GERMAN SHELL FUZES OF WORLD WAR II

SUMMARY OF NAVTECMISEU TECHNICAL REPORT #191-45 "STANDARD GERMAN PROJECTILE FUZES" (August 1945)

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GERMAN WWII ARMY FUZES

TYPE	NOMENCLATURE	MADE OF	DELAY	PROJECTILES	NOTES
NDF/MG	A.Z. 1531	Steel	None	13mm HE & HEI	Centrifugal arming.
	A.Z. 1532	Steel	None	Ditto	Ditto
	A.Z. 1551	Aluminum	None	15mm HE & HEI	Ditto
	A.Z. 1552	Steel	None	Ditto	Ditto
	A.Z. 1501	Steel	None	20mm HE & HEI	Ditto
	A.Z. 1502	Al. alloy	None	Ditto	Ditto
	A.Z. 1503	Steel	None	Ditto	Ditto
	A.Z. 1504	Aluminum	None	30mm HE & HEI	Ditto
	A.Z. 1528A	?	None	20mm Incendiary	Ditto
NDF/SD	Z.Z. 1505	Steel	None	20mm Incendiary 30mm Incendiary 2cmMauser HE	Centrifugal arming using steel balls that move outward. When air resistance slows down projectile spin, balls move back toward center and cause a spring to force firing pin into detonator for self-destruct.
	20mm Zerl.Z.	Steel	None	20mm Incendiary 30mm Incendiary	
BDF	Bd.Z. 1511	Steel	None	20mm APHE	
	Bd.Z. 1512	Steel	None	Ditto	
	Bd.Z. 1513	Steel	None	Ditto	
	Bd.Z. 1583	Steel	None	30mm APHE	
	Bd.Z. 1584	Steel	None	Ditto	
NDF/LAA	A.Z. 46	Steel	None	20mm HE & HEI	A.Z. 48 became standard fuze here, replacing 46, 47, and 49.
	A.Z. 47	Steel	None	Ditto	
	A.Z. 48	Steel	None	Ditto	
	A.Z. 49	Steel	None	Ditto	
	A.Z. 53	Steel	None	20mm Incendiary	
	A.Z. 5045	Steel	None	20mm HE & HEI	
	Kpf.Z.Zerl.Fg.	Steel	None	20mm Incendiary	German Navy uses.
	Kpf.Z.Zerl.P.	Steel	None	37mm Incendiary	German Navy uses.
	Kpf.Z.(16 or Zerl.Pv.)	Steel	None	Ditto	Obsolete in Army. German Navy uses.
	Kpf.Z.20	Steel	None	37mm HE & HEI	Replaces 16 in Army use.
	5cm Kpf.Z.Z.Zerl.P.	Steel	None	5cm HE & Incendiary	

GERMAN WWII ARMY FUZES (Continued)

TYPE	NOMENCLATURE	MADE OF	DELAY	PROJECTILES	NOTES
NDF/HE	A.Z. 23 m.z. (0.15)	Aluminum	0.15	7.5cm Spreng.Gr. 10.5cm Spreng.Gr.	Centrifugal bolt arming, with both a regular moving firing pin to hit the
	A.Z. 23 m.v. (0.25)	Aluminum	0.25	15cm Spreng.Gr. 10.5cm Spreng.Gr.	detonator plus a "graze" design where detonator moves to hit firing pin if a
	A.Z. 23 m.v. (0.15) Zn	Zinc	0.15	15cm Spreng.Gr. 10.5cm Spreng.Gr.	highly oblique hit occurs.
	A.Z. 23 m.v. (0.25) Zn	Zinc	0.25	15cm Spreng.Gr. 10.5cm Spreng.Gr.	Ditto
	A.Z. 23 m.v. (0.15) Pr.	Plastic	0.15	15cm Spreng.Gr. 10.5cm Spreng.Gr.	Ditto
	A.Z. 23 m.v. (0.25) Pr.	Plastic	0.25	15cm Spreng.Gr. 10.5cm Spreng.Gr.	Ditto
	A.Z. 23 m.v. (0.8)	Steel	0.8	21cm Spreng.Gr. 24cm Spreng.Gr.	Same as above A.Z. 23 fuzes as to arming and graze design.
	A.Z. 23 m.v. (0.15) umg.	Steel	0, 0.15	21cm Spreng.Gr. 24cm Spreng.Gr.	Same as above, but delay can also be set to either instantaneous (0) or 0.15 sec.
	A.Z. 23 umg. m. 2V	Steel	0, 0.2-0.8	21cm Spreng.Gr. 24cm Spreng.Gr.	Multiple, incremental delay settings from 0.2 to 0.8 sec or can be set to 0, but otherwise same as other A.Z. 23.
	A.Z. 23/28 m.v. (0.1)	Aluminum	0.1	8.8cm Spreng.Gr. 10.5cm Spreng.Gr. 12.5cm Spreng.Gr.	Same A.Z. 23 arming & graze design.
	A.Z. 23/28 m.v. (0.1) Zn	Zinc	0.1	8.8cm Spreng.Gr. 10.5cm Spreng.Gr. 12.5cm Spreng.Gr.	Same A.Z. 23 arming & graze design.
	A.Z. 23/28 m.v. (0.1) Pr.	Plastic	0.1	8.8cm Spreng.Gr. 10.5cm Spreng.Gr. 12.5cm Spreng.Gr.	Same A.Z. 23 arming & graze design.
	A.Z. 23/42 m.v. (0.15)	Aluminum	0.15	10.5cm Spreng.Gr.	Same A.Z. 23 arming & graze design, except spin rate to arm changed.
	A.Z. 23 m.v. (?) Geb.	Aluminum	?	8.8cm Spreng.Gr. 10.5cm Spreng.Gr. 12.5cm Spreng.Gr.	Same as A.Z. 23/28 in design, but delay time unknown.
	A.Z. 35 K m.v. (0.3).	Steel	0.3	17cm Spreng.Gr. 21cm Spreng.Gr. 24cm Spreng.Gr. 28cm Spreng.Gr.	Similar to A.Z. 23 in design, but adjusted for different projectile spin..
	A.Z. 5072	Aluminum	None	4.2cm Spreng.Gr.	Uses a steel ring around firing pin as only safety device prior to impact. Direct impact action.
	A.Z. 5075	Steel	None	3.7cm Stielgranate 41	Similar to A.Z. 5072.
	A.Z. 5080	Steel	None	3.7cm Stielgranate 41 & Incendiary	Ball bearing is released on firing and moves forward due to creep to allow firing pin to move on impact.
	A.Z. 5095/1	Steel	None	8.8cm Pz.Bu.Gr. (HEAT shell/rocket?)	Armed by centrifical force. Safety pin must be pulled to release arming spring.
	A.Z. 4331	Steel	None	28cm R.Gr. 4331 28cm R.Gr. 4341	Special rocket-assisted long-range HE projectiles. Fuze armed by rocket heat.
	A.Z. 38	Aluminum	None	7.5cm HEAT 7.62cm HEAT 8.8cm HEAT 10.5cm HEAT	Armed by centrifical force on brass segmented shutters released on firing.

