The 75 mm Bofors Semi-automatic Turret Gun

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[Colour plates relating to this article are in the plate section on pages 70 to 72 and on the back cover.]

Development

For almost 200 years Sweden has avoided participating in any of the many armed conflicts that have taken place in Europe. Staying neutral meant that Sweden needed strong armed forces and a domestic arms industry. The Bofors arms company has for over 100 years been one of the cornerstones of Swedish defence. Since the 1880s Bofors has designed and manufactured all kinds of artillery weapons for domestic use and for export to foreign countries.

Being a country with a long shoreline and many good harbours the threat posed by a seaborne invasion has always been an important factor in Swedish defence planning. Until the 1990s Sweden possessed one of the strongest coast artillery arms in the World. One of the main weapons deployed by the Swedish Coast Artillery during the Cold War was the 75 mm Bofors turret gun.

In the years between World War One and World War Two Sweden, like most other countries, reduced its armed forces and to a large extent relied on weapons acquired prior to or during World War One. The threatening political situation in the 1930s led to rearmament programmes but the demands of the military could not fully be met by the domestic arms industry. Consequently, old weapons had to be retained for years after they should have been replaced.

The German invasion of Denmark and Norway on April 9th 1940 placed Sweden in a serious situation and emphasised further the need to strengthen her defences in order to guard the neutrality and the territorial integrity of the country.

One of the measures was to strengthen the coast artillery arm but the availability of modern guns was very limited. Apart from a limited number of guns ordered from Bofors and some guns being manufactured by Bofors for foreign countries the guns readily available were mostly old naval types. Due to the shortage of modern coast defence guns they had to rely mostly on naval and coast defence guns acquired at the turn of the Century. Light 57 mm and 84 mm guns constructed during the 1880s and 1890s were the most common guns during the Second World War and succeeding years.

The end of the Second World War reduced the immediate threat to Sweden but with the Soviet dominance in the Baltic and Eastern Europe in the succeeding decades a major conflict could not be ruled out. During the Cold War years Sweden stayed neutral with strong armed forces. A weak coast defence would reduce Sweden's ability to resist a seaborne invasion.

One of the major problems confronting Swedish defence planners was the materiel situation of the Swedish Coast Artillery. As stated above, a very limited number of modern weapons had been added during World War Two and during the first post-war decade hardly any new weapons had been added at all. It became more and more obvious that either the old guns had to be replaced or the coast artillery had to be scaled down dramatically.

In order to solve this equipment crisis the Swedes initiated several equipment programmes which included developing new automatic turret guns. The most advanced design was a 105 mm automatic dual-purpose (coast artillery/anti-aircraft) turret gun of which only six were manufactured. The most extensive programme, however, was the development and manufacture of a new 75 mm semi-automatic turret gun of which no less than 106 were manufactured, export guns inclusive. The 75 mm gun was intended to replace the old 57 mm and 84 mm guns of the light batteries. Some of the guns in need of replacement were 70 to 80 years old when they were phased out.

After the end of World War Two most battleships and other heavily armoured warships were soon scrapped. The threat was therefore posed by smaller but faster naval vessels. Consequently, there was less need for a heavy coast defence gun than for a smaller quick firing gun.

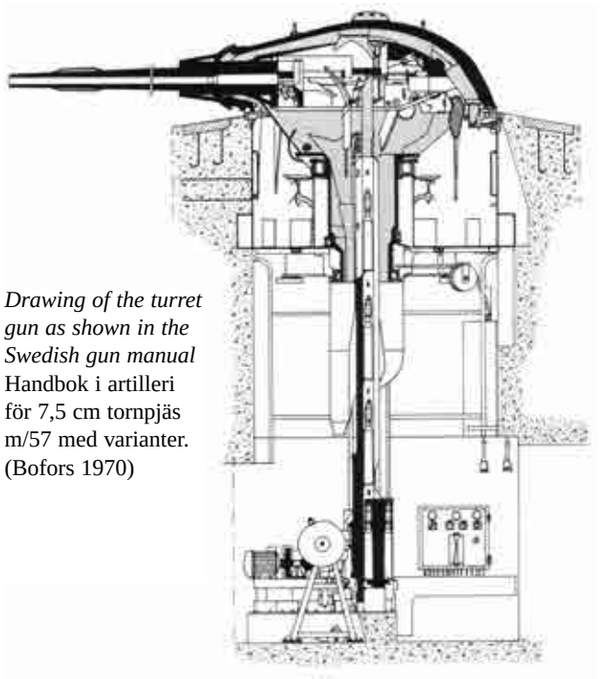
When gun development started in the early 1950s the Swedes considered a gun of 75 mm calibre sufficient to fill the requirements. By selecting the 75 mm calibre it would be possible to acquire a larger number of guns compared with a 105 mm system.

