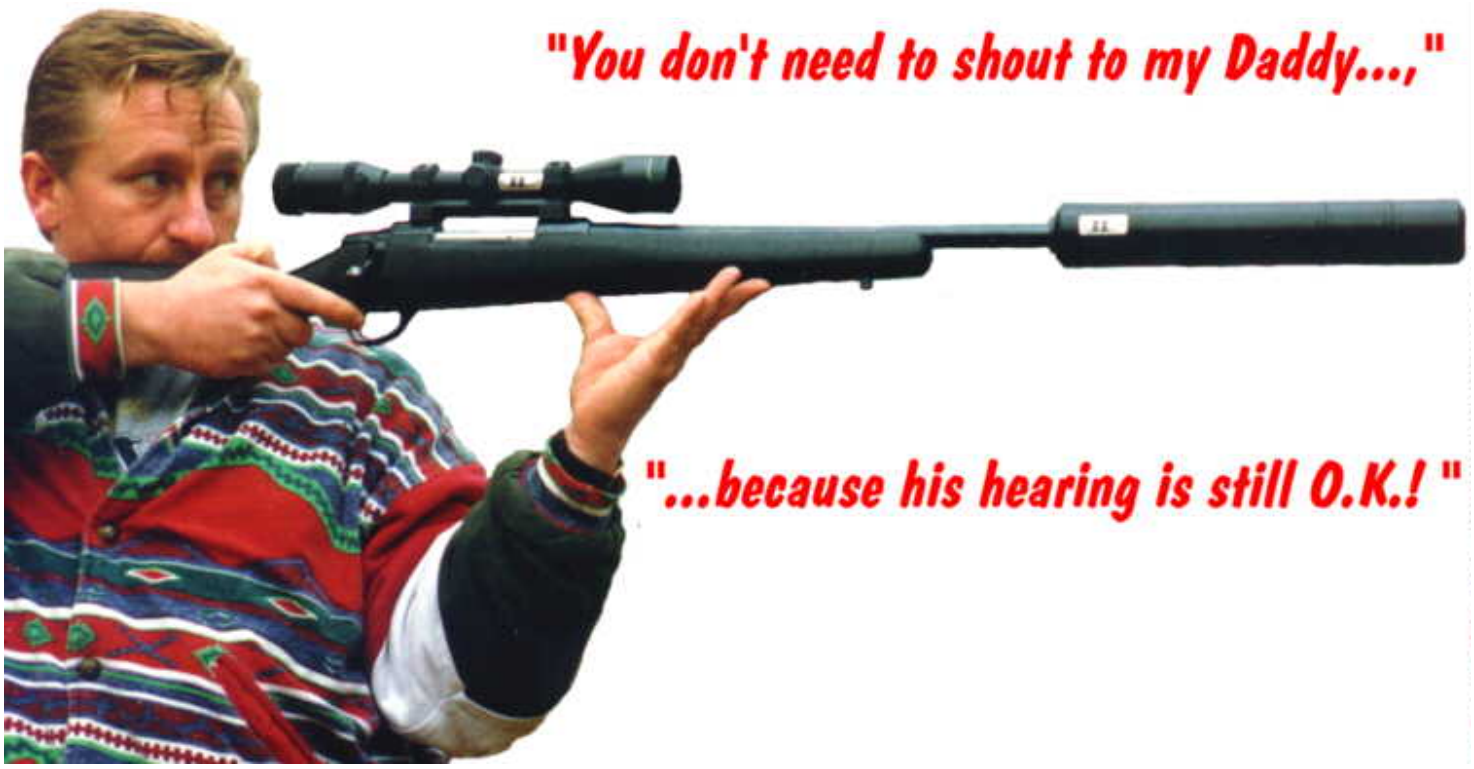
Reflex Suppressors™



The T8 Scout Reflex Suppressor has become the favorite of hunters, target and sports shooters in Finland, Sweden, Norway and UK, where suppressors are free to use or only partially restricted. Already several thousand Reflex Suppressor units are being used by Finnish hunters to protect themselves against loss of hearing and to safeguard their dogs against total deafening. "Nobody in our hunting party shoots any more without a suppressor", reported a hunter, "as two of our best hunting dogs got deafened by shots that took place too near!" Then, how do the authorities think? The official Finnish view to firearms suppressors is shown in the joint Suppressor Project Summary.

The CZ performs well with the MX Minireflex suppressor. This suppressor model is favored by target shooters in order to enable practicing without irritating the neighborhood of their shooting ranges. A gentleman shows consideration to other people!

This Barrett M82 .50 caliber rifle is equipped with the Reflex Suppressor BT8 that is suited for use with standard full power .50 BMG ammo. Muzzle brake effect of a suppressor is close to the original muzzle Barrett muzzle brake. Suppressor fastening goes without elbow grease to Barrett's existing threading for it's own original muzzle brake. However, the muzzle report is tamed considerably and it can be compared to a .308 unsuppressed rifle. The last but not the least, a suppressor is also an efficient flash hider.

A Steyr AUG at work with a T4AUG Ranger, the short model Reflex Suppressor, which is screwed on the standard AUG flash hider. An ejected case is seen flying away above the shooter's shoulder. AUG shooters report that the AUG Ranger and Scout Reflex Suppressors improve significantly the accuracy of the rifle. Comparing noise levels of 5.56 mm and 7.62 mm ammo, the difference between flight noises is significant: the same suppressor model adapted for 5.56 mm with tighter bullet holes gives roughly about 5 dB better attenuation than with a 7.62 mm rifle. A 9 mm rifle is still louder. For example, a short 4-baffle Ranger model Reflex Suppressor is already quite efficient with a 5.56 mm rifle, but an 8-baffle Scout is needed for corresponding performance with a 7.62, and 12 baffles with a 9 mm weapon. So need of baffles seems to be in proportion to the bore cross-sectional area.

Even with suppressors, it always makes sense to use hearing protection because the action noise of any self-loading firearm may be very high!

The AR15 / M16 is easy to control and it becomes even easier to fire with a suppressor due to the muzzle brake effect. This Reflex Suppressor is the T4AR Ranger.

Development of Reflex Suppressors Finnish assault rifle M62, cal. 7.62x39 mm started in 1985 and has continued ever since. This M62 is photographed during the joint Suppressor Project sound level measuring procedures in early nineties when practical shooting noise attenuation at varying distances and directions were recorded with and without suppressors. For noise levels measured for the first time completely around the rifle, see the Directional Noise Pattern. Well, how does a suppressor affect the accuracy of a rifle? The point of impact shift of suppressed and unsuppressed M62 was also tested.

The TX4 Ranger of M62 opened reveals the internal simplicity of the Reflex Suppressor that is especially designed for standard full power ammo. The muzzle blast gets offset from the bullet path by the diffractor cone. After that the first baffle reflects it backwards into the large expansion chamber telescopically around the barrel. This principle enables an exceptionally short and light all steel construction: the TX4 Ranger weighs less than 300 grams (2/3 lbs.) and extends over the muzzle 5 centimeters (2 in.). Becouse the Reflex Suppressors have initially been designed for Valmet M62 to be used with regular supersonic cartridges, the first expansion chamber is exceptionally large for only minor gas port pressure delay increase. The T8 Scout and T4 Ranger models for the more powerful .308 Win and other rifle calibers have even larger first expansion chamber.

M95 (above) and AK-5 (below). M95 is the modernized version of the Finnish assault rifle. It accepts the TR4 Ranger and TR8 Scout suppressors as screwed on the existing flash hider / grenade launcher. The same Reflex Suppressor models also fit the Swedish AK-5 / FN FNC conveniently.

Rifles that do not accept telescopic suppressors due to sights too near the muzzle, can be equipped with a muzzle-mounted suppressor. This Kalashnikov Reflex Suppressor KRS is favored by the Finnish voluntary defense organizations.

"Red hot test" being performed for a Reflex Suppressor with a belt-fed 8 mm MG34 machine gun at 900+ rounds per minute, a 50-round belt at one burst. This way the natural life span of a rifle suppressor can be tested and accelerated for product development purposes.

SMG / PDW suppressors are also required now and then, like this one for the Ingram.

The MX Reflex Suppressor with a Heckler & Koch P7/PSP (Polizei-Selbstlade-Pistole). See a detailed manual about Minireflex Moderators along with cut-away drawing and mounting and aligning instructions.

Reflex Suppressors

To rifle and shotgun page

To automatic rifles page

To .50 caliber page

To SMG page

To MG page

Contact page

General info

Index page

Link Page

Lyddemper.net

Suppressors in France

Suppressors in the UK

License Manufacturing

Suppressor Project snapshots

On-line Magazines: Gunwriters on the Web

Literature: Alan C. Paulson's book Silencer History and Performance, Vol. 1

Update 16.07.2002

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Index General Rifles 50 BMG SMG MG AR Contact Links Measuring License Manufacturing Lyddemper.net Suppressors in France Suppressors in the UK

Main General Rifles 50 BMG SMG MG AR Contact License Manufacturing Links Measuring Lyddemper.net Suppressors in France Suppressors in the UK

BR - Reflex Suppressors™

Reflex Suppressors for Environmental Firearms Noise Control and for Shooter's Hearing Protection

WHAT D'YA SAY?!

- Your hearing is irrepairable property. Once damaged, it is damaged forever. Easiest way to damage it is to shoot unprotected.
- If so, how can I use hearing protection during hunting? I must hear every sound around me!
- Thousands of hunters use sound suppressors today to protect their hearing. So do target shooters, who show consideration not only to themselves, but also to their audience and neighbourhood.
- Is it legal to use suppressors?
- In many countries it is, in some countries you need a licence.
- It must be expensive!
- No more expensive than the scope sight on your rifle.
- What is that suppressor mounted to your rifle?
- It is a T8 Scout Reflex Suppressor. This is already the most popular suppressor among hunters in Finland, Sweden and Norway.
- Where can I get one?

Reflex Suppressors pages:

Scientific:

Mounting Reflex Suppressors:

Aligning and centering a muzzle-mounted suppressor or silencer

På svenska: Monteringsinstruktion för Reflex-ljuddämpare T8 Scout

Drawings and Manuals:

MP5 Reflex Suppressor

UZI Reflex Suppressors

SAF Reflex Suppressors

T8 Scout rifle suppressor

Kalashnikov Reflex Suppressor

M16 & AR-15 Reflex Suppressor

Reflex Suppressors for Steyr AUG

Reflex Suppressor for H&K G3

Reflex Suppressor for FN FAL L1A1

Reflex Suppressor for Barrett M82A1

Scout and Ranger Suppressors for M62

Scout and Ranger Suppressors for M95 and AK-5

Minireflex Pistol Moderators MX12, MG 16 and MG12

Silenced Barrel Unit "Suhina-Suomi" SS-II for Suomi M31 SMG

Suomi SMG dummy cartridge suppressor for theatrical productions

Business:

Contact page

Lyddemper.net

Suppressors in France

Suppressors in the UK

License Manufacturing

On-Line Magazines:

Gunwriters on the Web

Suomenkielinen Gunwriters

Update 16.07.2002

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Main General Rifles 50 BMG SMG MG AR Contact License Manufacturing Links Measuring Lyddemper.net Suppressors in France Suppressors in the UK

Index Main Rifles 50 BMG SMG MG AR Contact Links Measuring License Manufacturing Lyddemper.net Suppressors in the UK

Reflex Suppressors™

Reflex Suppressors General Info

"The Sounds of Silence"

Update 20.11.01

BR-Tuote of Joensuu, Finland produces a wide variety of firearm suppressors for .22 rimfire firearms, handguns, rifles, submachine guns and machine guns. Our main product is a patented Reflex Suppressor, originally designed for Valmet M62 assault rifle, but later on adapted to other firearms.

What is a Reflex Suppressor?

The *Reflex Suppressor* is a trademark for suppressor construction, designed to be used with supersonic, high-powered ammunition. Above all, the Reflex Suppressor is built to fulfil or exceed military standards and stand for harsh military use. Of course it is adaptable to civilian shooting sports. Although the Reflex Suppressor is primarily designed for supersonic ammunition, it also works well with subsonic ammunition. The Reflex Suppressor doesn't only reduce the noise, but it also reduces recoil a great deal and completely eliminates the muzzle flash. Reflex Suppressors are made from sheet steel by stampings and welding. The weight is minimized, however, without loss of durability.

Why build a suppressor for supersonic ammunition?

At first it sounds ridiculous, since no suppressor can damp the flight noise of supersonic projectile. However, the muzzle blast can be effectively suppressed, and if we compare it with an unsuppressed shot, we can get almost incredible efficiency values.

In fact, when used with supersonic ammunition, the suppressor doesn't remove the flight noise, but it protects the shooter's hearing and makes a shooter almost impossible to locate. When the muzzle blast is damped, the reflections from flight noise of supersonic projectile will mislead the observers about the shooter's position.

For survival, the "invisibility" is inevitable for snipers and other riflemen. Unlocated sniper can effectively demoralize the enemy, especially when it is poorly trained. For noise levels measured completely around a suppressed and unsuppressed M62 rifle, see a Directional Pattern.

In civilian shooting sports the use of a suppressor with full-power ammunition will reduce the risk of serious hear damage. However, neither suppressor nor ear mufflers alone will protect one's hearing completely. But when used together, they will offer the best available hearing protection.

How to mount a Reflex Suppressor?

Whenever it is possible, Reflex Suppressor is mounted using existing thread originally intended for flash hider, muzzle brake, grenade launcher etc. If a suitable thread already exists, there is no need of thread cutting or special mounting device. Mounting doesn't require permanent modifications to firearm. If construction of firearm allows, the Reflex Suppressor will be built telescopic for shorter overall length and better balance. Telescopically mounted Reflex Suppressors stand more harsh use than ordinary frontal mounted ones. For this feature, the Reflex Suppressor is primary choose for military use.

Does it need regular maintenance?

No! The Reflex Suppressors are designed to be self cleaning. All Reflex Suppressors have a sealed construction, so there is no need or change for disassemble. No more cleaning the mesh or changing the rubber plugs.

.22 RIMFIRE SUPPRESSORS

Our line of .22 suppressors includes detachable, frontal and telescopically mountable units for most types of .22 rimfire rifles and handguns. Standard models are furnished with standard 1/2" UNF thread. As they are made of steel, they can be used for hunting rifles up to .222 Rem caliber class. Bayonet mounting models do not even need muzzle thread, like the models for bull barrel Ruger pistols.

HANDGUN SUPPRESSORS

MX and MG Minireflex Moderators are intended for 9 x 19 mm Para and 7.65 Auto caliber selfloading handguns operating on short-recoil, straight blowback or delayed blowback principle. They are built to meet the requirements of military use and allow both dry and wet operation.

MX12 is all steel construction and remarkably compact for the size. It weights only about 140 g and increases the overall length 131 mm. It is one of the smallest and lightest 9 mm suppressors currently available, except for the still lighter MG suppressor for Glock pistol. Normally, a Minireflex suppressor is mounted and aligned to muzzle with thread. Thread cutting and possibly some modifications are required

For effective suppressing, use of proper subsonic ammunition is necessary.
However, the MX12 can be used with full-power, supersonic ammunition without any problems or risk of breakage.
Remember, the Minireflex is not only a suppressor, it is also a flash eliminator and a muzzle brake, which makes a handgun a delight to shoot.

RIFLE SUPPRESSORS

Our line of rifle suppressors contains so called "general models" and specifically threaded units for certain assault rifles. Every rifle suppressor has all steel construction. Standard finish is military grade Parkerizing.

General models are intended for ordinary high-power hunting and sniper rifles. There are two basic types; Very short T4 Ranger and longer T8 Scout, which both will mount telescopically. The model number tells the amount of baffles used in the suppressor.

For mounting, it is necessary to remove the front sight. T4 and T8 won't mount on full or Mannlicher-stocked rifles or common bolt-action military rifles with short projecting barrel. Thread cutting is also required.

Specifically fitted T4 Ranger, T6 Trooper, T8 Scout and R12 suppressors are available for many battle and assault rifles. Most common production models are subsequent suppressors for following firearms:

-TX4, TX6, TX8 for 5.56 mm, 7.62 mm M43 and 7.62 mm NATO Valmet M62.

TR4 and TR8 for Sako M95.

-AK4 and AK8 for AK-5 / FN-FNC

-T4AR for 5.56 mm Colt AR-15/M16.

-R12ARC for 5.56 mm AR Carbine CAR-15.

-T4AUG for 5.56 mm Steyr AUG.

-T4R4 for 5.56 mm R4/LM4 (South African Galil).

-T6R5 for 5.56 mm R5/LM5.

-R12AK for 7.62 mm M43 AK-47, AKM and AK-74

-T6G3 for 7.62 mm NATO H&K G3.

-T6L1 for 7.62 mm NATO L1A1 (British version of FN FAL).

-T6M14 for 7.62 mm NATO M14/M1A.

Suppressors listed above can be mounted without any modifications to rifle. Mounting procedure can be carried out without special tools or skill.
Before mounting, the flash hider, sleeve nut or equivalent must be removed. For Steyr AUG, Sako M95 and AK-5 not even this is necessary, as the suppressor mounts on internal threaded flash hider.

SUBMACHINE GUN SUPPRESSORS

Reflex suppressors are also available for most modern and some older submachine guns. Construction of certain SMG's prevents the telescopic mounting and most SMG suppressors are frontal mounted. Only the suppressors for Uzi's and Sten MkII are telescopic.

Following SMG suppressors are currently available:

-R12U for UZI and Mini-UZI.

-R12MU for Micro-UZI.

-R12MP5 for Heckler & Koch MP5.

-R12FA for FAMAE SAF.

-R12MP for MP40.

-T12S for Sten MkII.

-R12IT for Intratec.

Like assault rifle suppressors, mounting of SMG suppressors can be carried out without any modifications. UZI and Sten suppressors replace the barrel retainer nut and MP40 suppressor mounts on readily existing muzzle thread. MP5 suppressor mounts with special bayonet bracket on three bayonet lugs on the barrel. SMG suppressors will also stand continuous use of full power ammunition.

MACHINE GUN SUPPRESSORS

Suppressors are also available for machine guns. They are designed and built with same specifications as our rifle suppressors. Machine gun suppressors have been examined and "red hot tested" with fast-firing machine guns (e.g. MG 34), which have 900 rd/min rate-of-fire.

Machine gun suppressors are intended for use with standard high velocity ammunition. They work as misleading devices for concealing shooters position. Suppressors are available for most machine guns to customer's specifications.

Reflex Suppressors

Index Main Rifles 50 BMG SMG MG AR Contact Links Measuring License Manufacturing Lyddemper.net Suppressors in the UK

Reflex Suppressors™

Modern shooting pleasure has greatly increased since the blunderbuss days, thanks to the gradual adoption of suppressors for firearms noise and muzzle flash control and for hearing protection, not to mention the relief to neighbours and environment. Today, you don't need to turn your head away from the firearm any more, like this fellow is doing, or neither be aware of a vigorous kick on your shoulder!

This T8 Scout is mounted to a varminting and hunting rifle designed by J. Hartikka to get full benefit of modern ammunition accuracy also in field conditions. Rifles are custom built by BR-Tuote in .308, 7.62x53R and 6 PPC calibers. Hunters using these rifles in 6 PPC caliber reported that longest sitting bird head hits have been 150 to 200 meters in practical hunting

situations. Why try head hits? - No flesh wasted!

Garand M1A1 National Match with a T6M14 Scout Reflex Suppressor as compared to an unsuppressed M14 with standard flash hider. The Reflex suppressor substitutes the flash hider, mounting readily on its threads.

The word "telescopic" means the way of keeping the Reflex Suppressor short by having the major part of its length on the barrel. When assembled, the suppressor is supported at two places: at the muzzle thread and at the rear end bushing. The muzzle thread fastening alone is sufficient to make it secure. This Reflex Suppressor model T8 Scout is shown as removed from the rifle.

Custom model "*Delisle Bretonne*" built by gunsmith *Herlé Kaigre*, L'Armurier Breton. "This is a very easy to make Delisle copy," Kaigre tells. "It is made for 44 magnum caliber so you don't need to modify the Lee Enfield bolt head. The magazine is a

Desert Eagle one, the 44 mag barrel is made from a Lothar Walther barrel blank. The suppressor is of course a special BR one."

Reflex Suppressors are available for rifles (above) and also examples have been made for measuring purposes for some single barrel shotguns, too (below). Mounting a suppressor to a hunting or target rifle is a relatively simple job to do.

Most shotguns, on the other hand, require modifications to barrel, like gas flow ports. Acceptable shotgun silencing effect is possible with subsonic ammo only because of the loud sonic crack of regular supersonic shotgun ammo.

The Shotgun Reflex Suppressors have a perforated barrel extension tube inside its body (photo above) running all the way through it, which will keep both shot and slugs from colliding suppressor elements. Although the tube is unchoked, the perforations perform the same effect as a choke by braking outer shots, making the suppressor about equal to a 3/4 choke with shots.

The limitations with suppressing shotguns are: 1 - With standard supersonic ammo the flight noise of shot is so high, that the suppressed noise is only 5 - 6 dB lower than as unsuppressed. If one gets or can load subsonic ammo, the noise reduction is quite enough for effective hearing protection. 2 - Only single barrel shotguns can be suppressed with reasonable amount of work. 3 - Suppressor affects balance and sight line of the shotgun.

Shotgun Reflex Suppressors are individually designed and built by special order for each shotgun. They are **not available for export**.

One of the exceptions in easy shotgun suppressing is the rare SPAS 15, which accepts the telescopic Reflex Suppressor XRS readily on its choke thread.

Update 14.01.2004

Reflex Suppressors for rifles and shotguns: http://guns.connect.fi/rifles.html

Index Main General 50 BMG SMG MG AR Contact Links Measuring Mounting Lyddemper.net
Suppressors in France Suppressors in the UK

Update 10.01.2003

An actual photo about the muzzle flash of a .50 caliber rifle: An unsuppressed flash is more than revealing in the dark, especially with a short barreled rifle, like this Liberty Arms LA-50 bolt-action bullpup. How a muzzle flash is actually born, and how do flash and sound suppressors 'hide' it? The powder gases contain a lot of unburned gases, which will eagerly burn as a momentary flash when mixed with the atmospheric oxygen if they are hot and under high pressure. With slow powder and short barrel, the muzzle residue pressure is high producing a handsome muzzle flash. A flash suppressor provides the powder gases a minor extra volume in front of the muzzle to drop their pressure and temperature by expansion to be significantly less eager to ignite themselves when colliding with oxygen of the air. The same effect can be accomplished by extending the barrel. Sound suppressors have an exceptionally large expansion volume, which makes them practically perfect flash suppressors.

The LA-50 aimed, equipped with a Reflex Suppressor. When compared to the open construction of the standard muzzle brake, which directs a very notable blast back and to the sides lifting dust, sand, snow and generally giving the position away very graphically, not to mention the uncomfortable spotter... the Reflex Suppressor eliminates that by containing most of the gases and projecting them forwards with very low profile.

Model LAX50 Reflex Suppressor for the exceptionally short LA-50 bullpup rifle mounts readily to it's flash hider thread.

The well known recoil-action Barrett M82 with model BT8 Telescopic Reflex Suppressor is almost comfortable to shoot, regarding the suppressing effect on noise and the absence of pressure shock on shooter and spotter. Current suppressor model has an integral muzzle brake (not shown in the cut-away drawing of an earlier model) to boost the recoil brake effect. Because a suppressor adds the mass of the recoil action barrel of the M82, some

shooters use a stiff spiral spring seen in the photo above between the suppressor and the receiver to further soften the felt recoil.

50 BMG Reflex Suppressors

50 BMG Reflex Suppressors on Internet: http://guns.connect.fi/rs/50cal.html

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See also the cut-away drawing of the Reflex Suppressor for Barrett M82A1

Index Main General Rifles SMG MG AR Contact Measuring Lyddemper.net North American Sales Suppressors in France Suppressors in the UK Links

Reflex Suppressors™

Nostalgic view of Thompson 1928 SMG, with accompanying instruments. The Reflex Suppressors for historical weapons have been made for eager firearms collectors willing to appear correctly equipped and dressed in collectors' meetings.

If the Thompson was one of the best SMG's made, the Sten was surely the most economically mass produced weapon of it's kind. However, it is easy and enjoyable to shoot at full auto, and it becomes a natural pointer with a suppressor. These guns are equipped with model T12S Reflex Suppressors, which replace the barrel nut in seconds and utilize the standard Sten barrel.

The Suomi M31 SMG was one of the Finnish legends of the Winter War. Small series of Integral Reflex Suppressors called "Suhina", i.e. "Sigh", was made for collectors. Even a dummy cartridge model of "Suhina-Suomi" was ordered and built for theatrical purposes!

MP40 was originally equipped with a muzzle thread, so a variant R12MP of the popular muzzle mounting Reflex Suppressor fits it easily. This SMG is one of the easiest of its kind to shoot with smooth feel of action and rather slow rate of fire - a classic by all means. For aligning muzzle mounting suppressors, look at aligning and centering instructions.

The Jati-Matic with red dot sight on BR mount and a laser sighting system. Here a Reflex Suppressor serves also as a front grip, making the Jati an instinctive pointer.

An Intratec with a R12IT Reflex Suppressor and a red dot sight on BR scope mount.

This Reflex Suppressor for Famae SAF needs no threads at the muzzle as it exploits a BR adapter for tightening. This SMG can be used also with the KRS Kalashnikov Reflex Suppressor, if mounted with the left hand M14x1 Kalashnikov muzzle thread.

UZI with Reflex Suppressor R16U simply replaces the barrel fastening nut of this SMG. This suppressor model fits both UZI and Mini-UZI with their standard barrels. When used as a front grip, the suppressor makes the otherwise marginally stable UZI very easy to control while full auto or burst fire, reducing or even removing the sharp muzzle climb. Also the feeling of instinctive pointing is much improved.

Micro-UZI Reflex Suppressor R12MU is also screwed on the barrel instead of the barrel nut (below). With a screw-between adapter it can easily be equipped with a BR mount for optical sights (above). Same kind of sight adapter is also available for UZI and Mini-UZI.

Heckler & Koch MP5 in action with a model R12MP5 suppressor. Newest MP5 suppressor model is the Easy Bayonet Mount Reflex Suppressor R16MP5.

Reflex Suppressors for SMG's

Back to main page

Reflex Suppressor for MP5

Reflex Suppressors for FAMAE SAF

Reflex Suppressors for UZI and MINI-UZI

Aligning and centering a muzzle mounting suppressor

Silenced Barrel Unit "Suhina-Suomi" SS-II for Suomi M31 SMG

"Sighing Suomi" SMG dummy cartridge suppressor for theatrical productions

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Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring

Reflex Suppressors™

Index Main General Rifles 50 BMG SMG AR Contact Links Measuring

This youngster barely three years old did not want to leave the shooting range, until having tried the Big Gun under his fathers strict surveillance. The tolerable sound of a suppressed Maxim 1910 in caliber 7.62x53R was not frightening at all, but pushing the stiff trigger demanded all the power at hand. The Reflex Suppressor R8MG was dwarfed by the large essence of the legendary firearm, suppressor appearing only slightly larger than the original flash hider it substituted. The veteran MG carried the suppressor with its usual dignity, knowing that once a member of Maxim family was the first inventor to make a firearms silencer known around the world.

Trying shooting from hip with Russian Degtaryev DP-27 in cal. 7,62x53R created an expression worth seeing on the face of this shooter... The DP-27 LMG was a rough but utterly reliable weapon, well liked by Finns and captured in quantities during

the extremely cold Winter War. Amount of captured DP-27's, nicknamed "Emma", finally exceeded the number of the Finnish LS-26's issued to troops as standard LMG. The DP-27 functions well with this T8D Reflex Suppressor, the peculiar slow "clacketiclack" action sound being highlighted from under the dampened muzzle noise.

MG-34 "twins" shot with different sounds in students' shooting event in Lappeenranta - one with the usual loud tearing noise, the other with curious puffing sound reminding of a diesel engine throttled. These guns were among the most favoured weapons among the shooting participants and audience of the event. Reflex Suppressor R8MG replaces the original flash hider in seconds.

Lahti-Saloranta LS-26 cal 7.62x53R LMG shown empty case just emerging. As a recoil-operated LMG, LS-26 is quite pleasant to shoot. During the wars, this well made weapon could even sugstitute a sniping rifle because of its good accuracy. Sound of a fired LS-26 is peculiar "whshBOOM". When suppressed, the feeding sound "whsh" can be sensed easier from under the much softer muzzle report. The Reflex Suppressor used is model R12LS, which mounts in flash hider threads of the LMG. An interested reader finds the history of Finnish LS26 from Small Arms Review 2/1998.

Reflex Suppressors for MG's

Index Main General Rifles 50 BMG SMG AR Contact Links Measuring

Reflex Suppressors™

Gary, 3 years, already knows how to save his hearing: *"When I go shooting with Pa we use **both** hearing protectors!"* Safe sound levels are attained only by combined use of both personal hearing protection and rifle sound suppressors. The rifles shown are Norinco 56S with a KRS Reflex Suppressor and a Finnish Sako M62.

The Steyr AUG has a grenade launcher type flash hider, which mounts a Reflex Suppressor in seconds to its internal M13x1 thread. The T4AUG Ranger (illustrated) extends only 59 mm in front of the flash hider, and weighs abt. 380 grams. A still quieter model T8AUG Scout is 30 mm longer than the Ranger model, and weighs abt. 450 grams. By users' reports, AUG Reflex Suppressors improve the already good accuracy of the rifle. Both models withstand full auto firing with full power .223

service cartridges. Designs of T4AUG and T8AUG are similar to the Sako M92 and AK5 / FN FNC Ranger and Scout models: See a cut-away drawing of them.

This momentary photo shows the injector effect of suppressors: The muzzle blast is tamed to a cooled powder gas blow forwards, instead of the usual unsuppressed pressure blast moving nearby branches or raising a cloud of dust. The rifle is a Sako M95 with a screw-on TR8 Scout Reflex Suppressor. Ejected case is flying just beside the sight.

The Sako M95 (above) has a grenade launcher type flash hider (center), which accepts readily a TR series Reflex Suppressor (below). The M92S Sporter rifle version has a different diameter flash hider, and its flash hider and corresponding Reflex Suppressor models are marked correspondingly TR4S and TR8S. The M95 illustrated above is equipped with a Russian PSO-1 sniper sight, well known from the Dragunov sniper rifle. Quick mount rails for the PSO-1 are manufactured by BR-Tuote and Ase Utra.

A sporter version of AR Carbine with a telescopic Reflex Suppressors. The standard CAR-15 Reflex Suppressor is a muzzle mounted R12CAR.

.308 Heckler & Koch G3 Reflex Suppressor T8G3 Scout shown disconnected (above) and screwed on the flash hider thread (below). The T8G3 Scout extends total length of G3 by about 73 mm (3"), compared to normal flash hider. Muzzle thread for flash hider is also the mounting thread of the suppressor. Standard finish of T8G3 Scout is military grade Parkerizing, like all Reflex Suppressors.

A British FN FAL L1A1 with a T4L1 Ranger Reflex Suppressor was one of the rifles used for sound travel measuring during the joint Suppressor Project. At the Suppressor project Mr. Rauno Pääkkönen (left) and Mr. Ilkka Kyttälä (center) measured rifle suppressor attenuations from distances changing from a few meters to more than a hundred meters. Suppressor attenuation (net sound reduction) was measured to be significantly lower from farther away. The attenuation drop over distance was declared by Rauno Pääkkönen to be due to quicker attenuating of higher frequency dominated spectrum of unsuppressed muzzle report, as compared to lower frequency sonic spectrum of suppressed muzzle noise. Of course, low note travels a longer distance, that's why fog horns of ocean ships have so low voices! The distance attenuation is one of the reasons that measuring close to the muzzle (1 m) regularly gives higher suppressor attenuation than measuring from farther away (beside shooter's ear or from 10 meters away). For more info about the joint Suppressor Project, please see Suppressor Project snapshots or the project summary.

Automatic Rifle Reflex Suppressors

Back to main page

M16 Reflex Suppressor

Steyr AUG Reflex Suppressor

M62 / M76 Reflex Suppressors

Reflex Suppressor for H&K G3

Reflex Suppressor for FN FAL L1A1

M95 / M92 and AK-5 / FNC Reflex Suppressors

Kalashnikov Reflex Suppressor KRS for AK, AKM, AK-74

Bullet impact shift with suppressed Sako M62 Assault Rifle

Related links:

Finnish homepage of Sako M95

The suppressor page of Sako M95 home pages

Update 11.12.2001

Index Main General Rifles 50 BMG SMG MG Contact Links Measuring License Manufacturing Lyddemper.net Suppressors in the UK

guns.connect.fi Gunwriters Reflex Suppressors Main General Rifles 50 BMG SMG MG AR Contact Measuring License Manufacturing Lyddemper.net North American Sales Suppressors in France Suppressors in the UK

Sound Suppressor Links

update 16.07.2004

Uudet: Saksaa puhuvat muovirunkoiset Steyr-Glock-H&K

New: Gunwriters' Iraqi War: They Were Not Asked - Friendly Fire - "Not in My Army!" - Baghdad Hit by Surprise - To Play With - War News by Manuscript.

Literature & Information:

Silencer History and Performance, Vol. 1 by Alan C. Paulson is today's Bible of Suppressors. Alternate purchasing addresses: Amazon, Spytech. Paladin Press is a publisher with a good choice of suppressor literature. IRSAIS website has objective information about infantry weapons and a technical glossary. Machine gun books has a selection of SMG and MG literature. Military Ordnance Design Ltd. is a company which specialises in databases for military, security forces and police. H&L Publications - Free E-book with animated drawings. E-book about Nagant revolvers. Firearms designer Pavel Makarov's home page.

Suppressors and Shooting Range Structures by Suppressor Project leaders Ilkka Kyttälä and Dr. Rauno Pääkkönen. Illustrated on-line summary of results. Apali: Finnish publisher of firearms and aviation history related books and magazines.

Kyttälä & Pääkkönen: Aseiden vaimentimet ja ampumaratarakenteet: Julkaisu ampumaratojen ja aseiden melusuojaukseen.

Inventions for sale on www.innoplaza.net with inventor's links.

Keksijäserveri www.innoplaza.net jossa on mm. keksintölinkkisivu ja myydään keksintöjä -palsta. Tukholman tekniikan messujen keksinnöt.

Revontuli Oy - kirjoja mm. Simo Häyhästä ja Lauri Törnistä (Larry Thorne). Aselainsäädännön osoitteet netissä. Ruotsin Hemvärnet. Suomen Aseliitto. Vapaaehtoisen maanpuolustuksen koulutuskorttijärjestelmä. Taajamatarkka-ammunta TTA. Kotimaiset asehistoriasivut.

Magazines:

Gunwriters on the Web: Iraqi War: They Were Not Asked - Friendly Fire - "Not in My Army!" - Baghdad Hit by Surprise - To Play With - War News by Manuscript. Technology and History Series - Shotgun Projectiles, parts 9 and 10. Gaston's Guns 1 and Gaston's Guns 2 in English or version française 1 and 2. Snipers' pages. Causeries. Mysterious CZ G-2000 both in English and version française by Gaston Depelchin. Feliks! Weapon of tomorrow by Pavel Makarov. DEFLAGRATION, EXPLOSION and DETONATION. Silenced 7.62 mm Nagant Revolver. T-34 Tank. Sound Suppressors on High-Powered Rifles. The Use of Firearm Sound Suppressors for Wildlife Management. On the Control of Silencers in the United States. Sako M95 production discontinued. The Assault Rifle Cartridge M/2030. A story about Handloading Subsonic Rifle Cartridges by P. T. Kekkonen, parts 1, 2 and 3 and the history of the legendary Suomi M/31 SMG. Kickback: Questions and Answers.

Suomenkielinen Gunwriters, etusivut 1 ja 2. Saksaa puhuvat muovirunkoiset Steyr-Glock-H&K. Tekniikkaa ja historiaa -sarja, osat 7, 8, 9 ja 10. Mauser C96 käsikirja osa 1, osa 2 ja osa 3. Talvisotaisia myyttejä ja muistelmia. Kalkkivaari metsästyksestä. Feliks! Takkuilevatko sivut? Vihjeitä surffarille. Mustaruuti tiivistyi "valssin tahdissa". Norsupyssyn kunnostus ja käyttöönotto. Husovaarnan huoripojat. L-39 "Norsupyssyn" ampumatarvikkeet. Atchissonin ryntöhaulikko. Tuntematon Rokka. Piäkirjotus. Burgessin linkkuhaulikko. Kaasutiivis revolveri - unelmaako vain? Peten Haag 1899. Schouboen pyssyt. Ajankohtaista: Ruutiset. Haku. Tokko tietoa on - palstalla yleisön kysymyksiin vastaa PeTe. Mestarien mietteitä tarkkuuspiippujen tuotannosta, P. T. Kekkonen. "Valkoinen kuolema", kirja tarkka-ampujalegenda Simo Häyhästä. Adam Mykkäsen tosi pieni ja kevyt hirviase. Joseph Kennedy ja V3, Hitlerin Raippa. Bergmann KP 18-I, konepistoolien esiäiti. Kolumni: Pete päivittelee. RK-patruuna vuonna 2030 -esittely. Sotka-tankki kulkee taas. Peten 'Pakinaa lähipatruunoista'. Osat 1, 2 , 3 , 4 ja 5 PTK:n suomenkieliseen Suomi KP/-31 -tarinaan. Pakinapalstalla Kalkkivaari.

