

# User Manual – PULSAR D Dual Solenoid HPA Engine

Última actualización hace 10 días • 33 min de lectura

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Low FPS

There is no nozzle cycle – TP NM warning pops up in GCS

Unstable FPS

Sudden drop in replica accuracy – scattering of BBs

Muffled firing sound – significantly different from the regular one

No BB feed

Nozzle does not return to the front position when it is depressed

- FAQ – Frequently Asked Questions

Which Hop-Up bucking should be used with the PULSAR D engine?

Which medium can I use for the power supply of the engine?

What is the air hose thread?

What is the nozzle length installed in the engine?

Do all IGL air hoses fit the engine?

Is the PULSAR D engine closed-bolt or open-bolt?

How much maximum pressure can I set with the PULSAR D engine?

What regulators are compatible with PULSAR D?

Fitting PULSAR D in a G&G Gearbox

- User Manual – TITAN II Bluetooth® EXPERT for V2 GB [HPA]

- Technical Specifications

- Legal Notice

Exclusion of Liability

Disclaimer

Intellectual Property

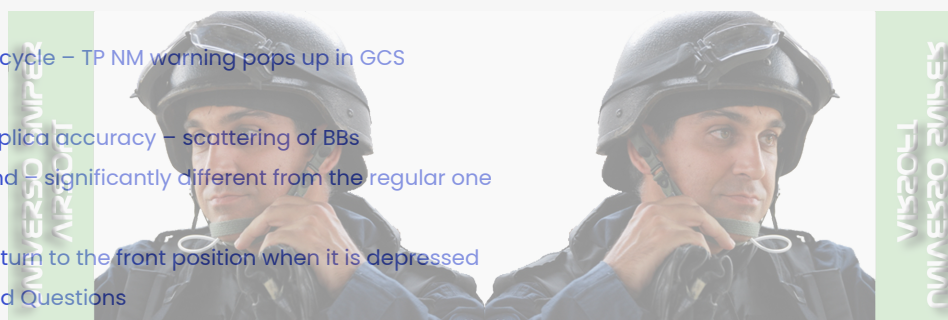
GATE Limited Warranty Policy

Product Disposal Instructions

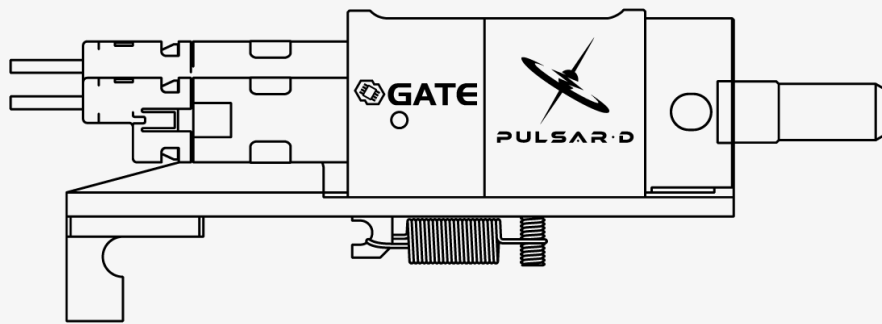
- Product Compliance

Declaration of Conformity

- Stay tuned with GATE







## General Information

Congratulations on your purchase of the new **PULSAR D HPA Engine** – the world's first dual solenoid valve closed-bolt ETU/FCU controlled HPA engine with optical sensors. Powered by the latest TITAN II Bluetooth® combined with HPA technology, you get absurd trigger response never before seen in airsoft. **Achieve insane muzzle velocities ranging from 250 to 650 FPS and ROF from 1 to 40 RPS for CQB, assault rifles and sniper rifles.** The closed-bolt system and innovative BB feed system guarantee you a stable and repeatable bullet trajectory even in AUTO mode – every time. **Engine calibration** has never been easier – PULSAR D with TITAN II Bluetooth® introduce an innovative automatic cycle synchronization system. The most advanced and user-friendly GCS app gives you access to numerous settings and configurations such as binary trigger, trigger sensitivity adjustment, ROF – live via Bluetooth®. You can even use remote shooting mode on your smartwatch. You now have the option to install the smallest and most advanced dual solenoid valve HPA engine in replicas where this was not previously possible due to engine size. Choose from one of the five included nozzles or use the standard AEG nozzle you have. **Take your replica into the future!**

*i* The information contained in this document is subject to change without notice.

*i* Read carefully before use. Keep for future reference.

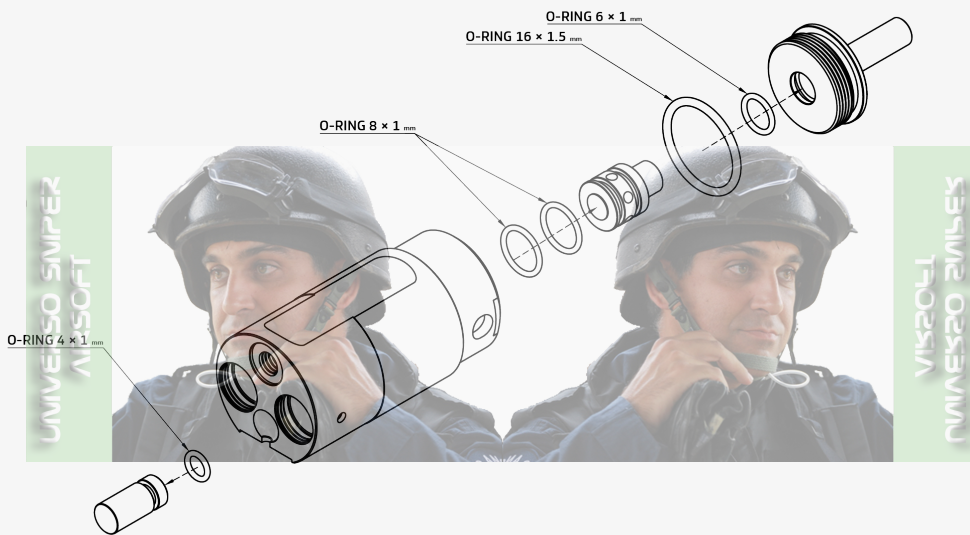
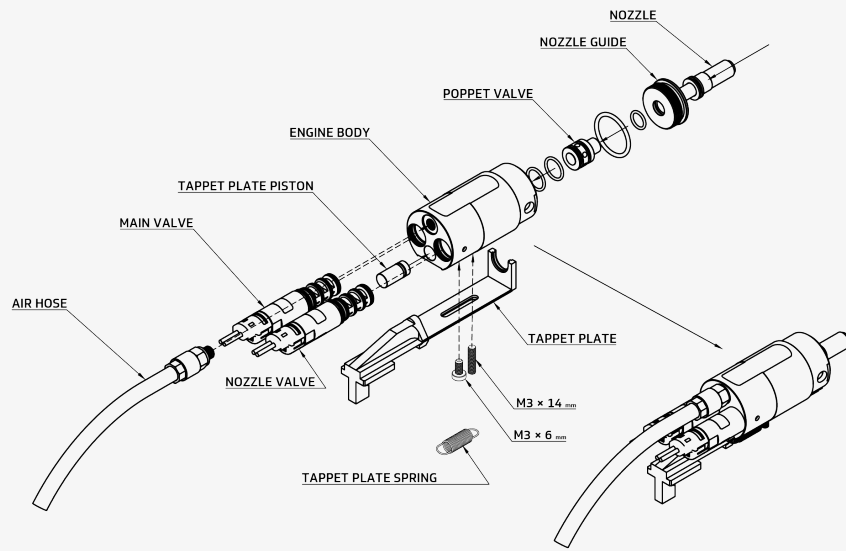
*i* Failing to read this information may void the guarantee!

