1)

- G 189 – G 194 — Germany, OKH/Wa B 7/VI b 3, (14.01.1938) (6)
 - G 209 — Germany, OKW/Ag WNV/Fu II b, rewire, (04.08.1943) (1)
 - G 222 – G 224 — Germany, I. G. Farben, special wiring **IGF**, (11.01.1939) (3)
- End users:
- 1) Stickstoff-Syndikat, Berlin, 1
 - 2) Firma H. Ahrens & Co. Nachf. (Owner Hermann Bosch) in Tokyo
 - 3) Deutsche Stickstoff-Handelsgesellschaft Krauch & Co. in Shanghai
- G 227 – G 228 — Germany, OKW/Ag WNV/Fu II b, special wiring **GD**, (10.07.1943) (2)
 - G 239 — Germany, OKW, Aussendienststelle Stahnsdorf, repair, (27.05.1941) (1)
 - G 242 — Germany, OKW, Aussendienststelle Stahnsdorf, repair, (05.12.1940) (1)
 - ## Contact person: Stabw. Blank or Uffz. Klapper.
 - G 245 — Germany, OKW, Aussendienststelle Stahnsdorf, repair, (17.10.1941) (1)
 - G 245 — Germany, OKW, Aussendienststelle Stahnsdorf, repair, (17.03.1942) (1)
 - G 251 — Germany, OKW, Aussendienststelle Stahnsdorf, repair, (27.05.1941) (1)
 - G 256 – G 257 — Germany, Reserved for OKH/In 7, (2)
 - G 256 - G 257 — Germany, I. G. Farben, special wiring **IGF**, (reported 29.01.1941, issued 1940) (2)
 - G 258 – G 297 — Germany, OKH/In 7, in storage at *Heeres Zeugamt* for future use (40)
 - G 259 — Germany, OKW, Aussendienststelle Stahnsdorf, repair, (27.05.1941) (1)
 - G 260 — Germany, OKW/Ag WNV/Fu II b, rewire to same wiring as G 209, (11.08.1943) (1)
 - G 263 — Germany, OKW/Ag WNV/Fu II b, repair, (11.03.1942) (1)
 - G 263 — Germany, OKW/Ag WNV/Fu II b, rewire to same wiring as G 209, (11.08.1943) (1)
 - G 264 – G265 — Germany, OKW/Ag WNV/Fu II b, rewire rotors to **WHS 14**, (12.06.1943) (2)
 - G 267 — Germany, OKW/Chi — Major Kaehler, rewired to special wiring **U**, (27.05.1941) (1)
 - G 269 – G 273 — Germany, OKW/Abwehr I i — Major Rasehorn, special wiring **GF** (27.05.1941) (5)
 - G 274 — Germany, OKW/Ag WNV/Fu II b, rewired to special wiring **GF**, (18.11.1943) (1)
 - G 276 – G 277 — Germany, General Stab des Heeres / Chef HNW, extra reserve wheels, (06.01.1941) (2)
 - G 279 — Germany, OKW/Ag WNV/Fu II b, rewired to special wiring **GF**, (23.09.1943) (1)
 - G 282 — Germany, OKW/Ag WNV/Fu II b, rewired to special wiring **GF**, (23.09.1943) (1)
 - G 282 — Returned to OKH/In 7 from Mil. Att. Sofia on 30.08.1943. See [6]
 - G 285 — Germany, OKW/Ag WNV/Fu II b, rewired to special wiring **GF**, (06.10.1943) (1)
 - G 285 — Returned to OKH/In 7 from Mil. Att. Istanbul on 15.09.1943. See [6]
 - G 286 — Germany, OKW/Ag WNV/Fu II b, rewired to special wiring **GF**, (03.11.1943) (1)
 - G 287 — Germany, OKW/Ag WNV/Fu II b, rewired to special wiring **GF**, (06.10.1943) (1)