Ronaldo Olive's Firepower is a thorough and interesting on-line magazine with a lot of articles about legendary and modern firearms.

Gunweb is a web magazine about firearms. Small Arms Review is a popular firearms magazine with a good website and a link page. Other magazines: Precision Shooting, Tactical Shooter, Captain S's Home Page, SOF Soldier of Fortune Magazine.

Urheiluampuja-lehti toimii liiton, alueiden, seurojen ja ammunnan harrastajien tiedonvälittäjänä. Ase-lehti. Skanneri - lehti / magazine.

Huumoria: Panssarivau.nulla puuhun. Pikkuinsinööri.

Organizations:

Pohjan pioneerikilta. Kaukopartio 2001 -harjoitus. Suomen Aseliitto.

Suppressors and Silencers:

Manufacturers: Sound Technology with good and accurate info about suppressors and their licensing in the U.S. and a regular newsletter. Gemtech, Special Op's Shop, Brugger and Thomet, AWC Systems Technology, Silent Options, Knight's suppressors. Finnish manufacturers: Ase Utra is a member of BR group. BR-Tuote is the central manufacturer of Reflex Suppressors. Suppressors in Norway. Jackson Rifles mounts rifle suppressors that comply with UK Noise at Work Regulations. L'Armurier Breton suppressors.

Suppressor pages: Gunther's Suppressors website tells about experimenting with suppressor types. Chris Halbrook's suppressor page.

SMG, MG, Pistols and Rifles

Tom Bowers' famous SMG and MG website has a MG board with active suppressor discussion, a reloading, a handgun and a semi-auto discussion board. Urban Armory is a site with a class III bulletin board for suppressors etc. Russian AK board. Mongo's popular MG pages with good weapon introductions, a MG board and a link page. IDPA International Defensive Pistol Association.

Sako M95 Finnish home page of the assault rifle tells also about its equipment, like TR8 suppressor with measured noise levels. The Dutch Galil site. Sturmgewehr. Valmet Weapons Club. CZ pages.

SAKO M95 kotisivut. Finnish weapons introduced by E. Juhola. IDPA Suomeen.

PPD34 pages. AIMED Point Shooting or P&S for CQ combat accuracy. Tactical Intervention Specialists. Armstech customizes rifles. Remtek has weapon data about FAMAS, FN, HK, IMI, SIG and Steyr. Modern Arms is an information page. AR-15 Dutch home page. Belgian gun page. McMillan. SMG page of Reflex Suppressors.

FCSA is a .50 shooters' association. Barrett manufactures 50 BMG rifles. .50 caliber page of Reflex Suppressors.

Sniper's Pages:

Finnish snipers' weapons. Mel's sniper page, a lot of pictures about sniper rifles. Sniper Country is a really good sniper site with good links and a discussion group. Special Operations page is full of info and links. Simo Häyhä in sniper's log book. TAK-85 Finnish target / sniper rifle. Sniper Store. Sniper Central.

Simo Häyhä, kaikkien aikojen legendaarisin tarkka-ampuja. Tarkk'Ampuja-Kilta perustettu Suomeen.

Link pages and gun indexes:

Gaston's website refers all the French gunsites. Firelinks of Firepower magazine. Duncan Long's firearms links. AR-15 / M16 links. Firearms in Russia links. Darrell Hayness' firearms links. Sherry's firearms link page. Steve Michaelson's NFA Firearms and Suppressors Ad Board. Tuco's link page. Suomen Armeija and Suojeluskunta Re-enactors' links. Surgical Shooting links. Gun Index. Shooters'. Gun Sites search. Guns.net. Experimental Energy Links.

Ammunition & reloading:

Sabots for reloaders. SLAP (Saboted Light Armor Penetrating) by Winchester-Olin and by CIS Singapore. 12 GA Flechette sabots by Sabot Designs LLC. Reloader's Supplies Ltd in New Zealand. Angelfire comments about Gunwriters' saboted Cartridge 2030 concept and ideas about subsonic bullet.

Norma has ballistic counters for all of its cartridges. Vihtavuori gives reloading information also in metric format. Lapua and Nammo ammunition manufacturer's sites. Hodgdon powders. Sierra bullets and good link library. Hornady bullets. Web Ballistics computer by David Basiji. Rainier bullets. AGUILA ammo. Tussari/Villikarju Oy. GS Custom HV Bullets. QuickLOAD ballistics program free demo.

Guns & Ammo Trade:

Asetalo. Mikko Erkkilä Oy. Eräliike/Gun Trade Riistamaa. Collector's Source Military Collectables. Keräilyaseita / Sammlerwaffen / Collector's weapons: PJ-Waffen-Guns. Guns dealing & Pro Firearms.

Hunting:

Jesse's Hunting Page gives good info about laser rangefinders and GPS.

Keskustelusivuja:

Vesan metsästyssivut, paljon tietoa, mm. keskustelupalsta ja ballistiikkaohjelmia. Aseliitto harrastajien etuja puolustamaan.

Shooting simulators:

Eko aims means totally silent shooting with a camera gun. Noptel makes laser shooting simulators.

Scopes & optical:

Leupold sights and other products. Premier Reticles builds special versions from Leupold sights. Schmidt & Bender home pages. Hensoldt makes military grade scopes. Tasco scopes, also tactical models. Leupold. Zeiss.

Historical & collecting:

Mosin Man's site of Russian and Finnish Weapons of the WW2 era with collector's forum, Tuco's discussion boards and a link page. Mosin-Nagant page by Dan Johnson. Russian Mosin-Nagant page by Bob Wheeler. Finnish Weapons and Sisu by Harvi L. Kiiski, collector. Maxim MG community: To share knowledge of Maxims firearms.

Mannerheim's weapons. Larry A. Thorne Memorial Chapter, Special Forces Association. Suomenkielinen Lauri Törnin muistosivu. Kalashnikov page with history and weapon types. Veteraaniperintö elää internetissä. Russian story from Finnish Winter War. Kotimaiset asehistoriasivut.

Finnish "Kyynel" long range patrol radio. Skanneri - lehti / magazine.

T 34 Tank with design history Soviet tanks, including T-34. Swedish T-34 Society. T-34 was Designed and Built in Ukraine.

Reflex Suppressors pages:

Main General Rifle and shotgun Automatic rifles .50 BMG SMG MG Contact License Manufacturing Index Lyddemper.net North American Sales Suppressors in France Suppressors in the UK

Scientific & Measuring Suppressors:

Suppressor Project Suppressor Project summary Suppressors and Shooting Range Structures Bullet flight noise at varying velocities Bullet impact shift of suppressed M62 Directional noise diagram of suppressed M62 308 Rifle Measured

Mounting Suppressors:

Minireflex Pistol Suppressor MX12 Mounting T8 Scout to a rifle Aligning and centering

Reflex Suppressor Drawings and Manuals:

MP5 T8 Scout Kalashnikov M16 & AR-15 Steyr AUG FAL L1A1 H&K G3 Barrett M82A1 Valmet M62 Sako M95 Pistol Sound Moderators Suomi SMG SS-II Dummy cartridge suppressor UZI , MINI-UZI & MICRO-UZI FAMAE SAF

Sound Suppressor Links to Firearms Magazines, Literature, Sound suppressors, Manufacturers and History: http://guns.contact.fi/rs/linx.html

guns.connect.fi Gunwriters Reflex Suppressors Main General Rifles 50 BMG SMG MG AR Contact Measuring License Manufacturing Lyddemper.net North American Sales Suppressors in France Suppressors in the UK

Snapshots from the Suppressor Project

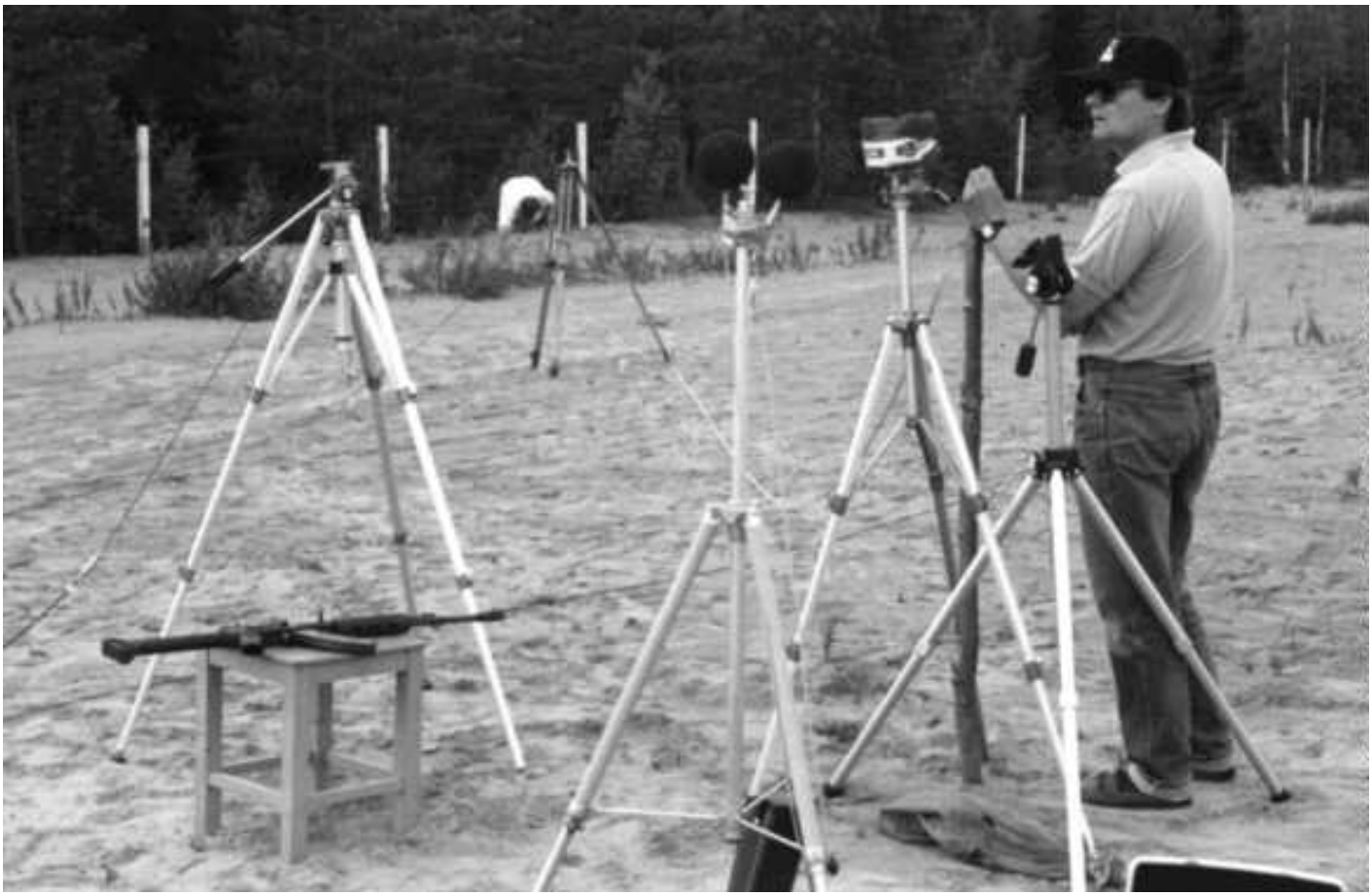
For Suppressor Project results, see: Suppressors and Shooting Range Structures. For brief results, see the Suppressor Project Summary.

Except rifles and pistols, also suppressed shotguns were measured in the Suppressor Project. The sound level meters are arranged at about half a dozen points around the shooter to measure both noise level exposure to shooting range neighbours and to the shooter's hearing. This photo is from Lahti shooting range, and the shotgun being carried to measuring stand is SPAS15 with an XRS Reflex Suppressor. One of the points of measuring shotgun noise levels was to find an alternate to having to build noise shields to shotgun shooting ranges, like those seen in the background.

It was also noted, that the plain feeding cycle noise of a self-loading rifle can reach marginal peak levels, like with this M62 assault rifle. For the same rifle, unsuppressed and suppressed noise levels with both standard and subsonic ammo had already earlier been measured as a directional diagram.

Suppressor effect on accuracy of a variety of.308 rifles was tested from Lapua Cartridge Factory machine rest in an indoor test shooting range. Chief Engineer Ilkka Kyttälä of Ministy of Labour, director of the Suppressor Project, checking length of a T8 Scout. See .308 measured and Suppressor Trials 1999.

Professionals were needed also for testing a variety of suppressors for M62 assault rifle, regarding their effect on accuracy and impact shift.. Shift of group center with plain barrel, flash hider and suppressors of different sizes and weights was shot from benchrest (above). Accuracy test was made from machine rest. To see resulting impact shifts, click Impact shift diagram.



Dr. Rauno Pääkkönen conducting research among sound meter jungle in Lapua. In this event, different methods of shooting noise measuring procedures were compared for finding simple means of measuring shooting noise. For noise exposure to neighbours of a shooting range, a position at 10 meters right to the side of a firearm was found a good average from different directions and distances compared. Shooter's noise exposure was quite logically measured from beside his ear. See Suppressors and Shooting Range Structures for more information.

Every .308 cartridge was handloaded prior to each shot for measuring bullet flight sound. A T8 Scout suppressor is attached to a BR varmint rifle. Sound meter remote readout and loading equipment are shown beside the rifle. Contrary to previous belief it was found, that in practise the speed of sound (Mach 1) was not any sudden threshold to sonic crack. In fact, the flight noise level started to rise from about 310 m/s and continued to rise all the way through the Mach 1 of 340 m/s up to 400 m/s, after which it leveled (see the diagram about resulting bullet flight noise). Results of these as well as of other Suppressor Project experiments are published in *Alan C. Paulson*'s book Silencer History and Performance, Vol. 1, and in *Rauno Pääkkönen*'s and *Ilkka Kyttälä*'s book Aseiden vaimentimet ja ampumaratarakenteet. See also an article about "How to Handload Subsonic Cartridges" from Gunwriters on the Web magazine by P. T. Kekkonen.

Measuring the slowest subsonic .308 loads was tricky. The flight path became so curved with the slowest bullets, that they started to scratch the diffuser stands of a speed meter situated downrange, and eventually one bullet hit the screen! Luckily, a precaution had been made by putting double acryl shields in front of the screen, and the meter itself was saved (although shocked, maybe)!

The speed dispersion of ultra slow .308 loads with jacketed bullets was high because of the minimum amount of powder in a large volume .308 case. One of the shots did not produce any speed readings, and it was very quiet also. After removing the suppressor, a curious sight was seen in the muzzle: The Slowest Bullet Ever was still hesitating its Giant Leap for the Wisdom of Mankind. Finally, it was carefully snapped out of the muzzle with a cleaning rod, and the test was continued.

Suppressor Project

Suppressor Project Samples and Documents:

Document: Suppressors and Shooting Range Structures

Document copy: Suppressor Project Summary

Directional noise diagram of suppressed M62

Bullet impact shift with suppressed M62

Flight noise diagram of a .308 bullet

Suppressor Trials 1999

.308 Measured

Literature links:

Aseiden vaimentimet ja ampumaratarakenteet by Suppressor Project leaders Ilkka Kyttälä and Rauno Pääkkönen.

Silencer History and Performance, Vol. 1 by Alan C. Paulson. Alternate purchasing addresses: Amazon, Spytech.

Index Main General Rifles 50 BMG SMG MG AR Contact Links

Reflex Suppressors™

Contacts, inquiries and orders

Retail terms:

We also sell our products now to individuals in countries where we do not have a distributor. NOTE: Prior to ordering, check that you are allowed to buy, import, hold and use a suppressor in your country or state. Take contact to our export sales... and in case you decide to buy a product from us, you will get a proforma invoice (no obligations to you), with prices, delivery times, how to pay, information needed for importing, etc. The postage and handling costs come in addition.

Residents in EU countries: without your VAT - number we add 22 % of VAT. Prices are ex works in Joensuu, Finland, without the VAT. All possible extra or other taxes, fees or equivalent are to be paid by the customer. As many suppressor and firearm designs exist, please consult first your local gunsmith about assemly to your gun. Necessary technical information follows every suppressor.

Residents in France: L'Armurier Breton, zone de la bourdinière, 22 120 Yffiniac, 00 33 02 96 72 76 55. Website: http://armurier.breton.free.fr . Email: armurier.breton@free.fr .

Residents in Norway: See website Lyddemper.net.

Residents in New Zealand: Please contact Reloader's Supplies Ltd, Onehunga, Auckland, New Zealand. Store at : 12 Newsome Street, Onehunga, Auckland, NZ. P.O.Box 13 - 010, Phone : (09) 636 - 5407, Fax : (09) 634 - 0267. Contact person: Mr. Scott Stonex. Orders : orders@reloaders.co.nz .

Residents in the UK: Please contact Jackson rifles. See website www.reflexsuppressors.co.uk .

North American Sales: Please contact Canadian Tactical Ltd. at www.canadiantactical.ca in Calgary, Alberta, or email them at info@canadiantactical.ca . Phone: 1-(403) 277-5184 fax: 1-(403) 699-0025.

U.S. Residents: Prior to inquiring, check from your local BATF authorities that you are allowed to buy, import, hold and use a suppressor in your state.

Distributor sales:

It is our intention to serve you through these pages with information you require. Please, do not hesitate in asking questions about safer and more silent shooting pleasure! You may also wish us to add a link to other pages dealing with firearms or to other related topics. Let us hear about it. If you wish to have brochures in GIF form, or an individual copy of any of the JPEG photos in these pages, feel free to ask us to send you one (s) by e-mail. Due to numerous requests and inquiries, we so far can answer only for inquiries with names and adresses.

Interested in distributorship? Here are some questions to help you to send us information about you and your interests:

- Who you are, where you are, your contact information (mail address, telephone and fax numbers, email and eventually other contact channels).
- What is your status (for example: already a gun or gun accessories dealer, distributor or eq., a class 2 or 3 mfr.)?
- What kind of gunsmithing skills you have or do you have good contacts to a qualified gunsmith as a partner?
- What kind of customer basis and experience you have?
- Are you operative locally or on a wider area?
- What brands you already have in your sales tray?
- Are you specially interested in some firearms related topics?
- Any information about your own situation (turnover, number of employees etc.) is essential.
- Where and when we could meet and have serious talks about the subject?

All inquiries about distributorship containing this reply information will speed up our handling of the matter. All replies will be handled confidentially and proceeding will be fast. Inquiries showing only an email name make it difficult for us to start serious negotiations about distributorship. We thank you in advance for your serious and constructive approach and welcome all inquiries and proposals warmheartedly!

Importing: Unless you already know all those issues needed to import, sell and assemble suppressors in your country, please get familiar with them as we have no updated info about federal, state or local rules, laws and possible restrictions. Also the time span needed to get those may vary significantly.

General terms:
- All documents are truthfully indicating the merchandise, we do not sell suppressors with other than "suppressor" or "sound moderator" contents.
- All payment documents bear true values.
- We act only according to international customs and authorities directives and our and our customers' laws. Any suggestions against laws and good practise will be neglected.

Price information, brochures and availability of suppressors to various firearms, deliveries to your country etc: Please contact our export sales, Mr. Kari Sauramo.

Manufacturing Reflex Suppressors under License:

Considering the possibility of manufacturing and marketing Reflex Suppressors in your country? For more information, please look at separate License Manufacturing page.

Export contact information:

Mr. Kari Sauramo
Metsäläntie 1, 04480 Haarajoki, Finland, Europe
Tel +358 9 271 3027, GSM +358 50 468 5550, Fax +358 9 2713027

BR-Tuote Ky is the central company in the network around Reflex Suppressors, lead by gunsmith Mr. **Markku Sivonen**. It is the original manufacturer of Reflex Suppressors, nowadays having basic production of them contracted to Ase Utra, and concentrating on sales of products. BR-Tuote produces also the most popular series of Finnish scope mounts for hunters and target shooters.

Ase Utra is the main manufacturer of Reflex Suppressors. It's owner, gunsmith Mr. **Kari Hirvonen**, almost exclusively concentrates on final assembly of the entire line of about 60 standard models of Reflex Suppressors made from parts obtained from numerous subcontractors. Annual production of Ase Utra reaches thousands of suppressor units a year. The user of a Reflex Suppressor can recognize his unit having been assembled in Ase Utra plant by stamping "AU" at the rear end of a Reflex Suppressor.

Mr. **Kari Sauramo** is a competent export agent having worked with Reflex Suppressors from the year 1998. He also represents several other companies with their products related to shooting or hearing protection. Nowadays he is having an own export agency, for which he has gained experience working for Finnish firearms and ammunition industry along his extensive commercial career.

Mr. **Juha Hartikka** is the inventor and designer of Reflex Suppressors and BR Scope Mounts, and a number of other products to several companies. Working as a private industrial product designer, his co-operation with BR-Tuote started almost from the establishing of BR in the late eighties.

Update 03.01.2004

Manufacturer: BR-Tuote Ky, Sahamyllynkatu 33, 80170 Joensuu, Finland, Tel/Fax: +358 13 896862

Export contact: Kari Sauramo, Metsäläntie 1, 04480 Haarajoki, Finland, Tel/Fax: +358 9 271 3027, GSM +358 50 468 5550

License manufacturing introduction: http://rs.innoplaza.net

Reflex Suppressors

Reflex Suppressors Contact Page on Internet: http://guns.connect.fi/rs/contact.html

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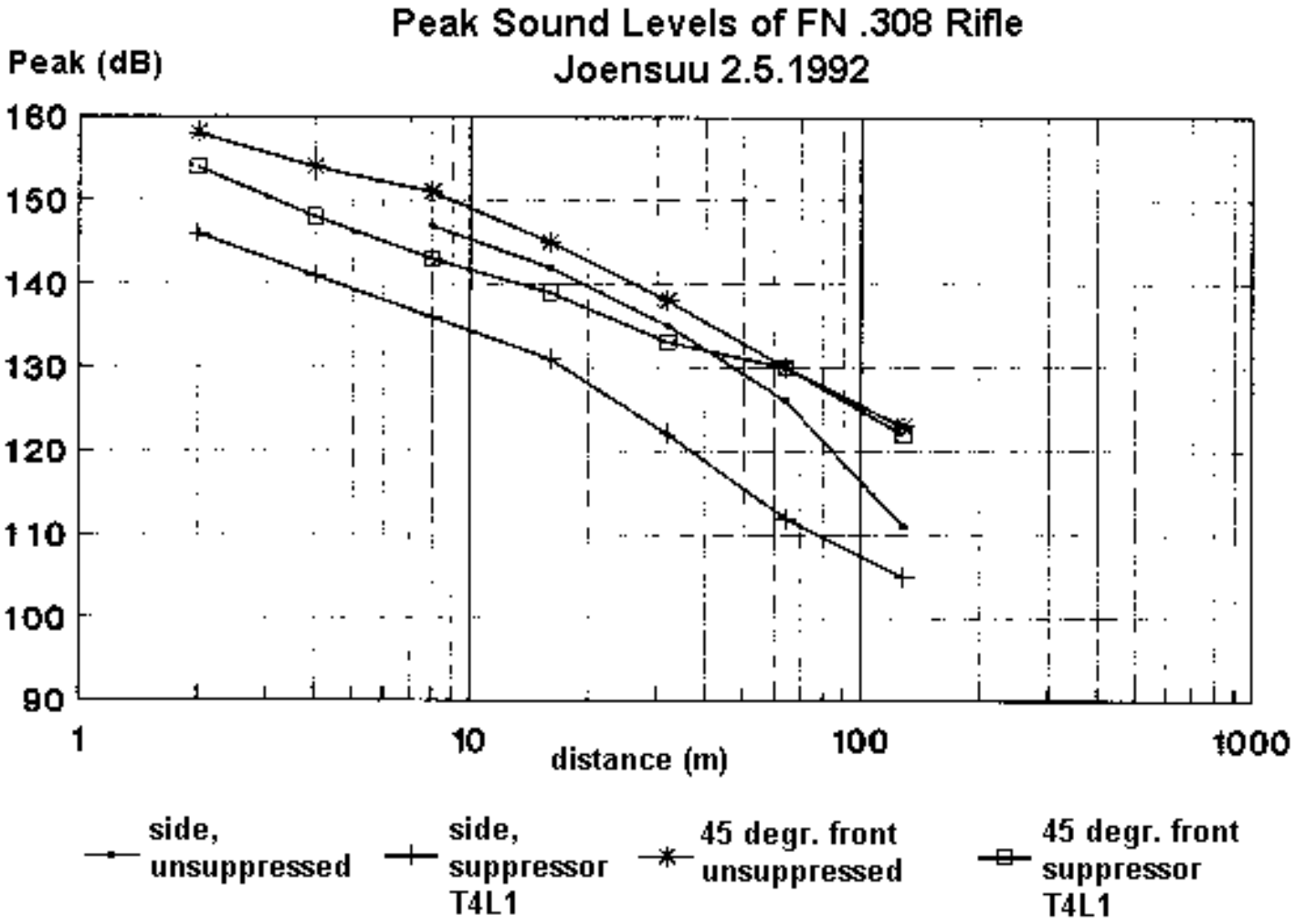
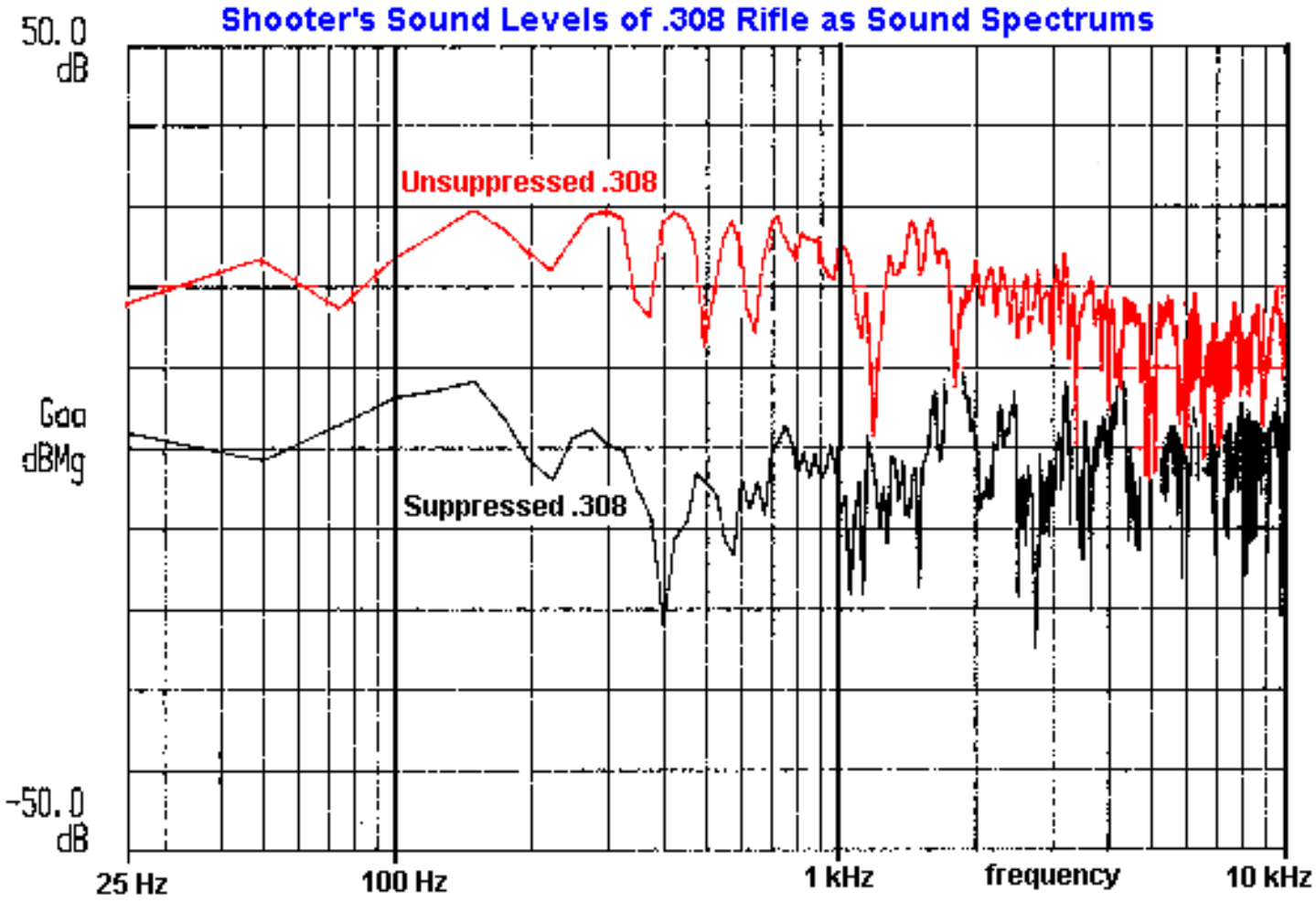
guns.connect.fi Index Main General Rifles 50 BMG SMG MG AR Links Measuring License Manufacturing Lyddemper.net North American Sales Suppressors in France Suppressors in the UK

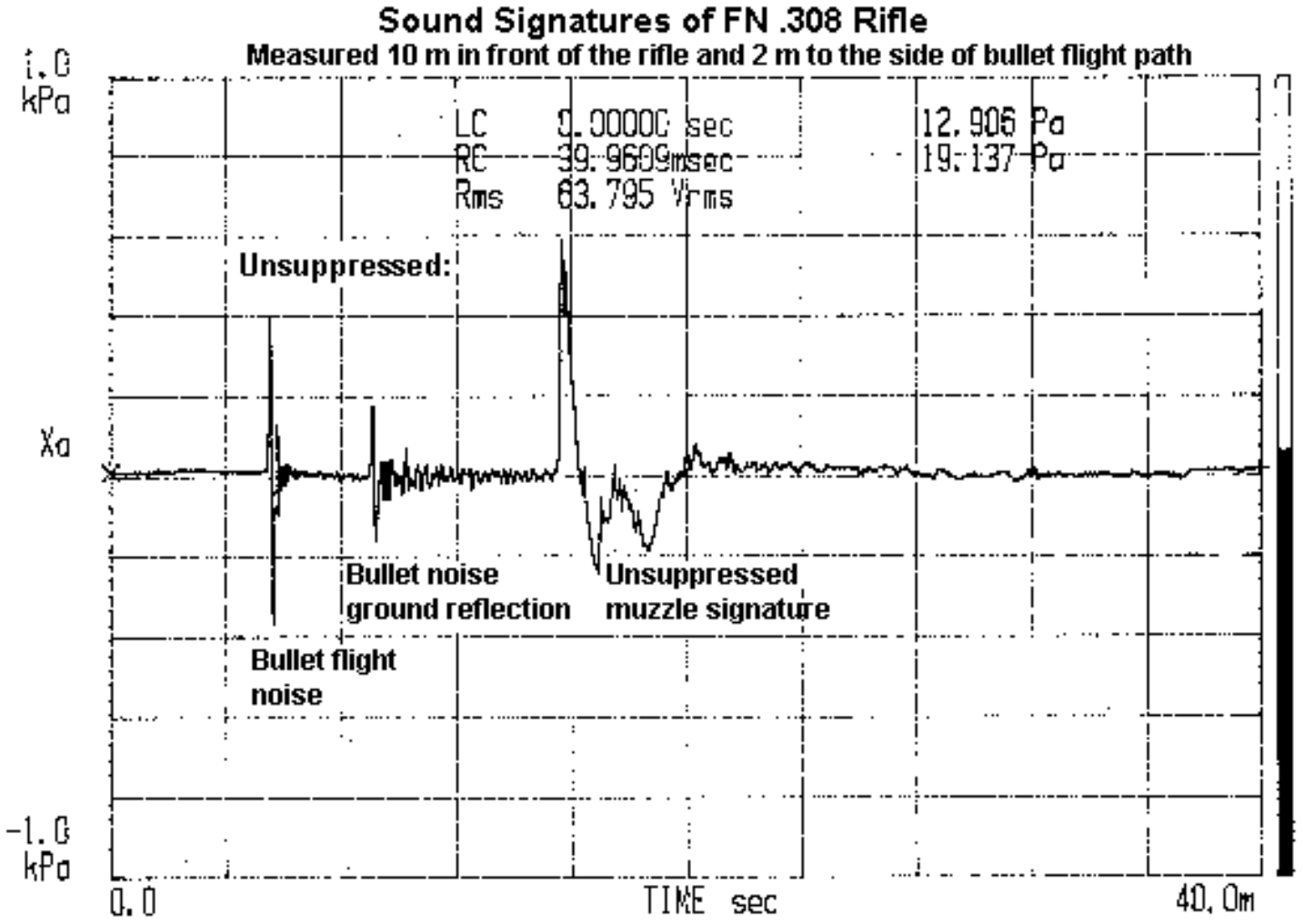
.308 Measured

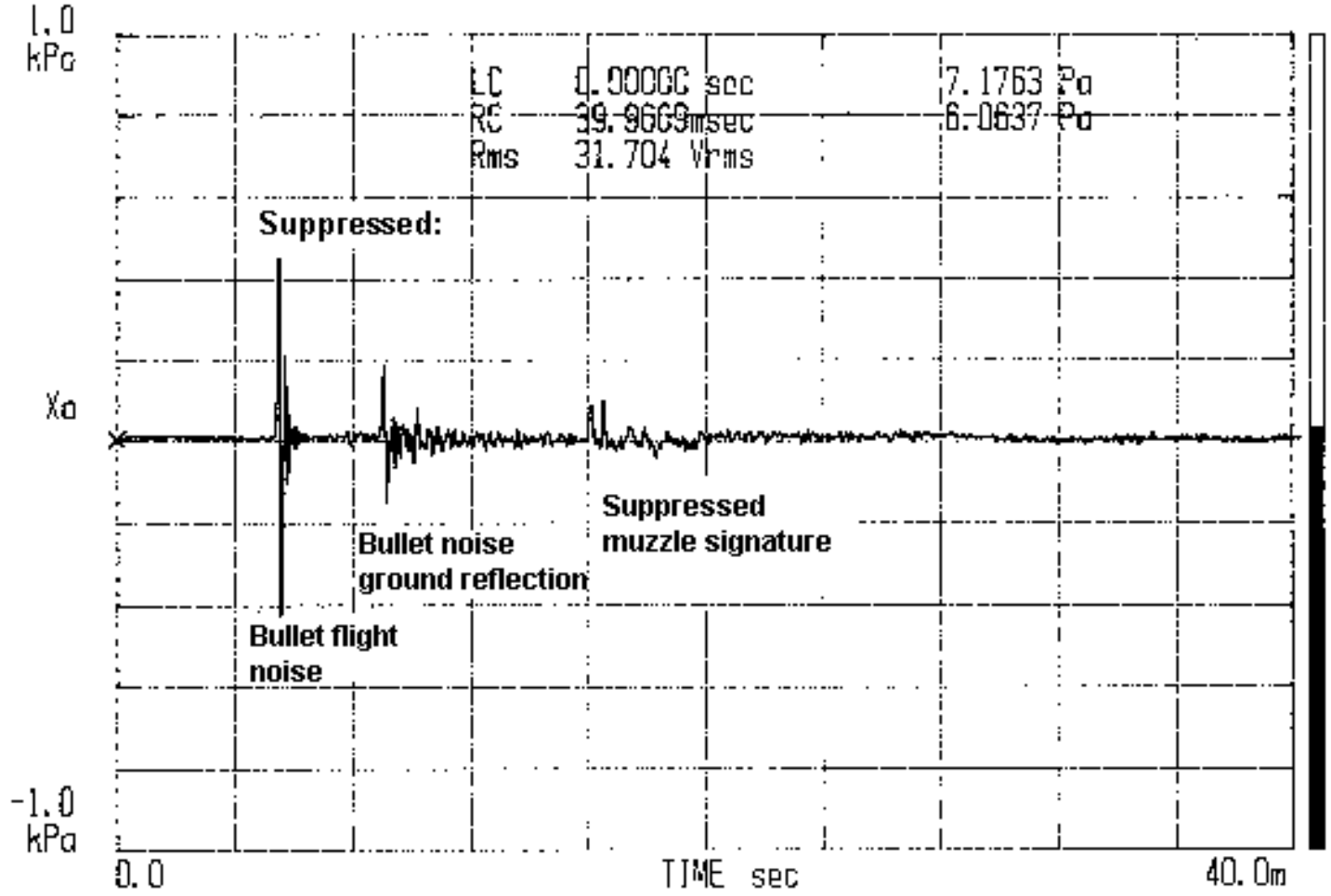


The sound levels above were measured from 2 to 128 meters distance in Joensuu by Dr. Rauno Pääkkönen and Chief Engineer Ilkka Kyttälä of Finish Ministy of Labour with a FN FAL L1A1 rifle using .308 Win standard high velocity ammo (initial velocity abt. 700 m/s). Sound levels were measured as unsuppressed and suppressed with a short T4L1 Ranger Reflex Suppressor from right angle and from 45 degrees angle in front of the rifle. As expected, suppressed and unsuppressed levels in front of the rifle were rather close to each other because of the flight noise of supersonic bullet. To the side the sound levels were significantly reduced. A new finding was that a suppressor reduces sound level more efficiently near the firearm than farther away. This is declared by the nature of high frequencies tending to get dampened earlier when traveling in air than low frequencies. High frequencies are also easier to attenuate by a suppressor than the bassy part of the gunshot which travels farther.