GERMAN WWII ARMY FUZES (Continued)

TYPE	NOMENCLATURE	MADE OF	DELAY	PROJECTILES	NOTES
NDF/HE	A.Z. 38 St.	Steel	None	7.5cm HEAT 7.62cm HEAT 8.8cm HEAT 10.5cm HEAT	Same as the aluminum A.Z. 38.
	A.Z. 39	Aluminum	None	3.7cm Spreng.Gr. 5cm Spreng.Gr.	Not used by Flak (AAA) shells. Setback & centrifical arming.
	A.Z. 39 Zn	Zinc	None	3.7cm Spreng.Gr. 5cm Spreng.Gr.	Same as the aluminum A.Z. 39.
	lo.Igr.Z. 23 m.v. (0.15)	Steel	0.15	7.5cm lo. IG. 18 7.5cm lo. Geb. IG.	Similar to A.Z. 23 in design.
	s. Igr.Z. 23 m.v. (0.4)	Steel	0.4	15cm s. IG. 33 7.5cm lo. Geb. IG.	Similar to A.Z. 23 in design.
	A.Z. 1 m.v. (0.15)	Steel	0.15	7.5cm Spreng.Gr. 10.5cm Spreng.Gr. 24cm Spreng.Gr. 28cm Spreng.Gr.	Replaced all previous Z. 23 versions in all of these shells. (Note that it did not replace the s. lgr.Z. 23 fuze. in the 15cm s. IG. 33 shell.)
	A.Z. 1/1	Steel	0.15	7.5cm Spreng.Gr. 10.5cm Spreng.Gr. 15cm Spreng.Gr. 24cm Spreng.Gr. 28cm Spreng.Gr.	Rep1aced s. lgr.Z. 23 and the A.Z. 1 in all of these shells.
	kl.A.Z. 23 m.v. (0.15)	Aluminum	0.15	7.5cm HEAT 7.62cm HEAT	Same as A.Z. 23, but smaller size.
	kl.A.Z. 23 m.v. (0.15) Pr.	Plastic	0.15	10.5cm F.H.Gr.34 Kl.	Ditto
	kl.A.Z. 23 m.v. (0.15)umg	Aluminum	0.15	10.5cm F.H.Gr. 35	Ditto. Now obsolete.
	kl.A.Z. 23/1 m.v. (0.15)	Aluminum	0.15	Ditto.	Small A.Z. 23 with modified balance weight.. Replaced "umg" version.
	Hbgr.Z. 40 K.	Steel	0, 0.15	38cm 'Siegfried' Gr. 40.6cm 'Adolf Hitler'Gr.	Has a covering windscreen. Two delays (0 &.15 sec) possible. Coast defense.
	Hbgr.Z. 17/23	Steel	None	10cm Gr. 15 Hb. 15cm Hbgr. Hb.	Has a covering windscreen. Armed by centrifical force. Direct impact action.
	Hbgr.Z. 17/23 umg.	Steel	None	Ditto	Ditto
	A.Z.f.Hbgr.	Steel	None	Ditto.	Ditto

The following Nose Detonating Fuzes (NDF/HE) have version used in smoke ("Nebel") projectiles (indicated by "Nb.") and, in some cases, also regular HE ("Spreng.Gr.") or HEAT or Nebelwerfer rocket ("Nebel. r.") projectiles, as indicated below:

kl.A.Z. 23 Nb.	Aluminum	None	7.5cm Nb.Gr. 10.5cm Nb.Gr.	Same as A.Z. 23, above, but for smoke rocket projectiles usually.
kl.A.Z. 23 Nb. Pr.	Plastic	None	Ditto	Ditto
kl.A.Z. 40 Nb.	Aluminum	None	15cm Gr.38 Nb. 15cm HEAT	Armed by centrifical force. Direct impact action.
kl.A.Z. 40 Nb. Pr.	Plastic	None	Ditto	Ditto
A.Z. 23 Nb.	Aluminum	None	15cm Gr.19 Nb. .	Armed by centrifical force. Direct impact action. Has long wooden rod for hammer and manual safety pin.
s. Igr,Z. 23 Nb.	Aluminum	0.15	15cm Nb. Nabel. r. 15cm Spreng.Gr. 15cm s. IG. 33	Armed by centrifical force. Direct impact action.
Hbgr.Z. 35 K.	Steel	0, 0.2	17cm K.Hb. 28cm K. 34	Has a covering windscreen. Two delays (0 and 0.2 sec) possible.
Hbgr.Z. 35 K. (modified)	Aluminum	0, 0.15	21cm Nabel. r.	Ditto, but alum. & w/0.15 sec vice 0.2
Hbgr.Z. 35/3 K.	Steel	0, 0.15	21cm K. 18	Ditto, but w/0.15 sec delay vice 0.2

GERMAN WWII ARMY FUZES (Continued)

TYPE	NOMENCLATURE	MADE OF	DELAY	PROJECTILES	NOTES
BDF	Bd.Z. 5103	Steel	None	3.7cm Pak. Spreng.Gr. 5cm Pak. Spreng.Gr. 7.5cm Pak. Spreng.Gr.	Obsolete
	Bd.Z. 5103"	Steel	None	Ditto	Slightly modified Bd.Z. 5103.
	Bd.Z. 5103/1	Steel	None	7.5cm Pak. Spreng.Gr. 8.8cm Pak. Spreng.Gr.	Final version of Bd.Z. 5103 in these two shells.
	Bd.Z. 5127	Steel	None	8.8cm Spreng.Gr. 12.8cm Flak. Spreng.Gr.	Replaced Bd.Z. 5103 in 8.8cm shells. Two steel balls held by collar stop firing pin motion. On impact, collar moves forward, balls now move outward by centrifical force, and firing pin hits detonator.
	Bd.Z. 5121	Steel	None	3.7cm Pak. Spreng.Gr. 5cm Pak. Spreng.Gr. 7.5cm Pak. Spreng.Gr. 12.8cm Pak. Spreng.Gr.	Replaces Bd.Z. 5103 in all of these shells. Armed by centrifical force.
	Bd.Z.f. 7.5cm Psgr.	Steel	None	7.5cm Psgr.	Armed when centrifical force overcomes spring holding set of interlocked brass shutters, which rotate outward one at a time to allow firing pin to move into detonator on impact.
	Bd.Z.f. 8.8cm Psgr.	Steel	None	8.8cm Psgr	Ditto
	Bd.Z.f. 10cm Psgr.	Steel	None	10cm Psgr. 10.5cm Psgr.	Ditto
	Bd.Z.f. 15cm Gr. 19 Be.	Steel	0.001-0.003	15cm Gr. 19 Be.	Ditto, but using a thin aluminum disk in front of firing pin to cause a slight variable delay.
	Bd.Z.f. 21cm Gr. 16 Be.	Steel	Ditto	21cm Gr. 19 Be. 35cm Gr. Be. 42cm K. Gr.	Ditto of 15cm Gr. 19 Be.
	Bd.Z.f.Sprgr.m.N.	Steel	Ditto	24cm Spreng.Gr 28cm Spreng.Gr.	Ditto of 15cm Gr. 19 Be.
	Bd.Z. 35 K.	Steel	None	24cm Gr. 35 28cm Gr. 35 & 35(Zi)	Ditto of 7.5cm Psgr., except that the detonator moves to hit fixed firing pin.
	Bd.Z. 40 K.	Steel	None	38cm "Sigfried" Gr. 40.6cm "Adolf Hitler"Gr.	Ditto of 35 K
	Bd.Z. D.O.V.	Steel	None	15cm Gr. 41 Spreng. 15cm Gr.w Wh.und Hb.	Ditto of 35 K
	Bd.Z. D.O.V.Pr.	Plastic	None	Ditto.	Ditto of D.O.V., but made of plastic.
	Bd.Z.f. 5130	Steel	None	3.7cm Stielgranate 41	Armed when setback moves a spring-loaded plate away from a steel ball, which can now move outward due to centrifical force and get out of the way of the firing pin, so that pin is free to to move into detonator on impact.
	Bd.Z. 5137	Steel	None	3.7cm Spreng.Gr. 4.7cm Spreng.Gr. 5cm Spreng.Gr.	Armed by centrifical force.
	Bd.Z. 5141	Steel	?	Large-cal. Spreng.Gr.	Armed by centrifical force. Used in anti-fortification artillery projectiles for breaching concrete walls and roofs.