*i* When using the product, always follow basic safety rules to reduce the risk of injury from fire or electrical shock.



## Device Structure

1. Nozzle
2. Nozzle guide
3. Poppet valve
4. Engine body
5. Tappet plate piston
6. Solenoid valves
7. Air hose
8. Tappet plate
9. M3 x 12
10. M3 x 6
11. Tappet plate spring
12. O-rings:
  - O-ring 6x1 x 1
  - O-ring 16x1.5 x 1
  - O-ring 8x1 x 2
  - O-ring 4x1 x 1



Please read this to ensure safe and correct use. Retain for future reference. The information contained in this document is subject to update without notice. When using a product listed here be sure to obtain the latest specifications.

For your safety, we recommend this product to be installed by a skilled person.

**Warning**

Situations that may cause injury to yourself or others.

**Caution**

Situations that may cause damage to your device or other equipment.

**Note**

Notes, usage tips or additional information.

**Warning**

This device is not a toy and may not be operated by people (including children) with limited physical or mental abilities, as well as by people with no earlier experience in operation of electronic equipment. They may use the device only under the supervision of people responsible for their safety.

**Warning**

Before starting the installation process, make sure that your ASG replica magazine is empty and there are no BBs inside.

**Warning**

When installing the device, every person within the replica's range must wear personal protective equipment.

**Warning**

This equipment is not suitable for use in locations where children are likely to be present.

**Warning**

Persons under 18 years of age ought not stay unattended near the device during the installation or servicing of a device installed in an ASG replica.

**Warning**

Persons under 18 years of age ought not stay unattended near the device installed in an ASG replica ready for use.

**Warning**

Persons under 18 years of age are not allowed to install or commission the device in an ASG replica.

**Warning**

Persons under 18 years of age are not allowed to service this device.

**Warning**

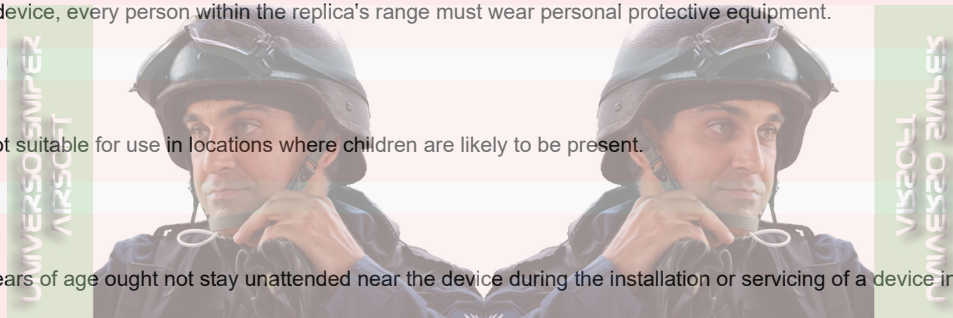
Do not store or carry flammable liquids, gases or explosive materials in the same compartment as the device, its parts or accessories.

**Warning**

Incorrectly connecting positive and negative battery terminals will cause immediate damage to the FCU, which is not covered by warranty, and can lead to fire.

**Warning**

Applying pressure of more than 140 PSI can cause immediate damage to the device, which is not covered by the warranty, and the consequences can be very dangerous.



**Warning**

Take caution to prevent short-circuiting the battery as the consequences may be very dangerous.

**Warning**

Excessive trigger sensitivity may cause unintentional discharge (firing).

**Warning**

When an airsoft replica is not in use, its battery must be disconnected and the hop-up chamber must be empty.

**Warning**

While handling an HPA replica with a connected battery, anyone within the range of the replica must wear personal protective equipment.

**Warning**

When not in SAFE mode, avoid using the device around strong electromagnetic fields, such as PMR transmitters exceeding European standards or when electrostatic discharges, e.g. lightning, occur in the atmosphere, which may cause malfunction of the device and unintentional discharge (firing).

**Warning**

When an airsoft gun is not in use, its magazine must be detached or kept empty with no BBs inside.

**Caution**

PULSAR D cannot be used with a nozzle sleeve since it uses AEG nozzles.

**Caution**

For your own safety you ought to use an additional fuse between the battery and the FCU.

**Caution**

When operating under unusual conditions, perform maintenance outlined below for the climate similar to your area. Operating in extremely cold temperatures is not recommended. Do not expose PULSAR D to direct sunlight for long periods of time. Keep away from dust or sand, which can cause malfunctions and/or excessive wear. Keep this product out of snow, rain, and water. This will prevent electrical failure and fluid buildup inside the gearbox.

**Caution**

Connecting batteries with nominal voltage over 7.4 V (e.g. NiMh 8.4 V, LiPo 11.1 V) can cause permanent damage to the solenoid valve or faster wear of the solenoid valve, which is not covered by warranty.

**Caution**

The use of CO2 may cause permanent damage to the device, which is not covered by the warranty.

## Installation of PULSAR D in the Gearbox

### Introductory Information

**Caution**

Regardless of your previous experience, follow all safety precautions to prevent any damage to your PULSAR D.

**Caution**

PULSAR D installation requires deep technical knowledge. To avoid damage, we recommend it to be installed by a skilled person. If, however, you wish to proceed with PULSAR D installation on your own, you must read this full-length document and watch the installation video beforehand. Incorrect installation may result in poor performance, malfunction, damage, which are not covered by warranty.

**Note**

In case you have any difficulties while installing or using this product:

- contact us via [help.gatee.eu](mailto:help.gatee.eu)
- send us an e-mail: [support@gatee.eu](mailto:support@gatee.eu)
- join [GATE Airsoft Community Discord Server](#)

## Fitting the PULSAR D Engine in the Gearbox





1. Get ready the replica where you will be installing your PULSAR D engine.



2. Remove the gearbox shell from the replica.



3. Remove all components from the gearbox.

4. Thoroughly clean and degrease the gearbox shell as well as the middle gear – you are going to use it in a moment.

5. Prepare the parts that you are going to use again when assembling the engine:

- a. gearbox shell
- b. trigger together with the spring
- c. selector plate
- d. middle gear.

