There are two different ways to align a laser: pin-point alignment, which is also known as convergent alignment, and parallel alignment. Doctrine varies from branch to branch and from country to country. There is no right or wrong, each serves its purpose.

Convergent alignment is often used for smaller target markers when the operator expects to shoot on short distances. One typical example would be a pistol where a regular combat distance is rarely more than 25m. Another example would be when using a laser pointer or a laser pointer for marking a target while moving. In short, at distances above 100m one would typically use a device with simple alignment features for short distances. Laser pointers are not visible at these distances. The same applies to night vision goggles, which are not usable at distances above 100m. Another advantage is that lasers can be pre-aligned in the field with only the help of iron sights or optical sights.

Parallel alignment needs to be conducted in the armory with the help of an alignment laser or alignment chart. The advantage is that the distance between the bore axis and the target marker is always the same. When the operator knows the exact bullet drop and the distance to the target, he can aim with the laser accordingly.

Click & Block Adjustment

No matter what alignment philosophy the operator decides to follow, there are still alignment aspects to be considered. It is a sign of quality and user friendliness for any marker laser that it features both click and block adjustments.

Click adjustment means that the lasers are factory-wise co-aligned. This should include all the target markers, IR illuminators and LRFs, featured in the device of choice. Besides saving time when adjusting only one laser instead of up to five, this is also a matter of reduction of possible alignment mistakes.

Click adjustment means that the adjustment of the lasers in azimuth and elevation is executed in increments. Each time the operator moves the screw one step, there is a “click” which the user can feel and also hear. In the ideal case the increment is 0.1 mil as this is the standard known from sniper scopes. An increment of 0.1 mil means that one click moves the aiming dot exactly 1 cm in 100 m distance.
There are five main scenarios for Laser Light Modules:

- Close Quarter Battle (CQB)
- Target marking for Close Air Support (CAS)
- Low light or no light scenarios
- Crowd and Riot control (CRC)
- Target acquisition for checkpoints

At Rheinmetall we supply our customers with the equipment they need to succeed. For many years Rheinmetall has supplied law enforcement and military customers world-wide with laser and laser light modules. The products are based on technical know-how and innovative spirit in combination with customer feedback which includes user experience from theatres all over the world. This has made us what we are today: a supplier of innovative military devices. In the infrared spectrum the company produces a regular 808nm target marker as well as a 940nm target marker. With the LLM Vario-Ray Rheinmetall offers the world’s first mil spec serial product with an integrated 940nm target marker.

### Typical Scenarios for Laser Light Modules

There are five main scenarios for Laser Light Modules:

- Close Quarter Battle (CQB)
- Target marking for Close Air Support (CAS)
- Low light or no light scenarios
- Crowd and Riot control (CRC)
- Target acquisition for checkpoints

#### CQB Scenarios

CQB scenarios are characterized by reducing or shutting down visibility by proper aiming devices. This includes aiming and fighting from cover to cover. A powerful laser or laser light module can help the operator to detect the operator in the distance that makes the difference.

There are two ways to use LLM in CQB scenarios. In visual mode the operator uses white light to illuminate the scene and also to dazzle adversaries with a blinding light. In infrared mode the operator uses a single individual inciting a crowd or a single offender acting out of an otherwise peaceful crowd, a visual target is used to direct people and to deter offenders. When precision counts, operators rely on LLM with integrated laser range finders (LRF). These modules are used by snipers, who are equipped with long range high power iR laser designators. (unguided bombs and other weaponry) to a target. This is in addition to target designation scenarios, in which forward air controllers (FAC) use ground-based piloted drones in their targets by using modulated high power iR laser designators.

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#### White Light Illumination

#### Infrared Illumination

Rheinmetall offers a wide range of laser and laser light modules. Depending on the mission and the situation either a single target marker or a weapon mounted iR light to all integrated devices dealing with visual light and IR illumination. Visible target markers (visible, iR, short Wave infrared (sWiR)) as well as a 940nm target marker. With the LLM Vario-Ray Rheinmetall offers the world’s first mil spec serial product with an integrated 940nm target marker.

### Product Portfolio

- Ruger Mark IV: a powerful laser range finder (LRF). These modules are used by snipers, who are equipped with long range high power iR laser designators.
- Target marking for Close Air Support (CAS)
- Low light or no light scenarios
- Crowd and Riot control (CRC)
- Target acquisition for checkpoints

#### Laser Range Finders

Laser range finders allow operators to measure distances with no time for a proper aiming process. This includes user experience from theatres all over the world. This has made us what we are today: a supplier of innovative military devices. In the infrared spectrum the company produces a regular 808nm target marker as well as a 940nm target marker. With the LLM Vario-Ray Rheinmetall offers the world’s first mil spec serial product with an integrated 940nm target marker.

#### Laser Safety

Laser devices can be operated in different laser classes (1, 2, 3R, 3, 4) and are detectable with night vision devices. The one integrated is a newer technology and is not currently detectable with in-service equipment. Moreover, this laser class is associated with minimal eye safety.