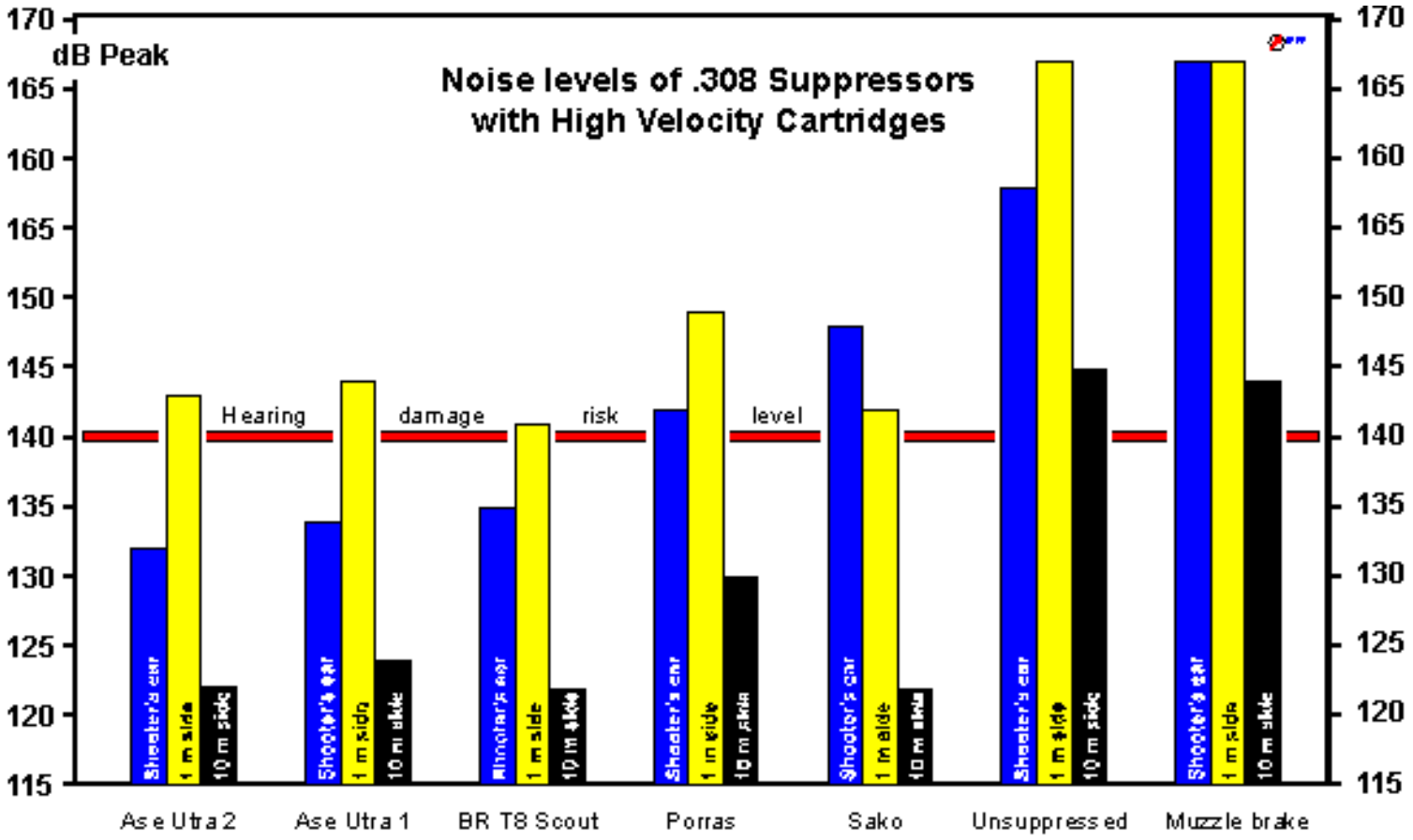
What frequencies do dominate the gunshot, then? This sound spectrum measured by Dr. Rauno Pääkkönen during Finnish Suppressor Project with a FN FAL .308 rifle both as unsuppressed (red line) and equipped with a T8L1 Scout Reflex Suppressor (black line) tells that shooter's sound level maximums are typically from 130 Hz to 3 kHz frequency range. A suppressor decreases the most harmful sound levels of the spectrum effectively. Gunshots typically create hearing loss within this range causing typically difficulties to understand speech or ringing in the ears. These damages can not be cured. Hearing protection can not be used in all situations like while hunting. Suppressors offer effective means to fight against permanent hearing damages. Best way to guard your hearing is to use a suppressor *together* with conventional means of hearing protection, whenever possible.


Sound Signatures of FN .308 Rifle
Measured 10 m in front of the rifle and 2 m to the side of bullet flight path
1.0 kPa
LC 0.00000 sec
RC 39.9609msec
Rms 63.795 Vrms
12.906 Pa
19.137 Pa
Unsuppressed:
Xa
Bullet noise ground reflection
Unsuppressed muzzle signature
Bullet flight noise
-1.0 kPa
0.0
TIME sec
40.0m


1.0 kPa
LC 0.00000 sec
RC 39.9609msec
Rms 31.704 Vrms
7.1763 Pa
6.0637 Pa
Suppressed:
Xa
Suppressed muzzle signature
Bullet noise ground reflection
Bullet flight noise
-1.0 kPa
0.0
TIME sec
40.0m

Above pictures shows typical unsuppressed and suppressed sound signatures with bullet noises as measured 10 meters in front of the rifle and 2 meters to the side of bypassing supersonic .308 bullet fired from a FN FAL rifle. The unsuppressed muzzle signature in the upper image is even louder than the bullet sonic crack preceding it. For human ears these two sounds come so close together they resemble one discharge. The curve in the image below shows the almost vanished suppressed muzzle signature. However, listened by ear the remaining bullet sound seems almost as loud as the suppressed shot. This is why a suppressor has practically no effect on sound levels *in front of* a rifle. *Behind* the rifle at shooter's position the bullet noise is almost nonexistent and 20 dB of the muzzle noise stressing his ears can be reduced. The suppressor can be used for efficient hearing protection of the shooter, but not for hiding the fact from that a high power rifle has been fired! For specific info see a page about bullet flight sound.

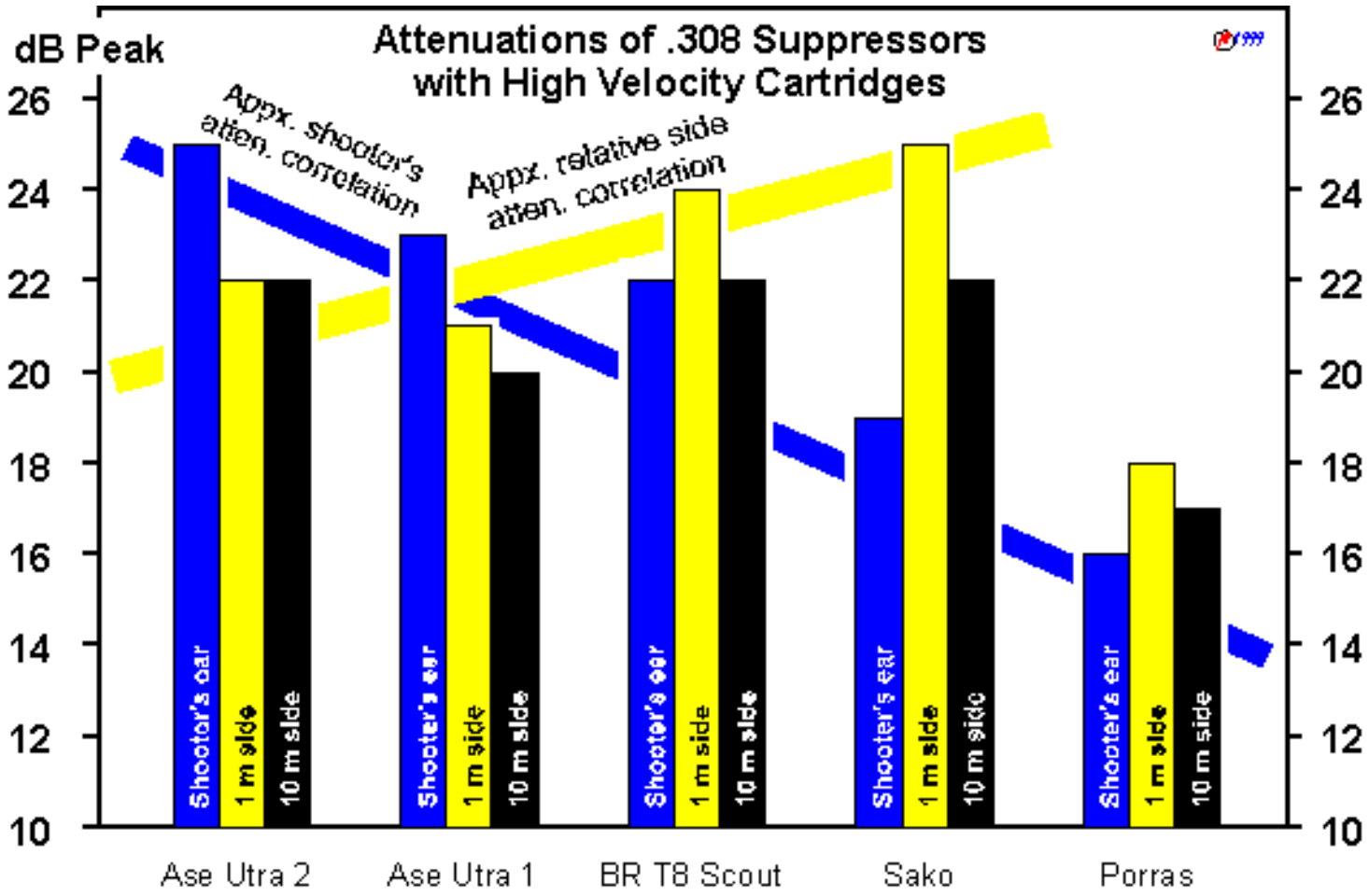
Rauno Pääkkönen (left) and Ilkka Kyttälä walking back from a succesfull distance attenuation in Lähdekorpi shooting range 2.5.1999. Gunwriter P. T. Kekkonen served as a test shooter of the FAL rifle equipped with a T8L1 Scout Reflex Suppressor.



Picture above: Noise levels of five .308 suppressors compared to unsuppressed noise levels of a Tikka M595 rifle with bare muzzle and a Sako TRG21 equipped with a muzzle brake. Lowest shooter's noise levels (blue) were provided by both Ase Utra and the BR-Tuote T8 Scout suppressors, which produced levels clearly below the hearing damage limit of 140 dB. Porras almost reached the limit. Although Sako exceeded the risk limit by eight decibels it's 10 meter side noise level (black) was among the three lowest along with the T8 Scout and Ase Utra 2.

As shooter's noise level tells the level of hearing protection os a suppressor, the 10 meters to the side level is used to estimate the average environmental noise pollution of a firearm. 1 m side noise level (yellow) is used for some military purposes, but it can also be used for estimating the noise exposure of a hunting dog accidentally got too close to the muzzle while a hunting rifle is fired. The 1 m level was lowest with the T8 Scout, followed closely by Sako and both Ase Utra models.

Unsuppressed levels (the two groups on the right) exceeded the 140 dB hearing damage risk level even at 10 meters side position (black) and reached 158 dB at shooter's position. When shot with an effective muzzle brake, a .308 rifle produced still 9 decibels higher noise to the shooter - a level of 167 dB can cause damage even with single shots to unprotected hearing! The muzzle brake did not have equal effect on the side noise levels (yellow and black). Source: Suppressor Trials May 28, 1999. Measured by Dr. Rauno Pääkkönen.



Picture above: Is there any correlation between suppressors attenuations (net sound reductions) measured from three positions: beside shooters ear, 1 meter to the side and 10 meters to the side of the muzzle? 1 meter to the side of the muzzle seems to systematically give higher attenuation measures than the 10 meter environmental noise measuring position. This is probably due to that high frequencies dominating firearm muzzle report are damped quicker while traveling through the air than the low frequencies. However, both 1 m and 10 m side attenuations correlate positively: If either side attenuation is high, the other is usually also high.

When measured beside beside shooter's ear (hearing protection position) the correlation to both side position seems to be negative with most measured suppressors. Those suppressors having exceptionally good shooter's attenuation may produce low or average side attenuations and good side attenuator suppressors may be average or insufficient for shooter's hearing protection. Declaration to this is: Although a correctly designed suppressor is able to absorb sound energy relatively to it's size, the remaining sound escaping the suppressor can be directed to different directions depending on suppressor design. If designed and optimized for good shooter's noise attenuation the remaining escaping sound energy is usually directed to other directions like to the side. This acts also vice versa: Trimming a suppressor for good side attenuation may result to more sound directed towards the shooter. Source: Suppressor Trials May 28, 1999. Measured by Dr. Rauno Pääkkönen.

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308 Rifle Measuring Data on Internet: http://guns.connect.fi/rs/308measured.html

Index Main General Rifles 50 BMG SMG MG AR Contact Measure Links

Index Main General Rifles 50 BMG SMG MG AR Contact Measure Links

Finnish Sound Suppressor Trials 1999 Measuring Data

Source: Suppressor Trials May 28, 1999. Measured by Dr. Rauno Pääkkönen.

Shot Nr.	Gun measured at Lapua 28.5.1999	Barrel length	Suppressor manufacturer & model	Ammo: Subsonic / Hi Velocity	Velocity	Meter nr. 1: shooter	Meter nr. 2: 1 m side	Meter nr. 3: 10 m side	Attenuations: shooter / 1 m side / 10 m side	First shot add
		(mm)			(m/s)	(dB)	(dB)	(dB)	(dB)	(dB)
1	Sako P94S	560	-	.22 SS	294	132	137	114	-	-
2	Sako P94S	560	Sako	.22 SS	300	109	110	91	23 / 27 /23	1
3	Sako P94S	560	-	.22 HV	389	132	140	118	-	-
4	Sako P94S	560	Sako	.22 HV	390	124	123	108	8 / 17 / 10	0
5	Ruger 10/22		LEI fixed	.22 SS	271	122	126	103	10 / 11 / 15	1
6	Ruger 10/22		LEI fixed	.22 HV	354	126	128	107	6 / 12 / 7	0
7	Ruger 77/22		LEI fixed	.22 SS	282	122	126	102	10 / 11 / 16	1
8	Ruger 77/22		LEI fixed	.22 HV	369	125	131	110	7 / 9 / 4	3
9	Toz 16		Eräkulma fixed	.22 SS	288	116	114	91	16 / 23 / 27	-5
10	Toz 16		Eräkulma fixed	.22 HV	370	126	125	107	6 / 15 / 11	-1
11	Ruger Mk II		Eräkulma fixed	.22 SS	219	115	112	92	17 / 25 / 22	-2
12	Ruger Mk II		Eräkulma fixed	.22 HV	290	118	117	95	14 / 37 / 23	5
13	Thompson Center		-	.22 SS	301	142	146	125	-	-
14	Thompson Center		Eräkulma	.22 SS	306	113	116	95	29 / 30 / 30	1
15	Thompson Center		-	.22 HV	379	145	150	128	-	-
16	Thompson Center		Eräkulma	.22 HV	379	125	125	108	20 / 25 / 20	0
17	Ruger Mk II	140	-	.22 SS	252	144	153	131	-	-
18	Ruger Mk II	140	Pirkan Ase	.22 SS	256	127	132	112	17 / 21 / 19	7
19	Ruger Mk II	140	-	.22 HV	289	146	154	132	-	-
20	Ruger Mk II	140	Pirkan Ase	.22 HV	327	128	134	113	18 / 20 / 19	7
21	Parabellum		German	7.65 Pb	323	140	139	117	-	-2
22	AK-47	414	-	7.62 HV	701	159	163	141	-	-
23	AK-47	414	-	7.62 SS	298	159	158	136	-	-
24	AK-47	414	PBS-1	7.62 SS	296	139	138	116	20 / 20 / 20	0
25	AK-47	414	PBS-1	Sako SS	331	137	136	117	-	1
26	Taurus PT99	125	-	9 mm HV	340	155	160	138	-	-
27	Taurus PT99	125	Eräkulma	9 mm HV	354	133	139	120	22 / 21 / 18	8
28	Taurus PT99	125	-	9 mm SS	286	154	159	137	-	-
29	Taurus PT99	125	Eräkulma	9 mm SS	291	132	136	116	22 / 24 / 21	8
30	Beretta 92	155	-	9 mm HV	346	152	159	137	-	-
31	Beretta 92	155	LEI SQ	9 mm HV	342	143	136	116	9 / 23 / 21	5
32	Beretta 92	155	-	9 mm SS	281	152	158	135	-	-

33	Beretta 92	155	LEI SQ	9 mm SS	276	139	135	113	13 / 23 /22	6
34	H&K Mk23	149	-	.45 CBC	263	155	160	137	-	-
35	H&K Mk23	149	B&T Impulse II	.45 CBC	276	143	142	123	12 / 18 / 14	2
36	H&K MP5	225	-	9 mm HV	383	154	157	135	-	-
37	H&K MP5	225	BR-Tuote R16MP5	9 mm HV	390	134	137	118	20 / 20 / 17	2
38	H&K MP5	225	-	9 mm SS	312	152	155	133	-	-
39	H&K MP5	225	BR-Tuote R16MP5	9 mm SS	308	135	137	116	17 / 18 / 17	1
40	H&K MP5	225	LEI MP5	9 mm HV	381	132	131	117	22 / 26 / 18	1
41	H&K MP5	225	LEI MP5	9 mm SS	310	131	125	105	21 / 30 / 28	6
42	H&K MP5SD		H&K	9 mm HV	280	133	127	106	21 / 30 / 29	2
43	H&K MP5SD		H&K	9 mm SS	230	133	126	104	18 / 29 / 29	1
44	H&K MP5SD		LEI	9 mm HV	281	132	127	109	22 / 30 / 26	5
45	H&K MP5SD		LEI	9 mm SS	225	130	127	107	22 / 28 / 26	1
46	SAR80	459	-	.223 HV	907	156	163	141	-	-
47	SAR80	459	LEI Universal	.223 HV	906	134	126	109	22 / 37 / 32	1
48	M16A1	508	-	.223 HV	874	155	163	141	-	-
49	M16A1	508	BR-Tuote T8AR	.223 HV	868	131	143	121	24 / 20 / 20	-2
50	Tikka		-	.308 HV	860	158	167	145	-	-
51	Tikka		Porras	.308 HV	865	142	149	130	16 / 18 / 15	4
52	Tikka		-	.308 SS	324	149	154	134	-	-
53	Tikka		Porras	.308 SS	316	129	131	112	20 / 23 / 22	8
54	Tikka M595	570	-	.308 HV	867	157	165	144	-	-
55	Tikka M595	570	BR-Tuote T8	.308 HV	866	135	141	122	22 / 24 / 22	2
56	Tikka M595	570	BR-Tuote T8	.308 SS	323	126	132	112	23 / 22 / 22	1
57	Tikka M595	570	Ase Utra 1	.308 HV	881	134	144	124	23 / 21 / 20	0
58	Sako TRG21	660	Muzzle brake	.308 HV	892	167	167	144	-	-
59	Sako TRG21	660	Sako	.308 HV	897	148	142	122	19 / 25 / 22	5
60	Sako TRG21	660	Sako	.308 SS	300	125	131	122	24 / 23 / 12	-3
61	LEI De Lisle Mk4		LEI	.308 SS	321	120	124	104	-	6
62	Tikka	570	Ase Utra 2	.308 HV	872	132	143	122	25 / 22 / 22	1

Finnish Sound Suppressor Trials 1999 Measuring Data on Internet: http://guns.contact.fi/rs/trial1999.html

Index Main General Rifles 50 BMG SMG MG AR Contact Measure Links

Document: Suppressor Project Summary

Index Main General Rifles 50 BMG SMG MG Contact Links Measuring

00 ENGLISH SUMMARY

In 1992 a joint project was established in Finland to test suppressors of rifle caliber firearms. There were several reasons for it, among others the adverse effects of shooting ranges on nearby settled areas and numerous cases of hearing injury among Army officers and conscripts as well as these among sport shooters and hunters. The recent promising experience from the efficiency of new Finnish made suppressors was believed to offer another effective possibility to save the shooters hearing and reduce the area required around the shooting ranges due to the noise of shooting. The project was financed by the Ministry of the Environment and the National Board of Labour Protection.

Comparative measurements were made using Army assault rifles (KALASHNIKOV type)*) and common .308 caliber hunting rifles, with and without suppressors to test all essential properties of suppressors and their effects on shooting. The test results were as follows:

1 All suppressors reduced the shooter's exposure from the level of 160 ± 3 dB (without suppressor) down to under the EC risk limit of 140 dB for peak level ($L\hat{p}_C$, L_{Cpeak}). At the bystander's position 2 m aside or in the rear section, noise reduction was similarly effective. At a "trainer's position" 10 m aside, the noise level decreased to less than 130 dB. Regarding the muffling effect, differences between brands of suppressors were small.

2 All brands of tested muzzle brakes or recoil compensators increased shooters noise exposure by 5 to 10 dB (Noise exposure is proportional to the recoil reducing effect of the muzzle brake; q.e.d.).

3 Suppressors reduced recoil energy by 20 to 30 per cent, or about as much as muzzle brakes, making powerful bolt-action hunting rifle considerably less painful to shoot (especially repeated shots in training). They also prevent muzzle climb of assault rifle, firing full-auto bursts or continued rapid fire.

4 Suppressors do not have an adverse effect on shooting accuracy. The statistical mean group diameter of assault rifle hits was actually slightly smaller, compared with the grouping diameter achieved by shooting without a suppressor (either from machine rest or on bench rest shooting with a telescope sight). The mounting of long suppressors must, however, be done with great skill. The twist of rifling must also be fast enough to gyro-stabilize the bullet even at subsonic velocities.

5 When the suppressor (or equal weight) is mounted on the barrel muzzle, the center of the group is usually shifted some centimeters away from the aim point of the target at 100 meters. The cause of this shift is changed frequency and/or amplitude of the barrel

group is usually shifted some centimeters away from the aim point of the target at 100 meters. The cause of this shift is changed frequency and/or amplitude of the barrel vibrations. That shift of hit grouping is easily compensated for by re-adjustment of the sight, or "off-aiming". (In machine-rest shooting also the mode of vibrations is changed which results in the shift usually appearing in the opposite direction from the aiming point)

*) caliber 7.62 x 39 mm Russian M-43 Yelisarov & Syemin.

6 Suppressors are not intended for shooting military blank cartridges, loaded with hollow wooden bullets or other frangible bullets, disintegrating in the bore or at the muzzle. (These cartridges are used for military training. On the other hand the "firecracker noise" produced by these wood-bulleted blanks and used to simulate a war-like atmosphere in the training field, is in that sense quite ineffective. Real bullet noise is much louder (155 dB when passing nerby) and much more frightening than the muzzle blast of the "enemy's" rifle).

7 In military use, or other sniping activities, the suppressor also hides the muzzle flash and efficiently prevents the movement of foliage, grass or twigs and the puff of sand or dust, which othervise tend to reveal the shooter's location. ("Suppressor doesn't make the soldier silent, but invisible", says a Finnish proverb.)

8 The ballistic cracking noise or "whiplash" noise of a bypassing bullet is an unavoidable problem, if the velocity of the bullet or projectile is as high or higher than the velocity of sound in air (Mach 1.0 = 310 to 350 meters per second, depending on the ambient temperature and pressure of air). No suppressor or "silencer" is able to prevent flight noise (155 dB at 0.65 meter from the flight path of a 7.62 mm bullet). The development of whiplash noise does not begin abruptly at velocity Mach 1.0, but gradually, when the velocity of a rifle caliber projectile is more than Mach 0.90. The diameter, length and shape of bullets (5.7 to 9 mm) seem to be less important factors in ballistic crack.

9 Suppressors do not favour poaching since they have no effect on the bullet noise.

10 The new telescoping reflex suppressors increase the length of firearms by only a few centimeters and they are not vulnerable even in harsh military (mis)use. Suppressors will increase the weight of an assault rifle by approximately 10 per cent (from 3.7 kg to 4.1 kg, for example).

11 The unit price of a mass-produced suppressor may be reduced to about 200 to 300 FIM or 50 to 70 $ (USD). Cheapness will make cost-effectiveness of the suppressor far better than that of any shooting range constructions at shooting places and, actually, also better than the cost-effectiveness of hearing protectors, especially when several persons are present while just one of them is shooting at a time.

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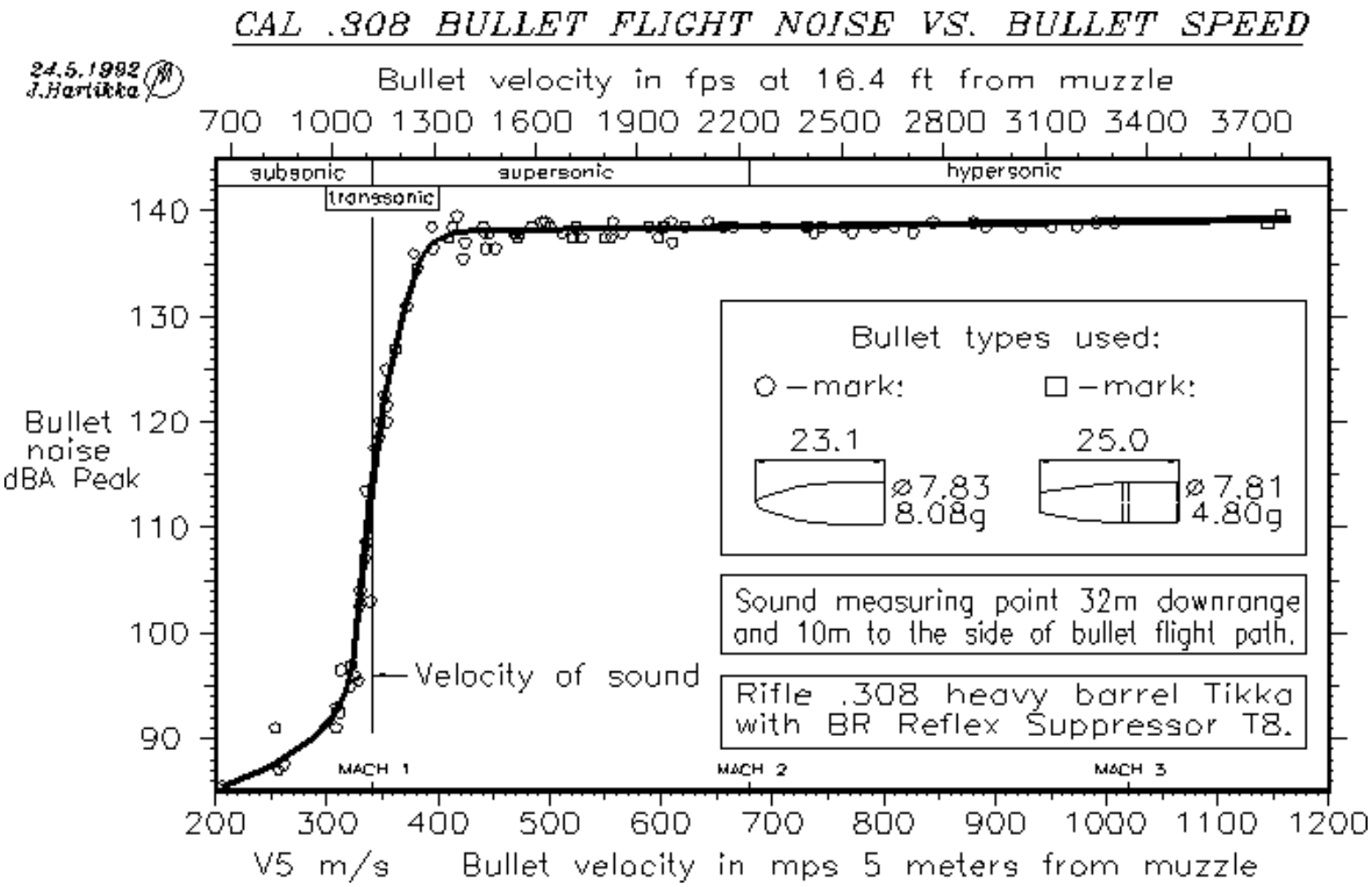
Suppressor Project

Back to Suppressor Project Snapshots page

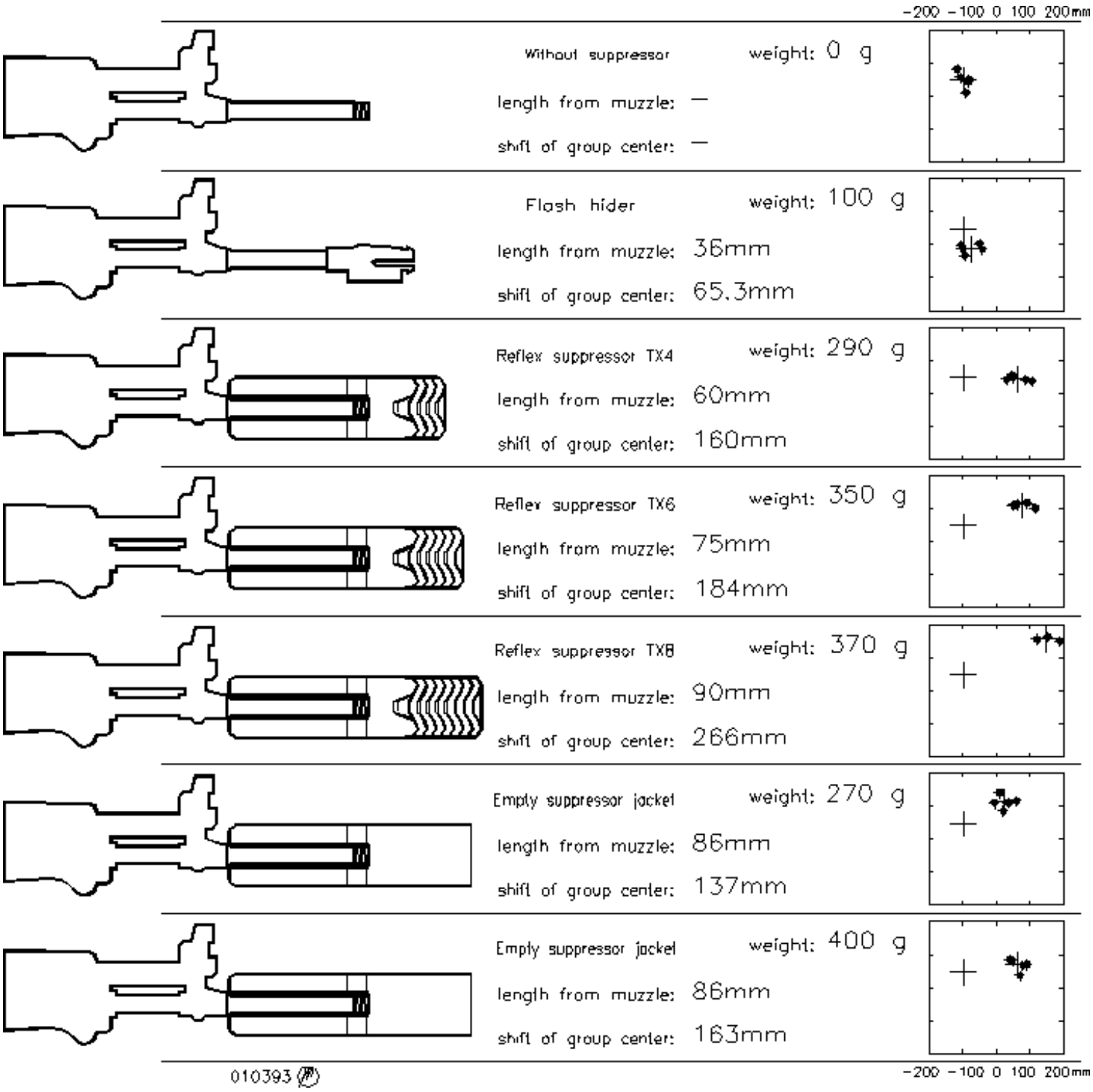
Bullet Flight Noise



Suppressor Project

Back to Suppressor Project Snapshots page

Impact Shift with a Suppressed Kalashnikov Action M62 Assault Rifle



The Suppressor Project experiments about suppressor effect on accuracy and Shift of group center with suppressors and empty suppressors jackets of different weights and a flash hider was tested with a 7.62 x 39 Kalashnikov action Sako/ Valmet M62, fitted with a PSO-1 sniper scope. Test was carried out 15.9.1992 at the 90 meters test range of Finnish Army Arsenal 1 (or Army Depot 1), shooting from sandbag rest with regular Finnish Army ammo. Manufacturer and ammunition lot was VPT 78. 5 round groups were fired with each combination by shooter T. Romppanen.

90 m average 5 shot machine rest group diameters were without suppressor 83 mm and with suppressors 74.8 mm, so tested five

different suppressors produced combined 10 per cent tighter average groups. Best groups were shot with TX8, resulting to 52 mm average group diameter, or 37 per cent improvement in accuracy from machine rest.

Impact shift test was shot to demonstrate the effect of mass attached to rifle barrel. It was suspected, that suppressors contributed to accuracy and shifted point of impact primarily by slowing down and suppressing barrel vibrations by their own mass, and not necessarily by affecting the flight of the bullet (excluding wipe type suppressors not tested). It was found, that any extra masses attached to muzzle, including regular flash hider and empty tubes made for this test, produced shift of impact. The amount of shift was roughly proportional to the mass and centre of gravity of the muzzle device. Results are shown in a neighbouring picture.

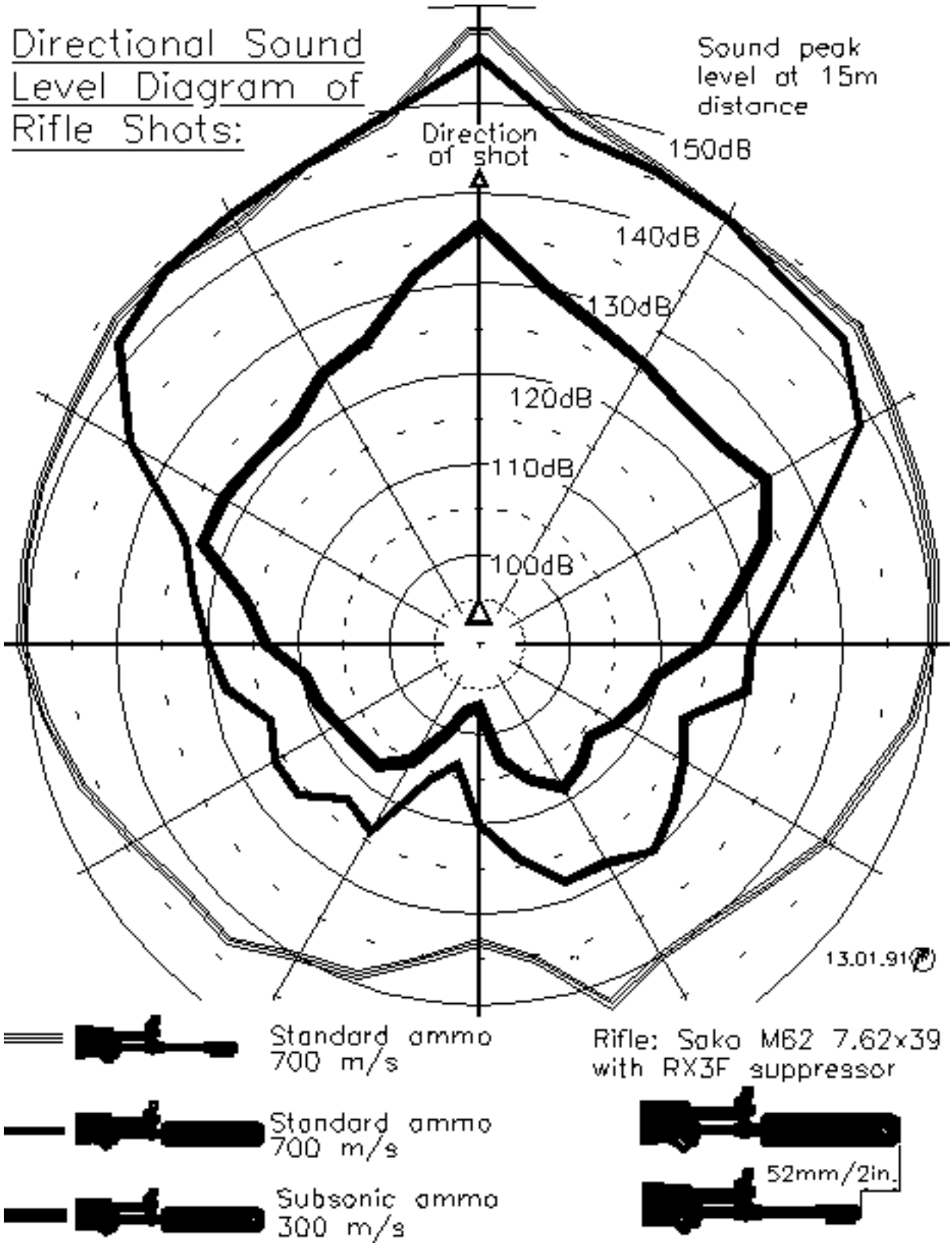
With the modified Kalashnikov clone, the Valmet M62 assault rifle, barrel vibrations clearly dominate accuracy and impact shift. In all Kalashnikovs, the barrel tends to strongly vibrate diagonally in up and right to down and left plane. The vibration is triggered mainly by the short two lug bolt suddenly clacking from loose to it's right position under chamber pressure. This causes strong bending vibrations in the barrel. The muzzle is allready moving diagonally, as the bullet emerges it. So, any mass attached to muzzle, including flash hider or suppressor, affects the phase and amplitude of muzzle vibrations, thus giving the bullet a usually reduced orthogonal velocity component.