6. Get familiar with the contents of the PULSAR D engine packaging and the contents of the manual.



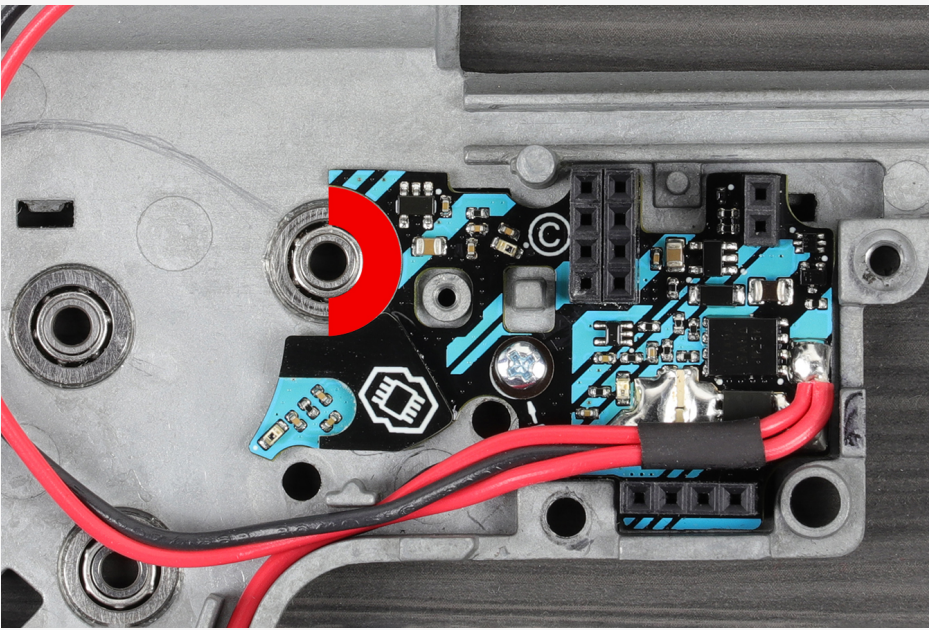
7. Prepare the items for installation:

- a. PULSAR D HPA engine
- b. Air hose
- c. TITAN II Bluetooth® V2 gearbox drop-in FCU mosfet HPA
- d. Accessory I/O cable for connecting the second solenoid
- e. Installation kit

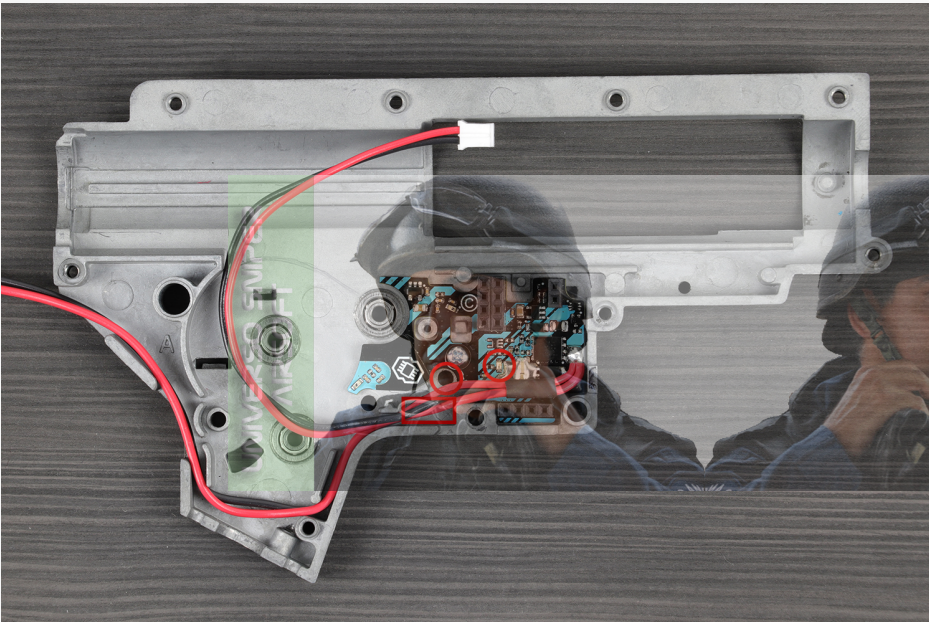




8. Install the bottom PCB of TITAN II Bluetooth®. The distance around the bearing should be symmetrical.



9. Place the wires as shown in the picture. Make sure that the wires do not obstruct the pin hole, the trigger sensor, and will not interfere with the trigger.

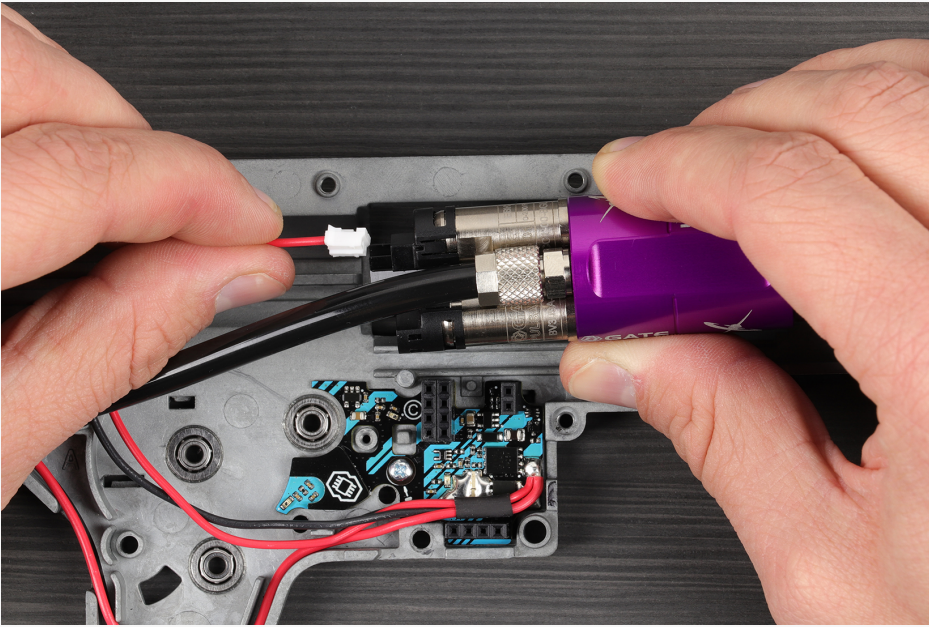


10. Screw the air hose connector into the engine body above the valve. You can use a wrench or combination pliers to tighten it a little more. Place the pliers in the area marked green.