The result of the development was the 75 mm model 57 semi-automatic turret gun. The Swedish designation was *7,5 cm kustartilleripjäs m/57* or simply 7,5/57. *Kustartilleripjäs* means coast defence gun in Swedish.

The turret guns were manufactured in three batches, known as A, B and C, between 1958 and 1974. In addition a batch of turret guns was manufactured for the Norwegian Coast Artillery. The latter turret guns were known as *75 mm TK L/60 M72*. A total of 106 turret guns were manufactured, 90 for Sweden and 16 for Norway.

As a supplement to the fixed coast defences the Swedes also had a number of mobile coast defence batteries. The barrel of the 75 mm turret gun was mounted on a mobile carriage and was known as the *7,5 cm kustartilleripjäs m/65*. Eighteen mobile guns were manufactured, one of which is on display at the *Beredskapsmuseet* in Djuremossa near Hälsingborg in South-west Sweden.

Considering the number of guns manufactured and its advanced design the 75 mm semi-automatic gun must be considered a success, even though it is now one of the lesser known coast artillery equipments.



Drawing of the turret gun as shown in the Swedish gun manual Handbok i artilleri för 7,5 cm tornpjäs m/57 med varianter. (Bofors 1970)

The Swedish batteries

The 90 Swedish turret guns were deployed in 30 batteries, each with three turret guns. Technically the turrets were almost identical. The main difference between the batches related to the fire control systems and the way the turrets were deployed. The way the turret guns of the second and third batch were deployed increased the survivability of the batteries. Appendix 1 contains a complete list of Swedish coast batteries armed with this gun.

The first Swedish batch comprised 24 turret guns for eight batteries and these guns were designated *7,5 cm kustartilleripjäs m/57A*, modernised guns of this batch being known as the *7,5 cm kustartilleripjas m/57D*. The eight batteries were finished between 1961 and 1965. In most cases the turrets in these batteries were deployed on a line with a main tunnel connecting the guns and the fire control post. This meant that the different parts of the battery were usually located very close together. However, in a few batteries the guns were dispersed on separate islands.

The second Swedish batch was known as the *7,5 cm*

Gun Data

Calibre:	75 mm
Mounting:	armoured turret
Length of piece:	4,245 mm (L/60)
Weight:	17,500 kg
Traverse:	± 270°
Elevation:	+20°
Depression:	-5°
Shell weight:	approx. 6.5 kg
Muzzle velocity:	870 m/s
Range:	up to 13,300 m
Rate of fire:	25 rds/min.