#### White Light Illumination

This means that the customer can choose between different lamp heads to get a tailor made solution. This way a later upgrade is possible when even more powerful lamp heads or a newer technology is available.

#### Laser Range Finders

#### Laser Safety

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#### Infrared Illumination

Infrared illumination is in the field of IR illumination. Rheinmetall works with two different technologies: 808nm and 940nm. The choice of technology is defined by the purpose for which the corresponding device is designed.

The operational mode of the illumination goes along with that: some devices have a non-scannable IR illumination, some have a mechanically scannable IR illumination and some have an electronically scannable IR illumination.

#### Technical know-how - Target Markers

Visible target markers include red and green target markers. Years after red target markers had their technical breakthrough and were available as mil spec, the technology of green lasers has evolved as well and such target markers are currently not detectable with in-service equipment. Moreover, this laser class is associated with minimal eye safety.
There are two ways to use LLM’s in low light and no light scenarios. In visual mode the operator uses white light to illuminate the scene and also to dazzle adversaries with a strong light. The operator can even use a lower intensity to target mark or a weapon mounted light to all integrated systems, in field of view illumination, with visible or invisible modes.

**Technically Know-How**

Visible target markers include red and green target markers. Yellow target markers are normally used in crowd control (CRK) and riot control (CRC). They are used for crowd control and riot control as well as in checkpoint scenarios. In cQB scenarios, the operator must be able to aim quickly and accurately. This includes user experience from theatres all over the world. This has made it possible to improve the operator’s split second that makes the difference.

**Laser Range Finders**

Laser range finders (LRF) are used by snipers, laser guided bombs, and other weaponry. This is in addition to target designation scenarios, in which forward observers must be able to guide the weapon directly to the target. Laser range finders are used by snipers, laser guided bombs, and other weaponry. This is in addition to target designation scenarios, in which forward observers must be able to guide the weapon directly to the target.

**Laser Safety**

All devices can be operated in different laser classes (CL) and are designed for specific applications. They are available in different modes including outdoor training (CL 1), outdoor training (CL 2), combat (CL 3R) and contact (CL 3B). Laser classes can be adjusted by the operator in the field.

**Technical Specifications**

Visible target markers are primarily used for crowd control and riot control. They are used for crowd control and riot control as well as in checkpoint scenarios. In cQB scenarios, the operator must be able to aim quickly and accurately. This includes user experience from theatres all over the world. This has made it possible to improve the operator’s split second that makes the difference.

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**Laser Safety**

All devices can be operated in different laser classes (CL) and are designed for specific applications. They are available in different modes including outdoor training (CL 1), outdoor training (CL 2), combat (CL 3R) and contact (CL 3B). Laser classes can be adjusted by the operator in the field.
There are five main scenarios to use LLM's:

- **Close Quarter Battle (CQB)**:features powerful laser markers (visible, iR, short Wave infrared (sWiR)) as well as a sWiR target marker. With the LLM Vario-Ray Rheinmetall offers the world's first mil spec serial product with an integrated sWiR target marker.

- **Target marking for Close Air Support (CAS)**: the products are based on technical know-how and innovative spirit in combination with customer feedback which includes user experience from theatres all over the world. This is made to what we call today. A supplier of state of the art LLM and market leader in Europe with the ambition to supply our customers with the equipment they need to stay unmatched.

- **Low light or no light scenarios**:cQB scenarios are characterized by shooting on shortest distances with no time for a proper aiming process. This includes street fighting and fighting from room to room. a powerful laser range finder (LRF). These modules are used by snipers, controllers lead laser guided bombs to their targets by using modulated high power iR laser designators.

- **Target marking for Close Air Support (CAS)**: in the field of iR illumination Rheinmetall works with two different technologies: iR lasers and iR LeD. The choice of technology is defined by the purpose for which the corresponding device is designed. The operational mode of the illumination goes along with that: some devices have a non-induced iR marking or a non-induced iR target marker. With the LLM Vario-Ray Rheinmetall offers the world's first mil spec serial product with an integrated sWiR target marker.

- **Visible target markers include a red and a green target marker. Years after red target markers had their technical breakthrough and were available as mil spec, the technology of green laser has evolved as well and such target markers are currently not detectable with in-service equipment. Moreover NIR laser ablations are regarded as laser safety.

**WHITE LIGHT ILLUMINATION**

Many of the products follow a modular white light philosophy. This means that the customer can choose between different lamp heads to get a tailor made solution. This way a later upgrade is possible when even more powerful lamp heads or a newer technology is available.

**LASER RANGE FINDERS**

Common laser work at 808nm or 940nm wavelength and are detectable with night vision devices. The ones integrated in the LLM can be operated in different laser classes (Lc) and are currently not detectable with in-service equipment. Moreover NIR laser ablations are regarded as laser safety.

**Laser Safety**

All devices can be operated in different laser classes (Lc) and feature at least one training mode and one combat mode. Some models even feature four different modes including indoor training (Lc 1), outdoor training (Lc 2), combat (Lc 3R) and combat 2 (Lc 3B). Laser classes can be adjusted by the operator in the field.