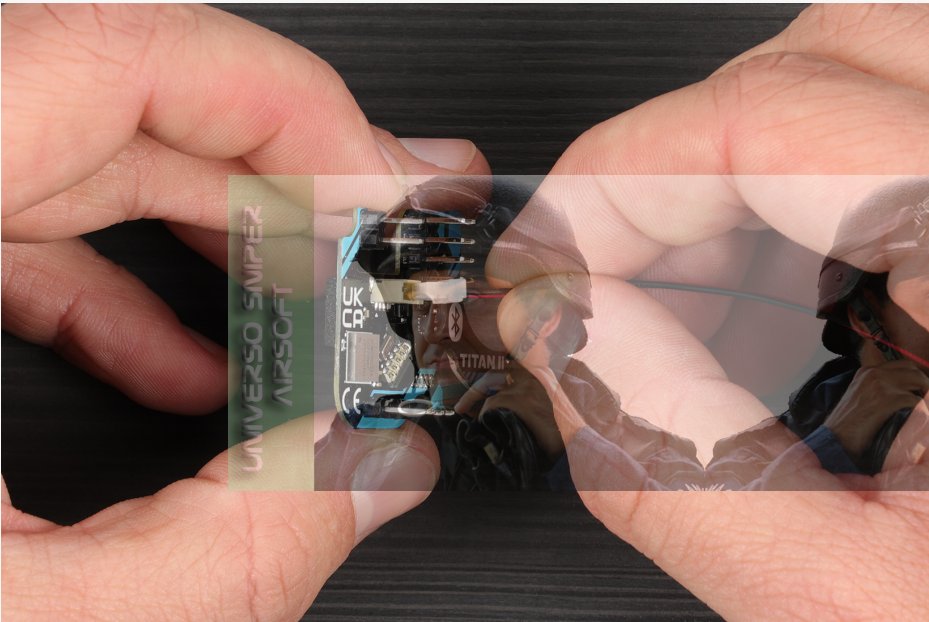




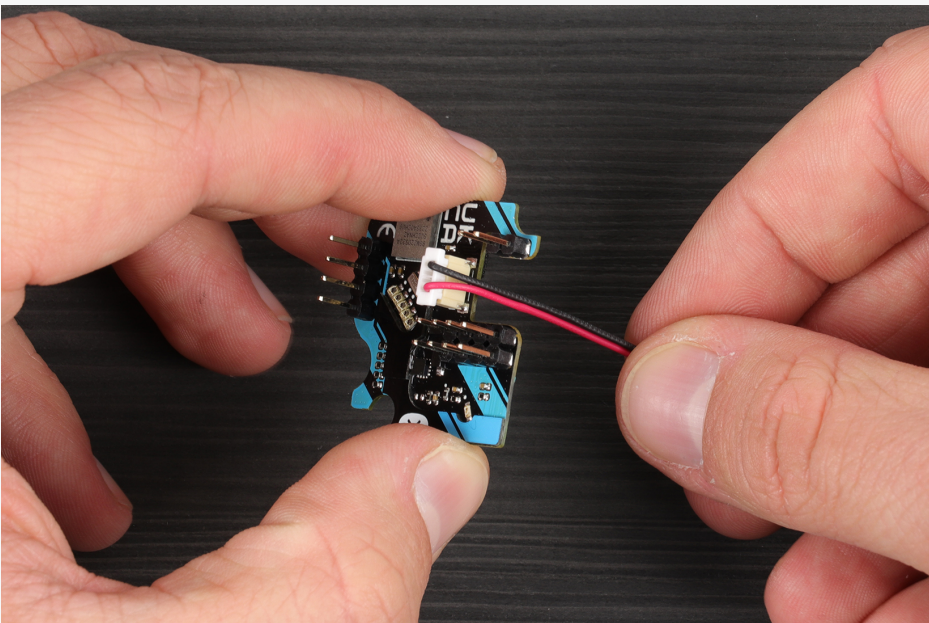
11. Connect the power supply cable from the lower TITAN II Bluetooth® board to the lower solenoid valve.



12. Connect the I/O accessory cable one end (multi-pin plug) to the top PCB of the TITAN II Bluetooth® – pay attention to the proper alignment of the plug with respect to the socket.