Ammunition Data

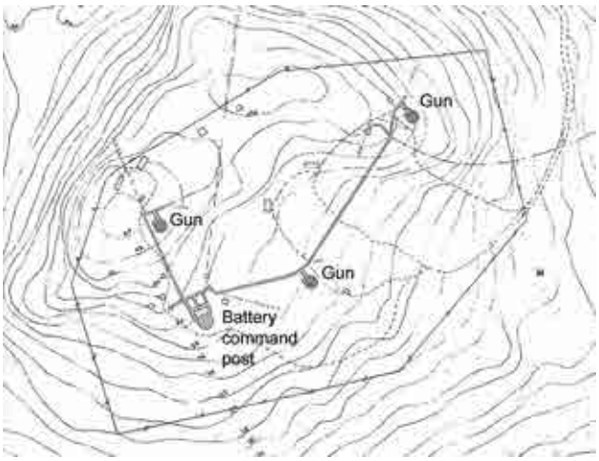
Ammunition type	Naval	Naval ER	HE	Practice
Weight of projectile with fuze	5.73 kg	6.35 kg	5.52 kg	6.55 kg
Weight of bursting charge	0.62 kg	0.81 kg	0.73 kg	none
Weight of complete round	11.5 kg	12 kg	11.5 kg	12.2 kg
Muzzle velocity	850 m/s	830 m/s	870 m/s	850 m/s
Time of flight to 3,000 m	4.6 s	4.3 s	4.1 s	4.3 s
Time of flight to 6,000 m	12.6 s	10.4 s	11.2 s	11.1 s
Max range (+20°C)	11,400 m	13,300 m	12,000 m	12,200 m

kustartilleripjäs m/57B. This batch comprised 30 guns for 10 batteries. In order to increase the survivability of the guns each turret was located separately with the fire control post co-located with one of the turrets. Batteries of this batch were usually dispersed over 1,000 to 1,500 metres.

The third Swedish batch was designated *7,5 cm kustartilleripjäs m/57C* and comprised 36 guns for 12 batteries. The guns of the third batch were further dispersed with some 200 to 500 metres between each turret and there was a separate location for the fire control post. The batteries of the third batch were fully protected against nuclear weapons. Norwegian batteries were similar to the Swedish third batch batteries.

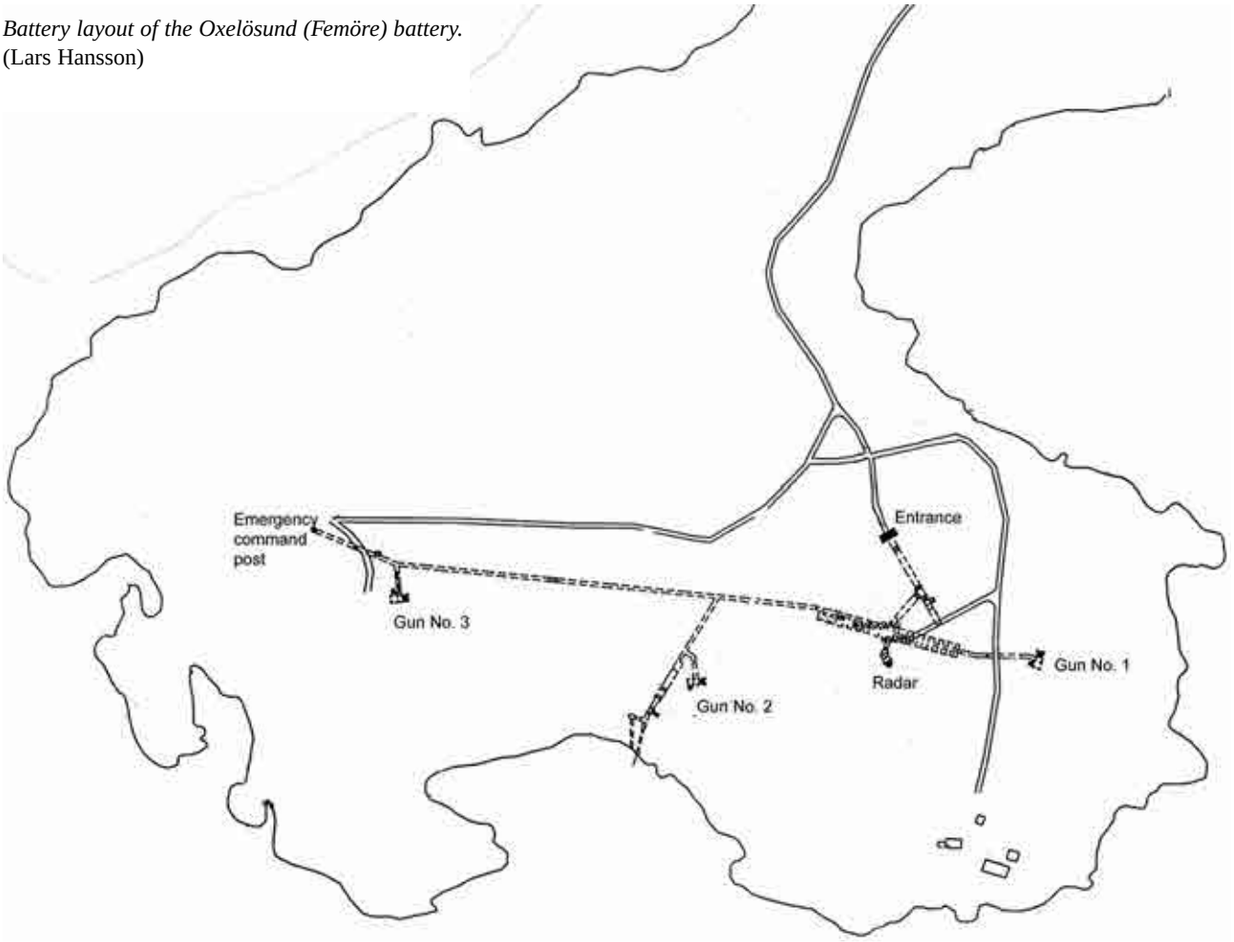
The manual for the Swedish guns also mentions the designation *7,5 cm kustartilleripjäs m/57D*. This was the designation for the modernised *7,5 cm kustartilleripjäs m/57A*. Another source designates this gun as *7,5 cm kustartilleripjäs m/57-95*, indicating an update introduced during 1995.