Suppressor Project

Back to Suppressor Project Snapshots page

Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring

Noise Pattern: Rifle Noise Levels to Different Directions



Assault rifle sound levels as seen from up on decibel scale. To shooting direction (up in drawing) the sonic crack

or flight noise of a supersonic bullet produces almost equally high noise levels with and without a suppressor. To the sides and back even supersonic standard ammo can be suppressed to comfortable levels. With subsonic ammo, a suppressor drops the noise level significantly also to the front of the rifle. A right hand shooter's "shade" on noise level curves can clearly be seen at back (in picture down) and left of the rifle position in the center of the diagram. Equally easily one can notice the "bulges" in curves to the back and right resulting from gas bleed of a gas operated Kalashnikov type action.

Directional Diagram

Back to Suppressor Project Snapshots page

Suppressor Project Summary Back to Suppressor Project Page

SUPPRESSORS AND SHOOTING RANGE STRUCTURES

ASEIDEN VAIMENTIMET JA AMPUMARATARAKENTEET

Ilkka Kyttälä
Rauno Pääkkönen

Translation by the authors • Tampere 1995

Shooting range and suppressor projects 1992-1993.

Financing: Ministry of Education, Ministry of Environment, Ministry of Labour, Lapua Oy

Supervisors: Yrjö Tolonen, Pertti Kärpänen and Risto Järvelä, Ministry of Education; Antero Honkasalo, Ministry of Environment; Seppo Palmu, Ministry of Defence; Ilkka Heikkilä, Defence Materiel Establishment; Esa Puurtinen, Technical Inspection Center, Juha Tikkanen and Ilkka Kiianlinna, Finnish Shooting Association; Juha Kairikko, Finnish Hunters' Association and Erkki Kiukas Hunters' Central Organization.

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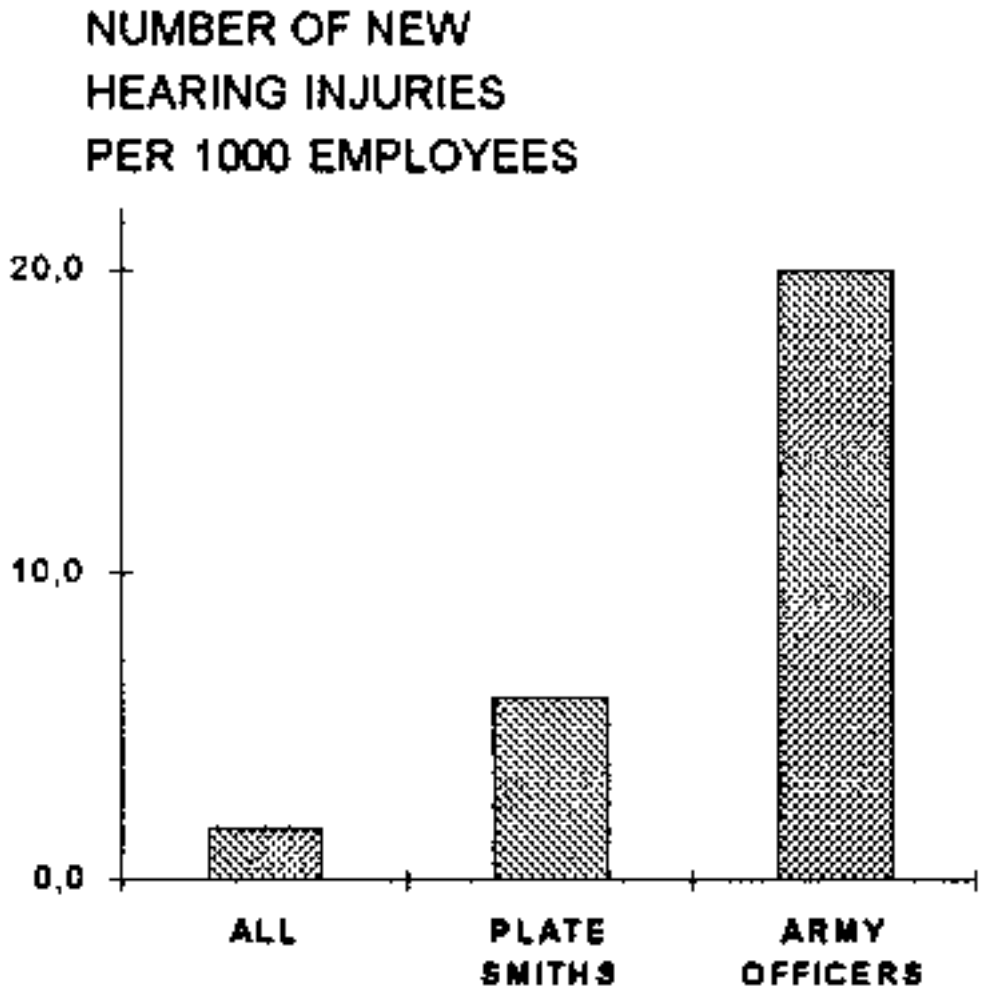
SUPPRESSORS AND SHOOTING RANGE STRUCTURES

SUMMARY

BACKGROUND



In 1992 a joint project was established in Finland to test suppressors of rifle caliber firearms and various shooting range structures against shooting noise. There were several reasons for this, e.g. the adverse effects of shooting ranges on nearby settled areas and the great number of hearing injuries among shooters, supervisors and other people present. Suppressors and better structures seemed to offer further possibilities in saving the shooter's hearing and reducing the area required around the shooting ranges.

Source: 1988 population counting and 1983 to 1988 statistics of occupational diseases

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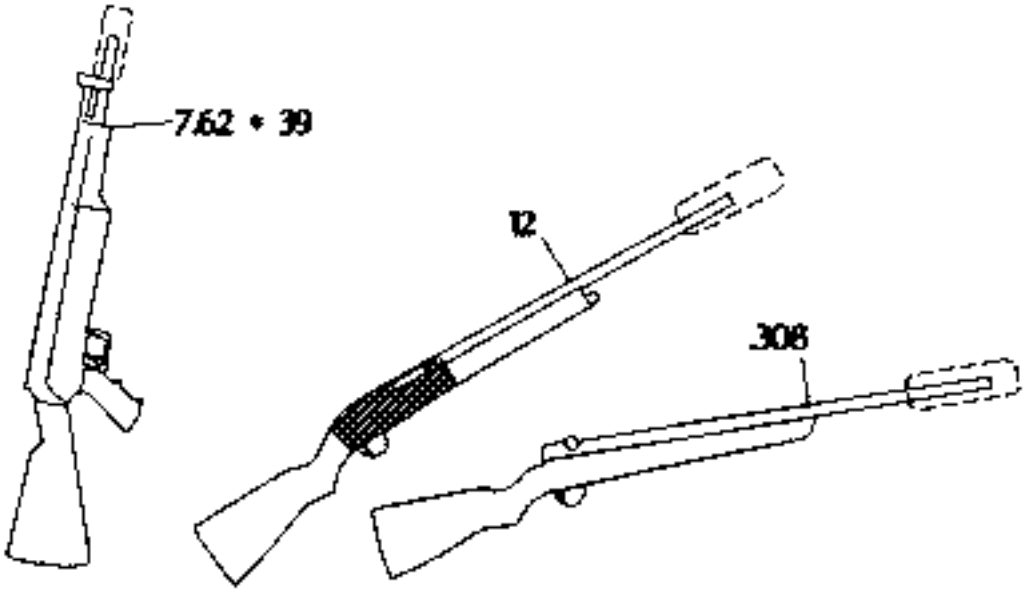
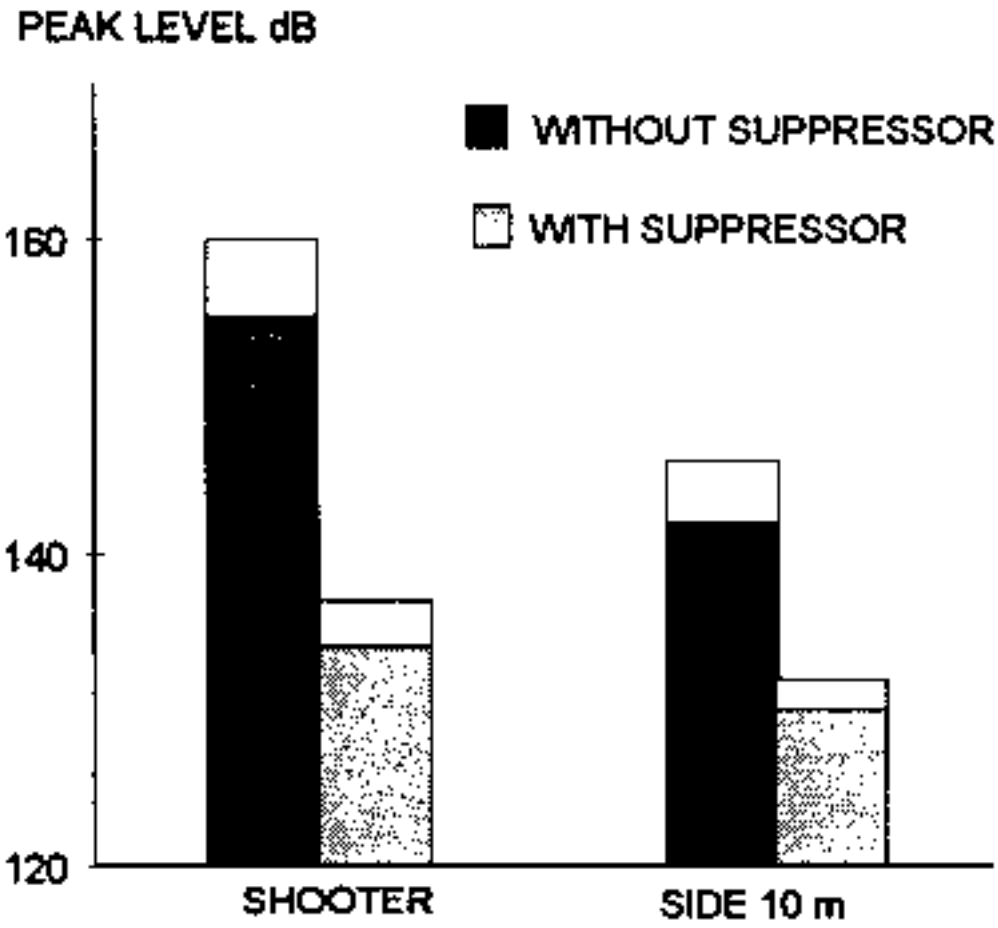


Comparative measurements were made mainly using cal. 7,62 Kalashnikov-Valmet M62 assault rifles, common .308 caliber hunting rifles and 12 cal. shotguns, with and without suppressors. The purpose was to test the acoustic and other essential properties of the suppressors, bullet noise barriers and other structures and their effects on shooting. After the tests and reports a summary for information purposes was produced, which - after statements - was corrected to get the present form:

MOST IMPORTANT RESULTS AND CONCLUSIONS

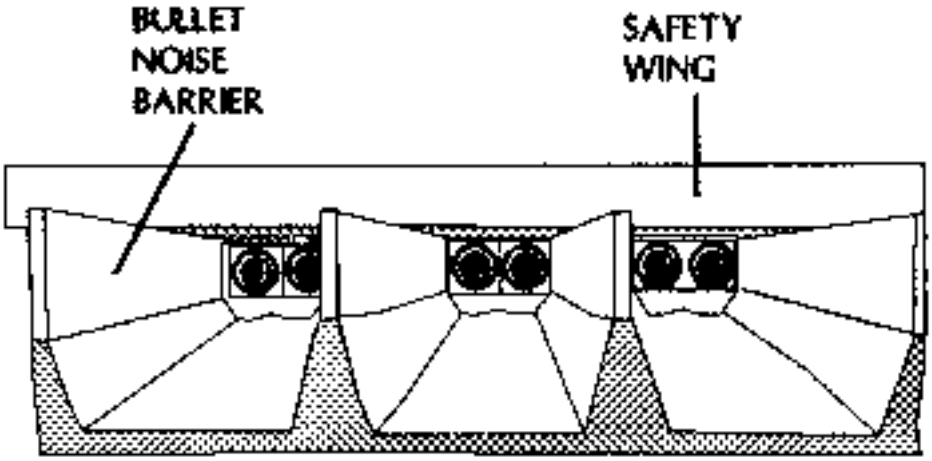
(Only the "new findings")



1a ATTENUATION EFFECT, SUPPRESSORS

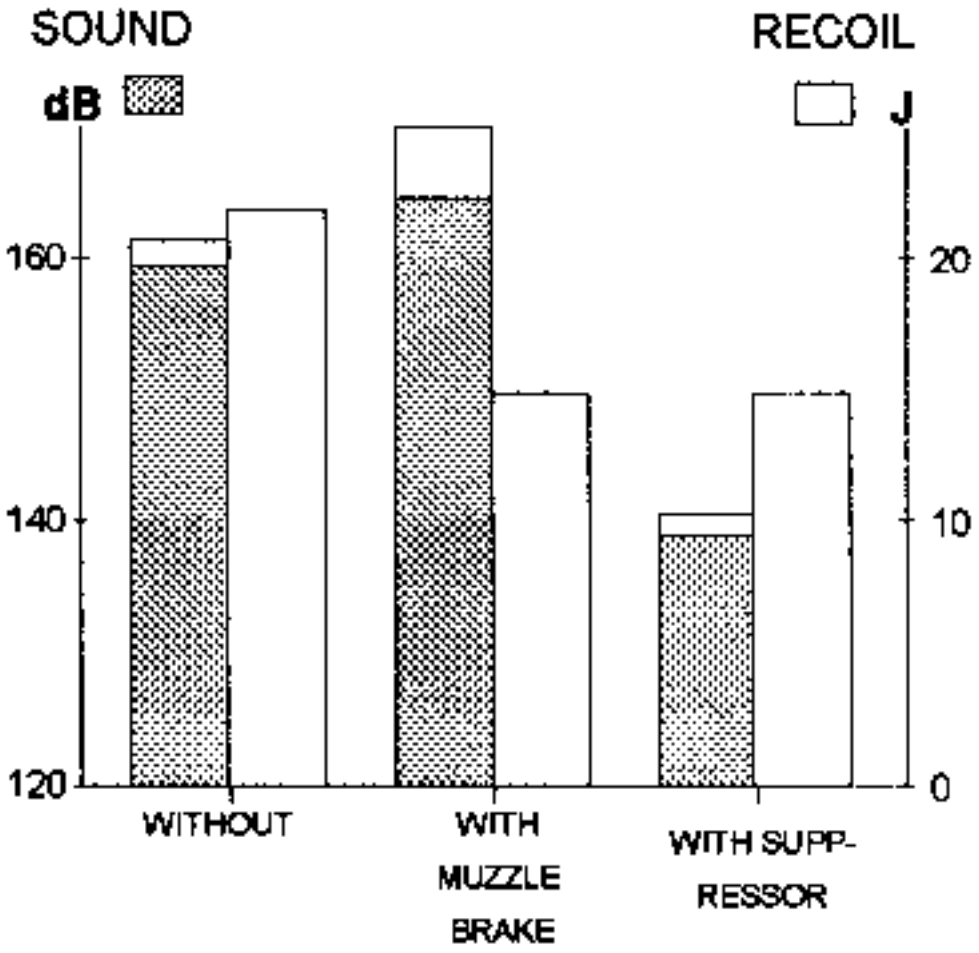
All rifle suppressors reduced the shooter's exposure from the original 160 ± 3 decibels to below the EU risk limit 140 dB. Differences between brands were small. Shotgun suppressor prototypes approached the limit only when used with subsonic cartridges. At the bystander's and trainer's positions noise reduction was similarly effective. Environmental noise attenuates almost as well in back and side sectors. The front sector is dominated by ballistic noise, which is not affected by suppressors. Bullet noise, however, is concentrated in higher frequencies than muzzle blast and thus attenuates faster when propagating.

1) Cal. .22 suppressors were most effective; attenuation more than 30 dB. On hunting rifles the same effect was achieved only with an oversized prototype made by Jorma Santala.



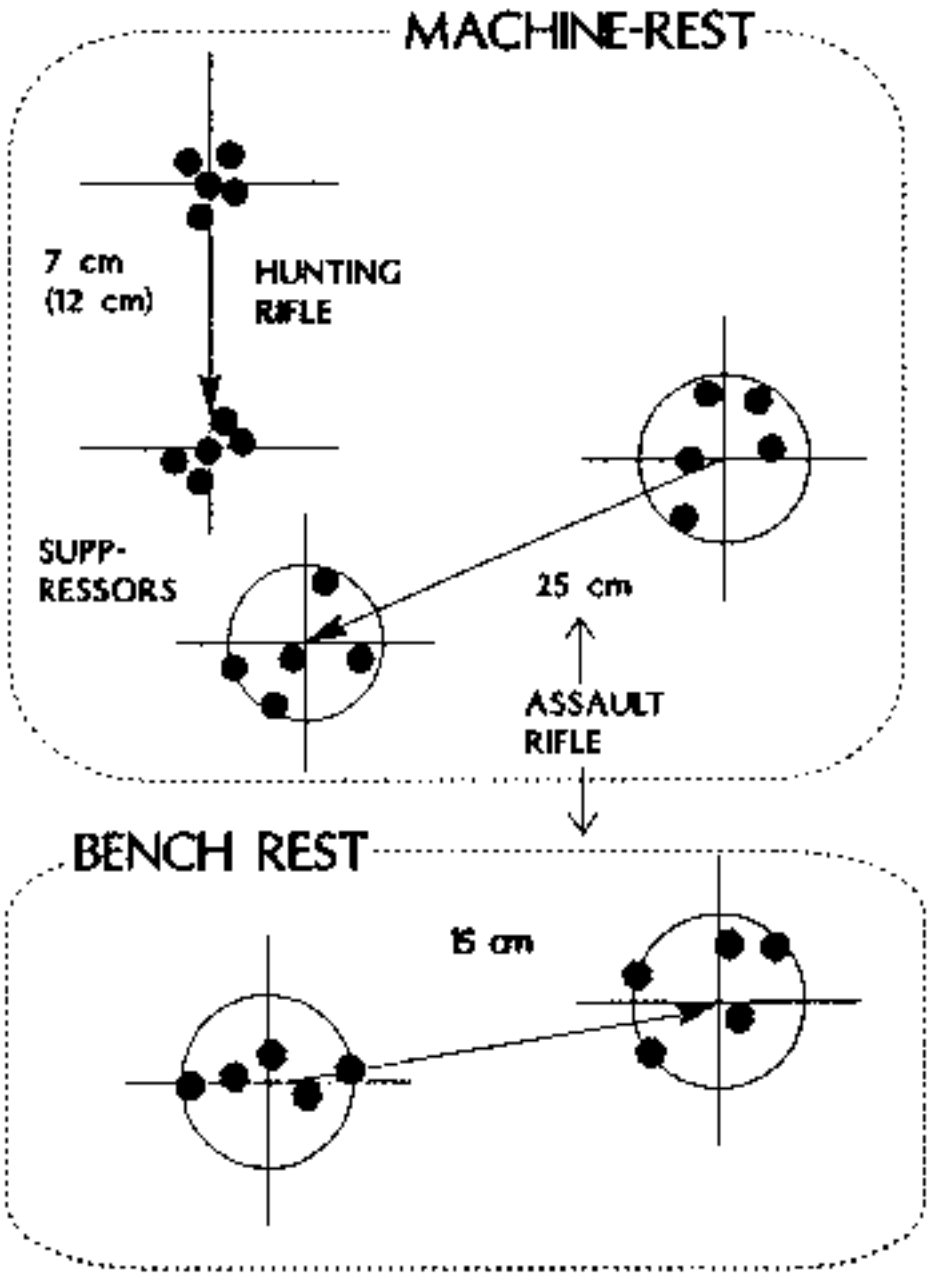
1b ATTENUATION EFFECT, BULLET NOISE EMBANKMENT AND BARRIERS

An obstacle of about 2,5 m - embankment, barrier or combination of them - attenuates the bullet noise by 10 to 20 decibels. The most advantageous results are obtained when the distance of the flight path from the barrier is less than one meter and it goes two meters lower than the top of the barrier; or in other situations where the proportions are similar, e.g. in a canyon. The barriers can support each other by connecting them with overhead safety wings.



2 MUZZLE BRAKES? RECOIL?

All brands of tested muzzle brakes increased the shooter's exposure by 5 to 10 dB. The increase in noise exposure is proportional to the recoil reducing effect of the muzzle brake. Replacing it by even a modest suppressor may thus produce a considerable 20 dB improvement at the shooter's position. This principle is valid for all weapons equipped with muzzle brake. Suppressors reduced recoil energy by 20 to 30 per cent, or about as much as muzzle brakes. They also prevented muzzle climb of assault rifles, firing full-auto bursts or continuous rapid fire.



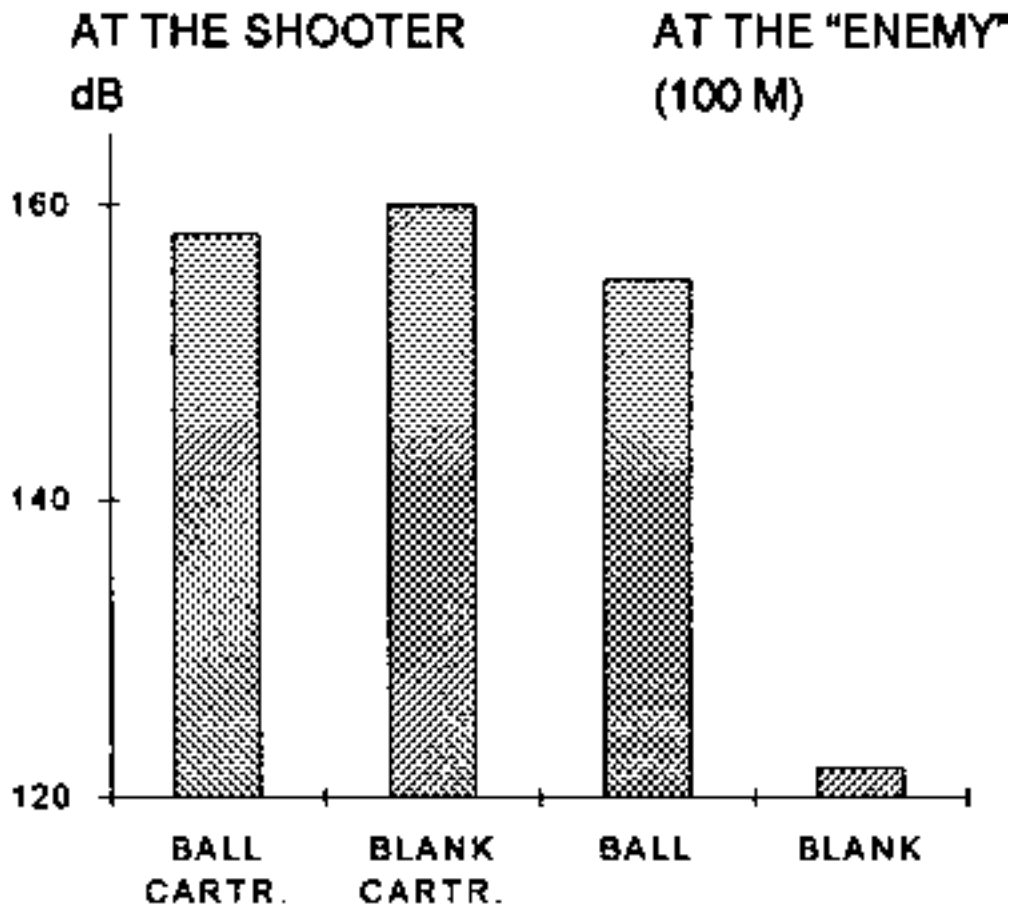
3 ACCURACY?

Suppressors did not have any notable adverse effect on shooting accuracy. The best group diameters of assault rifle hits were achieved with suppressors. The mounting of long

extensive suppressors must, however, be done with great skill.

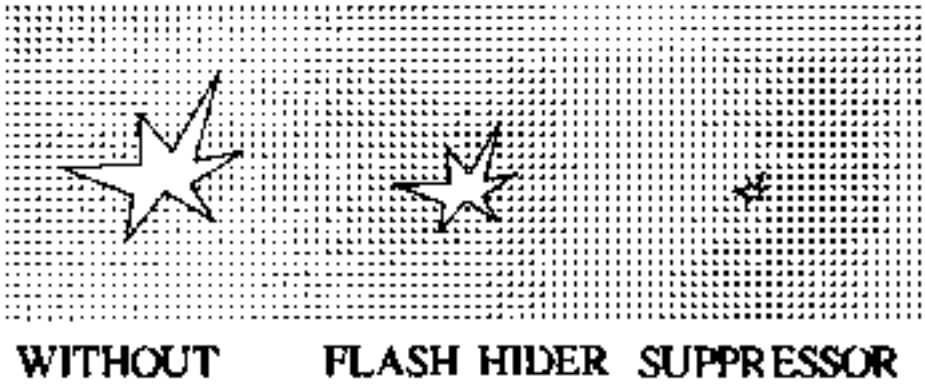
4 SHIFT OF GROUP?

When the suppressor (or equal weight) is mounted on the barrel muzzle, the center of the group of hits of hunting rifles was usually shifted down by about 10 cm (shooting from machine-rest, target at one hundred meters). For assault rifles correspondingly 25 cm left and down, but when shooting from bench rest about 15 cm right. The reason for this shift are changed vibration properties. It is compensated by normal re-adjustment of the sight. When shooting from a machine-rest the vibrations change in a way, which does not represent the real use.



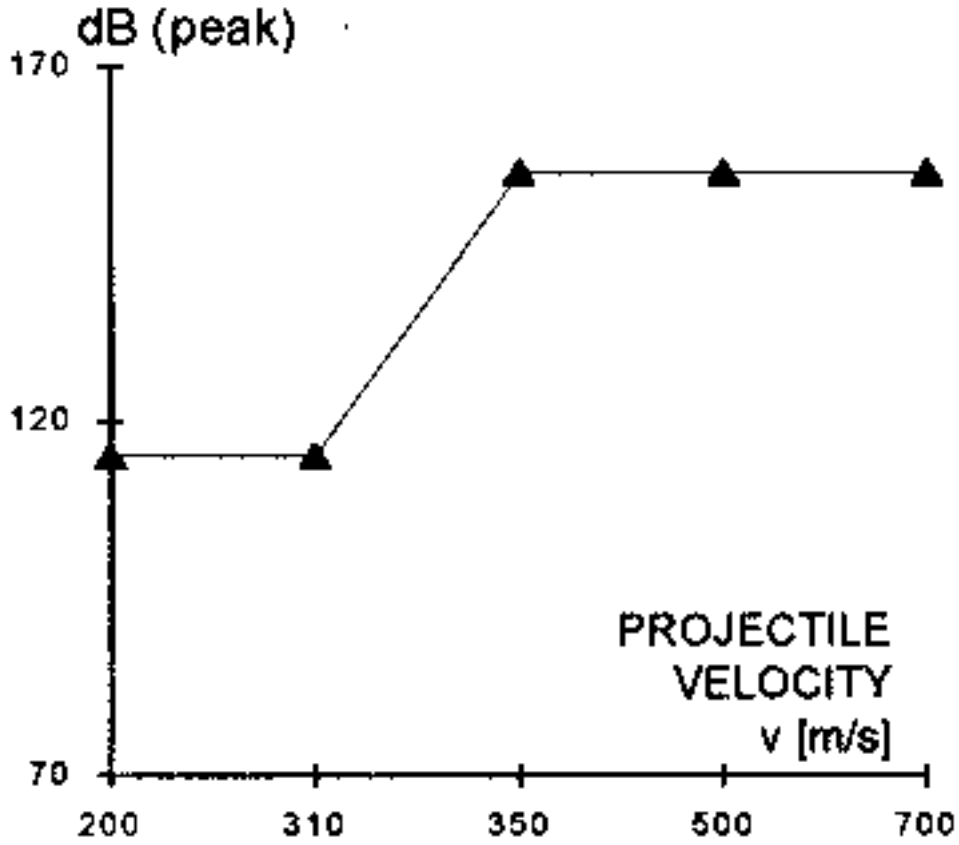
5 BLANK CARTRIDGES?

When shot close, blank cartridges can be louder than bulleted ones and they indeed cause most of the acute hearing damages of conscripts. The simulated gunfire should be achieved with methods 25 dB less loud than at present. The tested suppressor models do not apply for Finnish wood-bulleted military blank cartridges. However, they apply for usual blank cartridges with folded head. Harmless theatre weapons which sound "real" are also available. Shooting indoors with non-suppressed blank cartridges generally means the risk of immediate loss of health.



6 MUZZLE FLASH?

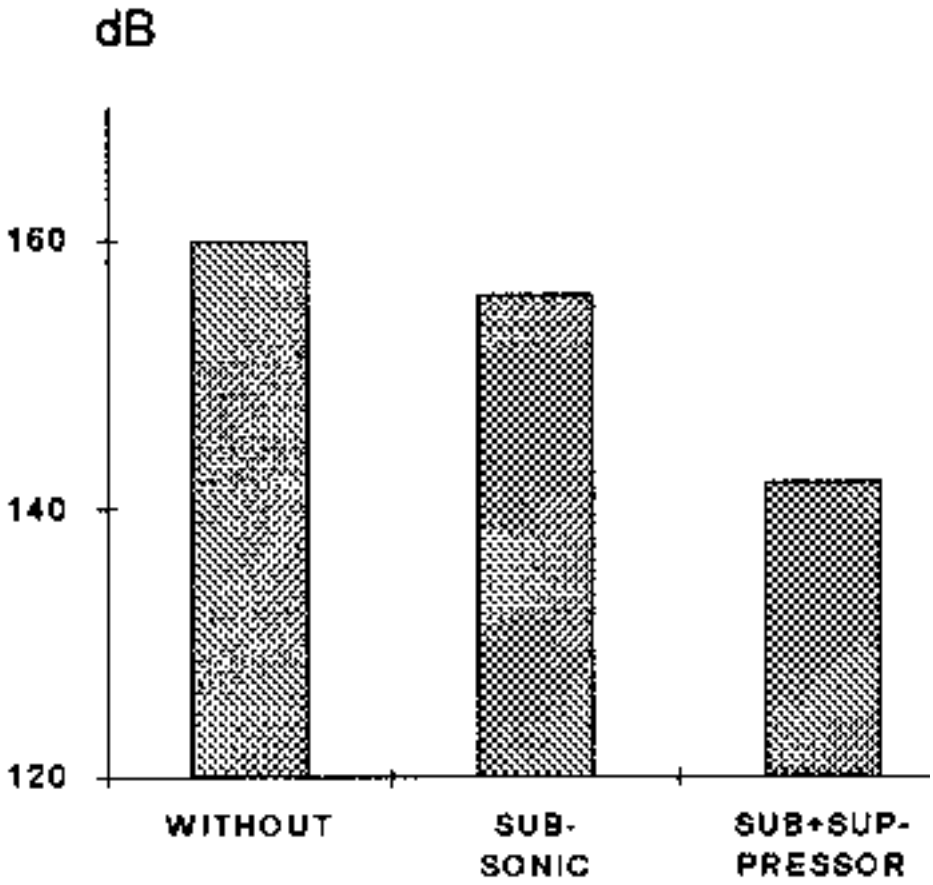
Suppressors hide the muzzle flash and effectively prevent the movement of foliage, grass or twigs and puffs of sand or dust.



7 BALLISTIC NOISE?

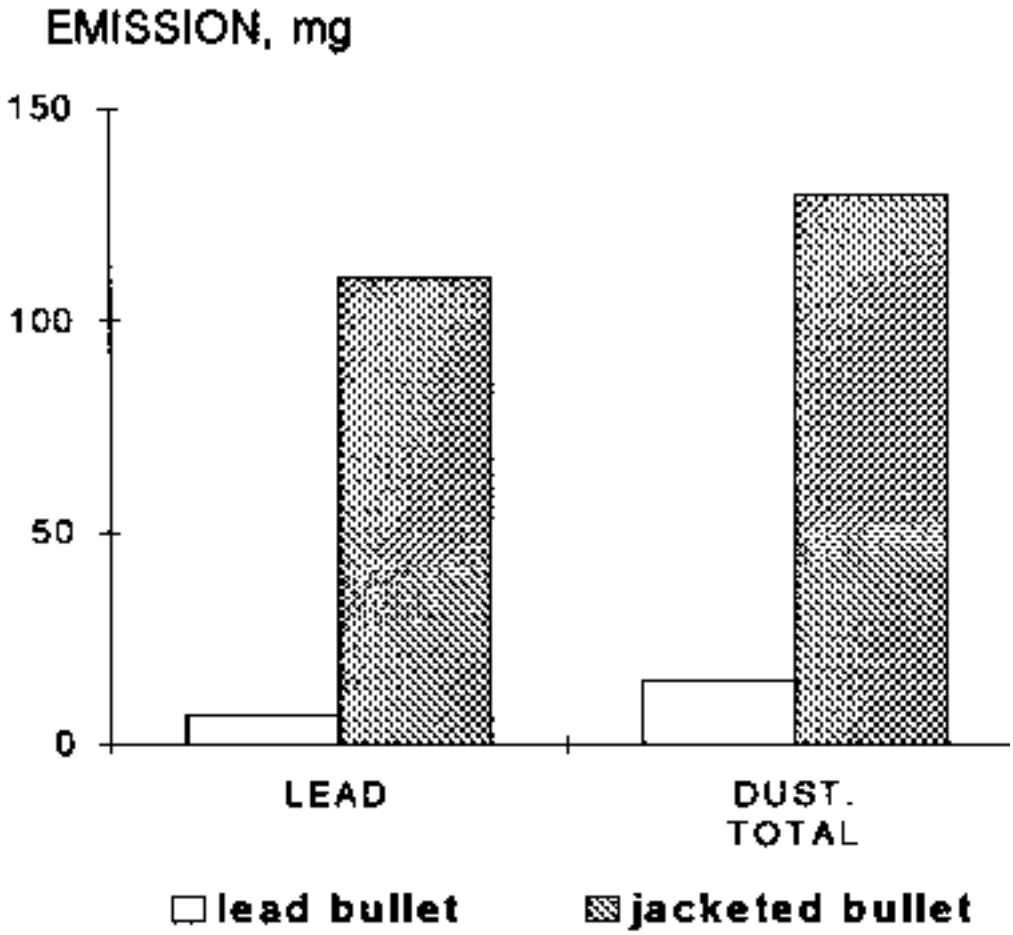
The ballistic "whiplash" noise of a bypassing bullet (around 155 dB at 0,65 meter distance) is an unavoidable environmental problem, if the velocity of the projectile exceeds the velocity of sound in air (from 310 to 350 meters per second depending on the temperature

and air pressure). No suppressor can prevent bullet flight noise. The diameter, length and shape of the bullet affect only slightly. The ballistic noise does not affect the shooter's exposure. Ballistic noise concentrates in higher frequencies and thus attenuates, when propagating, faster than the muzzle blast.