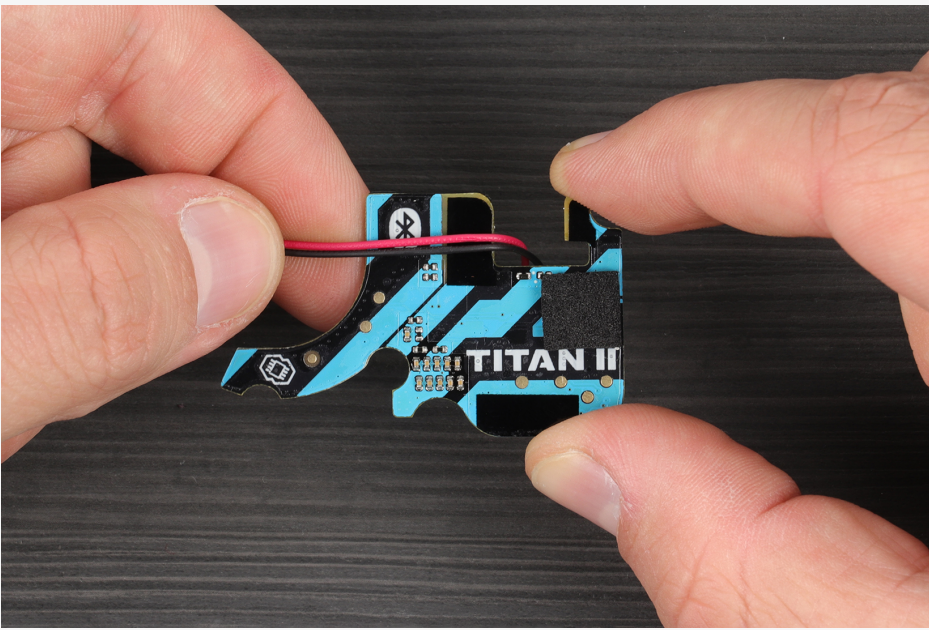


13. Bend the wires as shown in the photo.



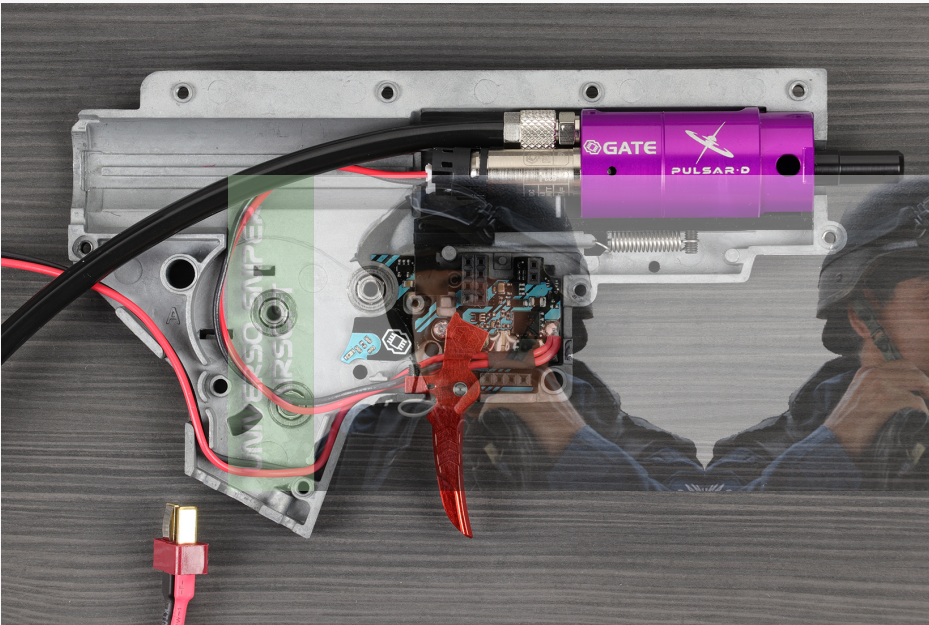


14. For PULSAR D, this wire should be routed along the outer surface of the top PCB.

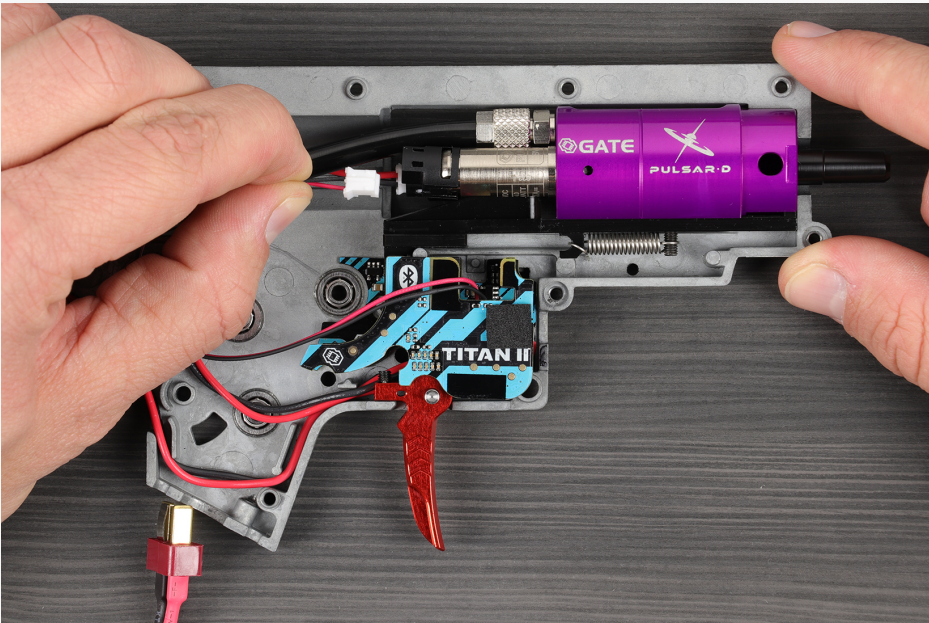


15. Install the trigger and the top PCB of TITAN II Bluetooth®. You will find the full TITAN II Bluetooth® manual here:

[https://help.gatee.eu/space/GHC/2873360445/User+Manual – TITAN+II+Bluetooth®+V2+gearbox+drop-in+FCU+mosfet+HPA.](https://help.gatee.eu/space/GHC/2873360445/User+Manual+TITAN+II+Bluetooth+V2+gearbox+drop-in+FCU+mosfet+HPA)

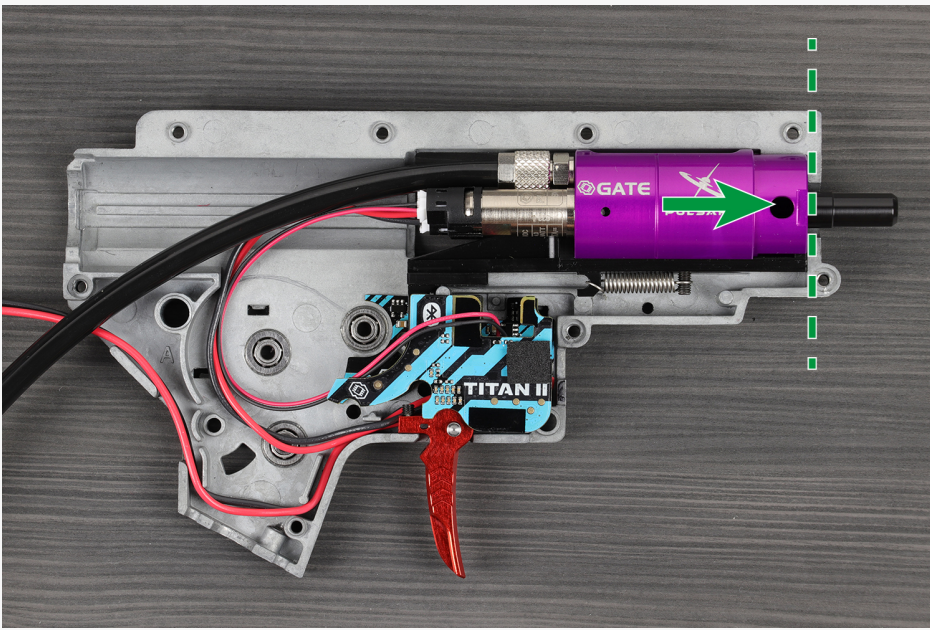


16. Connect the other end terminated with a two-pin plug to the other – upper solenoid valve.





17. Position the engine in the place of the cylinder – it should be pushed against the front wall of the gearbox.

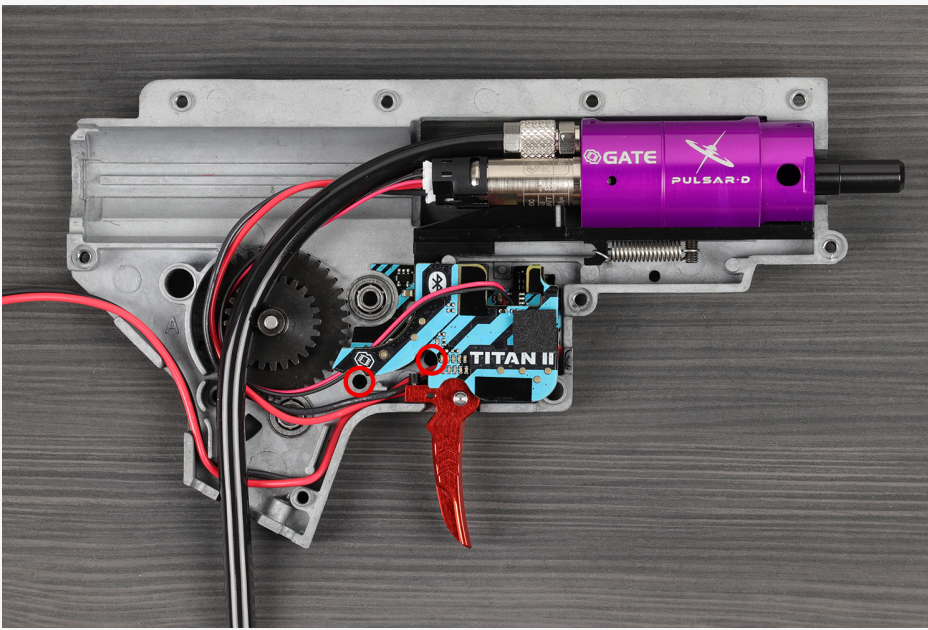


18. Install the middle gear and arrange the power supply cables and the air hose behind its axis as shown in the photo. This will prevent the air hose from colliding with the moving tappet plate and help organize the entire installation inside the gearbox.