The last Swedish battery was completed during 1975. In 1992 it was decided to reduce the number of batteries to 18, and in 1996 this number was reduced further to six batteries by 2000. At the time of writing (2007) no Swedish batteries are operated by the military but three



Complete battery layout for the Karlshamn battery. (Leif Högberg)

Battery layout of the Oxelösund (Femöre) battery. (Lars Hansson)



batteries (Oxelösund and Hemsö (batch 1) and Ellenabben (batch 3)) are preserved. The former is kept as a museum and is open to the public. Another gun is preserved at the *Beredskapsmuseet* at Djuremossa near Hälsingborg in South-west Sweden.

By the time of writing the abandoned batteries had mostly been scrapped and the gun pits filled in with concrete and earth.

The Norwegian batteries

During the second half of the 1960s the Norwegian Coast Artillery faced many of the same problems that the Swedes had faced in the late 1940s. When the German occupation forces surrendered in Norway in May 1945 the Norwegians took over 310 coast defence installations. The number of installations had gradually been reduced as obsolete guns were phased out and by late 1960s the only guns still in service were three German gun models: 10.5 cm SK C/32, 12.7 cm SK C/34 and 15 cm SK C/28 (single and twin mountings).

More than two decades after the end of World War Two most countries had abandoned the coast artillery arm and modern coast artillery was available from only a few manufacturers, the Swedish company Bofors being one of the few. Norway was one of Bofors' first foreign customers and, over the years, ordered several types of artillery equipment.

According to the Norwegian Coast Artillery Plan of 1968 no less than 56 75 mm semi-automatic turret guns were needed to modernise 16 Norwegian coast defence forts. Later the plans were reduced to 40 turret guns ordered in three batches, the first batch comprising 10 guns with an option for six more guns, the second 12 guns and finally a third batch of 12 guns. The guns were to be mounted in batteries of two or three guns.

In the event only 16 guns were delivered to the Norwegian Coast Artillery to be mounted in six batteries. Two batteries were located in the Oslofjord area, two guarding the approaches to Bergen on the west coast and two in Northern Norway. Appendix 2 contains a list of Norwegian batteries armed with this gun.

The Norwegian designation was *75 mm TK L/60 M72,* which means 75 mm turret gun L/60 model 72.