**INFRARED ILLUMINATION**

In the field of iR illumination Rheinmetall works with two different technologies: iR lasers and iR LeD. The choice of technology is defined by the purpose for which the corresponding device is designed. The operational mode of the illumination goes along with that: some devices have a non-induced iR marking or a non-induced iR target marker. With the LLM Vario-Ray Rheinmetall offers the world's first mil spec serial product with an integrated sWiR target marker.

**TECHNICAL KNOW-HOW**

Visible target markers include a red and a green target marker. Years after red target markers had their technical breakthrough and were available as mil spec, the technology of green lasers has evolved as well and such target markers are currently not detectable with in-service equipment. Moreover NIR laser ablations are regarded as laser safety.
There are two different ways to align a laser: pin-point alignment, which is also known as convergent alignment, and parallel alignment. Doctrines vary from branch to branch and from country to country. There is no wrong or right, each serves its purpose.

Convergent alignment is often used for close range target marker when the operator expects to shoot on short distances. One typical example would be a pistol where a regular combat distance is being more than 25m. Another example would be a submachine gun or an assault rifle, which is used in CQB scenarios. To shoot at distances above 100m one would typically use a scope with magnification. It would be more efficient to align the laser to the target marker at larger distances (100m – 200m). Another advantage is that lasers can be parallax aligned in the field, with only the help of iron sights or optical sights.

Parallel adjustment needs to be conducted in the armory with the help of an adjustment laser or an alignment chart. The advantage is that the distance between the bore axis and the target marker is always the same. When the operator knows the exact bullet drop and the distance to the target he can aim with the laser accordingly.

**Click & Block Adjustment**

No matter which alignment philosophy the operator decides to follow, there are clear advantages and disadvantages. It is a sign of quality and user friendliness for every operator that he can check and validate his alignment electronically.

Click adjustment means that the alignment of the lasers is factory zero-aligned. This should include all the target markers, IR illuminators and LRFs featured in the device. Besides from saving time when aligning only one laser instead of up to five, this is also a feature of all alignment reliability.

Click adjustment means that the adjustment of the lasers in azimuth and elevation is executed in increments. Each time the operator moves the screw one step, there is a “click” which the user can feel and also hear. In the ideal case the increment is 0.1 mil as this is the standard known from sniper scopes. Increments of 0.1 mil have the effect that one click moves the aiming dot exactly 1cm in 100m distance.
**BORE SIGHTING: PARALLEL VS CONVERGENT ALIGNMENT**

There are two different types of laser aim-point alignment, which is also known as convergent alignment, and parallel alignment. Doctrine varies from branch to branch and from country to country. There is no right or wrong, each serves its purpose.

Convergent alignment is often used for the visible target marker when the operator expects to shoot on short distances. One typical example would be a pistol where a regular combat distance is in the range of 25m. Another example would be a sub-machine gun where an example of a 500m range. To shoot at distances above 100m one would typically use a scope with magnification. In such a situation, it is often that visible target markers can not be seen; they are either too dim or not bright enough. To solve this problem, the operator can use infrared target markers. For night combat, the operator can use infrared lasers. This will help to aim at larger distances (100m – 200m). Another advantage is that lasers can be pin-point aligned in the field with only the help of iron sights or optical sights.

Parallel alignment has to be conducted in the armory with the help of an alignment laser or an alignment chart. The advantage is that the distance between the bore axis and the target marker is always the same. When the operator knows the exact bullet drop and the distance to the target, he can aim with the laser accordingly.

**CLICK & BLOCK ADJUSTMENT**

No matter what alignment philosophy the operator decides to follow, there are additional advantages to be considered here. It is a sign of quality and user friendliness for any weapon laser that it features both block and click adjustments.

Click adjustment means that the lasers are factory aligned. This should include all the lasers (target markers, IR illuminators and LRF) of the device. And the beauty of this is that it is also a measure of precision of the alignment technology.

Click adjustment means that the adjustment of the lasers in azimuth and elevation is executed in increments. Each time the operator moves the screw one step, he feels the “click” which the user can feel and also hear. In the ideal case, one click moves the aiming dot exactly 1 cm in 100m distance.

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**PIN-POINT (CONVERGENT) ADJUSTMENT**

Convergent alignment is often used for the visible target marker when the operator expects to shoot on short distances. One typical example would be a pistol where a regular combat distance is in the range of 25m. Another example would be a sub-machine gun or an assault rifle in a CQB scenario. To shoot at distances above 100m one would typically use a scope with magnification if available. Reason for that is that visible target markers can most likely not be seen during day operations (depending on the ambient light). At night, this changes as infrared target markers and illuminators can be seen several hundred meters with night vision devices. For night combat weapons are often pin-point aligned at larger distances (100m – 200m). Another advantage is that lasers can be pin-point aligned in the field with only the help of iron sights or optical sights.