The new revision of the PULSAR D engine includes a dedicated shaft that holds the power cable replacing the middle gear.

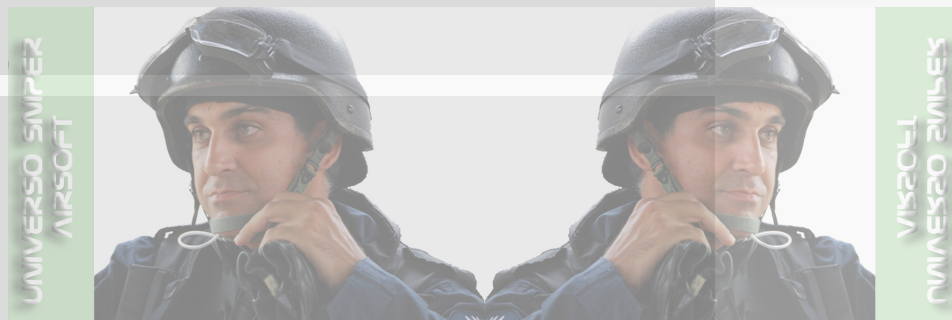
19. Before closing the shell, make sure that the wires do not obstruct important openings.



20. Close the gearbox shell and check that it closes evenly (do not tighten the screws). A slight gap before tightening is acceptable.

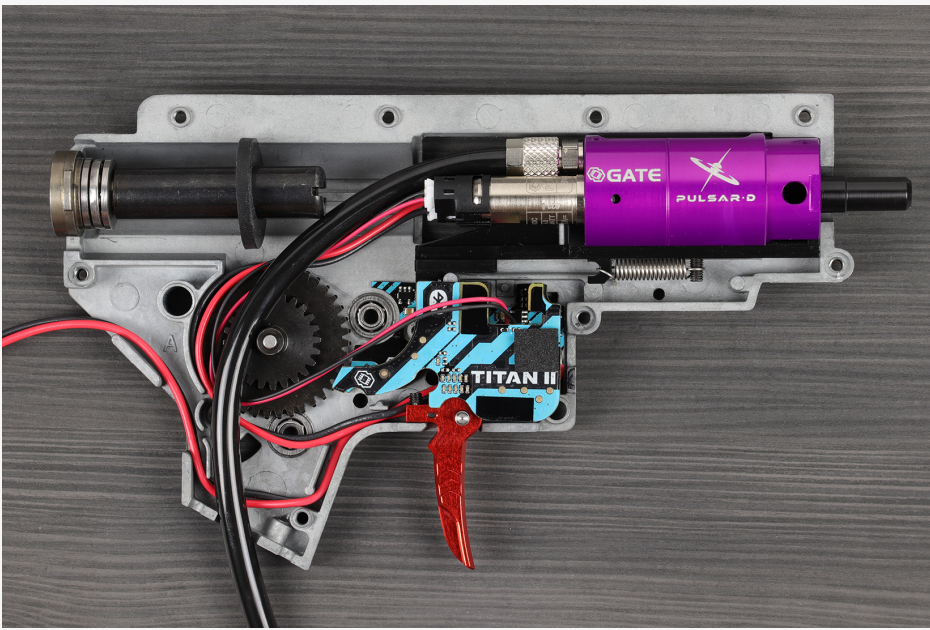


21. In a moment, you will be installing the spring guide. To stabilize it, you can use a bumper from the cylinder head - this will prevent the guide from coming off in the course of installation. Alternatively, you can use insulating tape by wrapping an appropriate amount around the end of the spring guide.





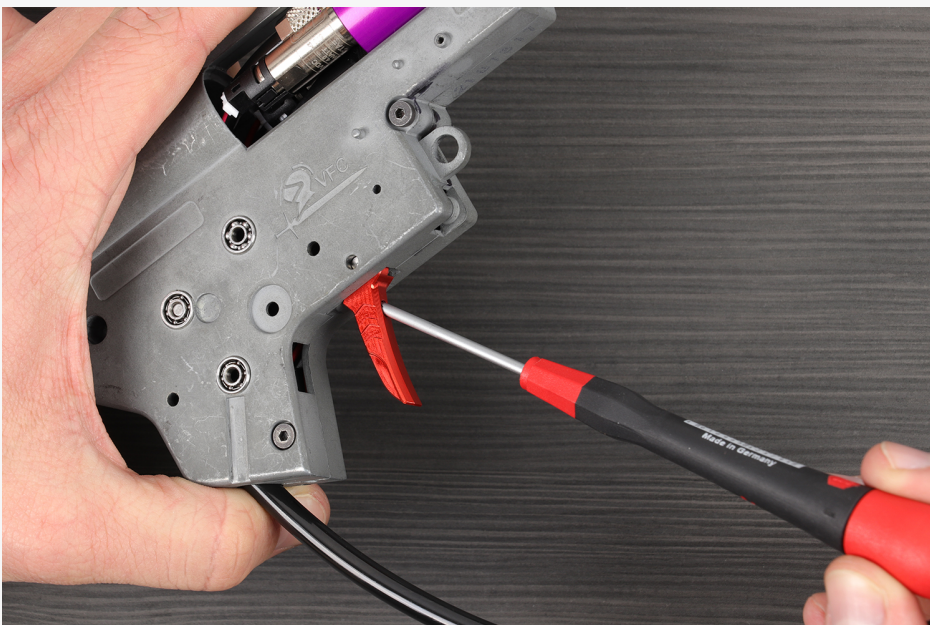
22. Open the gearbox and place the spring guide in its slot.



23. Close the gearbox shell and check that it closes evenly (do not tighten the screws). A slight gap before you have tightened it is acceptable.