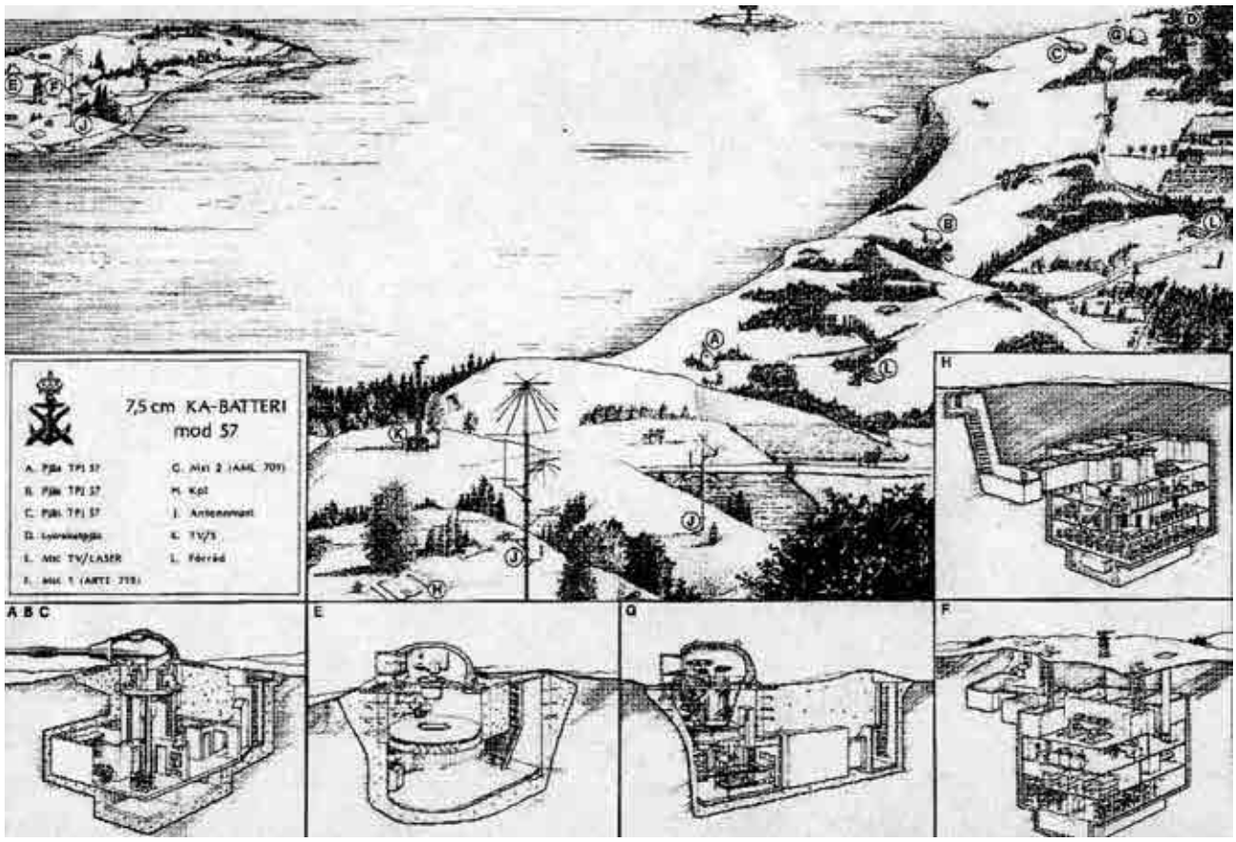
The first turret guns were mounted on Bolærne Fort in the Oslofjord area. The construction works started in early 1972 and by July 1972 two guns were ready. Later on it was decided to mount a third gun on the fort. This was

Partial battery plan for the Järnavik (Tärnö) battery showing two of the three guns. This battery was located on two islands, one with two guns and the battery command post. The other island (not shown) had one gun and an emergency battery command post. (Leif Högberg)

ready by July 1974.

The next forts to be armed with this gun were Visterøy Fort (also known as Buarøy Fort) on the West Coast, Breiviknes Fort and Årøybukt Fort in Northern Norway and Rauøy Fort in the Oslofjord area. These turret guns were mounted between 1974 and 1979. However, there were still two turrets outstanding and in 1979 a decision was made to mount the remaining turret guns at Skjellanger Fort to the North of Bergen on the West Coast of Norway.