GERMAN WWII ARMY FUZES (Continued)

TYPE	NOMENCLATURE	MADE OF	DELAY	PROJECTILES	NOTES
TNF	Zt.Z. S/30	Aluminum	Max 30	8.8cm Flak. Spreng.Gr. 10.5cm Flak. Spreng.Gr. 12.8cm Flak. Spreng.Gr.	Obsolete
	Zt.Z. S/30Pg.	Aluminum	Max 30	Ditto.	Has no main spring; uses centrifical force and angular momentum to run internal clock.
	Zt.Z. S/60 L.A.	Aluminum	Max 60	Many Star Shells.	
	Zt.Z. S/30^2	Aluminum	Max 30	Same as Zt.Z. S/30	Replaces previous Zt.Z. S/30 versions.
	Zt.Z. S/5	Aluminum	Max 5		Obviously, for short range shooting.
	Dopp.Z. S/60s.	Aluminum	Max 60	10cm Gr. 19 15cm Gr. 18 15cm Gr. 19	Similar to Zt.Z. S/30.
	Dopp.Z. S/60Pg.	Aluminum	Max 60	Ditto	Obsolete
	Dopp.Z. S/60v.	Aluminum	Max 60	Ditto	Similar to Dopp.Z. S/60Pg. w/mods.
	Dopp.Z. S/60 Geb.	Aluminum	Max 60	7.5cm Spreng.Gr. 7.5cm Gr. 41 Spreng.	Similar to Zt.Z. S/30. Similar to Zt.Z. S/60s.
	Dopp.Z. S/90F.	Steel	Max 90	17cm Spreng.Gr. 21cm Spreng.Gr.	Similar to Zt.Z. S/60s.
	Dopp.Z. S/90/45	Steel	Max 45	15cm Spreng.Gr. 17cm Spreng.Gr. 24cm Spreng.Gr.	Zt.Z. S/90 reduced to 45 sec max time.
	Dopp.Z. S/45-125	Steel	45-125	Large-cal. Spreng.Gr.	Zt.Z. S/90 changed to 45-125 sec only.
	Dopp.Z. 16 m.K.	Steel	Max 16	Small-cal. Spreng.Gr.	Armed and run by centrifical force.
	Dopp.Z. 16 m.F.	Steel	Max 16	Ditto	Ditto
	Dopp.Z. S/125-200	Steel	125-200	Large-cal. Spreng.Gr.	Zt.Z. S/45-125 changed to 125-200 sec.
	Dopp.Z. 28 K	Steel	Max 28	21cm K.Gr. 34 28cm Gr. 39	Has spring-loaded slide covering flash hole opened by centrifical force, which allows a direct flash path to detonator from primer when time runs out.
	Dopp.Z. 45 K	Steel	Max 45	28cm K.Gr. 35 38cm Gr. 40 40.6cm Gr. 40	Ditto
	Dopp.Z. 100 K	Steel	Max 100	21cm K.Gr. 35 28cm Gr. 39	Ditto

GERMAN WWII NAVY PROJECTILE FUZE TYPES

All base fuzes ("Bd.Z.") listed here for the German Navy work the same way: The firing pin is fixed and the primer weight can slide into it on impact when an interlocked ring of shutters is released by a setback pin on firing and move outward, one-at-a-time, until the path between firing pin and primer is clear--the black-powder delay element, if any, is between the primer and the detonator/booster combination. Preshaped, felt- and paper-wrapped blocks of TNT was the usual filler in AP and other anti-ship projectiles and the booster remained picric acid, to my knowledge, which is not quite powerful enough to be reliable with that insensitive filler (Britain and U.S. base fuzes switched to the much more powerful booster explosive tetryl (British "Composition Explosive" or "CE") with good results in the late 1920's, while the U.S. Army did so in 1918). All base and inner fuzes act on inertia, not direct impact on the firing pin due to a nose plunger hitting the target. Therefore, there is usually a minimum of about 0.003-second delay even when the fuze has a delay of "None" so the shell can penetrate at least a portion of its body through before detonating (possibly completely through the plate, if the projectile is small and the plate is proportionally thin). NOTE: In some cases, the base fuze indicated here is not the original base fuze used when the projectile was first issued--this is especially true with pre-WWI base-fuzed projectiles, but also true for some projectiles given here (at the end of WWII) that use multiple optional delay settings, since the original fuzes issued for them at or before the start of WWII may not have had such settings (these older fuzes may still be listed here for other shells).

Nose fuzes ("K.Z.") for impact use ("A.Z." or just "K.Z.") had a plunger rod sticking out of the tip that directly pushed the detonator and firing pin together. Most of these fuzes also had a "graze" unit to force the firing pin and primer holder together using inertia. In this design, arming released BOTH the firing pin and the primer holder to move toward one-another, with them being held apart by a strong spring during flight. On regular impact, the firing pin is pushed backward into the primer by the nose rod, but on a highly oblique impact, the primer, which is "floating" on the other end of that spring, can move forward onto the motionless firing pin, just as in a base fuze. Note that the use of variable-delay base fuzes in projectiles which also use nose fuzes ("Spgr.m.Bdz.u.Kz.") implies that a solid nose plug can be optionally used in place of the nose fuze, if the delay action is desired (otherwise, it would never be reliable, since even a "safed" impact nose fuze is subject to detonation when hitting a solid object, especially any kind of metal plate). The "Hbgr.Z." nose impact fuze is used with projectiles with long, pointed windscreens to improve range. It has a long wooden rod sticking up from the upper end of the fuze and reaching to the tip of the hollow windscreen, so that it directly pushes the firing pin into the primer on windscreen impact (most German nose impact fuzes use this principle, but in them the rod is short, made of wood or metal, and is usually entirely within the upper end of the fuze body or sticking only a little way beyond it). The Hbgr.Z. can have an optional short delay set in and was used in one kind of extra-light-weight, ultra-high-velocity, super-long-range 38cm and 40.6cm nose-and-base-fuzed HE Coast Defense gun shell. When set to delay, the target must be a very lightly constructed to keep the shell from exploding on impact against the steel plate hit. The delay would help in causing more damage due to underwater blast from near misses, but this effect is quite small from gun projectiles.

"Inner" fuzes ("I.Z.") are very similar to base fuzes but located in the upper end of the projectile where they were not subject to direct impact with the target (under a solid steel nose plug, I assume). They allow some light armor penetration using a large-cavity HE shell that normally uses a nose fuze, reducing the kinds of projectiles in the magazine (the explosives are usually loaded in through the front of the projectile in projectiles with only an I.Z., which completely unscrews to allow it and the inner fuze to be inserted). Inner fuzes were only used in a few German & Japanese Common projectiles, to my knowledge--U.S. Navy HC shells used steel nose plugs and their base fuzes for this purpose with the nose fuze removed. See Note above on BdZ. fuzes for minimum delay possible. The I.Z. was probably a later idea for use with an existing 38cm nose-fuzed and base-fuzed HE shell, since in projectiles with base fuzes usually will not get the base fuze to work if an standard impact or time nose fuze is present, even when set to "safe" when hitting all but the lightest-constructed targets, as the nose fuze would get crushed and set off the filler anyway. A solid nose plug to replace the I.Z. would probably also be available for delay-action base fuze operation.

Time nose fuzes ("Zt.Z." or "Z.Z.") gave their maximum time setting as "S/TIME" in seconds. A few fuzes also had a minimum time setting given as "S/TMIN-TMAX". They all used mechanical (clockwork run by centrifical and spinning forces) means to measure the time, based on the spin rate. I am not sure how they handled the gradual slowing down of the spin rate in large projectiles being fired at very long ranges. Perhaps the setting marks on the fuze were not linear.

Double-action ("Dopp.Z.") nose fuzes were both time and impact fuzes. A time fuze has a good chance of going off if the projectile hits something solid like a moderately-thick steel plate as it is crushed, but without a special impact feature inside it, the fuze will not be perfectly reliable even then and will definitely not be reliable if it hits soft targets, like sheet metal, earth, sand or water. Thus, the double-action fuze was specifically developed in case the projectile hits the target prior to the time running out. U.S. AA Common shells in some cases used a separate base fuze for this purpose, but it was not nearly as sensitive as a nose fuze and sometimes would not go off against the very light metal (including aluminum) or even wood used in WWII aircraft bodies. These German fuzes also used a graze feature in most cases, as described in "K.Z.", above.