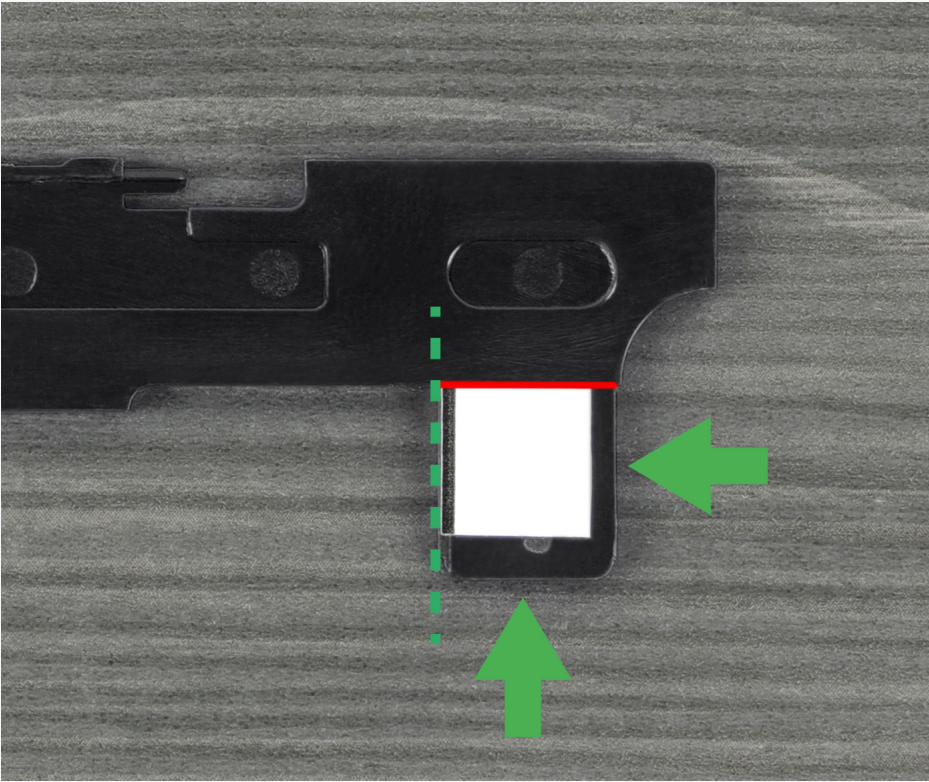


24. If you have an adjustable trigger, such as the Nova Trigger, you can now adjust its movement range. This should be done before calibrating the trigger sensor.

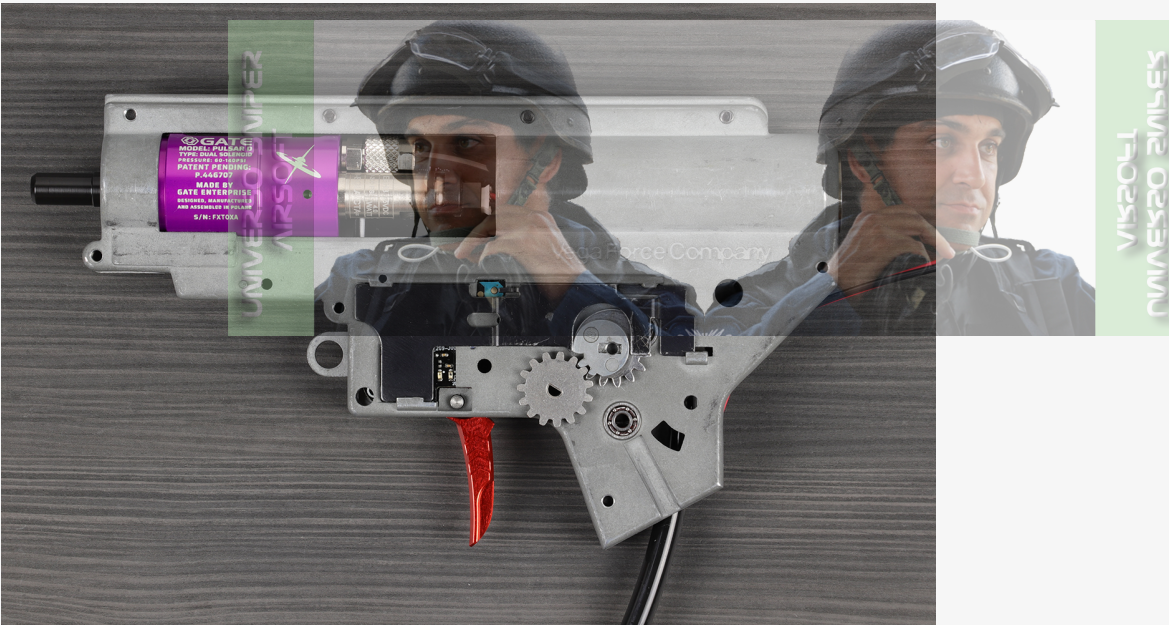




25. Have the selector plate properly prepared by sticking the sticker from the installation kit labeled **Selector Plate Sticker** on it. Precision and accurate placement of the sticker on the plate is very important – see photo below:



26. Install the selector plate and other selector components if any.



27. Place the shell in the body of the replica.



28. Install the grip by previously placing the air hose through the hole where the motor gear was previously located.



29. Remove the adjustment screw from the motor cover.



30. Then place the air hose through the hole where the screw was and install the cover.



31. Installing the buffer tube guide

- a. Gently tighten the guide screw so that the spring guide stays in place.
- b. Tighten the screw of the buffer tube guide until you feel resistance.

32. At the end of the air hose, install the connector in the standard you will be using.



33. Install the upper part of the replica body including the barrel and chamber. Remember not to use a nozzle sleeve with PULSAR D.