- G 289 — Germany, OKW/Ag WNV/Fu II b, rewired to special wiring **GF**, (06.10.1943) (1)
 - G 289 — Returned to OKH/In 7 from Mil. Att. Lisbon on 17.09.1943. See [6]
- G 291 — Germany, OKW/Ag WNV/Fu II b, rewired to special wiring **GF**, (03.11.1943) (1)
- G 293 — Germany, OKW/Ag WNV/Fu II b, rewired to special wiring **GF**, (03.11.1943) (1)
- G 295 — Germany, OKW/Ag WNV/Fu II b, rewired to special wiring **GF**, (06.10.1943) (1)
- G 298 – G 303 — The Netherlands, *Departement van Defensie IVde Afdeeling A*, (09.05.1940) (6) ## Den Haag, commercial wiring
 - G 298 – G 299 — Germany, OKW/Stab WNV/Fu II, rewire to special wiring **GI**, (28.05.1941) (2)
 - G 298 — Germany, OKW/Stab WNV/Fu II, repair, (10.10.1941) (1)
- G 304 – G 403 — Germany, OKW, in storage at H&R for future use, (1940) (100)
 - G 308 – G 309 — Germany, OKW, Aussendienststelle Stahnsdorf, repair, (05.12.1940) (2) ## Contact person: Stabw. Blank or Uffz. Klapper.
 - G 324 — Germany, OKW/Chi — Major Kaehler, special wiring **GN**, (27.05.1941) (1)
 - G 325 – G 326 — Germany, OKW/Chi — Major Kaehler, extra wheels, wiring **WHS 10**, (27.05.1941) (2)
 - G 331 — Germany, OKW/Chi — Major Kaehler, special wiring **GN**, (27.05.1941) (1)
 - G 331 — Germany, OKW/Ag WNV/Fu II b, rewired to special wiring **GF**, (07.03.1944) (1)
 - G 332 – G 333 — Germany, OKW/Chi — Major Kaehler, special wiring **U**, (27.05.1941) (2)
 - G 334 – G 335 — Germany, OKW/Chi — Major Kaehler, special wiring **GA**, (27.05.1941) (2)
 - G 336 – G 345 — Germany, OKW/Abwehr I i — Major Rasehorn, special wiring **GF**, (27.05.1941) (10)
 - G 339 — Germany, OKW, Aussendienststelle Stahnsdorf, repair, (17.10.1941) (1)
 - G 341 — Germany, , German Embassy in Lisbon. See [1]
 - G 346 – G 355 — Germany, OKW/Stab WNV/Fu II, rewire UKW to **UKW 5**, (15.07.1941) (10)
 - G 356 – G 360 — Germany, OKW/Stab WNV/Fu II, rewire UKW to **UKW 4**, (15.07.1941) (5)
 - G 356 — Germany, OKW/Ag WNV/Fu II b, rewired to special wiring **GF**, (18.11.1943) (1)
 - G 361 – G 365 — Germany, OKW/Stab WNV/Fu II, rewire UKW to **UKW 2**, (15.07.1941) (5)
 - G 366 – G 380 — Germany, OKW/Stab WNV/Fu II, rewire UKW to **UKW 5**, (11.12.1941) (15)
 - G 381 — Germany, OKW/Ag WNV/Fu II b, rewire rotors to **WHS 14**, (12.06.1943) (1)
 - G 383 – G 384 — Germany, OKW/Ag WNV/Fu II b, rewire to special wiring **GO**, (27.07.1943) (2)
 - G 389 — Germany, OKW/Ag WNV/Fu II b, rewired to special wiring **GF**, (07.03.1944) (1)

- G 404 – G 406 — Germany, I. G. Farben, special wiring **IGF**, (reported 29.01.1941, issued 1940) (3)
- G 407 — Germany, I. G. Farben, special wiring **IGF**, (reported 19.02.1942, issued 1941) (1)
- G 417 – G 418 — Germany, OKW/Ag WNV/Fu II b, special wiring **GP**, (04.09.1943) (2)
- G 419 – G 426 — Germany, OKW/Ag WNV/Fu II b, special wiring **GF**, (23.09.1943) (8)