GERMAN WWII NAVY FUZES

NOMENCLATURE	MADE OF	DELAY	PROJECTILES	NOTES
			40.6cm	
Bd.Z. 38 KV	Steel	0.015	Psgr.m.K. L/4,4 (m.Hb.) Spgr.m.Bdz. L/4,6* (m.Hb.) Spgr.m.Bdz.u.Kz. L/4,1 (m.Hb.) Spgr.m.Bdz.u.Kz. L/4,2 (m.Hb.)	Note short delay. Used in shells now relegated to Coast Defense for 40.6cm "Adolf Hitler" Battery--The light L/4,2 shell was called "Adolf Granat."
Hbgr.Z. 40 K	Steel	0,0.015	Spgr.m.Bdz.u.Kz. L/4,2 (m.Hb.)	Direct action at windscreen impact plus graze feature. Has 0 or 0.015-sec delay. Implies nose fuze can be replaced by a solid nose plug for Bd.Z. function.
K.Z. 27 (Lm)	Al. alloy	None	Spgr.m.Bdz.u.Kz. L/4,1 (m.Hb.) Spgr.m.Kz. L/4,8 (m.Hb.)	L/4,1 fuze has a heavier arming spring. Direct impact action plus graze feature. Steel nose plug needed to replace fuze for Bd.Z. use.
Z.Z. S/60 nA	Steel	None	Spgr.m.Bdz.u.Kz. L/4,1 (m.Hb.) Spgr.m.Kz. L/4,8 (m.Hb.)	
Dopp.Z. 45 K	Steel	Max. 45	Spgr.m.Bdz.u.Kz. L/4,2 (m.Hb)	(See German Army fuzes for details.)
Dopp.Z. S/90 K	Steel	Max. 90	Ditto	Ditto
			38cm	
Bd.Z. 38	Steel	0.035	Psgr.m.K. L/4,4 (m.Hb.) Spgr.m.Bdz.u.K. L/4,6* (m.Hb.) Spgr.m.Bdz.u.Kz. L/4,4 (m.Hb.)	Originally "C/38" for BISMARCK and. all later projected German battleships. Used in Coast Defense shells for 38cm "Sigfried" Battery.
Bd.Z. 40 K	Steel	0.015(?)	Spgr.m.Bdz.u.Kz. L/4,5 (m.Hb.)	Implies K.Z. could be replaced by a solid steel nose plug; as otherwise Bd.Z. would rarely get a chance to function. This light shell called “Sigfried Granat.”
I.Z 40 K	Steel	0**	Spgr,m,Bdz.u.Kz. L/4,4 (m,Hb.)	This fuze must replace other K.Z. or Z.Z. types, as it is a nose-mounted fuze, too. To allow Bd.Z. to function, all of these fuzes must be replaced by a solid steel nose plug. Only I.Z. for guns over 2cm.
Hbgr.Z. 40 K	Steel	0, 0.015	Spgr.m.Bdz.u.Kz. L/4,5 (m.Hb.)	See 40.6cm gun, above, for details.
K.Z. 27 (Lm)	Al. alloy	None	Spgr.m.Bdz.u.Kz. L/4,4 (m.Hb.) Spgr.m.Kz. L/4,6 (m.Hb.) Ub.Gr.m Kz. L/4,5 (m.Hb.)	See 40.6cm gun, above, for details.
K.Z. 27 (St)	Steel	None	Spgr.m.Bdz.u.Kz. L/4,4 (m.Hb.)	This variant has a heavier arming spring.
Z.Z. S/60 nA	Steel	None	Spgr.m.Bdz.u.Kz. L/4,4 (m.Hb.) Spgr.m.Kz. L/4,6 (m.Hb.) Ub.Gr.m.Kz. L/4,5 (m.Hb.)	
Dopp.Z. 45 K	Aluminum	Max. 45	Spgr.m.Bdz.u.Kz. L/4,5 (m.Hb)	(See German Army fuzes for details.)
Dopp.Z. S/90 K	Aluminum	Max. 90	Ditto	Ditto

*The 38cm Spgr.m.Bdz L/4,6 used with BISMACK and TIRPITZ had a thin, but complete, AP cap to allow intact penetration into heavy cruisers or battle-cruisers, which had relatively thin face-hardened armor. I am assuming the Coast Defense version of this projectile retained this modified AP cap design, but I cannot be sure. A 20.3cm Spgr. L/4,7 for railway guns similar.
**See Bd.Z. discussion about circa 0.003-second minimum delay with inertially-activated fuzes, which the I.Z. is.

GERMAN WWII NAVY FUZES (Continued)

NOMENCLATURE	MADE OF	DELAY	PROJECTILES	NOTES
			30.5cm	
Bd.Z. 38 KV	Steel	0.015	Psgr.m.K. L/4,9 (m.Hb.) Psgr.m.K. L/3,4(pre-WWI)(Bdib. S) Spgr.m.Bdz L/5 (m.Hb.) Spgr.m.Bdz.u.Kz. L/3,6 (m.Hb.)	Note short delay. Heavier material than used in the 40.6cm size. For Coast Defense batteries. Not original fuze in the pre-WWI shell.
Bd.Z. 38	Steel	0.035	Psgr.m.K. L/4,4 (m.Hb.) Spgr.m.Bdz L/5 (m.Hb.) Spgr.m.Bdz.u.Kz. L/3,4 (m.Hb.)	Heavier material than used in 38cm size. Designed for projected battle-cruisers and used in Coast Defense batteries.
Bd.Z. 36 KV	Steel	0.015	Spgr.m.K. L/3,4 Spgr.m.Bdz L/3,8 Ub.Gr.m.Bdz. L/3,4	Note short delay. Designed for projected. battle-cruisers and used in Coast Defense batteries.
K.Z. 27 (St)	Steel	None	Spgr.m.Bdz.u.Kz. L/3,6 (m.Hb.) Spgr.m.Bdz.u.Kz. L/3,4 (m.Hb.) Spgr.m Kz. L/4,8 (m.Hb.)	Direct impact action plus graze feature.
Z.Z. S/60 nA	Steel	None	Spgr.m.Bdz.u.Kz. L/3,6 (m.Hb.) Spgr.m.Bdz.u.Kz. L/3,4 (m.Hb.) Spgr.m Kz. L/4,8 (m.Hb.)	

GERMAN WWII NAVY FUZES (Continued)