The firepower of modern coast defence batteries can be illustrated by the Norwegian Oslofjord defences. The Bolærne and the Rauøy Forts are located on the Western and Eastern side of the Oslofjord respectively. The firing sectors of the turret guns interlocked between the forts. The firepower of the turret guns in this area was immense. Any enemy vessel attempting to enter the fjord risked a barrage provided by no less than six turret guns. If each turret gun fired 10 rounds per minute, which was less than half the maximum rate of fire, some 60 projectiles would rain down each minute. To this must be added that there was also one battery of four 12.7 cm SK C/34 guns and one of four 15 cm SK C/28 guns capable of firing into the same area simultaneously. Hardly any modern warship or



Schematic layout of a Swedish Batch 3 75 mm turret gun battery. (Swedish military illustration provided by Lars Hansson)

group of ships could survive a barrage like that!

The lessons of the first Gulf War (1991) showed how modern smart weapons could knock out identified military installations. From the early 1990s onwards the Norwegian Coast Artillery was gradually reduced. During the first half of the 1990s no less than 25 forts were abandoned. According to a plan dating from December 1997 nine gun batteries were to be kept, i.e. the six 75 mm turret batteries and three 120 mm Ersta batteries. In order to keep the Norwegian guns operational a number of Swedish guns were purchased for use as spares. By the time of writing (2007) all fixed Norwegian coast defence installations had been abandoned.

Although fixed coast defences have now been abandoned in Norway, only one of the former 75 mm turret batteries is easily accessible to the public. That is the Bolærne Fort in the Oslofjord area which has been turned into a recreation area. On this island it is possible to see the exterior of three turret guns and two fire control turrets. The entrances to the interior have been concreted over and covered with earth. The other forts where the 75 mm Bofors turret guns are mounted are still in the possession of the military and only accessible with their permission.

A barrel is on display at the Norwegian Coast Artillery Museum at Oscarsborg Fortress. This barrel has been cut open to show the interior of the gun barrel and is one of the Swedish gun barrels.

Description

The only visible part of a turret installation was the armoured turret in which the gun is mounted. The armoured turret had a diameter of 2.3 metres, was set in concrete and was camouflaged by an irregular shaped plastic cupola mounted on the turret. The height of the turret above ground was 0.9 metre. From a distance the turret looked like a rock and blended with the terrain.

Turret armour was 70 mm thick and provided protection against conventional bombs as well as heavy calibre projectiles and the effects of a nuclear explosion. Each turret installation contained an underground compartment providing protection for the turret crew and the magazine. These compartments were located approx. 9 metres below ground level on first batch turrets and approx. 6 metres on

the other batches. The turret could be sealed to remain operational following an NBC attack. Extra protection was obtained by use of dummy guns and placing the guns at strategic distances from each other.

The gun was 60 calibres long and provided with a vertical sliding semi-automatic breech block mechanism which opened during recuperation to eject spent cartridge cases. The one-piece ammunition was fed to the gun by an electric hoist. The ammunition handlers placed the ammunition onto a five-compartment loading table from which the rounds were moved to a hoist drum. Using a worm and a bevel gear indexed the round up the hoist in steps under microswitch control to a pendulum where it moved to a loading tube. The loading tube was supported on the pendulum which moved around the elevation trunnion centre. The raising of the pendulum and loading tube with the round was effected by a torsion spring placed in the trunnion centre and was tensioned by the barrel recoil. The loading tube delivered the round to a spring-operated rammer for loading into the breech. The gun was fired by the traverse layer using a foot pedal. After firing the spent case was ejected into a separate compartment. In case of electrical failure the system could be operated manually.

By using one-piece ammunition and a semi-automatic hoist system the gun could fire rapidly when necessary. According to some sources the theoretical rate of fire was up to 25 rounds per minute and some 200 rounds in 20 minutes but such a firing rate would result in overheating the barrel. According to the Swedish gun manual, when firing continually the ammunition hoist was able to lift approx. 15 rounds per minute to the gun. Unlike its successor, the 12 cm Ersta turret gun, the 75 mm gun was not provided with a liquid cooling system.