Wheel Wiring Drawings

Wiring	Wheel drawing	Date
Commercial	UKW: Ch 15 Tz 70, I – III: Ch 11 Tz 69 a – c	1927
U	UKW: Ch 15 Tz 115, I – III: Ch 15 Tz 114 a – c	13.08.1936
UKW 1	UKW: Ch 15 Tz 70	1927
UKW 2	UKW: Ch 15 Tz 115	14.07.1936
UKW 3	UKW: Ch 15 Tz 122	14.11.1938
UKW 4	UKW: Ch 15 Tz 126	19.06.1939
UKW 5	UKW: Ch 15 Tz 132	12.03.1940
WHS 1	I – III: Ch 15 Tz 118 a – c	19.01.1938
WHS 2	I – III: Ch 15 Tz 119 a – c	17.02.1938
IGF I–III	I – III: Ch 15 Tz 121 a – c	14.11.1938
WHS 3	I – III: Ch 15 Tz 123 a – c	1938
WHS 4	I – III: Ch 15 Tz 125 a – c	19.06.1939
WHS 5	I – III: Ch 15 Tz 128 a – c	21.08.1939
IGF IV–V	IV – V: Ch 15 Tz 130 a – b	Nov. 1939
WH I	I: Ch 15 Tz 131 a	12.03.1940
WHS 6	I – III: Ch 15 Tz 134 a – c	19.07.1940
WHS 7	I – III: Ch 15 Tz 135 a – c	19.07.1940
WHS 8	I – III: Ch 15 Tz 136 a – c	1940
WHS 9	I – III: Ch 15 Tz 160 a – c	24.10.1940
WHS 10	I – III: Ch 15 Tz 161 a – c	25.10.1940
WHS 11	I – III: Ch 15 Tz 162 a – c	30.10.1940
WHS 12	I – III: Ch 15 Tz 163 a – c	20.12.1940
WHS 13	I – III: Ch 15 Tz 164 a – c	1941
WHS 14	I – III: Ch 15 Tz 167 a – c	1943
WHS 15	I – III: Ch 15 Tz 168 a – c	1943
WHS 16	I – III: Ch 15 Tz 169 a – c	04.09.1943
GA	UKW: Ch 15 Tz 115, I – III: Ch 15 Tz 117 a – c	1938
GB	UKW: Ch 15 Tz 115, I – III: Ch 15 Tz 118 a – c	1938
GC	UKW: Ch 15 Tz 115, I – III: Ch 15 Tz 119 a – c	17.02.1938
IGF	UKW: Ch 15 Tz 122, I – III: Ch 15 Tz 121 a – c	14.11.1938

GD	UKW: Ch 15 Tz 115, I – III: Ch 15 Tz 123 a – c	1938
GE	UKW: Ch 15 Tz 126, I – III: Ch 15 Tz 128 a – c	23.08.1939
GF	UKW: Ch 15 Tz 132, I – III: Ch 15 Tz 131a, 125 b – c	03.04.1940
GG	UKW: Ch 15 Tz 115, I – III: Ch 15 Tz 134 a – c	08.08.1940
GH	UKW: Ch 15 Tz 115, I – III: Ch 15 Tz 135 a – c	19.08.1940
GI	UKW: Ch 15 Tz 126, I – III: Ch 15 Tz 136 a – c	1940
GJ	UKW: Ch 15 Tz 126, I – III: Ch 15 Tz 160 a – c	13.12.1940
GK	UKW: Ch 15 Tz 115, I – III: Ch 15 Tz 161 a – c	06.12.1940
GL	UKW: Ch 15 Tz 126, I – III: Ch 15 Tz 162 a – c	03.12.1940
GM	UKW: Ch 15 Tz 126, I – III: Ch 15 Tz 163 a – c	23.12.1940
GN	UKW: Ch 15 Tz 115, I – III: Ch 15 Tz 164 a – c	1941
GO	UKW: Ch 15 Tz 115, I – III: Ch 15 Tz 168 a – c	1943
GP	UKW: Ch 15 Tz 115, I – III: Ch 15 Tz 169 a – c	04.09.1943

Notes

1. The wheel I, Ch 15 Tz 131 a, and UKW, Ch 15 Tz 132, both created on 12 March 1940 are replacements for wheel I, Ch 15 Tz 125 a, and UKW, Ch 15 Tz 126, that originally must have been used in the machines with wiring **GF**. The original wiring data for these machines was created on 19 June 1939. The reason for this replacement is not known. Capture so early in the war is unlikely. It is more likely that the wiring drawings for these wheels went missing at the production firm Konski & Krüger for some time. This happened a few times during the war. Because UKW 4, Ch 15 Tz 126, continued to be used after this change it seems likely the situation was resolved after a short time.

References

1. OSS. 1945. OSS report HX-625. “Technical Survey of German Cryptographic Material” dated 12 October 1945. NARA, RG 226, Stack 250, Row 64, Compartment 32, Shelf 5, “Records of the OSS 1940–1946”, Box 45.
2. TICOM. 1945. Documents from the ENIGMA firm Heimsoeth & Rinke. Bestand Rückgabe TICOM, Politisches Archiv des Auswärtigen Amts. Berlin. Archive Signature: T 1715, T1716, T1717, and T1718.
3. TICOM. 1950. DF 190-AM: Enigma Machines in Foreign Countries. RG 457, Series P-4, File 5789, DF 190-AM. NARA, College Park, MD.
4. Kenyon, D. and Weierud, F. 2020. *Enigma G: The counter Enigma*, Cryptologia, Volume 44, Issue 5, pp. 385-420. [Author's Copy](#).
5. Weierud, F. 2019. *Enigma G Wiring ID Notes*. Crypto Cellar Research Web Publication.
6. OKH. 1943. Allgemeine Angelegenheiten der Wehrmacht und des Heeres, Band 3. RH 2/2943, pp. 366–499. Bundesarchiv, Freiburg.