8 BALLISTIC NOISE OF SHOTS?

The ballistic noise of the pellet swarm (and the cup) can be even louder than the muzzle blast. It strongly increases the peak levels in the front sector and slightly to the side and backwards. Good results can be obtained only when using subsonic cartridges (v0 around 300 m/s). For the two prototypes, peak levels of 142 and 144 dB were measured at the marksman's ear.

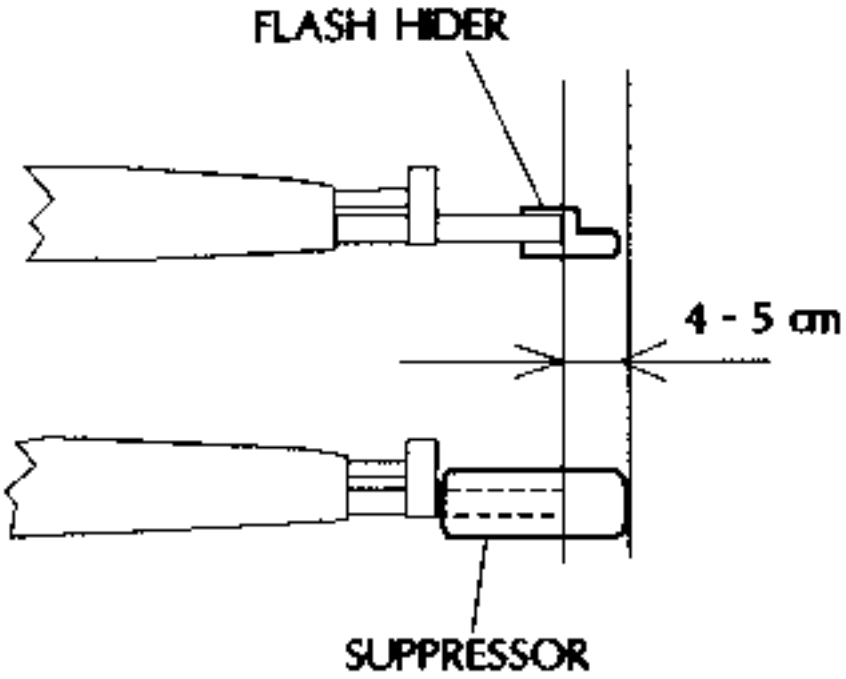


9 LEAD VAPOR EMISSION? UNBURNED POWDER?

Unjacketed bullets produced many times more lead vapor than jacketed ones. Also .22 caliber weapons produce lead vapors. Lead concentration can become a health problem at inside shooting ranges. Suppressors make a part of the lead emission harmless by solidifying it as card. Suppressors also burn a part of the otherwise not burned, sensitized powder that may cause a fire or even explosion risk in insufficiently cleaned indoor shooting ranges (five persons died in this kind of accident in Argenbühl, Germany 1993). On the other hand, it is possible that powder can build up inside a suppressor and cause a risk of explosion (cases not known).

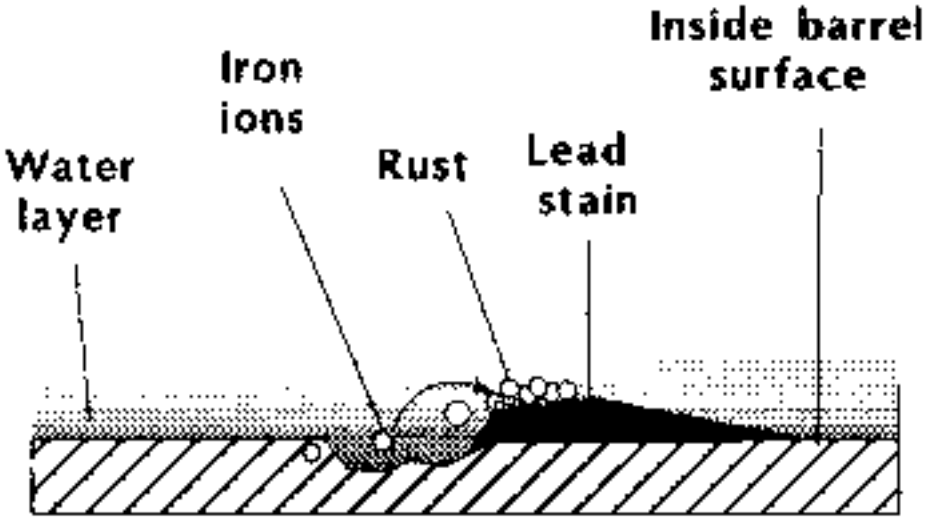
10 POACHING?

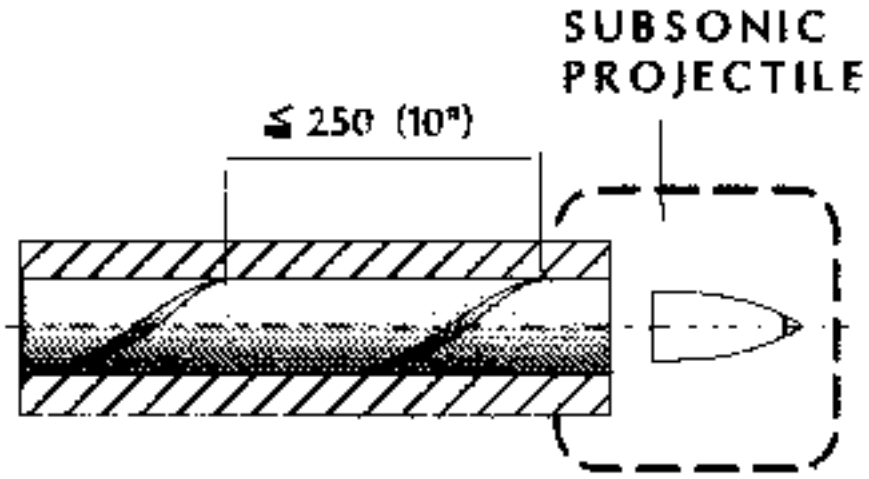
Suppressors do not decisively favor poaching or other criminal activity since they do not affect the bullet noise. The bass tuned 130 - 140 dB sound of the suppressed muzzle blast is also heard quite far, yet is not so disturbing. (Complete suppressors only exist in cinema). Because of the prejudice caused by the old hunting legislation, a person who hunts with a suppressed gun may have to carry a copy of the new law (615/93) for a long time.



11 ADDITIONAL LENGTH/WEIGHT?

The new telescoping suppressors increase the length of firearms by only a few centimeters and are not vulnerable even in harsh use. A steel suppressor increases the weight of an assault rifle by approximately 10 per cent (from 3.6 kg to 3.9 kg, for example), or - if it replaces a muzzle brake or a flash hider - only about 5 per cent; aluminum suppressor even less.



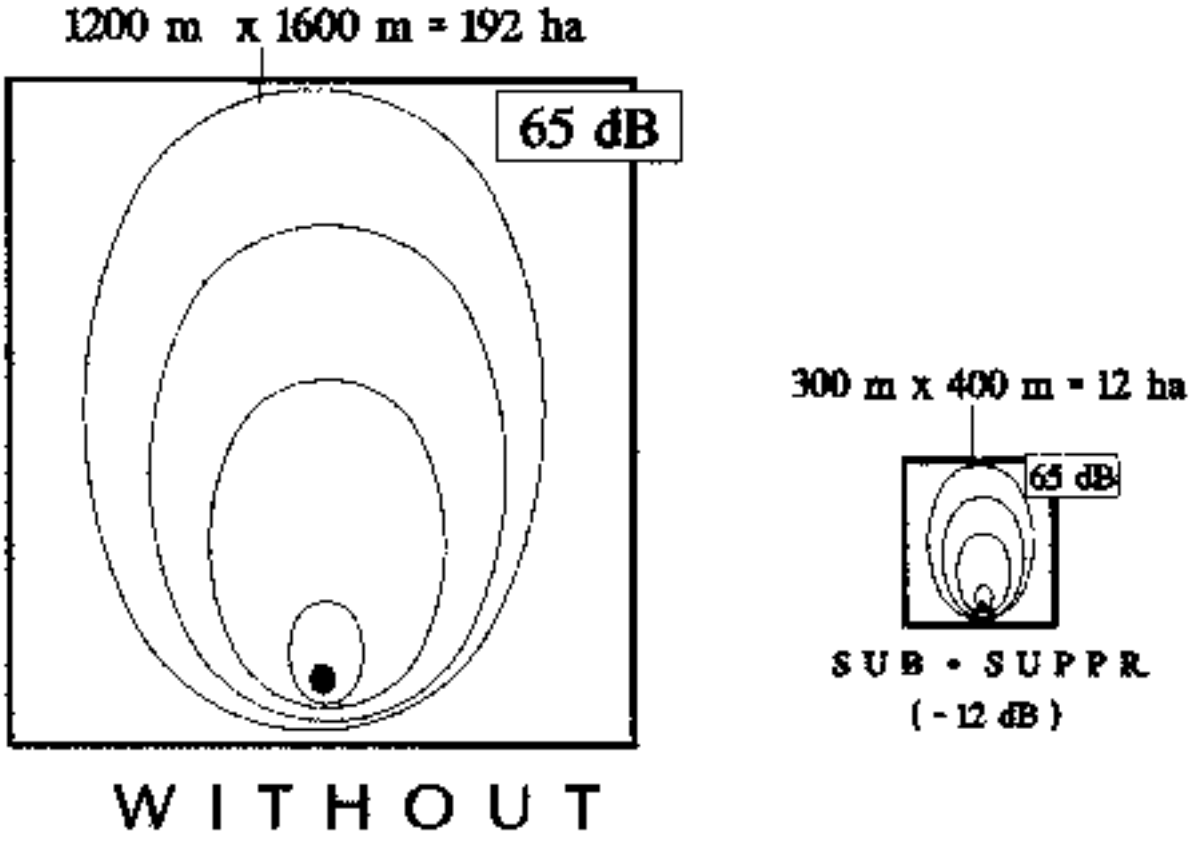


12 DURABILITY? CORROSION? OPERATIONAL CERTAINTY?

Steel suppressors seem to withstand continuous rapid fire, aluminum suppressors only in limited amounts. In automatic weapons the increase in the gate pressure can cause problems in mechanisms. For them further research is needed. The condensed water and lead can cause corrosion in untended weapons: After use the suppressor has to be disconnected and/or the barrel oiled.

To be properly stabilized, long bullets, which are used in subsonic cartridges, need the pitch of rifling to be less than 10 inches (generally 12 "). Instability of the bullet may, at least with long frontally mounted suppressors, cause contact with the suppressor structures, loss of accuracy and/or damage to the suppressor.

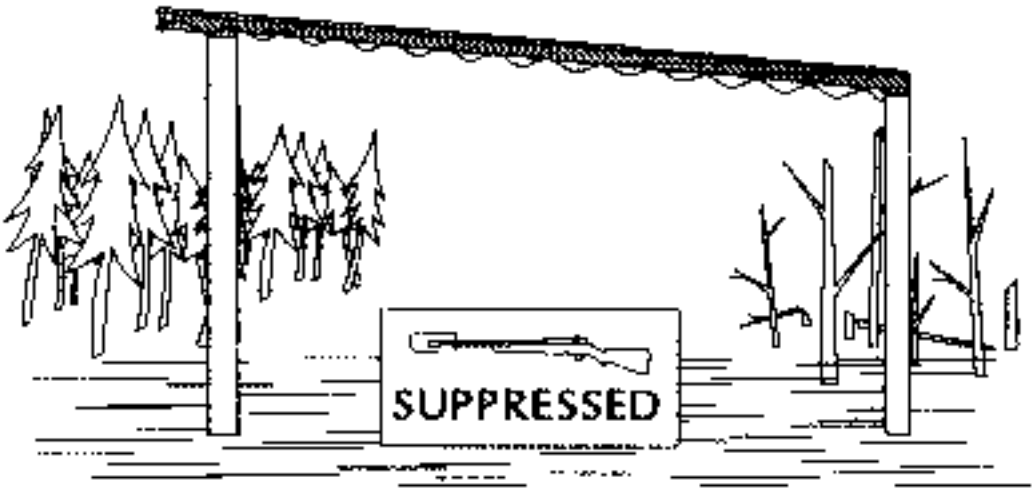
SHOTGUN

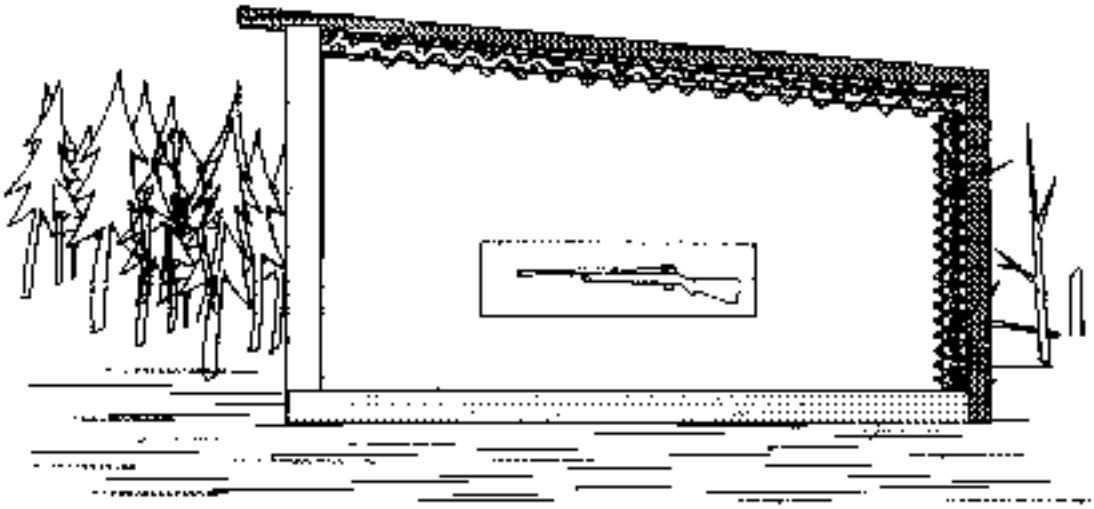


13 NEED OF LAND? EMBANKMENT?

If only suppressed firearms are used (presumed average attenuation 12 dB), the land requirement is reduced to 1/16* or even smaller. This is valid as such at shotgun ranges if only subsonic cartridges are used. On rifle and pistol ranges proper bullet crack embankments and/or barriers may be necessary if natural obstacles do not exist. (Don't place a range on a hill).

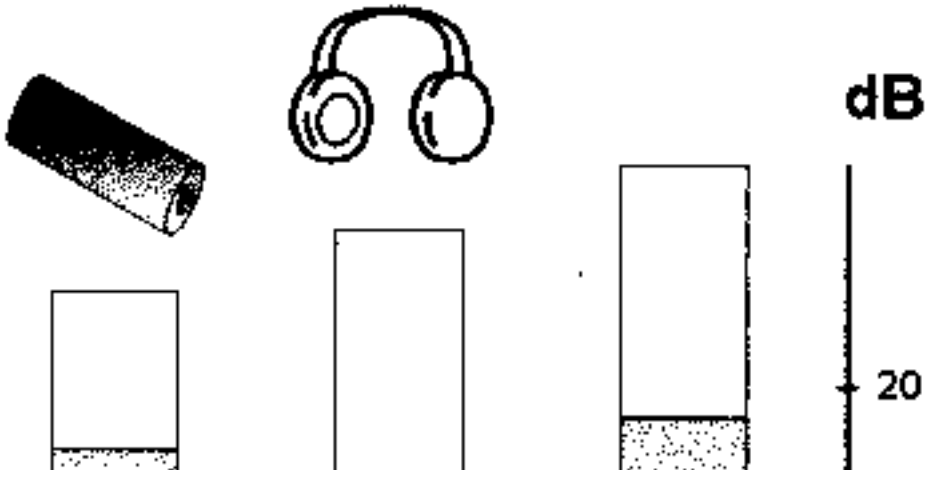
* If noise level decreases by 6 dB, distance to the neighbor can be halved.

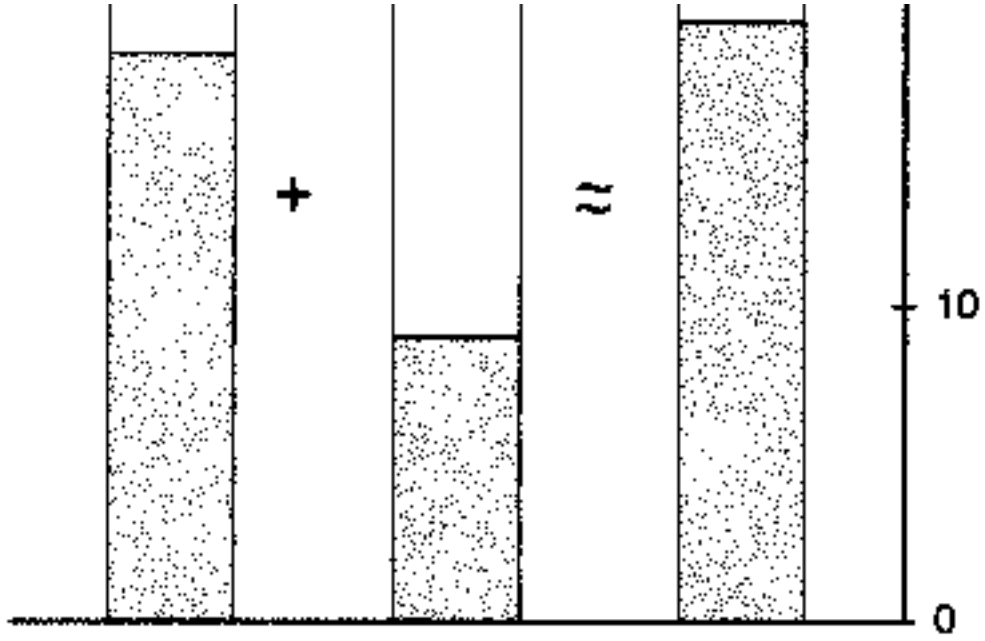


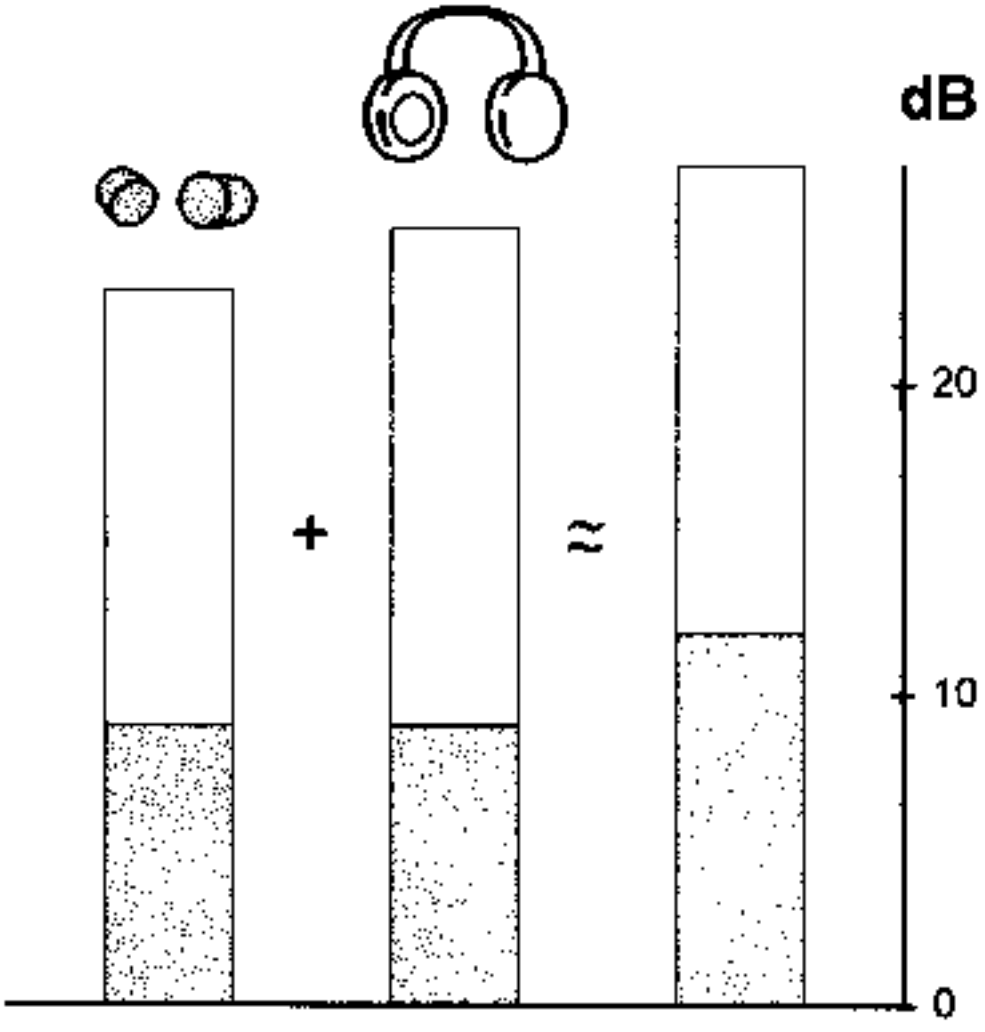


14 SHOOTING PLACE SHELTERS?

No shooting place constructions are needed when only suppressed weapons are used. If a shed is wanted for other reasons (e.g. against rain), it should have no walls and the ceiling should be lined with sound absorbing material like glass wool. At indoor shooting ranges (and under roofs) only a modest lining is necessary when only suppressed firearms are used. For unsuppressed weapons a thick layer of absorbtives and a solid structure (at least 20 kg/m2) is required, if there are neighbors in the same building.



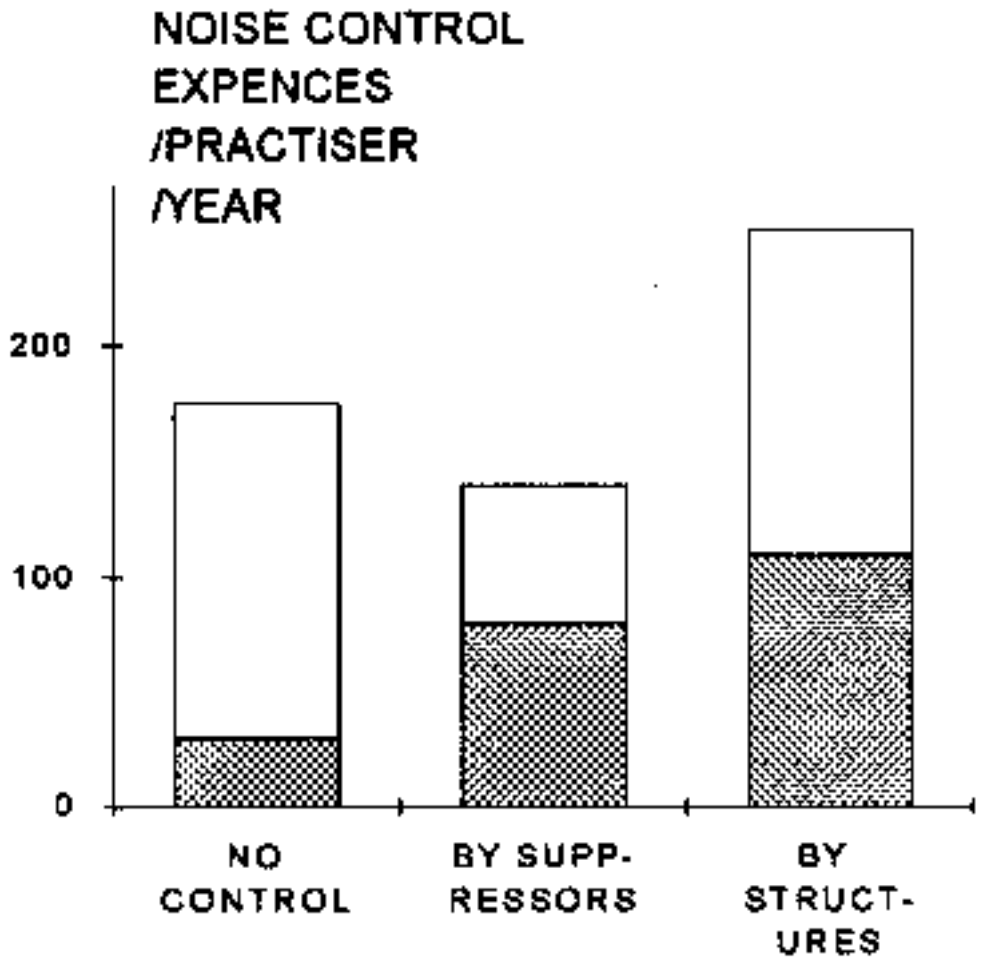




15 HEARING PROTECTORS?

The combined attenuation of protector and suppressor seems to remain modest. However, even when shooting with a suppressor it is good to wear (light) protectors: they help to concentrate.

In maneuvers, theatre or cinema production or exercises etc. all participating people should absolutely have hearing protectors, if present blank cartridges are used without suppression. The first shot is the most dangerous to hearing. If both shooters and bystanders use protectors in advance, and conscientiously, and the protectors are of an adequate type and fitted in, the protection is nowadays reliable. Large, heavy cups with stiff sealing discs and great frame force are suitable, expanding plugs as well. For heavy weapons double protection, cups + plugs, is used. Even that is not always enough. (Combined effect of cups and plugs is modest).



16 EXPENSES?

The unit price of a mass-produced suppressor may be reduced to about 200 to 300 FIM (20 to 30 £). The cost-effectiveness of suppressors is already now better than that of any shooting place constructions or hearing protectors.

The integrated noise control expenses for all Finnish outdoor shooting ranges, three alternatives:

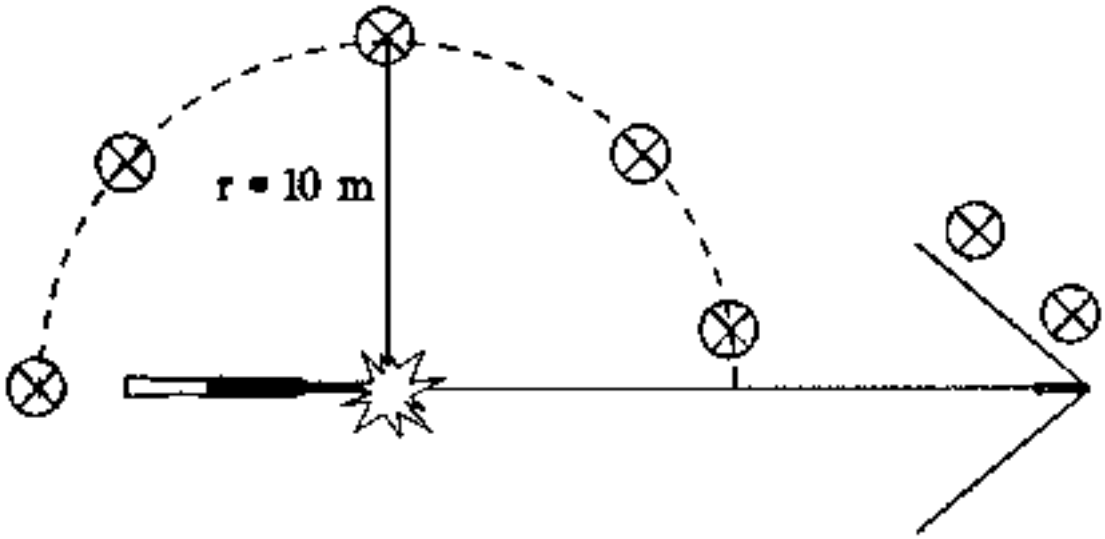
"Traditional" (no noise control, new range acquired further away if difficulties);

trial and protector expenses 124 mio FIM (Assumption: associations own the land),

Structure oriented; embankment, barrier. shelter and protector expenses 290 mio.

Suppressor oriented; suppressor, cartridge and embankment expenses 143 mio, about 100 FIM (10 £) per practiser/year.

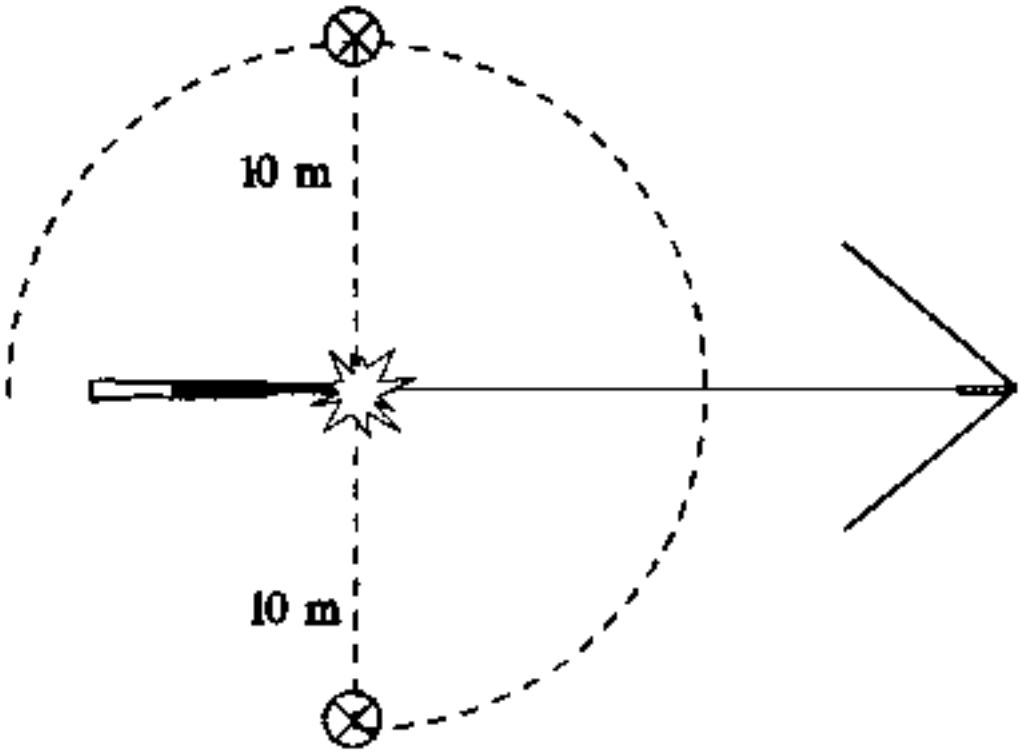
* Calculations are based on source 7 for a 20 year period. They do not include any expenses arising from hearing damages. As an average price of a suppressor, 850 FIM has been chosen.



17 MEASUREMENT?

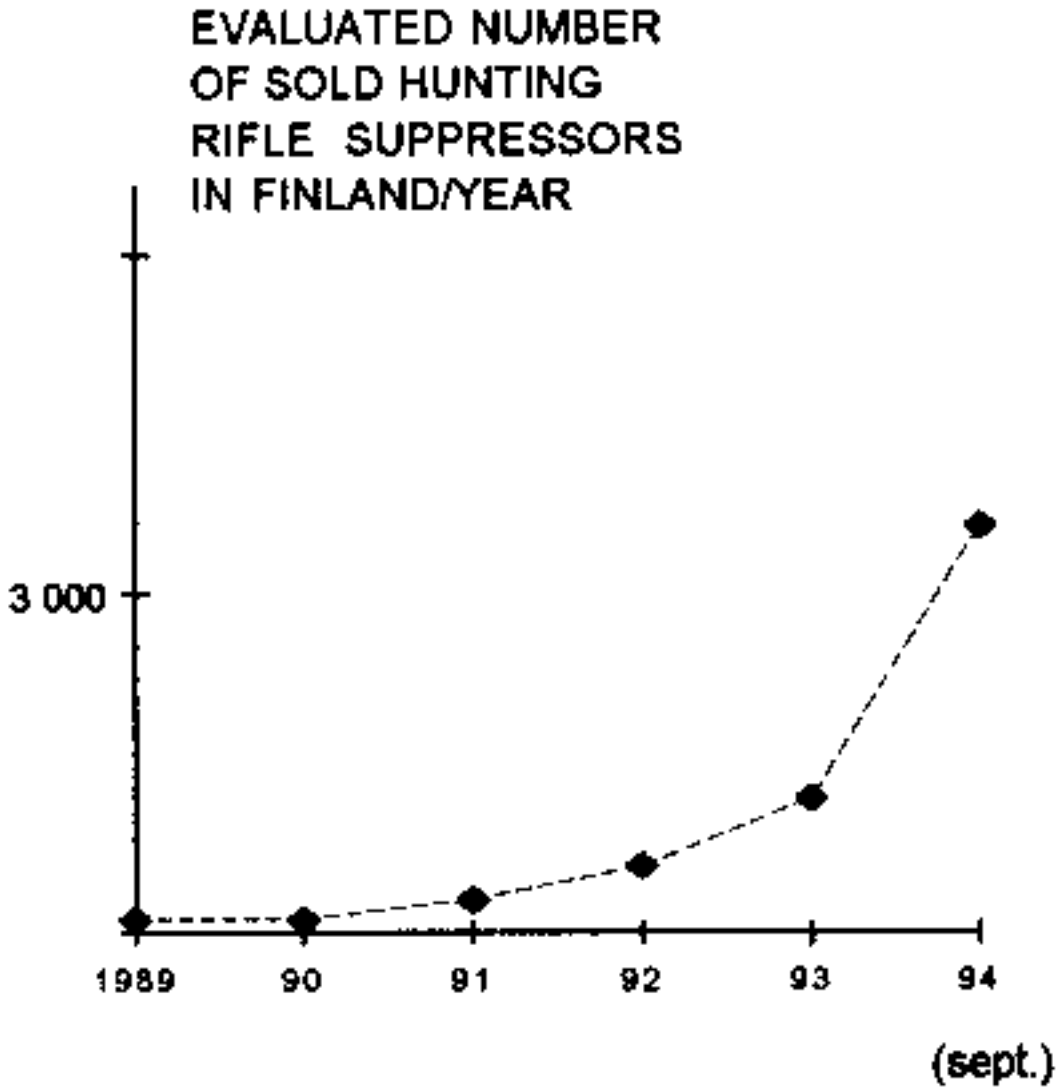
The attenuation, or more precisely the insertion loss, of suppressors for rifle caliber firearms can be measured with sufficient accuracy for most practical purposes by a four-point method in free field*. The insertion loss is measured for rear sector and, if necessary, also for front sector with bullet noise eliminated.

* Work item proposal: Acoustics. Measurement of impulsive noise emission of rifles shooting supersonic projectiles. Engineering methods.



18 INSTANT MEASUREMENT

Survey type measurements with only one microphone can be made by a simplified method: one second exposure level SEL (L_{AX}, L_{E1s}) is measured 10 meters aside for five shots with and without suppressor. The ballistic crack has a negligible influence in this point and the measurement results obtained here represent fairly well the mean of encircling measurement results. Only combinations representing the same caliber class can be compared by this method.



19 VIEWS

Nowadays every engine driven vehicle or machine has an efficient muffler: attenuation several tens of decibels. The newest active control applications attenuate even the lowest frequencies down to background noise level*. For firearms active noise and vibration (shock) control is just beginning? Control of noise and other emissions is probably mainly transferred to designers of weapon factories, where it belongs; e.g. a common two-barreled shotgun is difficult to be attenuated afterwards. This way also the reliability of functions is best optimized.

* Herdouin L et al.: An anti-pulsatory device used as an active noise control system in a duct. Acta Acustica 1 (1993) pp. 189-198.

REPORTS:

1 Työsuojeluhallitus, Selvityksiä 1/93, Vaimentimien mittaukset 1992, Tiivistelmä.

Tampere 1993, 33+14 s. (Out of stock)

2 Opetusministeriö, Liikuntapaikkajulkaisu 39, Ampumaratojen melu- ja turvarakenteiden kehittäminen. Suomen Ampujainliitto ry, MV-konsultit/Maa ja Vesi Oy, Insinööritoimisto Kari Pesonen Oy. SVUL-paino, Helsinki 1993, 79 s.

3 Opetusministeriö, Liikuntapaikkajulkaisu 38, Sisäampumaratojen suunnittelu- ja käyttöopas. Suomen Ampujainliitto ry, Projekti-insinöörit Oy. SVUL-paino, Helsinki 1993, 43 s.

4 Pääkkönen R, Kyttälä I: Työhallinnon julkaisu 29, Kiväärien ja pistoolien äänenvaimentimet, Loppuraportti 1. Työministeriö, Tampere 1993, 96 s.

5 Pesonen K: Äänenvaimentimien vaikutus luotiaseiden laukausääniin ja ympäristömeluun. Ympäristönsuojelutekniikan julkaisuja 3/1994. Teknillinen korkeakoulu, ympäristötekniikan laboratorio. Espoo, 60 s.

6 Pesonen K: Äänenvaimentimien vaikutus haulikkojen laukausääniin ja ympäristömeluun. Ympäristönsuojelutekniikan julkaisuja 2/1994. Teknillinen korkeakoulu, ympäristötekniikan laboratorio. Espoo, 87 s.