NOMENCLATURE	MADE OF	DELAY	PROJECTILES	NOTES
			28cm (actually 28.3cm)	
Bd.Z. 38 eV	Steel	0, 0.015, or 0.035*	Psgr.m.K. L/3,7 (m.Hb.) Spgr.m.Bdz.L/4,5 (m.Hb.) Spgr.m.Bdz L/4,2 (m.Hb.)	Can be set for 0 delay or for a delay of either 0.015 or 0.035 second.
Bd.Z. 36	Steel	0.035	Psgr.m.K. L/2,6 (pre-WWI shell) Spgr.m.Bdz L/2,9 (pre-WWI shell) Spgr.m.Bdz. L/4,3 (m.Hb.) Ub.Gr.m.Bdz. L/2,6 (pre-WWI shell)	Not original fuze in the pre-WWI shells. . Only L/4,3 is a post-WWI projectile.
Bd.Z. 36 KV	Steel**	0.035	Psgr.m.K. L/4,4 (m.Hb.) Psgr.m.K. L/3,2 (pre-WWI shell) Spgr.m.Bdz L/3,6	A guess for SCHARNHORST guns. Not original fuze in the pre-WWI shells.
		0.015	Ub.Gr.m.Bdz. L/2,6 (pre-WWI shell)	Short delay version of Bd.Z. 36 KV.
Bd.Z. 36 SF	Steel**	0.015	Ub.Gr.m.Bdz. L/3,2	Short delay version of Bd.Z. 36 SF.
Note the rather long base fuze delays used in many of the base-fuzed HE shells (in most Spgr.m.Bdz. & in Ub.Gr.m.Bdz. L/2,6).				
K.Z. 27 (St)	Steel***	None	Spgr.m.Bdz.u.Kz. L/4,1 (m.Hb.) Spgr.m.Bdz.u.Kz. L/4,2 (m.Hb.) Spgr.m Kz. L/4,1 (m.Hb.) Spgr.m Kz. L/4,2 (m.Hb.) Spgr.m Kz. L/4,4 (m.Hb.) Ub.Gr.m.Kz. L/4 (m/Hb.)	Direct impact action plus graze feature. Ub.Gr.m.Kz. L/4 also uses a variant with a heavier arming spring.
Z.Z. S/60 nA	Steel	None	Spgr.m.Bdz.u.Kz. L/4,1 (m.Hb.) Spgr.m.Bdz.u.Kz. L/4,2 (m.Hb.) Spgr.m Kz. L/4,1 (m.Hb.) Spgr.m Kz. L/4,2 (m.Hb.) Spgr.m Kz. L/4,4 (m.Hb.) Ub.Gr.m.Kz. L/4 (m.Hb.)	
			24cm	
Bd.Z. 38 eV	Steel	0, 0.015, or 0.035*	Spgr.m.Bdz.u.Kz. L/4,2 (m.Hb.)	Can be set for 0 delay or for a delay of either 0.015 or 0.035 second.
Bd.Z. 36 eV	Steel	0, 0.015, or 0.035*	Psgr.m.K. L/2,6 (pre-WWI shell) Spgr.m.Bdz. L/4,1 (m.Hb.) Ub.Gr.m.Bdz. L/2,6 (pre-WWI shell)	Can be set for 0 delay or for a delay of either 0.015 or 0.035 second. Not original fuze used in pre-WWI shells.
Bd.Z. 36 SF	Steel**	0.035	Spgr.m.Bdz L/4,1	Long delay version of Bd.Z.36 SF.
K.Z. 27 (St)	Steel***	None	Spgr.m.Bdz.u.Kz. L/4,2 (m.Hb.)	Direct impact action plus graze feature.
Z.Z. S/60 nA	Steel	None	Spgr.m.Bdz.u.Kz. L/4,2 (m.Hb.)	

*See Bd.Z. discussion about circa 0.003-second minimum delay with inertially-activated fuzes.
**Heavier construction than Bd.Z. 36 fuzes used in the projectiles over 28.3cm.
***Modified material from steel used in K.Z. 27 steel fuzes for projectiles over 28.3cm.

GERMAN WWII NAVY FUZES (Continued)

NOMENCLATURE	MADE OF	DELAY	PROJECTILES	NOTES
			21cm	
Bd.Z. 38 eV	Steel	0, 0.015, or 0.035*	Spgr.m.Bdz.u.Kz. L/4,3 (m.Hb.)	Can be set for 0 delay or for a delay of either 0.015 or 0.035 second.
Bd.Z. 36 eV	Steel	0, 0.015, or 0.035*	Psgr.m.K. L/2,9 (pre-WWI shell) Spgr.m.Bdz.u.Kz L/4,3 (m.Hb.) Ub.Gr.m.Bdz. L/2,9 (pre-WWI shell)	Can be set for 0 delay or for a delay of either 0.015 or 0.035 second. Not original fuze used in pre-WWI shells.
K.Z. 27 (Lm)	Al. alloy	None	Spgr.m.Bdz.u.Kz. L/4,3 (m.Hb.)	Direct impact action plus graze feature. Has heavier arming spring than K.Z. 27 versions usually used by shells over 21cm.
Z.Z. S/60 nA	Steel	None	Spgr.m.Bdz.u.Kz. L/4,3 (m.Hb.)	
			20.3cm	
Bd.Z. 38 eV	Steel	0, 0.015, or 0.035*	Psgr.m.K. L/4,4 (m.Hb.) Spgr.m.Bdz.u.K. L/4,7 (m.Hb.)	Can be set for 0 delay or for a delay of either 0.015 or 0.035 second. "u.K." shell had a light AP cap, a rounded nose, a magnesium-aluminum alloy windscreen, and was used by German railway guns.
Bd.Z. 38 KV	Steel	0.015	Spgr.m.Bdz. L/4,7 (m.Hb.)	Naval projectile with hood ("gründring") and aluminum alloy windscreen.
K.Z. 27 (Lm)	Al. alloy	None	Spgr.m.Kz. L/4,7 (m.Hb.) Spgr.m.Kz. L/4,7 Br. (m.Hb.) Ub.Gr.m.Kz. L/4,6 (m.Hb.)	Direct impact action plus graze feature. Has heavier arming spring than K.Z. 27 versions usually used by shells over 21cm.
Z.Z. S/60 nA	Steel	Max 60	Spgr.m.Kz. L/4,7 (m.Hb.) Spgr.m.Kz. L/4,7 Br. (m.Hb.) Ub.Gr.m.Kz. L/4,6 (m.Hb.)	
Z.Z. S/60 nA	Steel**	Max 60	Lg. L/4,5	Star Shell
			17cm (actually 17.4cm)	
Bd.Z. 36 eV	Steel	0, 0.015, or 0.035*	Psgr.m.K. L/3 (pre-WWI shell)	Can be set for 0 delay or for a delay of either 0.015 or 0.035 second. Not original fuze used in pre-WWI shells.
K.Z. 27 (St)	Steel***	None	Spgr.m.Kz. L/4,6 (m.Hb.)	Direct impact action plus graze feature. Has heavier arming spring than K.Z. 27 versions used in shells larger than 21cm.
K.Z. nA für Spgr. (St.)	Steel	None	Spgr.m.Kz. L/3,3	Direct impact action plus graze feature. New version of K.Z. 27 nose fuze.
Z.Z. S/60 nA	Steel	Max 60	Spgr.m.K. L/4,6 (m.Hb.)	
Z.Z. S/60 nA	Steel**	Max 60	Spgr.m.Kz. L/3,3	
Zt.Z. S/5-W****	Steel	Max 5(?)	Lg. L/3,7	Star Shell.

*See Bd.Z. discussion about circa 0.003-second minimum delay with inertially-activated fuzes.
**Heavier construction than Z.Z. S/60 nA fuzes used in the projectiles over 28.3cm.
***Modified material from steel used in K.Z. 27 steel fuzes for projectiles over 28.3cm.
****Fuze was specified "Not for star shells", but this obviously only was for the regular version. There must have been a modified type (different booster, probably) for star shells.

GERMAN WWII NAVY FUZES (Continued)

NOMENCLATURE	MADE OF	DELAY	PROJECTILES		NOTES
			15cm		
Bd.Z. 36 eV	Steel	0, 0.015,	Spgr.m.Bdz. L/4,1		Can be set for 0 delay or for a delay
		or 0.035*	Spgr.m.Bdz. L/3	(pre-WWI shell)	of either 0.015 or 0.035 second.
					Not original fuze used in pre-WWI shells.
Bd.Z. 38 eV	Steel	0, 0.015,	Psgr.m.K. L/3,7	(m.Hb.)	Can be set for 0 delay or for a delay
		or 0.035*	Psgr.m.K. L/3,8	(m.Hb.)	of either 0.015 or 0.035 second.
			Psgr.m.K. L/4,6 (in test)	(m.Hb.)	
			Spgr.m.Bdz.. L/4,3	(m.Hb.)	
			Spgr.m.Bdz. L/4,52	(m.Hb.)	
K.Z. 27 (St)	Steel**	None	Spgr.m.Kz. L/4,5	(m.Hb.)	Direct impact action plus graze feature.
			Spgr.m.Kz. L/4,5 Br.	(m.Hb.)	Has heavier arming spring than K.Z. 27
			Spgr.m.Kz. L/4,6	(m.Hb.)	versions used in shells larger than 21cm.
			Spgr.m.Kz. L/4,6 Br.	(m.Hb.)	
K.Z. 28 (Lm)	Al. alloy	None	Spgr.m.Kz. L/4,7		Direct impact action plus graze feature.
					Minor variation of K.Z. 27 nose fuze.
K.Z. nA für Spgr. (St.)	Steel	None	Spgr.m.Kz. L/4,1		Direct impact action plus graze feature.
			Spgr.m.Kz. L/3,6		New version of K.Z. 27 nose fuze.
			Ub.Gr.m.Kz. L/4		
Z.Z. S/60 nA	Steel	Max 60	Spgr.m.K. L/4,5	(m.Hb.)	
			Spgr.m.Kz. L/4,5 Br.	(m.Hb.)	
			Spgr.m.Kz. L/4,6	(m.Hb.)	
			Spgr.m.Kz. L/4,6 Br.	(m.Hb.)	
Zt.Z. S/45	Steel	Max 45	Spgr.m.Kz. L/4,7		
Zt.Z. S/30	Al. alloy	Max 30	Spgr.m.Kz. L/4,7		
Zt.Z. S/5-W***	Steel	Max 5(?)	Spgr.m.Kz. L/4,6	(m.Hb.)	Windscreen unscrews to set fuze.
			Spgr.m.Kz. L/4,5 .	(m.Hb.)	Ditto
			Spgr.m.Kz. L/4,3		
			Spgr.m.Kz. L/3,6		
			Lg. L/4,3		Star Shell.
			Ub.Gr.m.Kz. L/4		
Lg.Zdr. S/33	Steel	Max 33	Lg. L/4,3		Obsolete star shell only fuze.
E. Dopp.Z. S/30 Fg	Steel	Max 30	Spgr.m.Kz. L/4,7		Sensitive impact action. Original version.
E. Dopp.Z. S/30 Fg1	Steel	Max 30	Spgr.m.Kz. L/4,7		Ditto. Modified version of fuze.
Dopp.Z. S/60v	Steel	Max. 60	Gr. 15 Nb.		Smoke shells.
			Gr. 19 Nb.		(See German Army fuzes for details)