The gun was hand-layed in traverse and elevation by two hand cranks in the turret. For indirect laying follow-the-pointer dials were used. For direct aiming a periscope sight with dual eyepieces, one for each layer, was provided. Fire control usually consisted of one radar and one or two optical/laser rangefinders, the laser rangefinder being mounted in an armoured revolving turret operated by a crew of two.

The gun and the complete installation had a very high level of preparedness. The internal supply net ensured that all material, ammunition and fuel always were easily accessible. The time for making a gun ready was extremely short – less than one hour at mobilization and a matter of minutes when manned. The crew of a 75 mm turret was usually five to seven, i.e. the turret commander who also acted as traverse layer, an elevation layer, a loader in the turret and ammunition handler/s in the ammunition magazine.

Appendix 1 – Swedish batteries

KA 1 – Vaxholm Coast Artillery Regiment (Stockholm area)
KA 2 – Karlskrona Coast Artillery Regiment (South coast)
KA 3 – Gotland Coast Artillery Regiment (Gotland Island in the Baltic)
KA 4 – Älvsborg Coast Artillery Regiment (Gothenburg area on the West Coast)
KA 5 – Härnösand Coast Artillery Regiment (North Eastern Sweden)

Each Swedish coast defence battery was given a letter code.

Batch 1 batteries

Battery	Letter code	Regiment	Completed	Stood down
Ljugarn (Sjausterhammar)	LN	KA 3	1961	1995
Mörtö-Bunsö	MB	KA 1	1962	1995
Hemsö (Havstoudd)	HÖ	KA 5	1963	1994
Karlshamn (Sternö)	KM 2	KA 2	1963	1996
Oxelösund (Femörehuvud)	OD	KA 1	1963	1997
Holmsund (Bredskär)	HO 3	KA 5	1964	1995
Kolguskär	KN	KA 1	1965	1995
Simrishamn (Gladsax)	SI	KA 2	1964	1993

Batch 2 batteries

Battery	Letter code	Regiment	Completed	Stood down
Råstensudde	RN 2	KA 1	1996	2000
Arkösund (Bergön)	AD	KA 1	1996	1995
Ystad (Svarte)	YD 2	KA 2	1967	1995
Malmö (Lernacken)	MÖ	KA 2	1967	2000
Malmö (Lernacken)	GÖ	KA 4	1967	2000
Sundsvall	SL 4	KA 5	1967	1994
St. Olofsholm	SE 2	KA 3	1968	1997
Långskär	LÅ	KA 1	1968	1997
Hambergsudden (Härnön)	HÖ 3	KA 5	1969	1994
Lysekil (Kornö)	LK	KA 5	1969	1995

Batch 3 batteries

Battery	Letter code	Regiment	Completed	Stood down
Gisslingö	GI	KA 1	1970	1997
Örstensudde	RN 4	KA 1	1971	1997
Yttre Gården	MS 4	KA 1	1972	1997
Bråviken (Kungshamn)	BÅ	KA 1	1973	2000
Båtskären	SA 2	KA 1	1974	1997
Vindalsö	KO 2	KA1	1975	1997
Ellenabben (Aspö)	EN	KA 2	1972	2000
Järnavik (Tärnö-Harö)	JV	KA 2	1973	1996
Trelleborg (Maglarp)	TE 2	KA 2	1972	1996
Fårö (Ryssnäs)	FÅ	KA 3	1970	2000
Kappelshamn	KP	KA 3	1971	2000
Marstrand (Koön)	MD	KA 4	1974	1997

Appendix 2 - Norwegian batteries

Battery	Number of guns	Completed
Bolærne Fort	3	1972 (2 guns) 1974 (1 gun)
Visterøy Fort	2	1972
Breiviknes Fort	3	1976
Årøybukt Fort	3	1977
Rauøy Fort	3	1979
Skjellanger Fort	2	1983

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