7 Kukkola A: Ampumaratamelun yhteiskunnalliset kustannukset. Diplomityö. Lappeenrannan teknillinen korkeakoulu. Tuotantotalouden osasto. Lappeenranta 1994.

8 Kyttälä I: Vaimentimet ja ampumaratarakenteet, yhteenveto. Sisäisen lausuntokierroksen -94 yhteenveto. Moniste. Työministeriö. Tampere 1994.

Original publication:

Kyttälä & Pääkkönen: Aseiden vaimentimet ja ampumaratarakenteet

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Back to Suppressor Project Page

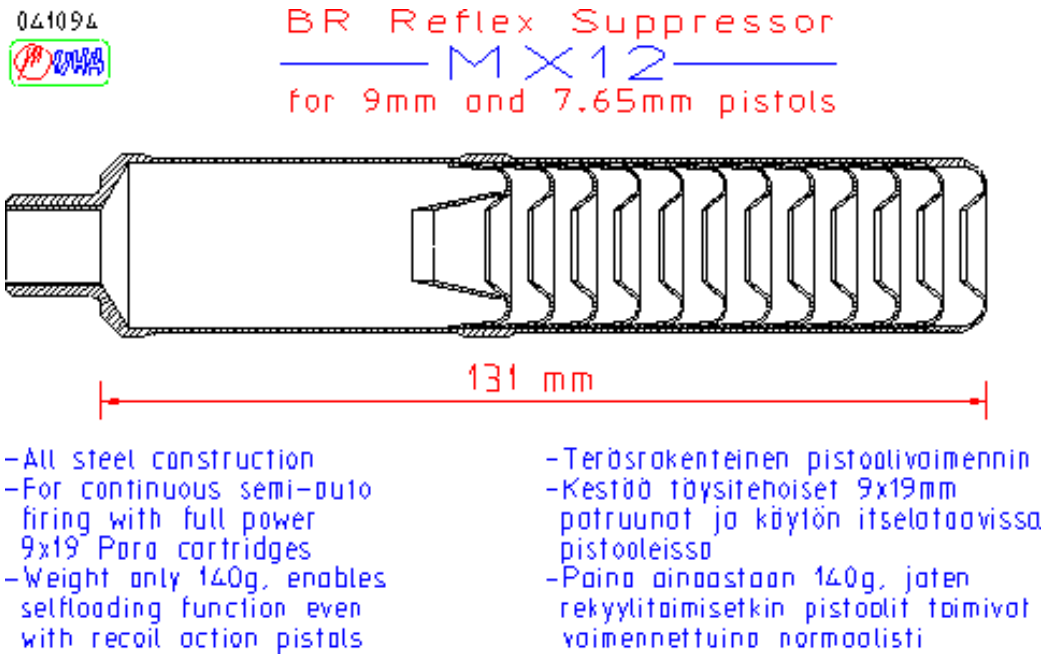
Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring

Aligning Minireflex Moderators Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring

Reflex Suppressors™

Muzzle Mounting MX Minireflex Moderators for 9 mm and 7.65 mm Pistols

MX12, MG16 *and* ***MG12*** *Minireflex Moderator variants are "moderator"-class sound suppressors lightweight enough to enable semi-auto operation of most recoil-action 9 mm pistols shot with full power ammo, like* ***CZ*** *and* ***Tanfoglio***, ***Beretta*** *and* ***Taurus***, ***FN Hi-Power*** *and its variants. Most heavy bullet subsonic 9 mm ammo will also cycle their action satisfactorily. These pistols may require a spare shortened recoil spring for suppressed shooting to compensate the extra weight added to moving barrel.*



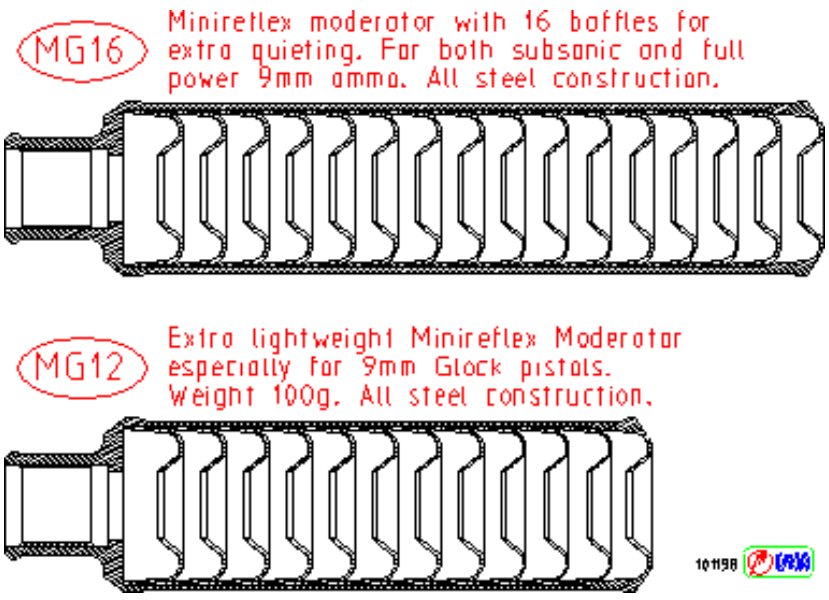
Straight or delayed blowback pistols with fixed barrel, like 9 mm ***Heckler & Koch P7*** *and almost all 7.65 mm pistols, will cycle normally without any modifications to recoil spring. Some recoil action pistols, like* ***Glock****, are especially sensitive to any extra mass attached to barrel. For Glock, ask for the extra lightweight* ***MG12*** *Minireflex Moderator. Both main and striker springs of Glock need to be shortened for reliable functioning with any mass like a suppressor or an effective muzzle brake mounted to barrel. Use unshortened spare main spring when not using a moderator to avoid stressing slide and action.*

*Purchasing an **extra long barrel** for suppressor/ moderator use is the easiest and most advisable way to mount a Minireflex to the pistol. However, the mounting can also be accomplished with a threaded extension piece soldered to the muzzle of standard barrel, or by broadening the barrel bushing of the slide for sinking the suppressor back extension inside it. Minireflex moderators are made for a large variety of standard and fine metric and inch threads.*

Update: 070799

User's Manual: MX Sound Moderators for 9 mm and 7.65 mm Pistols

MX Minireflex Moderators are light and small all-steel devices primarily intended for reduction of environmental grievances and defects of hearing, caused by noisy reports of 9 x 19 mm and 7.65 mm pistols. The basic model MX12 weighs ca. 140 g and adds ca. 140 mm to the length of a pistol. **MX12** is an extra durable pistol moderator best suited for very active shooters using primarily full power 9 mm ammo for IPSC shooting, target practising etc. If the pistol is shot primarily with subsonic ammo, the Minireflex Moderator **MG16** is the primary choice with its added number of baffles. Dimensions of MX12 and MG16 are chosen to compromise between silencing effect and automatic function of selfloading pistol, loaded with full power supersonic or heavy bullet subsonic cartridges. Properly mounted Minireflex Moderator does not affect bullet speed or precision. Standard finish of Minireflex moderators is military grade parkerizing. Diameter of a Minireflex Moderator is small enough (max. 27.5 mm) to enable aim with pistol's standard iron sights. Very best silencing effect is possible by shooting subsonic 9 x 19 mm cartridges (bullet velocity ca. 300 m/s). However, all-steel Minireflex Moderators endure shooting with full power rounds of 9 x 19 mm Para/Luger ammunition (bullet velocity 350 to 400+ m/s). Shooting noise is then comparable to noise level of an unsilenced .22 LR target pistol.



Mounting of a Minireflex Moderator is usually carried out by male thread on the muzzle. Recoil action pistols like **CZ-75** and it's 9 mm variants, as well as **FN-GP/ Browning HP, Beretta 92, Taurus PT92** and many other 9 mm selfloaders are suitable for use with a moderator (see appendix below for mounting directions). Most recoil action pistols require shortening the recoil spring, for compensating the moderator extra mass on recoiling barrel. **Glock** is particularly sensitive to any mass on its muzzle, and it requires its very own extra light moderator version, the "**MG12**". Even then, both recoil and striker springs of Glock need to be shortened for reliable cycling. Users report, that the **striker spring of Glock** can be shortened by 25 to 30 % without getting misfires. The **recoil spring** tolerates 10 ... 30 % shortening before causing feeding problems. Cut one turn at a time from the spring and try the pistol. Use spare unshortened recoil spring for shooting without a moderator to avoid stressing the action of the pistol. Striker spring needs not to be replaced for unsuppressed shooting. Straight or delayed **blowback pistols**, like **Heckler & Koch P7**, will cycle normally with a sound

moderator without modifications to recoil spring. Shooting noise of **revolvers** (other than the obsolete gas-tight Nagant R95) is impossible to be reduced effectively by any moderator or suppressor.

Fastening and unfastening of a Minireflex Moderator is easily done by winding on/off, tightening firmly by just one hand. **Note**: Never use tools; over-tightening is unnecessary, and may lead to eccentric mounting. Use heat protective glove or cloth for unwinding, if rapid firing has heated up the jacket of the Moderator. Along with noise reduction, the Moderator acts as a **muzzle brake** or a **compensator** of recoil and muzzle jump. Additional weight ahead of the pistol renders also steady aim and enhanced accuracy of shooting.

Minireflex Sound Moderator is primarily a muffler of excessive noise; also known as "semi-silencer". Silencing effect is, however, available in full extent just by use of **subsonic cartridges**. "Ballistic crack" or "whiplash noise" of bypassing bullet is unavoidable evil, if flight velocity of bullet is as high as velocity of sound in air at ambient temperature (Actually must bullet velocity be less than Mach 0.85, because development of flight noise will start along with transsonic velocity). See an image about bullet flight noise for more information.

For extra silencing effect, Minireflex Moderators are strong enough to be used also as a "**wet**" suppressor, by applying about a spoonfull of grease inside the moderator from its back and spreading it with a stick among the baffles and away from the bullet path. Grease or liguid inside a sound moderator absorbs muzzle blast energy by its immediate vaporization. The effect stays for 3 ... 20 shots after each refilling, depending on the properties of the absorbing substance. Ordinary lithium based lubricating grease is one of the most easily available absorbers. See *Alan C. Paulson's* book Silencer History and Performance for more details about wet suppressing techniques and noise absorbers. **Caution!** Do not over-fill the moderator, as it will raise the inside pressure beyond a risk of suppressor damage!

Functioning of recoil action pistols is inherently sluggish or deficient, because of extra weight attached to recoiling barrel. A great many pistols will eject and/or feed reliably no other loads, but those with extra heavy bullets (weight 9 g or more). A makeshift trick is to obtain an extra recoil spring, and cut it short enough to reduce spring tension 20 to 25 per cent. This method may, however, result in feed jams - especially when the magazine of the pistol is crammed till it's nominal capacity. Shooting with reduced tension recoil spring and without Sound Moderator may curtail life of pistol, if powder charge of cartridges (behind standard weight bullet) is not reduced along with spring tension (20 to 25 %). Use of heavy bullet and reduced charge is the most advisable way to get reliable autoloading of the pistol, along with reduction of shooting noise. Some brands of 9 x 19 mm Subsonic cartridges with heavy bullets are available factory loaded (f. ex. Lapua with 9.7 g CEPP bullet), but any experienced handloader is able to develop and reload "subsonics". Cast bullets of lead alloy are excellent for these loads. Recommended bullet weight is circa 9.5 g /146 grains. Bullets with round point are best, if reliable functioning of pistol is of vital importance.

If automatic function is unnecessary, it is possible to get very good **silencing effect** by rather heretical use of **9 mm Browning Short** (.380 Auto; 9 x 17 mm) cartridges with 90 to 95 grains bullet, velocity ca. 265 m/s. Theoretically it is impossible to shoot cartridges having 17 mm case length in 19 mm chamber, but in practice most 9 x 19 mm pistols are able to fire 9 mm shorts. However, when cycling the slide manually the extractor hook of pistol will keep the cartridge in reach of firing pin. Feed from magazine is also usually reliable, in spite of less length and diameter of cartridge. For target practising without disturbing the neighbourhood, using 9 mm shorts is usually an economic way. Because the pistol does not "sow" spent cases all over, also unnecessary littering of the surrounding is avoided.

Does it need an extra barrel for mounting? No - most centerfire pistols have thick enough barrel wall (2 millimeters or more) so a threaded barrel extension can be mounted to them by soldering with regular silver alloy. The extension is made by a gunsmith or a suppressor manufacturer and it is a very economic alternative to purchasing a new extra long barrel. Internal thread in the muzzle is in principle also possible but the barrel wall thickness may not be sufficient for it and the thread is prone to heavy fouling. It is also possible to "sink" the Minireflex suppressor thread end extension inside the slide by enlarging the slide bushing around the muzzle (a recess with 15 mm diameter on the front end of slide around the muzzle, deep enough to expose muzzle thread and relief cut). A lot of Minireflex Moderator mounting has been made also this way but the soldered barrel extension is a preferable way because it does not require enlarging slide bushing.

Not always even muzzle extensions are needed. Some pistols with long muzzles, like Beretta 92 and Taurus 99, need just thread cut on the muzzle. However, most models - like Browning Hi-Power and CZ-75 - need a muzzle extension. Thread mounting of suppressors is unsuitable for pistols with twist-barrel action: for instance Colt All-American, Steyr Hahn M 1912, Savage, Mab PA-15 or CZ Vzor 24.

Mounting of a Moderator may cause need to re-adjust the sights. Single shot pistols may shoot too low due to decreased "jump" of muzzle. Use of cartridges with reduced charge and heavy bullet in single shot pistols may, however, eliminate the need of sight adjustment, because increased weight of bullet has natural tendency to enhance jump momentum of handguns. Knowledge of this effect is important especially when pistol is equipped with fixed sights. A Moderator is not as "foolproof" device as the Telescopic Reflex Suppressors are, because of it's thread mounting at the muzzle only. Check frequently the tightness of mounting thread. **Do not shoot** unstable bullets or shot-capsule cartridges trough the Moderator! Remove the Moderator also before shooting with discarding sabot bullets or flechettes.

Maintenance: A Minireflex Moderator is a practically maintenance-free device. Normal fouling of powder and primers cannot take effect on its functioning. Loose solid impurities, like powder kernels and carbon chips, are easy to remove by brisk shaking, while keeping the Moderator vertically, rear-end downwards.After shooting session it is advisable to remove the Moderator. This helps steam condensed from powder gases to evaporate away.

APPENDIX:

Mounting directions: Competent gunsmith is needed for mounting. Thread must absolutely be lathe-turned; not cut with hand die. Barrel must be unfastened from pistol, centered between three-jaw chuck (or four-jaw, if necessary due to odd shape). Muzzle must be centered with a conical point of tailstock in the bore.

Length of thread (M12x1, M13x1, M14x0.75, 1/2"x28G as most common ones) is about seven (7) millimeters or more including relief cut, which is usually 1.5 mm wide and no more deep than the nominal inner diameter of the thread, or smallest diameter of female thread in Moderator's mounting sleeve. Fit of male (muzzle) and female (sleeve) thread must be loose enough for easy winding on/off with three fingers of hand, but excessive slackness must be avoided. Aligning of mounted moderator and bore of barrel must be checked by looking through the bore from the chamber. If the bore and holes of diaphragms (silencing baffles) are not in line, it is possible to correct slight eccentricity by filing or grinding very carefully rear end of mounting sleeve slanting, until aligning is achieved. See separate aligning instructions.

MX Minireflex Moderators

MX Minireflex Pistol Moderators on Internet: http://guns.connect.fi/rs/mxgraaf.html

Aligning Minireflex Moderators Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring

Reflex Suppressors™

Telescopic Reflex Suppressor T8 Scout

Update 16.11.2001

Owner's Manual - Read before use!

Telescopic Reflex Suppressors for Rifles

The rifle caliber telescopic *Reflex Suppressor* is a device developed for hearing protection for full power cartridges. It diminishes superbly the environmental noise attacks and risks of hearing deterioration. The *T8 Scout* suppressor is today the world's most produced rifle suppressor. For the shooter its noise-killing effect equals best hearing muffs. T8 Scout and its shorter version *T4 Ranger* are the most widely used suppressors for hunting and accuracy rifles. The hunters as well as their dogs are efficiently safeguarded against hearing losses.

Construction: Because of it's telescopic layout most of the suppressor body is behind the muzzle, and the suppressor supports itself from two points around the barrel. Disconnectable barrel bushing at the back of the suppressor enables using the same suppressor on separate rifles with barrel diameters up to 22.5 mm. Telescopic mounting makes a very rigid mounting, and a Telescopic Reflex Suppressor withstands shooting even a few turns loose, which will regularly damage traditional forward mounting suppressors. Reflex Suppressor is a wipeless design, so it does not reduce bullet velocity. Because of its sturdy construction it can be used also as wet. For details about wet suppressor techniques and absorbing substances see *Alan C. Paulson*'s book: Silencer History and Performance, volume 1 (Paladdin Press).

Dimensions and calibers: Telescopic Reflex Suppressors outside diameter is 50.5 mm (2"). They come in two standard lengths: *T4 Ranger* with four suppressing baffles extends the rifle by only 60 mm or 2 1/2". Short T4 Ranger is commonly used in .223 rifle caliber class. Longer *T8 Scout* with eight baffles extends the rifle by 98 mm or less than 4", and it is commonly used in .308 or heavier calibers. A special reinforced model *T8M* is for magnum rifle calibers. Reflex Suppressors are available with four different bullet hole diameters in baffles, the largest being for .458 Magnum. Separate larger Reflex Suppressor models are available for some .50 BMG rifles.

Performance: The T8 Scout drops the peak noise level of full-power .308 Win cartridges typically from 157 dB down to 135 dB, which is clearly under the recommended max. peak level in EC and US standards of 140 dB and one of the very lowest shooter's noise levels measured with .308 high velocity ammunition. Please remark that the risks of hearing injuries are not totally avoided even below the 140 dB risk level if one is shooting in indoor ranges prone to echoing or firing hundreds of shots weekly. Combined use of hearing protectors and a suppressor is recommended whenever that is possible because only then centerfire rifle noise levels are dropped considerably below the noise level of a .22 rifle that can be regarded as almost riskless.

Bullet noise: When using a suppressor with normal high velocity ammunition the sound in front of the weapon is not removed, but the noise towards the shooter is brought down enough to be considered safe for occasional shooting with unprotected hearing. Thus in hunting circumstances the game hears the shot and escapes the shooter like with unsuppressed weapons. The noise in front of a suppressed firearm is due to the fact that the noise of a bullet exceeding the speed of sound (sonic barrier or Mach 1) cannot be removed with any suppressor. Only bullets traveling slower than the speed of sound (bullet velocity abt. 300 m/s), known as ”subsonics” will remove that noise.

However, subsonics have far too low energy level for practical hunting and they are not even allowed for hunting in most countries. Their range is also very short, as the trajectory becomes very curved after 50 meters. If using subsonic cartridges please also pay attention to adequate rifling twist declared in chapter ”Rifling twist with subsonic ammo” (below).

Accuracy: When properly mounted, a suppressor usually does not increase spread of impacts. Instead, it may even tighten the group. Additional weight on the barrel shifts the place of the group center, but that displacement is easily corrected by aiming off. Extent of displacement is usually less than one MIL or four Minutes Of Angle (<10 centimeters at 100 meters), depending on type of rifle and ammo. More extensive off-aiming or sight adjustment may be needed when using subsonic cartridges because of their slow initial velocity and curved trajectory. With self-loading rifles low powered subsonics are usually unable to eject and feed. If mechanical noise of action is to be avoided, it is advisable to keep possible gas port valve closed even when shooting with full-power cartridges.

Rifling twist with subsonic ammo: Using custom-loaded 7.62 x 51 mm /.308 subsonic rounds (muzzle velocity ca. 300 m/s or 1000 fps) the noise of the shot is not very much louder than the sound of a firing hitting an empty chamber. However, these loadings require a 254 mm or 10" twist of rifling to stabilize heavier bullets than 9.7 g or 150 gr. in .30 caliber class. Lighter bullets will be stabilized also in 305 mm or 12" twist. Do not shoot with unstable ammo, because they may graze or even damage the baffles of a suppressor!

Tightening the suppressor on muzzle: When winding the Telescopic Reflex Suppressor on your rifle tighten it only moderately. It is advisable to use only as much force as realized with fingertips of one hand. **Do not overtighten!** Overtightening may result to excess shift of group or loss of accuracy. It is a good habit to tighten the suppressor always and repeatedly to same finger felt tightness to ensure optimum accuracy and to keep the same point of aim.

Maintenance: Reflex Suppressor is a practically maintenance-free device. Normal fouling from powder and primers do not have effect on its functioning. Loose solid impurities like powder grains and carbon chips are easy to remove by shaking the suppressor, while keeping it vertically, front end downwards. Compressed air may be used for cleaning and gun oil for preserving, but washing with liquids or solvents is unadvisable. Remove the suppressor or leave the action of the rifle open after a shooting session. This helps to avoid corrosion by letting steam condensation from powder gas to evaporate away.

Please observe: It is to be emphasized that protecting the hearing depends on everyone’s own precautions and activity; suppressors offer means to diminish the risks of hearing damage. The manufacturer cannot be held responsible in any event or circumstances for any hearing injuries as the possibility to have control over the use of product does not exist. Appropriately mounted suppressor, when used according to normal shooting and gun handling precautions, delivers noise attenuation that helps bring down risks of hearing injuries.

Muzzle brake effect: Reflex Suppressor is a highly efficient muzzle brake, due to abrupt reflection or blowback of muzzle blast in the first expansion chamber. The threading for a suppressor also serves for mounting a separate muzzle brake. Attention! The devices serving only as muzzle brakes are not recommended, as they increase essentially the shooter's noise level! The peak noise level to shooter may go up from abt. 157 dB to up to abt.167 dB with a .308 Win rifle if equipped with a muzzle brake. Such a noise level can cause permanent damage to unprotected hearing even with single shots!

Mounting is made by the manufacturer or by a competent gunsmith. As the suppressor extends telescopically backwards from the muzzle and around the barrel, the front sight must be removed. A M15x1, M17x1 or M14x1 thread with centering sleeve is cut on the muzzle in a lathe; for details see separate mounting instruction. Other threads are available by request. Telescopic suppressors do not mount to guns having a long tubular magazine or full stock. In such cases, the forward mounting Reflex Suppressor R12 or KRS may be used.

Warning:

- Do not shoot shotshells, unstable projectiles or discarding sabot bullets through a suppressor, as they may damage it.
- With self-loading rifles all suppressors tend to increase powder gas blowback through the action opening after the shot. With rifles having this tendency, use shooting goggles to prevent powder particles getting in your eyes.

The Reflex Suppressor T4 Ranger or T8 Scout accessories:

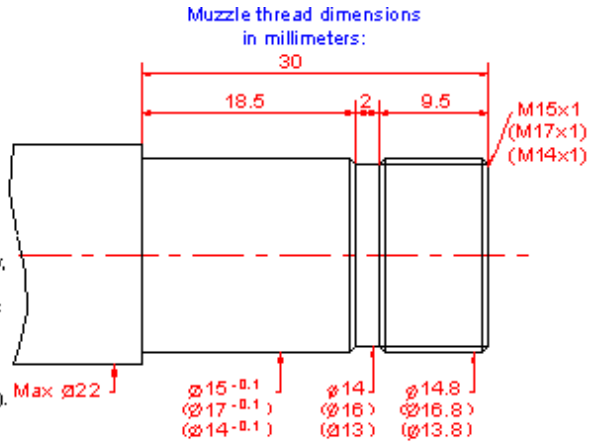
- Standard: A thread shield nut for M15x1, M17x1 or M14x1 muzzle thread for unsuppressed use of the rifle.
- By request: If mounting is not done by manufacturer, a jig for centering the barrel bushing nut in a three-jaw chuck of a lathe, to enlarge the bushing aperture to barrel diameter.
- By request: Extra barrel bushings for mounting one suppressor to separate rifles.

Mounting Instructions

Mounting Telescopic BR Rifle Reflex Suppressors:

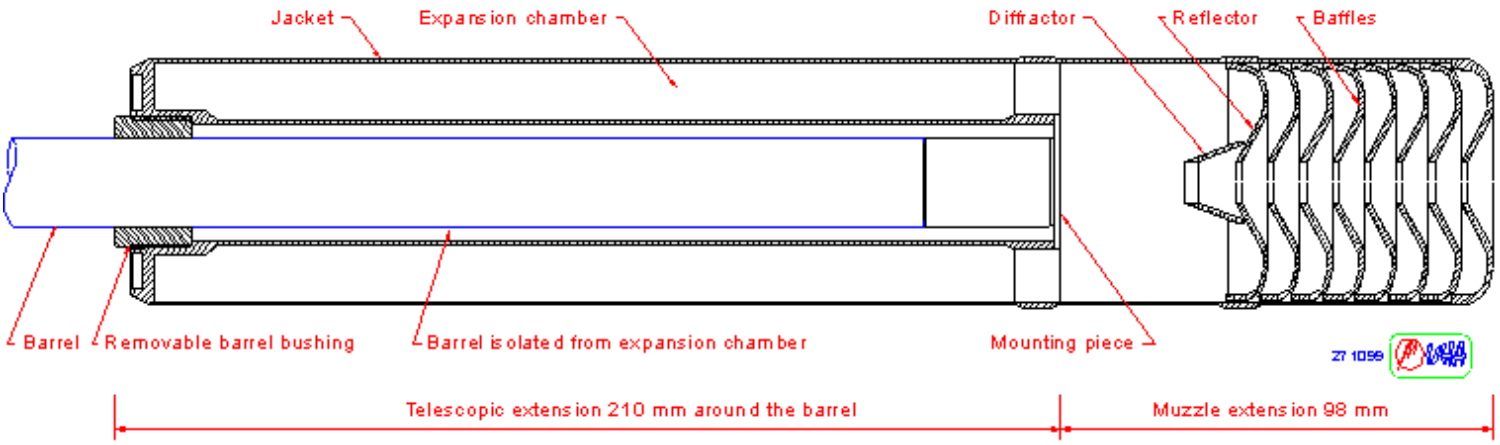
Most common mounting threads are M14x1, M14x1.5, M15x1, M17x1. Thread is selected suitable for the caliber and barrel diameter of the rifle. Reflex suppressors are made for practically any threads by request. Steps:

1. Remove the front sight.
2. Make a muzzle thread with a relief cut and a cylindrical cut (see drawing beside) in a lathe. The muzzle must be centered against a rotating conical support for accurate thread aligning. Fasten the barrel to the three jaw chuck of the lathe from the point of barrel bushing (= suppressor back end, typically 210 mm from muzzle), or if not possible, from the back end of the receiver. The thread should be loose enough to allow the suppressor freely align itself along the barrel by the bushing. If necessary, cut the thread groove wider until a slight clap is observed between suppressor and muzzle thread.
3. After thread cutting, finish the muzzle by grinding in a rotating lathe with a fine hand-held 90 degrees conical tipped stone to remove any support marks or spurs from the end of rifling.
4. Unscrew the barrel bushing from the back of the suppressor.
5. Screw the suppressor on the muzzle without the barrel bushing.
6. Measure the diameter of the barrel at the back of the suppressor (typically 210 mm from the muzzle).
7. Enlarge the barrel bushing hole in a lathe to measured barrel diameter + 0.1 mm. A threaded jig supplied by the manufacturer for fastening the bushing to the lathe is recommended.



Update 15.11.2001

Reflex Suppressor T8 Scout:



Click to enlarge drawing!

Mounting instruction sheet similar to above follows with the suppressor. If the rifle can not be fastened to the three jaw chuck of the lathe from the position of suppressor back end, the rifle is fastened from the back of its receiver and centered by its barrel. It is important to make sure the muzzle is centered for thread cutting against a rotating conical support of the lathe. Unsupported threading will lead to poor suppressor aligning and bullet grazing baffles. A careful gunsmith will grind the muzzle end of the rifling in a lathe with a fine hand-held stone to 45 degrees of angle after cutting muzzle thread. The muzzle finishing is done to remove any marks of the support from the muzzle to preserve the accuracy of the rifle.

Muzzle Thread Fitting Instructions:

Muzzle thread tolerance: The muzzle thread should have enough tolerance to allow the suppressor freely align itself according to the barrel bushing. The thread should NOT be dragging tight. It should be loose enough to act a bit like a spherical joint. Correct thread tolerance is easily checked by first winding the suppressor without barrel bushing completely on it's thread - do NOT tighten it yet! - and then unwinding it half a turn or so. Then swing the back end of the suppressor sideways back and forth. The thread should allow it freely swing to and fro for about three millimeters. If the suppressor back end does not swing for at least two millimeters you have a too tight thread and it should be cut looser.

Tip for Optimum Precision: To ensure optimal aligning during mounting procedure do NOT wind the suppressor TIGHT on the muzzle thread WITHOUT the barrel bushing. When winding the suppressor on the barrel without barrel bushing tighten it only very lightly. Only after the muzzle thread and barrel bushing fittings are finished, the bushing is attached to the suppressor and the suppressor is wound for the first time on the barrel you may tighten it to final tightness described in the Owner's Manual above. The purpose of this procedure is to attain maximum aligning precision by letting the virgin metal surfaces of muzzle thread and suppressor mounting piece to settle against each other in correct alignment when tightened for the first time.

Monteringsinstruktioner på svenska >>

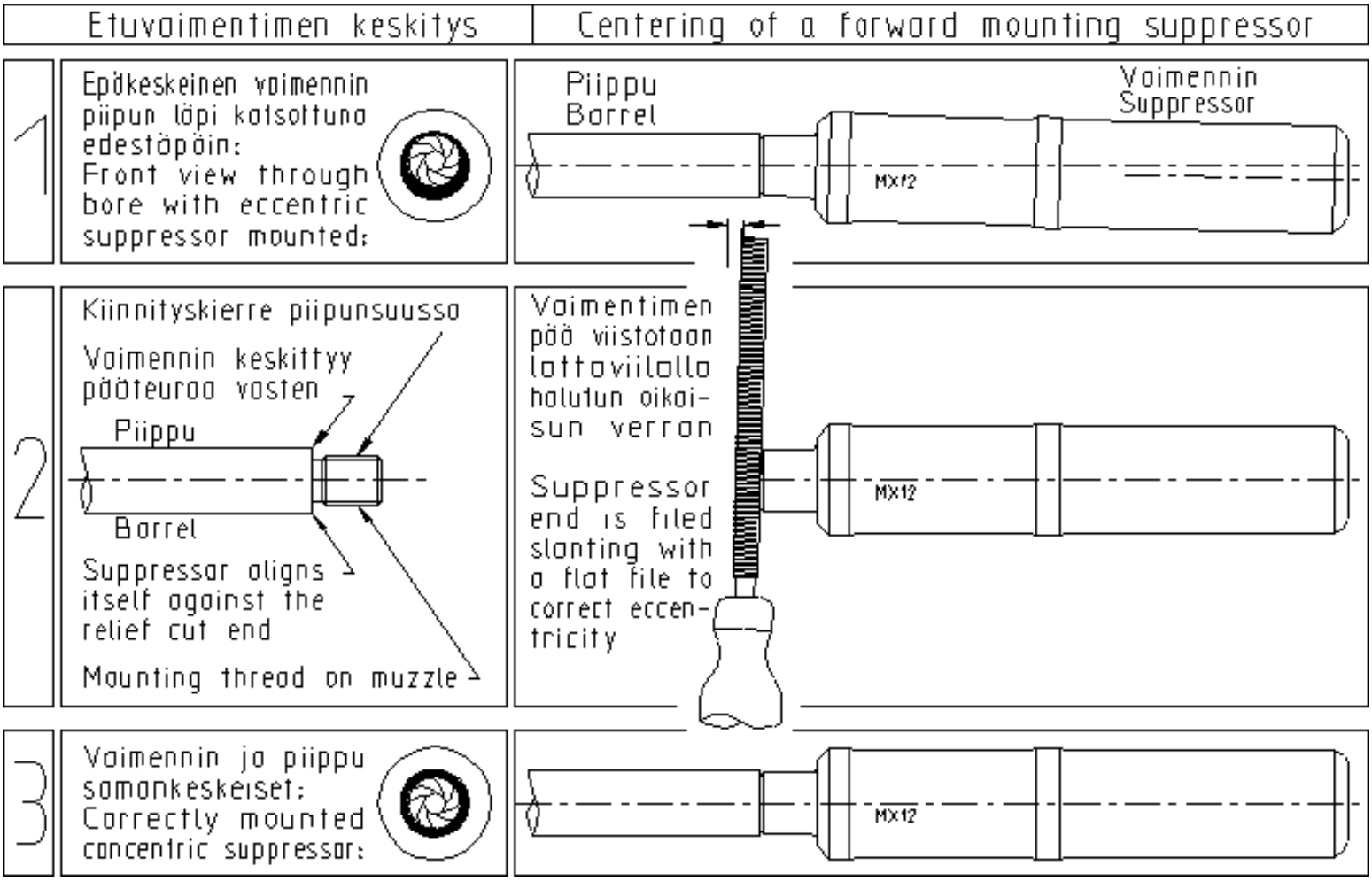
Reflex Suppressors for Rifles

Photo of a custom built BR Integral rifle with a Telescopic Reflex Suppressor.

Rifle Reflex Suppressors on Internet: http://guns.connect.fi/rs/mounting.html

Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring License Manufacturing Lyddemper.net Suppressors in the UK På svenska

Aligning and Centering a Muzzle Mounting Suppressor



This is the usual method of aligning a suppressor mounted on muzzle thread. The suppressor aligns itself against the relief cut shoulder, which must be lathe-turned perpedicular to the bore axis. Missalignment will cause deterioration of accuracy or even damages to suppressor due to bullet grasp to baffles.

Suppressor aligning procedure is needed only when mounting it, from then on it will keep the alignment when properly used. Please avoid overtightening - this will cause unnecessary wear to aligning surfaces. Do not shoot with loose or untightened suppressor, as this may damage it!

Telescopic suppressors do not need aligning, because they support themselves from two points against the barrel. These instructions do not apply to conical thread, bayonet or other special means of suppressor mounting.

MX Minireflex Suppressor

Kalashnikov Reflex Suppressor KRS

[MX12 pistol suppressor]

Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring

Reflex Suppressors™

Reflex-ljuddämpare för jakt- och prickskyttegevär

06.10.1999

Användningsinstruktion:

Reflex-ljuddämpare T8 Scout och T4 Ranger för gevär

Den teleskopiska Reflex-ljuddämparen för gevär är ett hörselskydd utvecklat för full-effekt patroner och den passar utmärkt för minskning av buller från skyttebanor samt hörselskaderisker blir mindre. Modellen *T8 Scout* är nuförtiden den mestproducerade gevärsljuddämparen i världen. Den har samma ljuddämpningseffekt som hörselskydd. T8 Scout och dess kortare version *T4 Ranger* är de populäraste jakt- och prickskyttegevärsdämparna i Norden. Inom jakt har dämparen tackats för skoning av jakthundarnas hörsel också. En Reflex-dämpare är byggd teleskopiskt och den korta modellen T4 Ranger sträcker sig bara ca. 60 mm utanför vapnets mynning och den längre modellen T8 motsvarande ca. 89 mm. Det är möjligt att få teleskopiska ljuddämpare ända till kalibrar .458 Magnum och .50 BMG.

Dämparen inte tar bort ljudet i vapnets framsida med normalpatroner, men minskar ljudet till odämpad miniatyrgevärsnivå vid skyttens öron. Sålunda t.ex. inom jakt flyr viltet bort på samma sätt som utan dämpare. Bullret i vapnets framsida med dämparen beror på att kulans flygljud överstiger ljudets hastighet och det bullret kan tas bort bara med subsoniska patroner där kulans hastighet inte överstiger ca. 300 meter per sekund. I så fall du använder subsoniska patroner skall du lägga märke till stigning av räfflor, se punkt "Skjutning".

Skyddsholken för gängor innegår i priset. Dämparen vrids i platsen med enhandsstyrka. Övervridning kan skifta träffpunkten. Det går att byta dämparen mellan vapen. Då skall man ha en individuellt passad bakre gängholk, som är passad tätt för varje enstaka vapen. Därför att Reflex-dämparen går över pipan teleskopiskt, måste framsikten tas bort. Montaget lyckas inte med fullstockade, dubbelpipiga eller piplånga rörmagasinvapen. Dessa skall ha mynningsmonterade Reflex-dämpare R12. Gängan

för dämpare också passar för mynningsbromsen. Den inte mer rekommenderas, för den ökar hörselskaderisken betydligt, t.ex. från 157 till 167 dB. T8 Scout sänker bullernivån med fulla .308-laddningar typiskt från 157 dB till 135 dB, och det är tydligt under den hörselskadegränsen 140 dB. Dock är det alltid rekommendabelt att använda hörselskydd. Samverkan av hörselskydd och ljuddämpare sänker ljudnivån under det som ett miniatyrgevär har. T8 är toppen i sin klass. Även om den gör geväret bara mindre än tio centimeter längre, dämpningseffekten med fulla .308 patroner är: skytten / 1m åt sidan / 10 m åt sidan: 22 / 24 / 22 dB (Peak). Med subsoniska patroner skytten får ca. 126 dB och dämpningsvärden är: 23 / 22 / 22 dB (Peak).