*See Bd.Z. discussion about circa 0.003-second minimum delay with inertially-activated fuzes.

**Modified material from steel used in K.Z. 27 steel fuzes for projectiles over 28.3cm.

***Fuze was specified "Not for star shells", but this obviously only was for the regular version. There must have been a modified type (different booster, probably) for star shells.

GERMAN WWII NAVY FUZES (Continued)

NOMENCLATURE	MADE OF	DELAY	PROJECTILES		NOTES
			12.8cm		
Bd.Z. 1521	Steel	None*	Psgr. 43		(See German Army fuzes for details.)
K.Z. 28 (Lm)	Al. alloy	None	Spgr.m.Kz. L/4,5 Spgr. (H)		Direct impact action plus graze feature. Minor variation of K.Z. 27 nose fuze.
K.Z. 28-L-	Steel	None	Spgr.m.Kz. L/5		Ditto. Elongated for streamlining.
Zt.Z. S/45	Steel	Max 45	Spgr.m.Kz. L/4,5 Spgr. (H)		
Zt.Z. S/45-L	Zinc	Max 45	Spgr.m.Kz. L/5		Elongated for streamlining.
Zt.Z. S/30 Ausf. A	Al. alloy	Max 30	Spgr.m.Kz. L/4,5		Original version of Zt.Z. S/30 fuze.
E. Dopp.Z. S/30 Fg	Steel	Max 30	Spgr.m.Kz. L/4,5		Sensitive impact action. Original version.
E. Dopp.Z. S/30 Fg1	Steel	Max 30	Spgr.m.Kz. L/4,5		Ditto. Modified version of fuze.
			12.7cm		
Bd.Z. 36 eV (KV)	Steel**	0, 0.015, or 0.035*	Spgr.m.Bdz. L/4	(m.Hb.)	Can be set for 0 delay or for a delay of either 0.015 or 0.035 second.
K.Z. 27 (St)	Steel***	None	Spgr.m.Kz. L/4,4	(m.Hb.)	Direct impact action plus graze feature. Has heavier arming spring than K.Z. 27 versions used in shells larger than 21cm.
Kl.A..Z. 23 Nb.	Aluminum	None	Nb. Gr. L/4		Smoke shell. (See German Army fuzes for details.)
Zt.Z. S/5-W****	Steel	Max 5(?)	Spgr.m.Kz. L/4,4 Lg. L/4,5		Star Shell.
Z.Z. S/60 nA	Steel	Max 60	Spgr.m.Kz. L/4,4		
			12cm		
Zt.Z. S/45	Steel	Max 45	Spgr.m.Kz. (H) Lg. L/4,6		Star Shell.
E. Dopp.Z. S/30 Fg	Steel	Max 30	Spgr.m.Kz. (H)		Sensitive impact action. Original version.
E. Dopp.Z. S/30 Fg1	Steel	Max 30	Spgr.m.Kz. (H)		Ditto. Modified version of fuze.

*See Bd.Z. discussion about circa 0.003-second minimum delay with inertially-activated fuzes.
**Heavier construction than Bd.Z. 36 fuzes used in the projectiles over 28.3cm.
***Modified material from steel used in K.Z. 27 steel fuzes for projectiles over 28.3cm.
****Fuze was specified "Not for star shells", but this obviously only was for the regular version. There must have been a modified type (different booster, probably) for star shells.

GERMAN WWII NAVY FUZES (Continued)

NOMENCLATURE	MADE OF	DELAY	PROJECTILES	NOTES
			10.5cm	
Bdz. für 10cm Psgr.	Steel	None*	Psgr. Fl.	(See German Army fuzes for details.)
Bd.Z. 36 eV	Steel	0, 0.015, or 0.035*	Spgr.m.Bdz. (Thin-walled)	Can be set for 0 delay or for a delay of either 0.015 or 0.035 second.
K.Z. 28 P	Plastic	None	Spgr.m.Kz. L/4,1 Spgr.m.Kz. L/4,1 Pr. Spgr.m.Kz. L/4,4 Spgr.m.Kz. L/4,4 Stg. Spgr.m.Kz. L/4,4 Pr. Spgr.m.Kz. L/4,4 Pr. zugs. Flak. Spgr.m.Kz. L/4,4 Br.	Direct impact action plus graze feature. Minor variation of K.Z.27 nose fuze.
K.Z. nA für Spgr. (St)	Steel	None	Spgr.m.Kz. L/3,6	Direct impact action plus graze feature. Minor variation of K.Z. 27 nose fuze.
Kl.A..Z. 23 Nb.	Aluminum	None	Nb. Gr. L/4	Smoke shell. (See German Army fuzes for details.)
Zt.Z. S/5	Steel	Max 5	Spgr.m.Kz. L/4,4 Spgr.m.Kz. L/4,4 Stg. Spgr.m.Kz. L/4,4 Pr. Spgr.m.Kz. L/4,4 Pr. zugs. Flak. Spgr.m.Kz. L/4,4 Br.	
Zt.Z. S/30 Ausf. B1	Al. alloy	Max 30	Spgr.m.Kz. L/4,1 Spgr.m.Kz. L/4,4 Spgr.m.Kz. L/4,4 Stg. Spgr.m.Kz. L/4,4 Pr. zugs.	Modified version of Zt.Z. S/30 fuze.
Zt.Z. S/30 Ausf. C	Al. alloy	Max 30	Spgr.m.Kz. L/4,4	Further modification of Zt.Z. S/30 fuze.
Zt.Z. S/30 Ausf. C1	Steel	Max 30	Spgr.m.Kz. L/4,4 Spgr.m.Kz. L/4,4 Stg. (cast steel) Spgr.m.Kz. L/4,4 Pr. zugs.	Further modification of Zt.Z. S/30 fuze.
Zt.Z. S/30 Ausf. D	Zinc	Max 30	Flak. Spgr.m.Kz. L/4,4 Br.	Further modification of Zt.Z. S/30 fuze.
Zt.Z. S/5-W**	Steel	Max 5(?)	Spgr.m.Kz. L/3,6	
			Lg. L/4	Star Shell.
			Lg. L/4,1	Star Shell.
			Lg. L/4 ,2	Star Shell.
Lg.Zdr. S/33	Steel	Max 33	Lg. L/4 Lg. L/4,1 Lg. L/4 ,2	Obsolete star shell only fuze.

*See Bd.Z. discussion about circa 0.003-second minimum delay with inertially-activated fuzes.

**Fuze was specified "Not for star shells", but this obviously only was for the regular version. There must have been a modified type (different booster, probably) for star shells.

GERMAN WWII NAVY FUZES (Continued)

NOMENCLATURE	MADE OF	DELAY	PROJECTILES	NOTES
			8.8cm	
Bdz. für 8.8cm Psgr.	Steel	None*	Psgr. (original AP shell for Flak. 18)	(See German Army fuzes for details.)
Bd.Z. 5103/1	Steel	None*	Psgr. 39	Ditto
Bd.Z. 5127	Steel	None*	Psgr. 39	Ditto. Obsolete.
Bd.Z. 39a	Steel	None*	Spgr.m.Bdz. (Thin-walled)	
K.Z. 28 P	Plastic	None	Spgr.m.Kz. L/4,5 Spgr.m.Kz. L/4,5 Pr. Spgr.m.Kz. L/4,5 Stg. Spgr.m.Kz. L/4,4 Pr. zugs.	Direct impact action plus graze feature. Minor variation of K.Z.27 nose fuze.
K.Z. 36	Al alloy	None	Spgr.m.Kz. L/2,6 (?) Ub.Spgr. L/2.6 (?)	Direct impact action plus graze feature. Originally called "K.Z. C/36." A steel version also was used.
Kl.A..Z. 23 Nb.	Aluminum	None	Nb. Gr. L/4	Smoke shell. (See German Army fuzes for details.)
Zt.Z. S/5	Steel	Max 5	Spgr.m.Kz. L/4,5 Spgr.m.Kz. L/4,5 Stg. Spgr.m.Kz. L/4,5 Pr. zugs.	
Zt.Z.S/30 Ausf. D	Zinc	Max 30	Spgr.m.Kz. L/4,5	Modified version of Zt.Z. S/30 fuze.
Zt.Z.S/30 Ausf. D1	Steel	Max 30	Spgr.m.Kz. L/4,5 Stg.	Further modification of Zt.Z. S/30 fuze.
Zt.Z.S/30 Ausf. E	Steel	Max 30	Spgr.m.Kz. L/4,5 Pr. zugs.	Further modification of Zt.Z. S/30 fuze.
Zt.Z.S/30 Fg1.	Al. alloy	Max 30	Spgr.m.Kz. L/4,5	Further modification of Zt.Z. S/30 fuze.
Zt.Z.S/30 Fg1.Ausf.A1	Al. alloy	Max 30	Spgr.m.Kz. L/4,5	Further modification of Zt.Z. S/30 fuze.
Zt.Z. S/5-W**	Steel	Max 5(?)	Lg. L/4,4	Star Shell.
Lg.Zdr. S/33	Steel	Max 33	Lg. L/4,4	Obsolete star shell only fuze.

*See Bd.Z. discussion about circa 0.003-second minimum delay with inertially-activated fuzes.

**Fuze was specified "Not for star shells", but this obviously only was for the regular version. There must have been a modified type (different booster, probably) for star shells.

GERMAN WWII NAVY FUZES (Continued)

NOMENCLATURE	MADE OF	DELAY	PROJECTILES	NOTES
			7.5cm	
Bdz. 5103	Steel	None*	Psgr. 39	(See German Army fuzes for details.)
Bd.Z. 39	Steel	None*	Spgr.m.Bdz. (Thin-walled)	
K.Z. 41(H)	Steel	None	Spgr..(H)	Direct action without a graze feature.
Pbr.Z.41(H) Ausf. A	Steel	None	Spgr..(H)	Original form of Pbr.Z.41(H) impact fuze.
Pbr.Z.41(H) Ausf. B	Steel	None	Spgr..(H)	Modified version of Pbr.Z.41(H) fuze.
Pbr.Z.41(H) Ausf. C	Steel	None	Spgr..(H)	Further modification of Pbr.Z.41(H) fuze.
Zt..Z. Fr. 5 (Tavaro)	Steel	Max 5	Spgr..(H)	
Zt.Z. S/5-W**	Steel	Max 5(?)	Lg. L/4,5	Star Shell.
Zt.Z. S/5	Steel	Max 5	Spgr.m.Kz. L/4,6 Spgr.m.Kz. L/4,7 Spgr.m.Kz. L/4,8	
Zt.Z.S/30 Fg1Ausf.A1	Al. alloy	Max 30	Spgr.m.Kz. L/4,6	Modified version of Zt.Z. S/30 fuze.
Zt.Z.S/30 Fg1Ausf.B	Zinc	Max 30	Spgr.m.Kz. L/4,7 Spgr.m.Kz. L/4,8	Further modification of Zt.Z. S/30 fuze.
Zt.Z.S/30 Fg1Ausf.B1	Al. alloy	Max 30	K.Gr, rot. (red tracer)	Further modification of Zt.Z. S/30 fuze.
			6cm	
K.Z. für 6cm	Steel	None	Spgr.m.Kz. L/3,4	Direct action . (Graze feature?)
			5cm	
K.Z. für 5cm (St.)	Steel	None	Spgr.m.Kz. L/3,3	Direct action . (Graze feature?) Equipped for tracer ("L'Spur"). Previous versions made of Al. alloy and pure Aluminum now obsolete.
			4cm	
Bd.Z. 42a	Steel	None*	Psgr. L'Spur. Zerl.	Includes self-destroying element ("Zerl.") at tracer ("L'Spur") burnout.
Bd.Z. für 4cm	Steel	None*	Psgr. L'Spur. Zerl.	Ditto. Obsolete.
K.Z. 40 (St.)	Steel	None	Spgr. L/2,8 Lh. Spgr. L/4,4 Lh. 106/8	Direct action without graze feature. Self-destroying powder time element, which also releases locking pin that holds centrifical detent to allow fuze to arm.
K.Z. 40 LB	Steel***	None	Spgr. L/2,8 Lh Spgr. L/4,4 Lh. 106/8	Ditto. Obsolete
K.Z. 40 BP	Steel-Plastic	None	Spgr. L/2,8 Lh Spgr. L/4,4 Lh. 106/8	Ditto. Obsolete.
K.Z. für 4cm	Steel	None	Spgr, L/2,8 Lh. Spgr. L/4,4 Lh. 106/8	Ditto. Obsolete.

*See Bd.Z. discussion about circa 0.003-second minimum delay with inertially-activated fuzes.

**Fuze was specified "Not for star shells", but this obviously only was for the regular version. There must have been a modified type (different booster, probably) for star shells.

***Modified form of steel were used in the FB and BP versions. Only the original Aluminum alloy (Lm) version and another Steel-Zinc version, both used for 3.7cm projectiles, was still used other than the (St.) version for the 4cm Bofors gun.

GERMAN WWII NAVY FUZES (Continued)