Skjutning: En ljuddämpare fungerar också som en mycket effektiv mynningsbroms baserande på att den reflekterar den mynningstryckvågan bakåt. Den har ingen effekt till träffpunktspridning. Träffpunktcentern byter plats något, beroende på vapentypen (0 – 30 cm / 100 m). Därför att en teleskopisk ljuddämpare har två stödpunkter på pipan, är det inte skadligt att skjuta med en ofastskruvad dämpare. Använd inte ostabila eller utom pipan fragmenterande projektiler, hagelladdningar o.dyl. emedan dessa kan skada dämparen. Obs. att många .308 gevär med en svag stigning av räfflor (305 mm eller 12") inte tillräckligt stabiliserar tunga kulor (över 9,7 g) med subsoniska hastigheter! Till exempel räffling som används i stormgevär och i gamla militärgevär (254 mm eller 10") i stället räcker till att stabilisera de tunga kulorna med subsoniska hastigheter. Räfflingens stigning kan mätas genom att trycka en putsstång in i pipan och räkna hur långt det tar att den gör en hel rund.

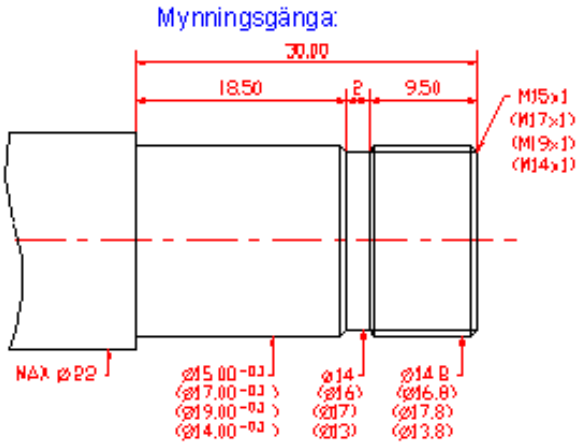
Service och underhåll: En Reflex-ljuddämpare rensas genom att skaka den löstagna dämparen med framsidan nedåt och varvid lösa partiklar faller bort. Efter några första skott kan det hända att somliga svetspärlor faller ur dämparen. Det är helt normalt och varar inte längre än några skott. Efter skjutningen är det bra att lämna slutstycket öppet för att kondensen avdunstar och inte blir kvar i dämparen eller vapnet och orsakar rost. Något särskilt underhåll behöver dämparen inte. För lagring kan dämparen oljas lätt med vanlig vapenolja.

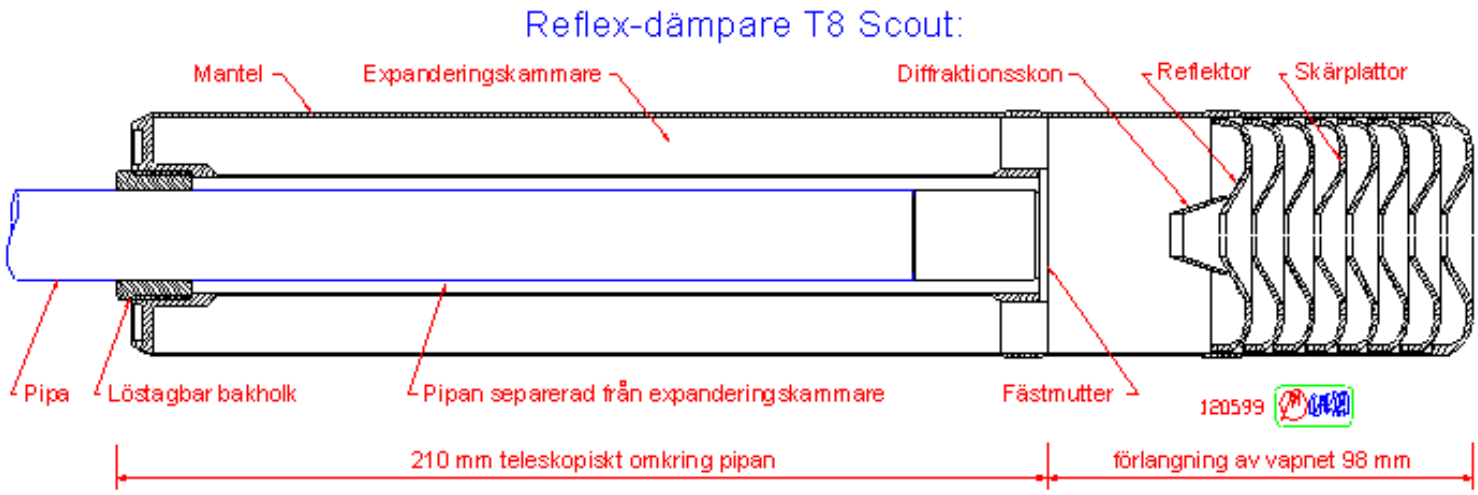
Garanti: Reflex-dämparna har ett års tillverkningsgaranti.

Montering av BR - Reflex - ljuddämpare

Arbetsfaser:

1. Gör svarvning på pipan enligt skissen för dämparens gänga. Fäst vapnet vid pipan vid dämparens bakre ända till svarvets chuck. Om detta inte är mojligt, fäst vapnet vid låsramens (baskylens) bakre ända och centrera efter pipans yttre yta. Stöd mynningen till den roterande mitt. Efter gängningen slipa mynningen med en fin konisk sten i handgreppet i roterande svarv för att ta bort mittspetsens spår från räfflorna.
2. Lösgör gängholken (mässingholken) ur dämparens bakre ända.
3. Vrid dämparen på pipan.
4. Mäta pipans diameter vid dämparens bakända.
5. Brotscha gängholkens öppning att motsvara pipans diameter. Gör det här i svarvjiggen. Tolerans att vara + 0,1 mm.
6. Vrid holken på dämparen och dämparen på vapnet och kontrollera dämparens centrering med att titta genom pipan.



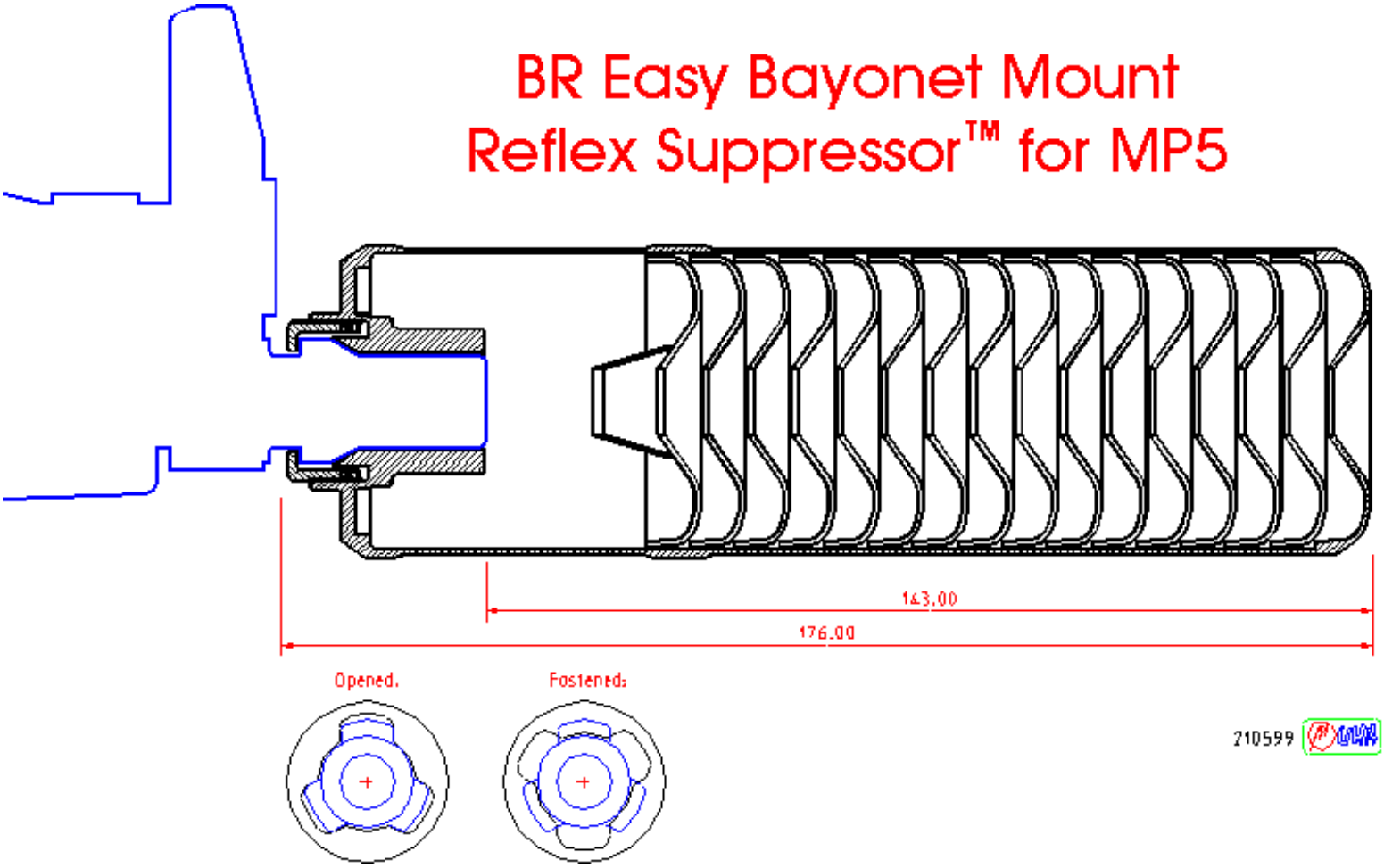


Tillverkning: BR-Tuote Ky, Sahamyllynkatu 33, 80170 Joensuu, Finland Tel. / Fax : +358 13 896 862:
Se Internet: http://guns.connect.fi/rs/montering.html

Mounting instructions in English >>

Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring

R16MP5 Reflex Suppressor



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Manual: MP5 Reflex Suppressor with Easy Bayonet Mount (TM)

Reflex suppressor or silencer R16MP5 for Heckler & Koch Maschinenpistole 5 has a new quickly detachable Easy Bayonet Mount with a friction ring against accidental loosening. The all steel Reflex suppressor is a long-lasting and almost maintenance-free muffler of muzzle blast, flash hider and recoil compensator. Suppressor is also used to protect the shooter from hearing loss, which is a common menace especially among those using firearms by their profession. Standard Reflex Suppressors finish is military grade parkerizing. Model R16MP5 extends only 143 mm forwards from the muzzle.

Reflex Suppressor is designed to withstand full-auto shooting with full power 9x19 mm Para cartridges. Reduction of shooting noise is considerable, but mechanical noise of firing cycle and bullet's flight noise (ballistic "crack") are impossible to eliminate by any suppressor. Flight noise of supersonic bullet is found to be useful in actual battle: Cracking sounds of bypassing bullets tends to bluff the enemy, and so hide the position of a shooter, as muzzle blasts, muzzle flashes and other shooting signatures are eliminated with a suppressor. Shooting noise with a suppressor and full-power 9x19 mm cartridges is about as loud as a .22 rifle with Super Speed cartridges.

If extra quieting is needed it may be necessary to use cartridges with reduced powder charge; so called subsonic loads with bullet velocity preferably less than 300 m/s. If commercial subsonic ammo is unavailable, any experienced handloader may develop and reload them. If the bullet weight is 8 g or less, these loads are unable to complete the feeding cycle of MP5 reliably. However, mechanical noise - other than snap of the hammer - will be absent, and suppressed muzzle blast is not much more audible. Manual ejection and feeding are quick and easy to accomplish. For extra quieting, Reflex Suppressor can also be used wet. If bullet weight is 9 g or more, it is possible to get reliable automatic feeding along with silent flight of the bullet. Mechanical noise of the action is, however, always present. Truly 'silenced' shooting with self-loading or full-auto firearms is possible just with limitations.

Mounting a suppressor with an Easy Bayonet Mount: H&K MP5 submachine gun has three bayonet lugs behind the muzzle. If lugs and muzzle are undamaged, unaltered and not badly worn, mounting is done easily without special skill or tooling. Slip the nut of the suppressor onto the muzzle and beyond the bayonet lugs. First turn the suppressor counter-clockwise a couple of turns to make sure the locking nut is opened enough to engage the lugs. Then rotate the suppressor clockwise. After 1/6 turns you should feel the lugs clutching in their slots inside the nut. Now just tighten it clockwise. You will feel some resistance. This is a safety feaure of the novel friction ring of the Easy Bayonet locking nut to prevent losing the nut from disconnected suppressor while transfer and to provide more security against suppressor getting loose on the muzzle. The friction ring is a standard 20x2 mm O-ring and it can easily be replaced to a disconnected nut if it is worn or lost. **Caution:** Do not overtighten the suppressor! Twist by one hand, not with tools. Overtightening will cause unnecessary wear of muzzle aligning surfaces and in worst case result in unaligned mounting. Never shoot with a loose suppressor, as this will cause the bullets grasp the baffles. **Disconnecting**: Turn the suppressor counterclockwise a couple of turns while pulling it forwards (towards the muzzle). Now the lugs can be uncluthched from their slots by pushing the suppressor towards the gun, then rotating the suppressor 1/6 turns counterclockwise and pulling it straight out of the muzzle.

Maintenance: Reflex Suppressor is practically maintenance-free device. Normal fouling of powder and primers do not have effect on its functioning. Loose solid impurities like powder kernels and carbon chips are easy to remove by brisk shaking while keeping the rear-end pointing downwards. After a shooting session it is advisable to remove the suppressor. This helps water condensed from powder gas to evaporate away. For storage, ordinary gun oil can be applied.

For alternate means of bayonet mounting, see also manual of screw secured MP5 Reflex Suppressor

MP5 Easy Bayonet Mount Reflex Suppressor

MP5 Reflex Suppressors on Internet: http://guns.connect.fi/rs/MP5.html

Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring

Reflex Suppressors for UZI's

The

UZI Reflex Suppressors mount in seconds: Just remove the barrel retaining nut and screw the suppressor on!

Owner's Manual: Reflex Suppressor R12U for UZI & MINI-UZI and R12MU for MICRO-UZI

Telescopic Reflex Suppressors are developed for military use. All-steel construction will ensure long active life and durability. Due to telescopic mounting partially on the barrel, these suppressors extend the length of the submachine gun considerably less than conventional muzzle-affixed silencers or sound suppressors. Standard model R12U extends, for instance, just 128 mm forward from the muzzle of the **UZI**, and mounts also **MINI-UZI** without modifications. The corresponding model R12MU for **MICRO-UZI** and UZI pistol differs from R12U by having a different mounting thread. Both models are mounted in seconds by replacing the barrel retaining nut to the suppressors. Longer models are available by user's specifications. Any and all models are durable enough to stand full auto or burst-fire with full-power 9 x 19 mm cartridges. Standard finish of Reflex Suppressors is military grade Parkerizing.

Please, note: No suppressor is able to eliminate ballistic "crack" of supersonic bullets (velocity 340 m/s or more), but noise towards the shooter is usually not much louder, than the snap of a .22 rimfire rifle, shooting Hi-Velocity .22 LR cartridges. Crackling flight-noise of a supersonic bullet is beneficial in most exchanges of shots, if muzzle blast is absent. Shooter is very hard to locate, because echoes of the ballistic crack mislead the opponents. If possibly quiet operation is required, subsonic ammo (bullet velocity about 300 m/s) should be used. With subsonic bullets the clacking sound of moving bolt is the dominant shooting noise.

Mounting: Unscrew barrel retainer nut. Push exposed muzzle end of the barrel into the suppressor jacket. Screw the suppressor on the thread of the barrel nut (M26x1.5 in UZI and MINI-UZI, M24x1 in MICRO-UZI and UZI pistol). Store up the barrel retainer nut, if the suppressor is not intended as a permanent part of the submachine gun. Reflex Suppressor will take its stand concentrically on the barrel of the UZI SMG or pistol without particular effort. Remark! Some license manufactured UZI's have a painted barrel surface finish, which is thicker than the original Parkerized or blued finish. Thus, their barrels are slightly larger in diameter, and they will not fit in the precisely machined barrel aperture in the suppressor, if the paint is not removed. Short-barreled **MINI-UZI** is somewhat more complicated than standard UZI. After mounting of the suppressor for the first time, it is necessary to inspect the aligning of the suppressor by looking through the barrel, with bolt opened. Eccentric mounting may ruin the accuracy of shooting by contact of bullets with silencer baffles.

Even the short Micro-Uzi becomes a natural pointer with a Reflex Suppressor as a front grip. The muzzle jump stabilizing effect of the suppressor is considerable, making the Uzi's much easier and safer to shoot full-auto.

Shooting with suppressor is a pleasure, because of reduced recoil and muzzle jump. Reflex Suppressor is a highly efficient muzzle brake, due to abrupt reflection or blowback of muzzle blast inside silencer jacket. UZI will become well-adapted for instinctive shooting, when used with a Reflex Suppressor, because the suppressor jacket is a very natural front-end. Sustained rapid firing will, however, heat the jacket up after about 20 rounds. Using gloves is advisable.

Maintenance: Reflex Suppressor is practically maintenance-free device. Normal fouling of powder and primers cannot take effect on its functioning. Loose solid impurities, like powder kernels and carbon chips, are easy to remove by brisk shaking, while keeping the suppressor vertically, rear-end downwards. Loose litter drops out through the apertures of the mounting sleeve. After shooting session it is advisable to remove the suppressor. This helps water condensed from powder gas to evaporate away. For storing, gun oil may be applied inside and outside the suppressor.

UZI & MICRO-UZI Reflex Suppressors

http://guns.connect.fi/rs/UZI.html

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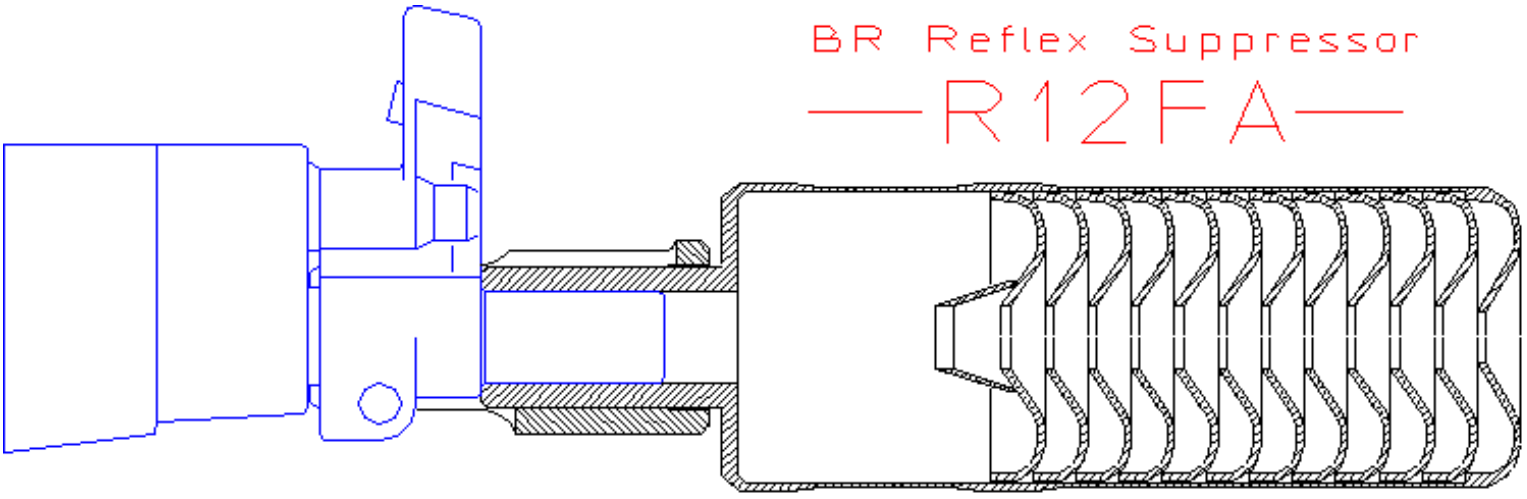
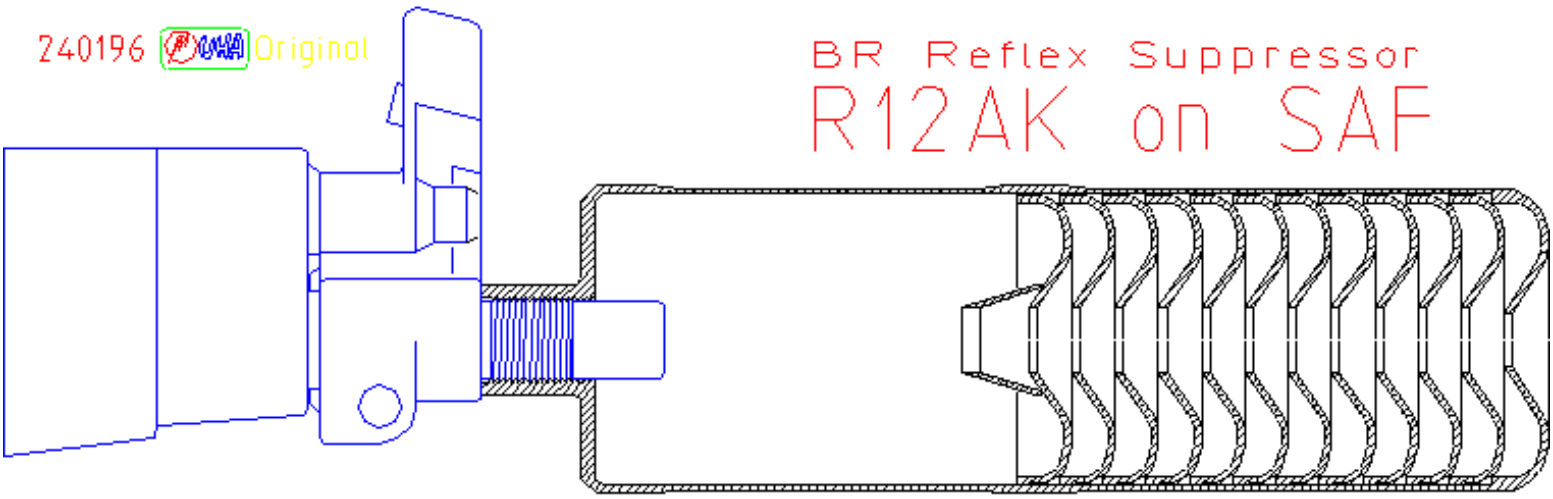
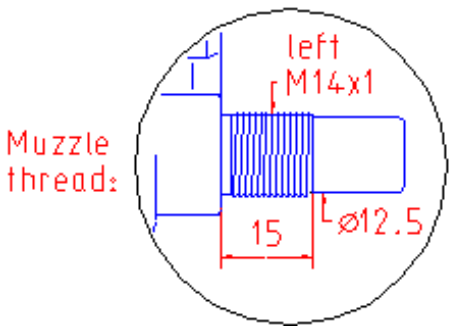
Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring

FAMAE SAF Reflex Suppressor



Reflex Suppressor R12FA for FAMAE SAF smg
- All steel construction
- Full auto capable with standard ammo
- Mounts without modifications to weapon
- Attenuation typically 20 dB(A) Peak, as measured 10m/90° to the right





Kalashnikov' suppressor R12AK with FAMAE SAF

The Reflex Suppressor R12AK is suitable for use with a multitude of rifles, sub-machine guns and pistols, if equipped with Kalashnikov's M14x1 muzzle thread. Being a left hand thread, this combination eliminates tendency of muzzle attachments to turn loose in usual right hand rifled weapons. Performance of this combination is similar to regular SAF's R12FA.

190299

Suppressor for FAMAE SAF. User's Manual.

Reflex suppressor R12FA of 9x19 mm FAMAE SAF SMG is designed primarily for harsh military use. This steel-constructed device is a long-lasting and almost maintenance-free muffler of muzzle blast, efficient flash hider and recoil compensator. Suppressor also

helps to protect the shooter from hearing loss.

Standard model R12FA extends just 140 mm forwards from muzzle. Suppressor is designed to withstand full-auto shooting of full power 9x19 mm Para cartridges. With 320 m/s cartridges, R12FA drops shooting noise typically by 20 dB(A) Peak, as measured at 10 m distance to the right of the muzzle. Beside shooter's ear, noise level is reduced down to USA and European maximum peak noise level of 140 dB(A) or less. To temporarily achieve even quieter operation, about spoonful of ordinary grease may be applied into the suppressor, being careful not to let it get into the flight path of bullet. Grease absorbs part of the energy of muzzle blast, and as a side effect helps to protect the suppressor from corrosion. See also literature for "wet suppressors" techniques.

Reduction of shooting noise is considerable, but mechanical noise of firing cycle and bullet's flight noise (ballistic "crack") are impossible to eliminate by any suppressor. Flight noise of supersonic bullet is found to be useful in actual battle: Cracking sound of bypassing bullets tend to bluff hostile individuals, and so hide position of shooter, when muzzle blasts, muzzle flashes and other shooting signatures are eliminated with a suppressor. Shooting noise with suppressor and full-power 9x19 mm cartridges is about as loud as report of a .22 rifle with Super Speed cartridges. For protecting shooter's hearing, a suppressor is about as effective as wearing regular hearing protection.

For special operations it may be necessary to secure cartridges with reduced powder charge; so called subsonic loads with bullet velocity preferably less than 300 m/s. If commercial subsonic loadings are unavailable, any experienced handloader may develop and reload them. If bullet weight is 8 g or less, these loads are unable to complete feeding cycle reliably. However, mechanical noise - other than snap of the hammer - shall be absent, and suppressed muzzle blast is not much more audible. Manual ejection and feed are quick and easy to accomplish. If bullet weight is 9 g or more, it is possible to get reliable automatic feed along with silent flight of the bullet. Mechanical noise is, however, always present. Silenced shooting with self-loading or full-auto firearms is possible just with limitations.

Mounting the Suppressor: Standard model FAMAE SAF submachine gun has no factory option for mounting a suppressor. By a specially designed BR mounting piece, mounting of R12FA is, however, done easily and readily without special skill or tooling or any modification to the weapon. If a regular muzzle thread mounting suppressor is favored, the SAF can be mounted with the KRS Kalashnikov Reflex Suppressor. For KRS, see mounting instructions in drawing above and separate aligning instructions.

First loosen and disconnect the mounting nut from threaded sleeve integrated in the rear-end of the suppressor. Next, slip the nut onto muzzle from down to up, central aperture or slot upwards, threaded end forwards and locking lugs engaging behind the front sight base. Now, slip the suppressor inside the nut and around the barrel, and tighten it into it's thread just by one hand avoiding unnecessary force - using excess force tends to wear the mounting surfaces.

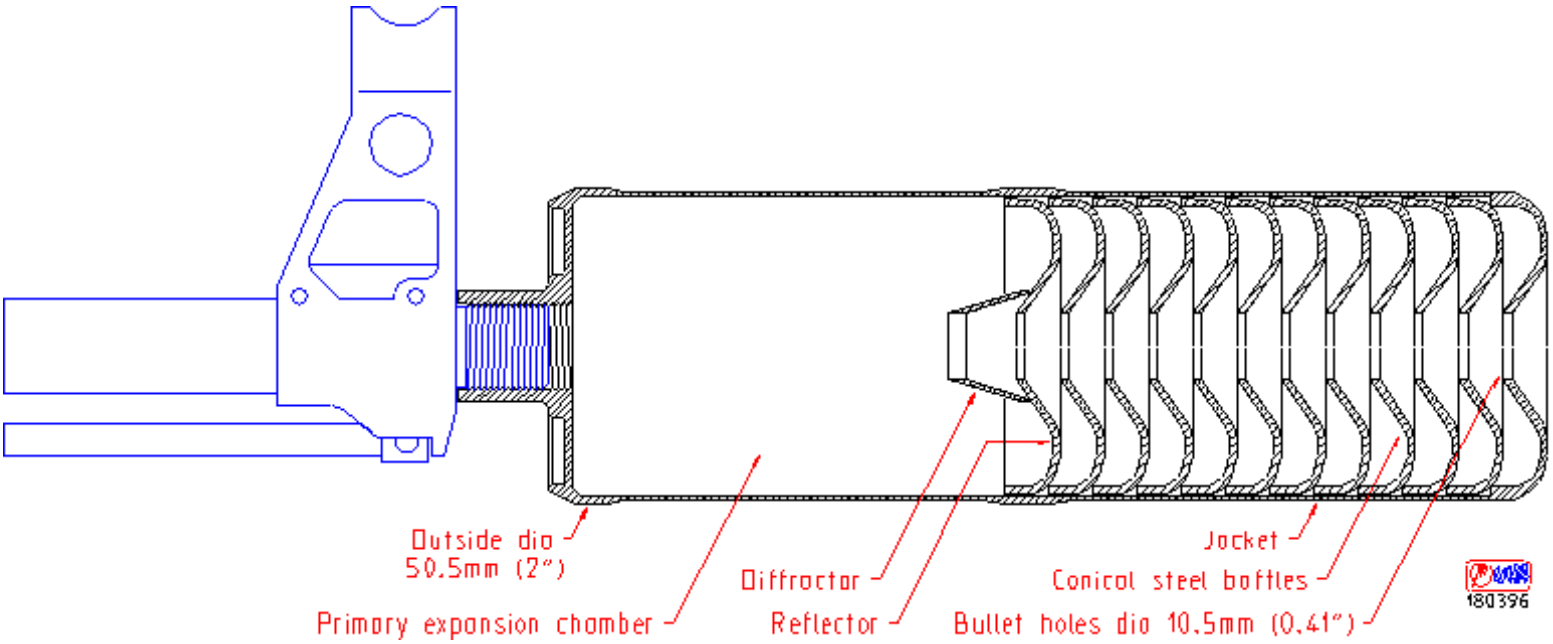
When mounting the suppressor for first time, check the aligning of the suppressor and the barrel by looking through the bore, with suppressor attached. If it appears to be for some reason off center, mounting should be checked by a gunsmith qualified for suppressor mounting. Do not shoot with the suppressor loose or with the nut unlocked, as this may cause harm or even damage the suppressor.

Maintenance: Reflex Suppressor is practically maintenance-free device. Its standard finish is military grade Parkerizing. Normal fouling of powder and primers cannot take effect on functioning of Reflex Suppressors. Loose solid impurities, like powder kernels and carbon chips, are easy to remove by brisk shaking, while keeping the suppressor vertically, rear-end downwards. After shooting session it is advisable to remove the silencer. This helps water condensed from powder gas to evaporate away. Regular gun oil can be used for storage.

SAF Reflex Suppressor

Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring

Kalashnikov Reflex Suppressor KRS



The KRS (MPV) Kalashnikov Reflex Suppressor handles full auto firing with standard full power ammo simply by having a sufficiently large volume first expansion chamber and welded steel construction. Gas port pressure increase is very moderate, but still enough for reliable feeding cycle with subsonic ammo. KRS operates by offsetting muzzle blast with a diffractor cone, and then reflecting the blast as a single wave front backwards in expansion chamber. Blast waves escaping through bullet holes are progressively muffled in low pressure expansion chambers between 12 cup-formed baffles. KRS is used with model marking "MPV" (Maanpuolustusvaimennin = Defense Suppressor) with MPS rifles made for Finnish reservists by Norinco, China. KRS unit weight is 420 grams (14.8 oz.) and length 177 mm (6.96"), and it mounts in seconds to the Kalashnikov standard left-hand M14x1 muzzle thread. Suppressor aligning must be checked when mounting it for first time, because AK muzzle thread aligning may vary individually.

270399

User's Manual: Kalashnikov Reflex Suppressor KRS

KRS (MPV) is an all-steel Reflex Suppressor for Kalashnikov AK-47, AKM and AK-74 rifles, operating on shock wave reflection and gas expansion principle. Suppressor is primarily intended for reduction of environmental grievances and eliminating risks to hearing. KRS is built for harsh military use and full-auto firing. KRS does not affect bullet speed or precision and mounts on the already existing left handed M l4x1 muzzle thread of AK or AKM. Although the optional silencing effect is achieved with subsonic cartridges (bullet velocity abt. 300 m/s), Reflex Suppressor KRS accepts full power 7.62 x 39 ammunition (bullet velocity 700 m/s or more) and the shooting noise is comparable to an unsuppressed .22 LR rifle. Along with the noise reduction, the suppressor acts as a muzzle brake thus bringing down recoil and muzzle jump. Additional weight in front of of the muzzle results in steady aim and enhanced accuracy. Flash hiding effect is outstanding. Reflex Suppressors standard finish is military grade Parkerizing.

Fastening and unfastening: The muzzle compensator of AK or AKM is removed by pushing its locking pin down and rotating the nut clockwise. Suppressor is rotated counterclockwise on the left-hand M14x1 muzzle thread, tightening firmly by just one hand. Note: Never use tools; over-tightening is unnecessary and may lead to eccentric mounting. When unwinding , use a heat-insulating glove or cloth, if rapid firing has heated up the jacket of the suppressor.

Mounting and aligning: After mounting the suppressor to the rifle for the first time, its aligning with the barrel must be checked by looking through the bore. If the bore and the holes of the silencing baffles are not in line, the eccentricity is corrected by filing carefully the rear end of the mounting sleeve slanting, until aligning is achieved. See separate aligning instructions. If in doubt, how the job should be done, leave it to a qualified gunsmith. Centering should be rechecked for each AK or AKM individually, as the muzzle threads of Kalashnikovs are not absolutely precise. Check frequently the tightness of the mounting thread. Unaligned or loose suppressor will affect accuracy or in worst case the suppressor may be damaged by bullets scratching the baffles. After aligning, the KRS may be secured against accidental loosening by filing or machining in the rear end of it a slot just like the original AK compensator has for its locking pin in the front sight base.

Please, note: Do not shoot unstable bullets or shotshells through the suppressor! Also remove the suppressor before shooting discarding sabot bullets or flechettes. With full power supersonic ammo the "ballistic crack" or "whiplash noise" of bypassing bullet is an unavoidable evil, as the velocity of the bullet is higher than the velocity of sound in air (330-340 m/s). When subsonic, bullet velocity must be less than Mach 0.88 (about 300 m/s), as flight noise gets generated along with transonic velocity. For detailed information, see bullet flight noise vs. bullet speed. However, the crack of a supersonic bullet may be used to camouflage the position of a shooter acoustically.

Maintenance: KRS is practically maintenance-free. Normal fouling , due to powder and primer residue, has no effect and they are easy to remove by shaking the suppressor vertically, rear end downwards. After shooting it is advisable to remove the suppressor to avoid the condensation of corrosive powder gases, allowing them to evaporate. In very corrosive conditions, a thin layer of high-temperature resistant grease (lithium , copper or graphite) can be applied on the thread before fastening again to avoid need of excessive power in assembly or disassembly. Apply regular gun oil for storage inside and outside the suppressor.

Kalashnikov Reflex Suppressor KRS

Kalashnikov Reflex Suppressor in Internet: http://guns.connect.fi/rs/krsgraaf.html

Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring

Reflex Suppressors™

Reflex Suppressors for M16 / AR-15

*Photo: M16 equipped with a 4-baffle **T4AR Ranger** Reflex Suppressor fired full auto. Two empty cases are seen flying to the right. The Reflex Suppressed weapon is only insignificantly longer than unsuppressed, still retaining its original handy measures. Relatively easy to control AR15 / M16 becomes even easier to fire with a suppressor due to it's muzzle brake and compensator effect. A .223 Rem bullet has a relatively low bullet flight noise level (supersonic crack) and a moderate powder charge thus both factors making .223 rifles easy to suppress to comfortable and safe sound levels. For still quieter report also a longer 8-baffle **T8AR Scout** Reflex Suppressor is available for the M16.*

Update 11.12.2001

AR-15/ M16 Reflex Suppressor Manual

Telescopic Reflex Suppressor is a sound suppressor, designed especially for use with full-power service 5.56 x 45 mm/ .223 caliber cartridges. Suppressor **T4AR Ranger** extends total length of Colt AR-15 A2 Sporter or M16 abt. 30 mm (1.2") when compared with normal flash hider. The **T8AR Scout** for extra quiet operation extends the rifle by abt. 59 mm (2.3"). Mounting on flash hider thread is possible to normal and heavy-barreled AR Sporter/ M16 variations, with exception of short-barreled carbine and 9 mm models, for which the **R12CAR** forward mounting Reflex Suppressor is suitable. Reflex Suppressors standard overlay is military grade Parkerizing.