NOMENCLATURE	MADE OF	DELAY	PROJECTILES	NOTES
			3.7cm	
Bd.Z. 5103	Steel	None*	Psgr. 18 (original 37mm APHE shell)	(See German Army fuzes for details.)
Bd.Z. 42a	Steel	None*	Spgr. L'Spur. Zerl.	Includes self-destroying element ("Zerl.") at tracer ("L'Spur") burnout.
Bd.Z. für 3,7cm	Steel	None*	Spgr. L'Spur. Zerl.	Ditto. Obsolete.
K.Z. 40 (Lm.)	Al. alloy	None	Spgr. L/4,1 Lh. 37 Spgr. L/4,5 Lh. 146/4	Direct action without graze feature. Self-destroying powder time element, which also releases locking pin that holds centrifical detent to allow fuze to arm.
K.Z. 40 (St.-Zn.)	Steel-Zinc	None	Spgr. L/4,1 Lh. 37	Ditto. Modified version of K.Z. 40.
K.Z. 32 (St.)	Steel	None	Ub.Gr. L/2,5	Direct action without graze feature. Originally "C/32". Obsolete.
K.Z. für 3,7cm	Steel	None	Ub.Gr. L/2,5	Direct action without graze feature. Obsolete.
K.Z. für 3,7cm C/30	Steel	None	Ub.Gr. L/2,5	Ditto. Obsolete.
Zerl.Z. 20 K	Al. alloy	None	Spgr. 18 Spgr. 18 L'Spur. Br. Spgr. 18 Br. Spgr. v.K. L'Spur.	Direct action without graze feature. Self-destroying powder time element, which also releases locking pin that holds centrifical detent to allow fuze to arm.
3,7cm Kpf.Z. Zerl. Pv. Ausf. A	Al. alloy	None	Spgr. 18 Br. Spgr. 18	(See German Army fuzes for details.) Obsolete. Original version of fuze.
3,7cm Kpf.Z. Zerl. Pv. Ausf. B	Steel	None	Br. Spgr. v.K. L'Spur.	Ditto. Modified version of fuze.
3,7cm Kpf.Z. Zerl. Pv. Ausf. C	Steel/Zinc	None	Br. Spgr. v.K. L'Spur.	Ditto. Further modification of fuze.
			2cm	
I.Z. 43	Al. alloy	None	Psgr. L'Spur. Zerl. Psgr. L'Spur. Zerl. (Oerl.) Psgr. L'Spur. Zerl. (Mds.)	Includes self-destroying element ("Zerl.") at tracer ("L'Spur") burnout. Centrifically armed. Prior to this fuze, no fuze was used with 2cm AP shells.
A.Z. 48	Steel	None	Spgr. L'Spur. W Br. Spgr. L'Spur. Spgr. L'Spur. (Oerl.) Br. Spgr. L'Spur. (Oerl.) Spgr. L'Spur. (Mds) Br. Spgr. L'Spur. (Mds)	Includes self-destroying element ("Zerl.") at tracer ("L'Spur") burnout. Replaces all A.Z. fuzes below. (See German Army fuzes for details.)
A.Z. 49	Al. alloy	None	Ditto.	(See German Army fuzes for details.)
A.Z. 50	Al. alloy	None	Ditto.	Ditto. New fuze being developed.
A.Z. 46	Steel	None	Ditto.	Ditto.
A.Z. 5045	Al. alloy	None	Ditto.	Ditto.
2cm Kpf.Z. 1502 F	Al. alloy	None	Ditto.	Ditto.
2cm Kpf.Z. 45	Al. alloy-Zn	None	Spgr. L'Spur. (Oerl.) Br. Spgr. L'Spur. (Oerl.) Spgr. L'Spur. (Mds) Br. Spgr. L'Spur. (Mds)	Mechanical self-destruct that is held by centrifical force until friction slows down the spin and lets a spring push the firing pin into the primer.
2cm Kpf.Z. Zerl. Fg.	Al. alloy	None	Br. Spgr. o.L'Spur. Br. Spgr. v.K. L'Spur. Spgr. o.L'Spur. (Oerl.) Br. Spgr. o.L'Spur. (Mds)	Ditto.

*See Bd.Z. discussion about circa 0.003-second minimum delay with inertially-activated fuzes.

GERMAN WWII NAVY FUZES (Continued)

NOMENCLATURE	MADE OF	DELAY	PROJECTILES	NOTES
			15mm	
A.Z. 1551	Aluminum	None	Spgr. L'Spur. (Lu)	(See German Army fuzes for details.)
A.Z. 1552	Steel	None	Br. Spgr. L'Spur. (Lu)	Ditto
15mm K.Z. 39	Steel	None	Spgr. L'Spur. (Bruna) Br. Spgr. L'Spur. (Bruna)	
			13mm	
A.Z. 1531	Aluminum	None	Br. Spgr. L'Spur.	(See German Army fuzes for details.)
A.Z. 1532	Steel	None	Spgr. L'Spur.	Ditto

NOTE:

A number of fuzes exist which had no known shell using them. Most were variations of existing fuzes listed above, possibly to fix some small defect or because wartime shortages required a different material for part of the fuze body or mechanism.

GLOSSARY

Zt.Z. or Z.Z.	Time Fuze (powder train or, in most German WWII fuzes, clockwork)
Bd.Z.	Base Fuze (always impact design using internal inertia to set off fuze)
K.Z. or Kpf.Z.	Nose Fuze (impact or time or both)
A.Z.	Impact Fuze (nose hammer rod and, usually, inertial "graze" design)
I.Z.	Inner Fuze (located at top of cavity, but acts like a base fuze on impact)
Dopp.Z.	Dual Impact/Time Nose Fuze (has base-fuze-type inertial detonator added)
K.Gr.	Cannon Projectile (any kind, but usually with an explosive filler)
Spgr.	H.E. Projectile (either nose, base, inner, or both nose and base fuze used)
Psgr. or Pzgr.	Armor-Piercing Projectile (any kind, though only explosive type has fuze)
Ub.Gr.	Practice Projectile (inert or small explosive filler--obsolete shells used)
Lg.	Star Shell (has time fuze and a parachute flare)
Nb.	Smoke Projectile (also used for H.E. rocket fuzes--"Nebelwerfer roket")
m.K.	With AP Cap (German Navy terminology)
m.Haub or m.Hb. or Hbgr.	With Windscreen (if nose fuze, with long hammer rod to windscreen tip)
Br. or Pbr.	Incendiary Filler Added (usually white phosphorus--"P"--to an H.E shell)
L'Spur.	Tracer (base plug w/bright, short-lived flare; may be self-destruct element)
Rot.	Red Tracer
Zerl.	Self-Destruct Added (has maximum range where shell detonates if no hit)
S/XX	Time Fuze Maximum Value = XX Seconds
XX or C/XX	Designed/Introduced in Year 1NXX ("N" = 8 or 9 (user assumed to know))
L/X,Y	Length of Projectile in X.Y Calibers (German Navy shell ID terminology)
Ausf. N	Model N ("N" is a letter or letter/number combination)
nA or n/A	New Type (occasionally the term "aA" or "a/A" for "Old Type" used)
Fl.	Centrifically Armed (uses projectile spin to free arming mechanisms)
Al.	Aluminum (fuze outer case material; internal parts may be different)
Lm.	Aluminum Alloy (ditto)
St.	Steel (ditto)
Zn.	Zinc (ditto)
Pr.	Plastic (ditto)
umg.	Modified Version
V.	Internal Time Delay Used (black powder delay after impact sets off fuze)
eV.	Variable Time Delay (two or three possible settings in a nose or base fuze)
Kl.	Smaller
m.	With (e.g., German Navy "m.Kz." = "with nose fuze")
o.	Without (e.g., German Navy "o.L'Spur." = "without tracer")
u.	And (e.g., German Navy "m.Kz.u.Bdz." = "with nose and base fuzes")
S.K.	Naval Gun (against surface targets; ID may include barrel length "L/XX")
F.K.	Field Gun (general-purpose Army gun)
F.H.	Field Howitzer (high-angle, low-velocity Army gun)
Flak.	Anti-Aircraft Gun (can also be used against surface targets--German "88")
Pak.	Anti-Tank Gun (no high-angle ability)
Kwk.	Tank Gun (usually Army F.K., Pak., or Flak. modified for use in a tank)

GLOSSARY (Continued)

Stu.K. or Stu.G. XX	Assault Gun (on tracked vehicle)--if given, “XX” is gun length
Kst.K.	Coast Defense Gun (some special-made, but most are naval guns)
Geb.	Mountain Gun (lightweight, low-velocity Army gun)
Zdlg.	Exploder or Booster (final stage in fuze train before projectile filler)
Patr.	Cartridge (usually referring to fixed/semi-fixed brass powder case)
Schr.	Schrapnel Projectile (time-fuzed light-case shell filled w/steel balls)
Sprgst. or Sprgldg.	H.E. Projectile Filler (mostly TNT, but picric acid and others used)
Stg.	Cast Steel High-Capacity H.E. Projectile (light-case with nose fuze)
Oerl.	Oerlikon (made 20mm Swedish rapid-fire guns--used by Allies, too)
Mds.	Mauser and Solothurn (other German 20mm rapid-fire guns)