Please, note: No suppressor is able to eliminate ballistic "crack" of supersonic bullet, but noise of report towards the shooter is usually not louder than snap of .22 rimfire rifle, shooting Hi-Velocity .22 LR cartridges. Using custom-loaded 5.56 x 45 mm subsonic rounds (muzzle velocity ca. 300 m/s or 1000 fps) the noise of the shot is not very much more audible than is the

hammer click of a dry-fired rifle.

Mounting: Heat flash hider with propane torch or on an electric cooking plate until thread locking glue is softened. Unscrew flash hider while hot and let the muzzle cool down. Clean remnants of glue away from the 1/2" x 28G muzzle thread and screw mounting sleeve (inside suppressor jacket) on the muzzle thread. Do not use tools or excessive twist force. Overtightening is unnecessary and a way to excessive shift of shot group.

Shooting with suppressor: Reflex Suppressor is a highly efficient Muzzle Brake, due to abrupt reflection or blowback of muzzle blast inside suppressor jacket. Suppressor shall not increase group diameter of shots in target or object. Additional weight on barrel shifts the place of group center, but that displacement is easily corrected by sight adjustment. Extent of displacement is usually less than one MIL or four Minutes Of Angle (<10 centimeters at 100 meters). More extensive off-aiming or sight adjustment may be needed, when using subsonic rounds. Trajectory of subsonic bullet is very curved. Low power subsonic loads are usually unable to produce automatic ejection and feed.

Maintenance: Reflex Suppressor is a practically maintenance-free device. Normal fouling of powder and primers cannot take effect on its functioning. Loose solid impurities, like powder kernels and carbon chips, are easy to remove by shaking the suppressor, while keeping it vertically, front end downwards. Compressed air may be used for cleaning, but liquid or solvent washing is unnecessary and unadvisable. Regular gun oil can be used for storing. Remove suppressor, or leave the action of the rifle open after shooting session. This helps water condensed from powder gases to evaporate away.

Colt AR-15 & M16 Reflex Suppressors on Internet: http://guns.connect.fi/rs/ar15supp.html

Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring License Manufacturing
Lyddemper.net Suppressors in the UK

Reflex Suppressors for Steyr AUG

210398

Manual: Steyr AUG Reflex Suppressors T4AUG Ranger and T8AUG Scout

Telescopic Reflex Suppressor **T4AUG Ranger** is a sound suppressor designed especially for use with full-power service 5.56 x 45 mm/ .223 caliber rifle cartridges. Suppressor T4AUG extends total length of the barrel just 59 mm forward from the flash hider, and it is mounted readily to its inside thread. For still more quieting, a longer model Reflex Suppressor **T8AUG Scout** is also available for the AUG. T8 Scout extends the rifle by 89 mm. Standard coating of Reflex Suppressors is military grade Parkerizing. T4AUG or T8AUG is not applicable for the 9 mm smg variation of the AUG, which requires its own Reflex Suppressor model.

Please, note: No suppressor is able to eliminate ballistic "crack" of supersonic bullet, but noise of report towards the shooter is usually not louder than snap of .22 rimfire rifle, shooting Hi-Velocity .22 LR cartridges. Using custom-loaded 5.56 x 45 mm subsonic rounds (muzzle velocity ca. 300 m/s) the noise of the shot is not very much more audible than is the hammer click of a dry-fired rifle.

Mounting: Do not remove the flash hider of the AUG. Clean powder fouling (carbon) away from the thread inside the flash hider. Push the Reflex Suppressor onto barrel, until the male mounting thread (inside suppressor jacket) meets the female M13 x 1 thread of the flash hider. Screw the suppressor on the barrel without tools or excessive twist force. The internal design of AUG Reflex Suppressors is similar to the Sako M95 and Swedish AK5 Reflex Suppressors.

Shooting with suppressor: Reflex Suppressor is a highly efficient muzzle brake (Mündungbremse), due to abrupt reflection or blowback of muzzle blast inside the suppressor jacket. Suppressor does not increase group diameter of shots in target or object. Additional weight on barrel shifts place of group center, but that displacement is easily corrected by adjusting the sight. Extent of displacement is usually less than one MIL or four Minutes Of Angle (<10 centimeters at 100 meters). More extensive off-aiming or sight adjustment may be needed, when using subsonic cartridges. Trajectory of subsonic bullet is also very curved. Low power of subsonic load is usually unable to produce automatic ejection of spent case and feed of fresh cartridge. Mechanical noise of action may give trouble in some sniping operations. If automatic ejection and feed are not essential, it is advisable to shut gas port (gas block), located in the front sight base, and feed each cartridge manually.

Maintenance: Reflex Suppressor is a practically maintenance-free device. Normal fouling of powder and primers cannot take effect on its functioning. Loose solid impurities, like powder kernels and carbon chips, are easy to remove by shaking the suppressor, while keeping it vertically, front end downwards. Compressed air may be used for cleaning, but wash with liquids or solvents is unadvisable. Regular gun oil can be used for storage. Remove the suppressor, or leave the action of the rifle open after shooting session. This helps water condensed from powder gas to evaporate away.

AUG Reflex Suppressor

Steyr AUG Reflex Suppressors on Internet: http://guns.connect.fi/rs/AUG.html

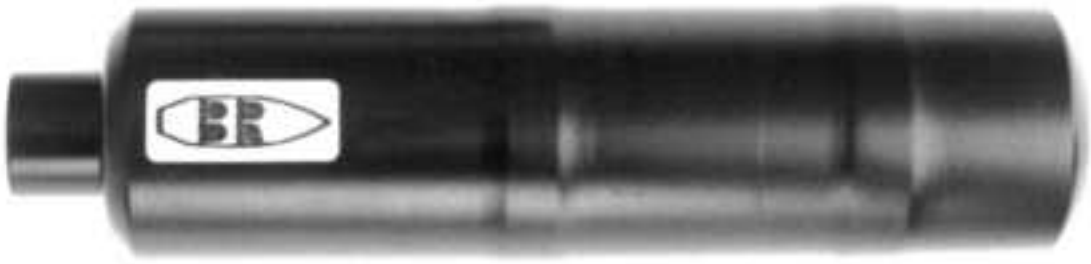
Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring

Reflex Suppressor for Heckler & Koch G3

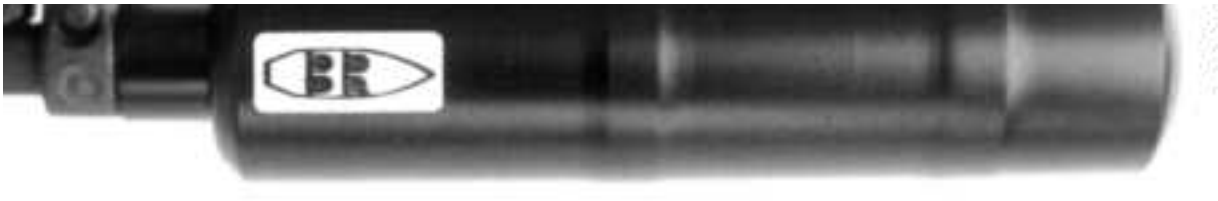
270399

Owner's Manual: G3 Reflex Suppressor

Telescopic Reflex Suppressor is a Sound Suppressor, designed especially for use with full-power service 7.62 x 51 mm/ .308 Win. caliber rifle cartridges. Suppressor **T8G3 Scout** extends total length of G3 by about 73 mm (3"), compared to normal flash hider. M15x1 muzzle thread for flash hider is also the mounting thread of the suppressor. Standard finish of T8G3 Scout is military grade Parkerizing. Also shorter and longer G3 Reflex Suppressor models are available by user's specifications.



Please, note: No suppressor is able to eliminate ballistic "crack" of supersonic bullet, but noise of report towards the shooter is usually not louder than snap of .22 rimfire rifle, shooting Hi-Velocity .22 LR cartridges. Using custom-loaded 7.62 x 51 mm subsonic rounds (muzzle velocity ca. 300 m/ s or 1000 fps) the noise of the shot is not very much louder than plain hammer click. However, G3 has too slow **twist of rifling** for heavy bullet subsonic ammo. Subsonic loadings require a



254 mm or 10" twist of rifling to stabilize heavier bullets than 9.7 g or 150 gr in .30 caliber class. Lighter bullets will be stabilized also in 305 mm or 12" twist of G3. Do not shoot with unstable ammo, because they may graze or even damage the baffles of a suppressor!

Photo: G3 suppressor shown as disconnected and mounted. The M15x1 flash hider muzzle thread supports the suppressor from its middle and the grenade launcher quide ring from back. Internally, the G3 Reflex Suppressor resembles the Valmet M62 Reflex Suppressors - see a cut-away drawing of them!

Mounting: Unscrew the flash hider. Heat it if necessary on electric cooking plate or with gas flame to release the bond of thread locking glue. Clean the muzzle thread and screw the suppressor to the muzzle. Do not use tools or excessive twist force. Overtightening is unnecessary, and it is a way to get excessive shift of shot group.

Shooting with suppressor: Reflex Suppressor is a highly efficient Muzzle Brake, due to abrupt reflection or blowback of muzzle blast inside suppressor jacket. Suppressor shall not increase group diameter of shots in target or object. Additional weight on the barrel shifts the place of the group center, but that displacement is easily corrected by aiming off. Extent of displacement is usually less than one MIL or four Minutes Of Angle (<10 centimeters at 100 meters). More extensive off-aiming or sight adjustment may be needed, when using subsonic cartridges. Trajectory of subsonic bullet is also very curved. Low power subsonic loads are usually unable to produce automatic ejection and feed.

Maintenance: Reflex Suppressor is practically maintenance-free device. Normal fouling of powder and primers cannot take effect on its functioning. Loose solid impurities, like powder kernels and carbon chips, are easy to remove by shaking the suppressor, while keeping it vertically. Compressed air may be used for cleaning, but washing with liquids or solvents is unadvisable. Remove the suppressor, or leave the action of the rifle open after shooting session. This helps water condensed from powder gases to evaporate away. Regular gun oil can be applied for storage.

G3 Reflex Suppressor

Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring

Reflex Suppressor for British FN FAL L1A1

Owners' manual: Reflex Suppressor for FAL L1A1

Telescopic Reflex Suppressor is a Sound Suppressor, designed especially for use with full-power service 7.62 x 51 mm/ .308 Win. caliber rifle cartridges. Suppressor **T8L1 Scout** does not extend total length of FN FAL L1A1 at all, compared to normal flash hider. The short model **T4L1 Ranger** (illustrated) is 30 mm shorter than the flash hider. Muzzle thread for flash hider is also the mounting thread of the suppressor. Standard finish of T8L1 Scout is Parkerizing.

Please, note: No suppressor is able to eliminate ballistic "crack" of supersonic bullet, but noise of report towards the shooter is usually not louder than snap of .22 rimfire rifle, shooting Hi-Velocity .22 LR cartridges. Using custom-loaded 7.62 x 51 mm subsonic rounds (muzzle velocity ca. 300 m/s or 1000 fps) the noise of the shot is not very much louder than plain hammer click.
However, these loadings require a 254 mm or 10" twist of rifling to stabilize heavier bullets than 9.7 g or 150 gr in .30 caliber class. Lighter bullets will be stabilized also in 305 mm or 12" twist of FN FAL. Do not shoot with unstable ammo, because they may graze or even damage the baffles of a suppressor!

Mounting: Push the flash hider securing pin out with a suitable punch. Remove the lock washer held by the securing pin. Unscrew the flash hider. Easiest way to have the flash hider detached is fastening it between the jaws of a lathe chuck and twisting from the bayonet lug. Clean muzzle thread and screw mounting sleeve (inside suppressor jacket) on the muzzle. Do not use tools or excessive twist force. Overtightening is unnecessary, and it is a way to get excessive shift of shot group.

Shooting with suppressor: Reflex Suppressor is a highly efficient Muzzle Brake, due to abrupt reflection or blowback of muzzle blast inside suppressor jacket. Suppressor shall not increase group diameter of shots in target or object. Additional weight on the barrel shifts the place of the group center, but that displacement is easily corrected by aiming off. Extent of displacement is usually less than one MIL or four Minutes Of Angle (<10 centimeters at 100 meters). More extensive off-aiming or sight adjustment may be needed, when using subsonic cartridges. Trajectory of subsonic bullet is also very curved. Low power of subsonic load is usually unable to produce automatic ejection and feed. Gas cut-off is advisable to keep closed (index line downwards), and to shoot with manual loading. If mechanical noise of action is to be avoided, it is advisable to keep gas cut-off closed even when shooting full-power cartridges.

To avoid gas bleed noise from the gas regulator, keep regulator in position "0". If it is not possible due to power of the cartridge used, close the gas cut-off (gas block), and shoot with manual cartridge feed. Better safe than sorry!

Maintenance: Reflex Suppressor is practically maintenance-free device. Normal fouling of powder and primers cannot take effect on its functioning. Loose solid impurities, like powder kernels and carbon chips, are easy to remove by shaking the suppressor, while keeping it vertically. Compressed air may be used for cleaning, but washing with liquids or solvents is unadvisable. Remove the suppressor, or leave the action of the rifle open after shooting session. This helps water condensed from powder gases to evaporate away. Regular gun oil can be used for storage.

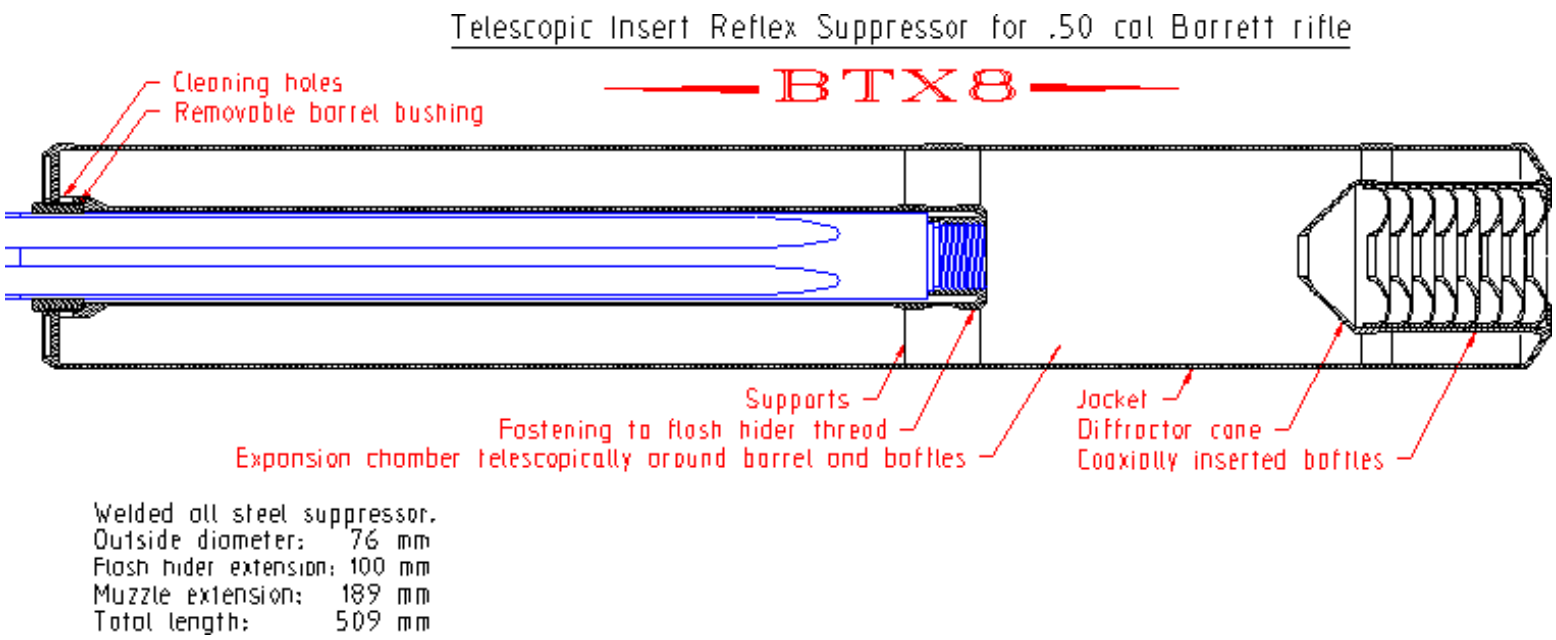
230399

FAL L1A1 Reflex Suppressor

FAL L1A1 Reflex Suppressors in Internet: http://guns.connect.fi/rs/L1supp.html

Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring

Reflex Suppressor for Barrett M82A1

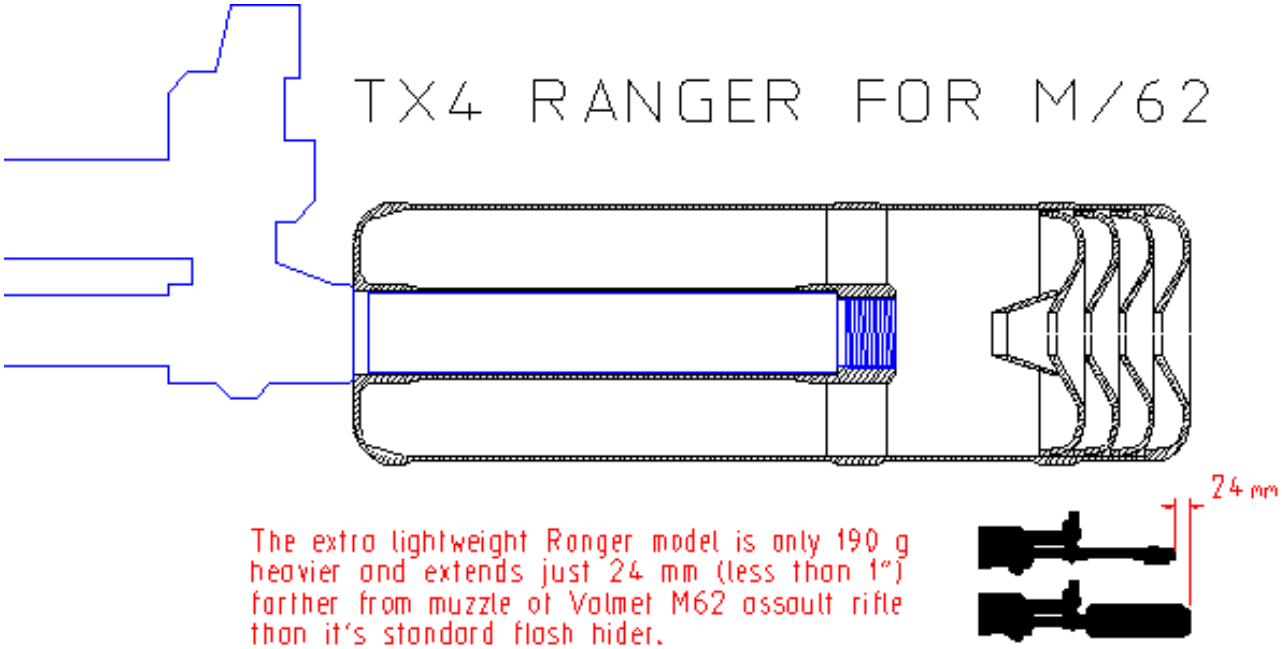


Welded all steel suppressor.
Outside diameter: 76 mm
Flash hider extension: 100 mm
Muzzle extension: 189 mm
Total length: 509 mm

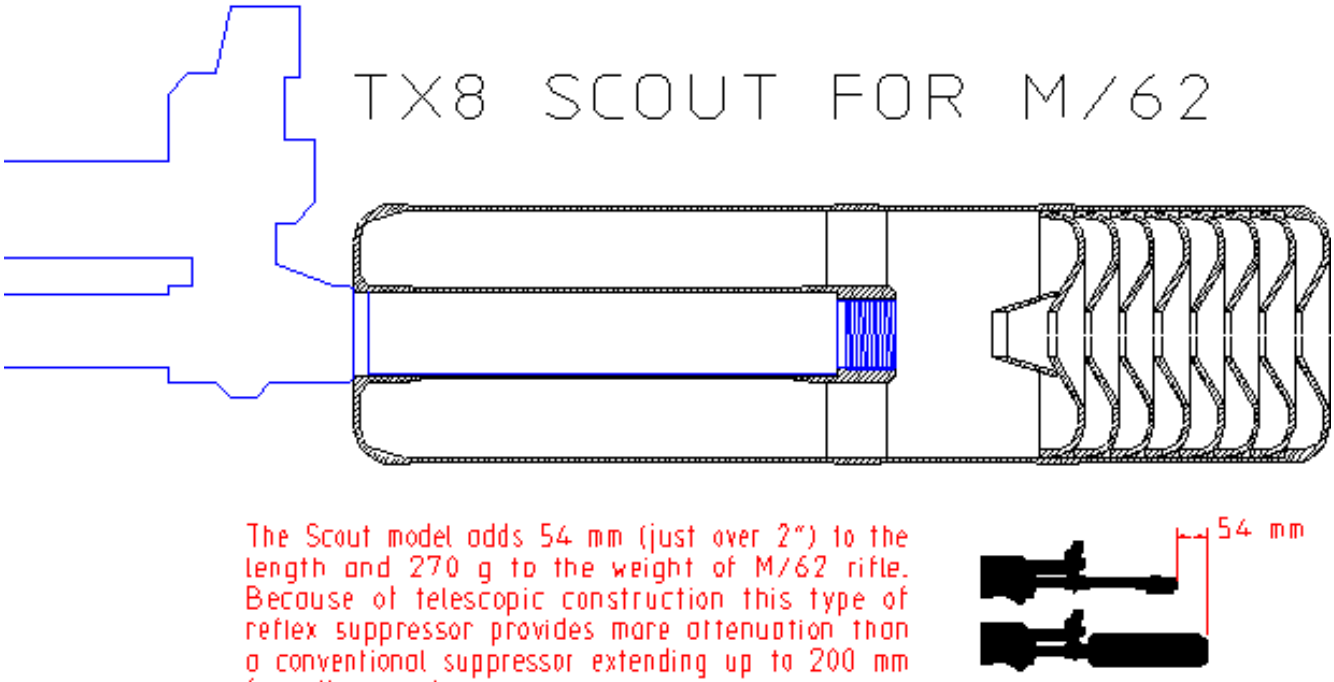
50 BMG Reflex Suppressor

Reflex Suppressors™

Ranger and Scout Model Reflex Suppressors for Finnish Assault Rifle M62



The extra lightweight Ranger model is only 190 g heavier and extends just 24 mm (less than 1") farther from muzzle of Valmet M62 assault rifle than it's standard flash hider.



The Scout model adds 54 mm (just over 2") to the length and 270 g to the weight of M/62 rifle. Because of telescopic construction this type of reflex suppressor provides more attenuation than a conventional suppressor extending up to 200 mm from the muzzle.

Because BR Reflex Suppressors are made as solid units from welded low carbon steel, they are full auto proof with standard assault rifle ammo.

240196 Original

Update 01.09.00

Manual: Reflex Suppressors for Valmet M62

Telescopic Reflex Suppressors **TX4 Ranger**, **TX6 Trooper** and **TX8 Scout** are sound suppressors designed especially for use with full-power service 7.62 x 39 mm (Soviet M43) caliber cartridges. Mounting is done readily on flash hider thread. "Ranger Model" TX4 is the shortest and lightest assault rifle suppressor capable of heavy full-auto fire with full power military ammo, while still dropping shooter's noise exposure from unsuppressed 160 dB(A) Peak down to USA and European maximum peak noise level of 140 dB(A) or less. TX4 extends total length of Valmet M62 by just 24 mm (less than 1"), when compared with normal flash hider, and it is only 200 g heavier. The "Scout Model" TX8 is still several decibels quieter, while extending the rifle by 50 mm or 2" as compared to flash hider. "Trooper Model" TX6 is an intermediate type, adding some attenuation, while being only slightly longer and heavier than TX4. Reflex Suppressors have parkerizing as standard finish.

Please, note: No suppressor is able to eliminate ballistic "crack" of supersonic bullet, but noise of report towards the shooter is usually not louder than snap of .22 rimfire rifle, shooting Hi-Velocity .22 LR cartridges. Using custom-loaded 7.62 x 39 mm subsonic rounds (muzzle velocity ca. 300 m/s or 1000 fps) the noise of the shot is not very much more audible than is the hammer click of a dry-fired rifle. For handloader, subsonic loads with 1.05 g of H322 powder and 10.9...13 g bullets are usually sufficient to cycle the action of M62.

Mounting to Valmet M62: Push the flash hider securing pin out with a suitable punch to the right, as seen from behind the rifle. Heat flash hider with propane torch or electric cooking plate until thread locking glue is softened. Unscrew flash hider while hot and let the muzzle cool down. Clean remnants of glue away from muzzle thread and screw the suppressor on the muzzle thread. Do not use tools or excessive twist force. Overtightening is unnecessary and a way to excessive shift of shot group. Caution! While shooting with any type of suppressor, M62 tends to blow powder remnants and smoke towards shooter's face and eyes through narrow slot on the upper side of the action cover latch on the back of the cover. This slot should be sealed with tape, fabric or some other substance before firing, to avoid possible eye injuries!

Shooting with suppressor: Reflex Suppressor is a highly efficient muzzle brake, due to abrupt reflection or blowback of muzzle blast inside suppressor jacket. Suppressor does not increase group diameter of shots in target or object. Additional weight on barrel shifts the place of group center on M62 and other Kalashnikov family weapons typically at 100 m by 10...18 cm to the right and up, but that displacement is easily corrected by adjusting sights. More extensive off-aiming or sight adjustment may be needed, when using subsonic rounds. Trajectory of subsonic bullet is also very curved. Low power of subsonic load with light bullet is usually unable to produce automatic ejection and feed.

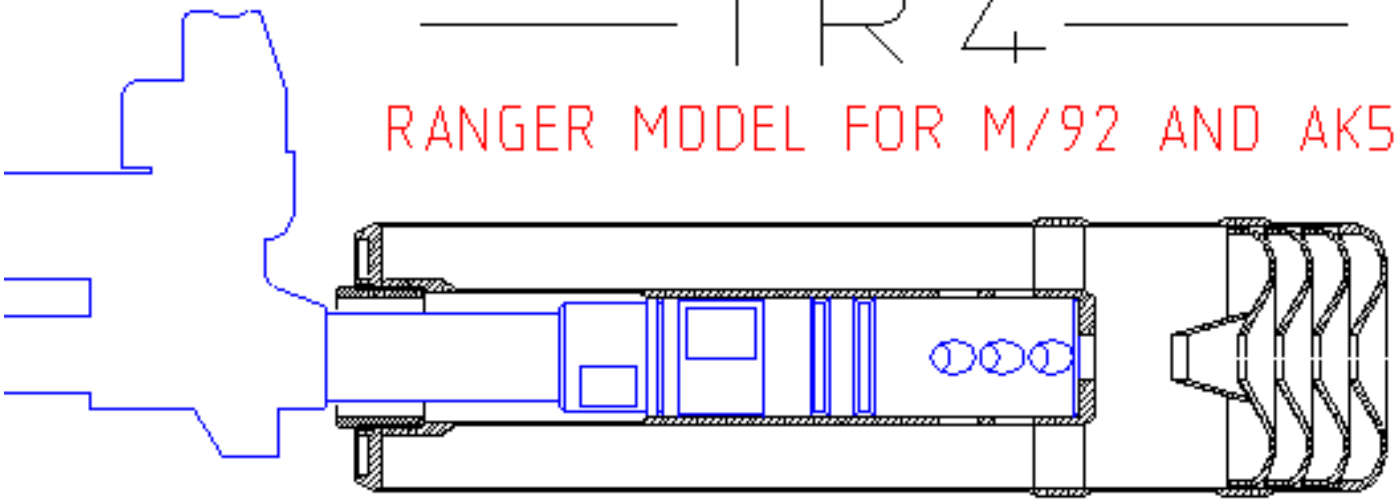
Maintenance: Reflex Suppressor is a practically maintenance-free device. Normal fouling of powder and primers cannot take effect on its functioning. Loose solid impurities, like powder kernels and carbon chips, are easy to remove by shaking the suppressor, while keeping it vertically, rear-end downwards. Compressed air may be used for cleaning, but liquid or solvent washing is unnecessary and unadvisable. Remove suppressor, or leave the action of the rifle open after shooting session. This helps water condensed from powder gas to evaporate away. Apply gun oil for storage.

Valmet M62 Reflex Suppressors on Internet: http://guns.connect.fi/rs/m62graaf.html

Ranger and Scout Model Reflex Suppressors for Finnish Assault Rifle Sako M95, M92 and Swedish AK-5 (FNC)

TR4

RANGER MODEL FOR M/92 AND AK5

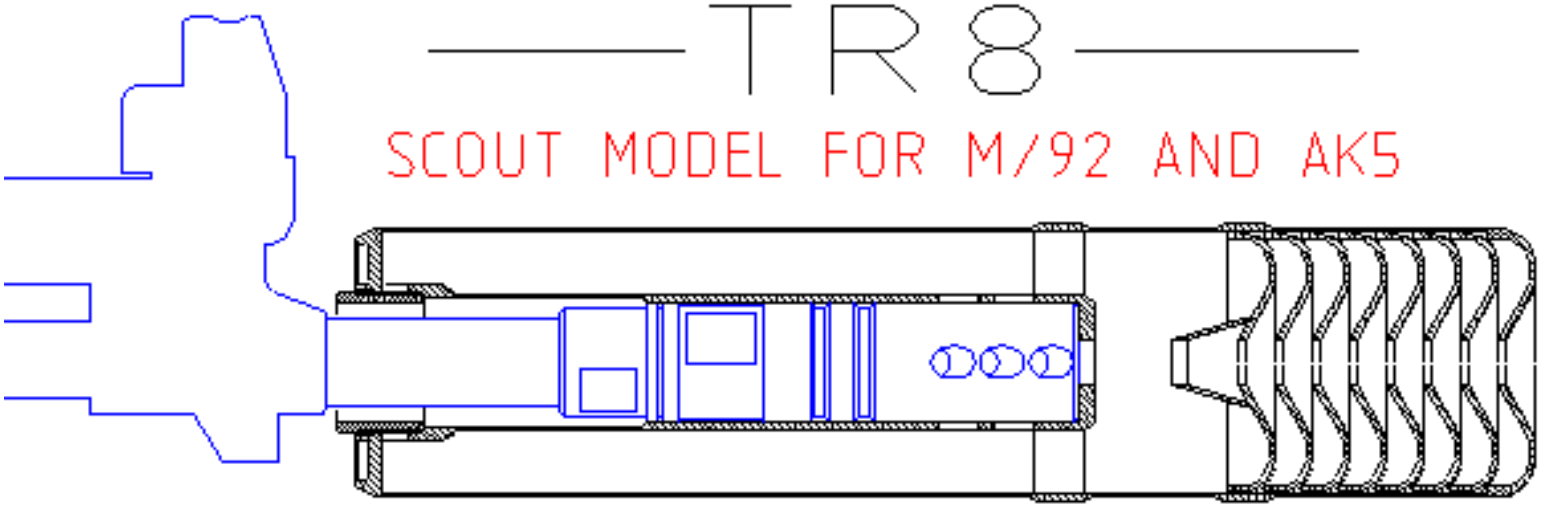


Reflex Suppressor TR4 for Finnish M92 and Swedish AK5 assault rifles

- Mounts readily on flash hider
- Welded steel construction
- Capable of full auto firing with full power ammo
- Flash hider extension 59 mm
- Typical weight 420 g

TR8

SCOUT MODEL FOR M/92 AND AK5



301095

Reflex Suppressor TR8 for Finnish M92 and Swedish AK5 assault rifles

- Mounts readily on flash hider
- Welded steel construction
- Capable of full auto firing with full power ammo
- Flash hider extension 89 mm
- Typical weight 490 g

Reflex Suppressors for M95, M92 and AK-5

Sako M95 Reflex Suppressors on Internet: http://guns.connect.fi/rs/m95graaf.html

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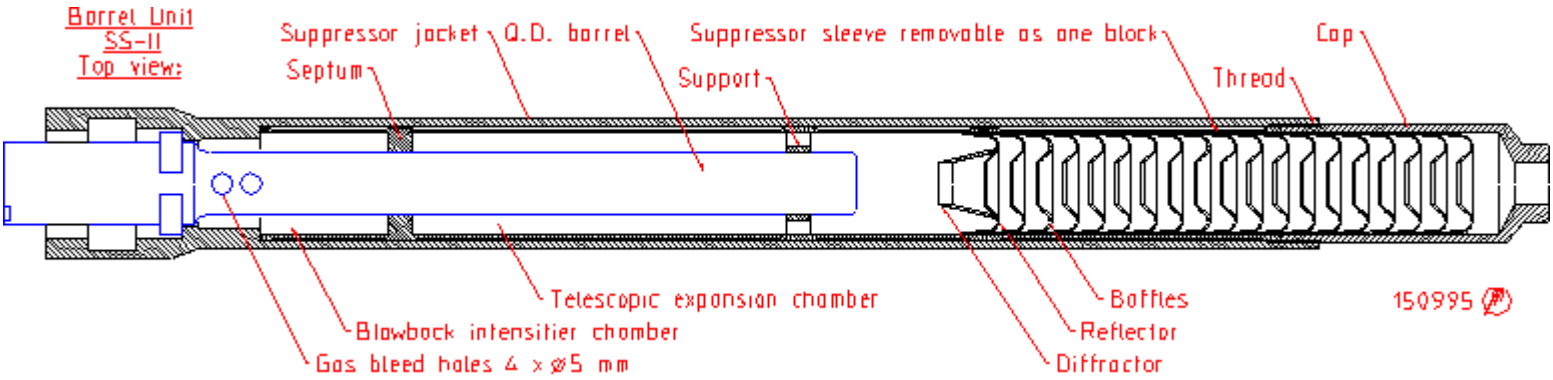
Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring

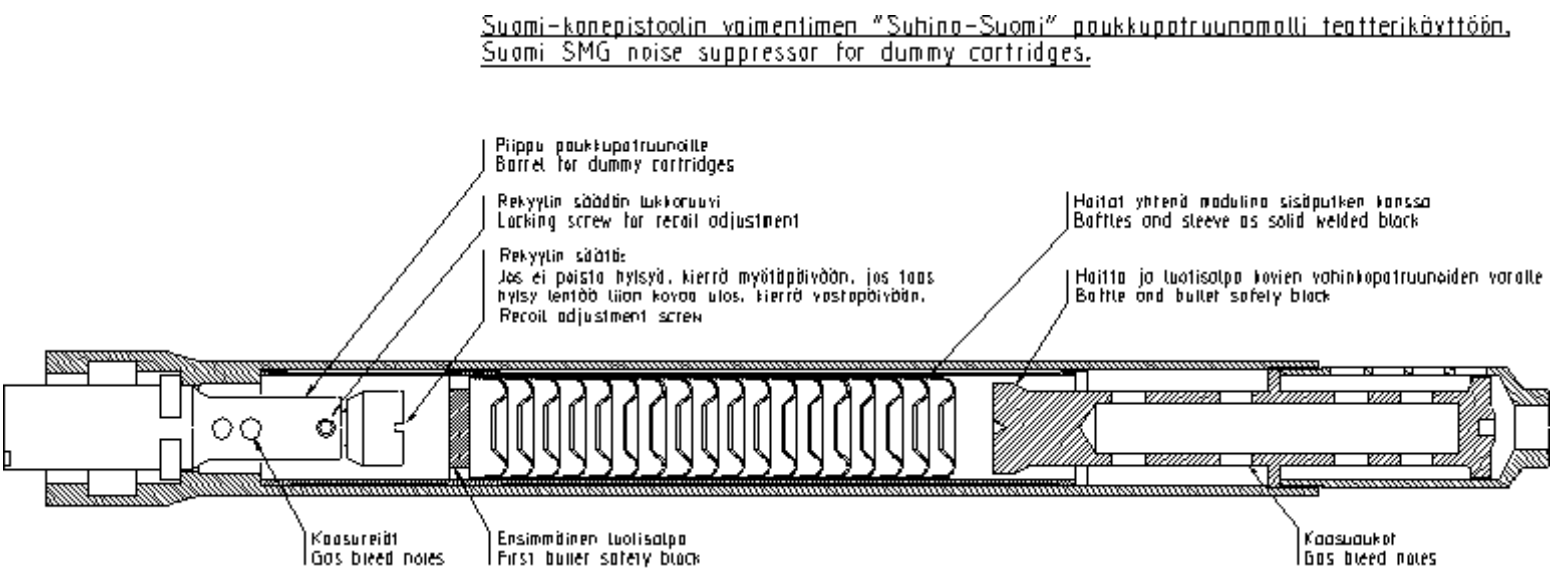
Integral Reflex Suppressor Unit SS-II for Suomi SMG



"Sighing Suomi", SS-II

Index Main General Rifles 50 BMG SMG MG AR Contact Links Measuring

Dummy Cartridge Integral Reflex Suppressor for Theatrical Productions



"Sighing Suomi" for Suomi SMG