34. Connect the battery and perform trigger and selector calibration using the GCS app.



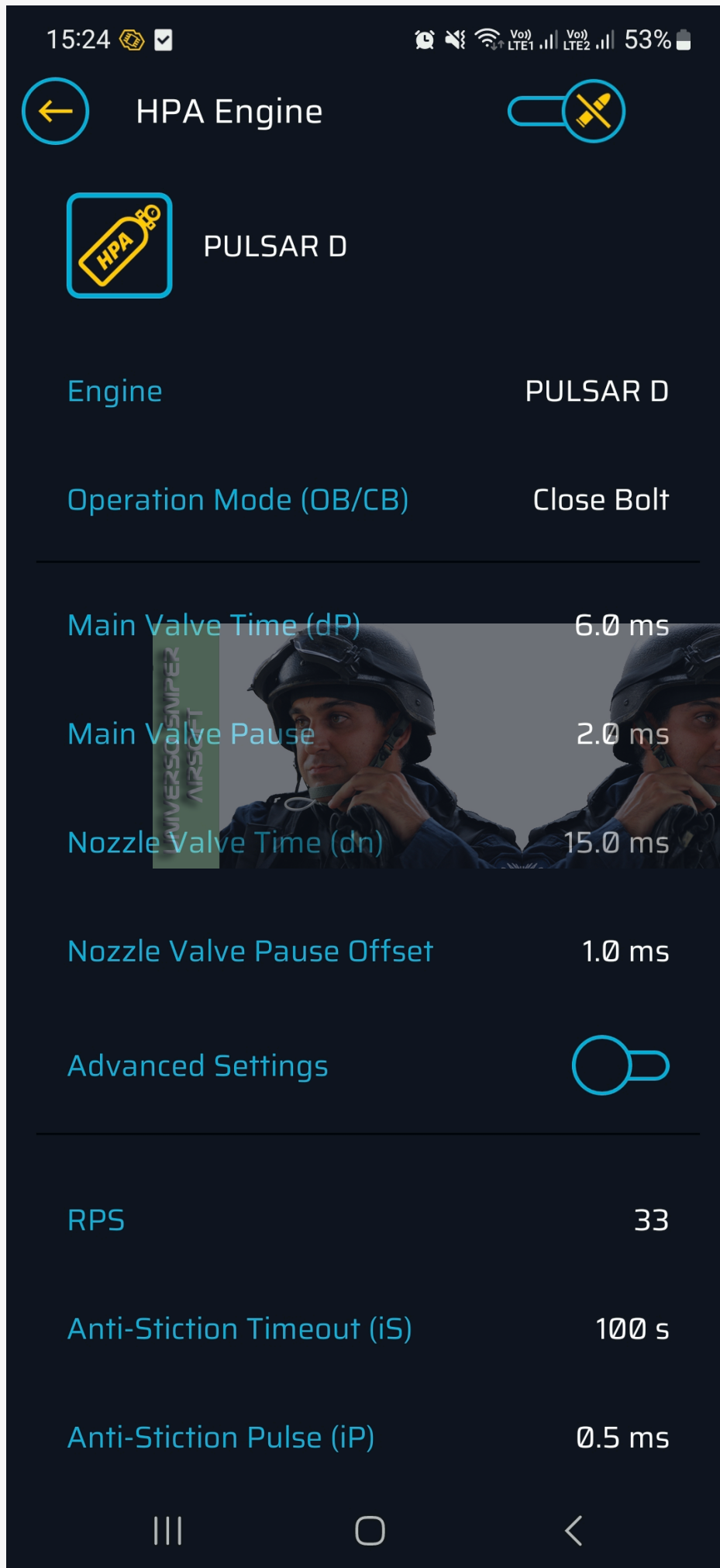


a. After each firmware update, restore the **factory settings**.

b. To reset the time settings restore the **default settings**. They should go as follows, and in most replicas will be a good starting point for precise calibration. Before you do so, read the other points mentioned.

[Calibration of HPA Engine Control Times](#)

[PULSAR D Engine Calibration](#)



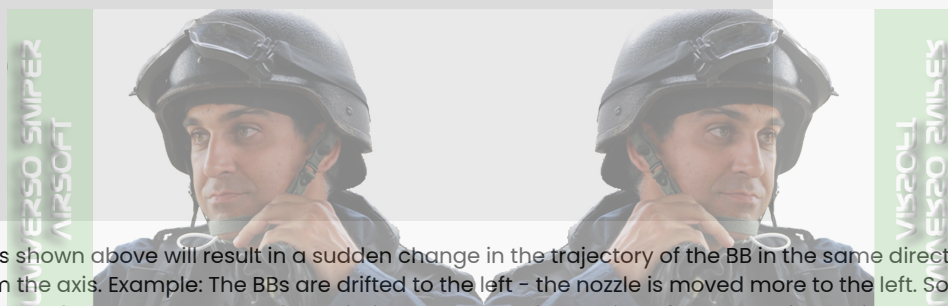
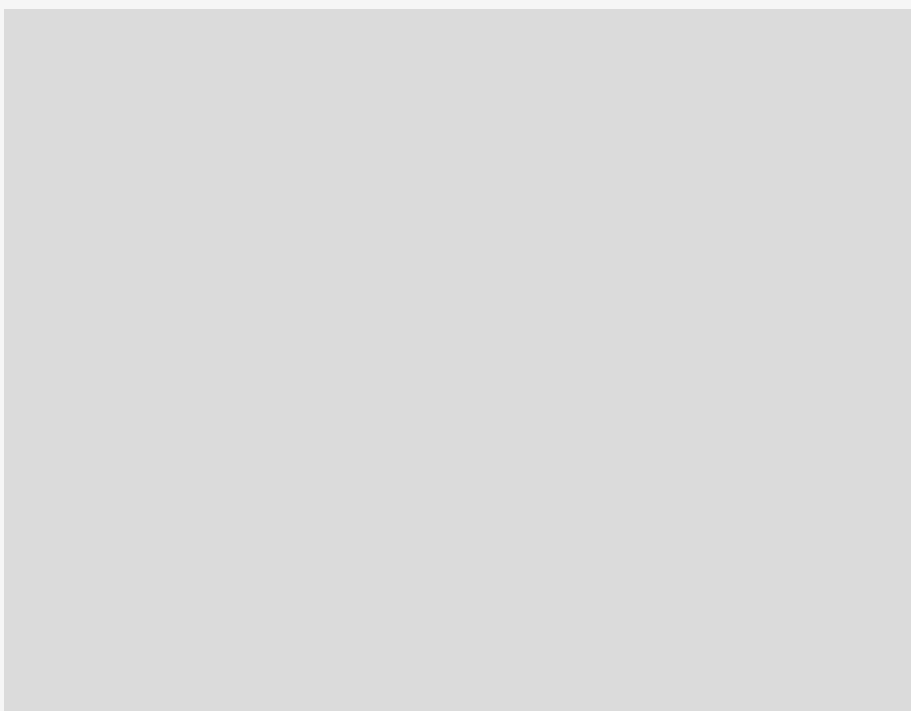


36. Insert your magazine loaded with the BBs of the weight you're going to be using.
37. Carry out FPS measurements using a chronograph.
- a. If the results are stable, proceed with accuracy test – step 38.
  - b. If you encounter FPS spikes or results that are too low, then probably the gearbox has not been installed axially in the lower receiver. Go to step 39.
38. Aim test – if the previous FPS measurements and now the accuracy test are satisfactory, then your replica is ready for precise calibration. Go to [PULSAR D Engine Calibration](#). **If you have encountered problems at any of the previous stages, proceed to the next point.**

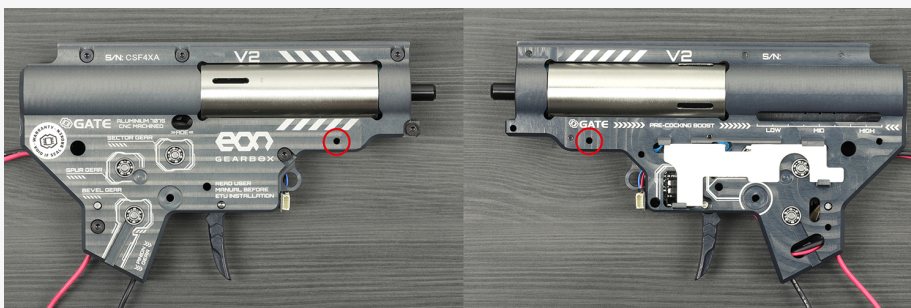


39. Axial alignment is very important when building an HPA replica. HPA engines, especially those operating in an open-bolt system, are very sensitive to deviations from alignment.

- a. If you have specialized knowledge of replica building, you can correct the gearbox deviation from the body axis yourself. Otherwise, it is best to have a reliable service technician align the replica
- b. Using an inspection camera with a diameter of less than 6 mm is most effective in assessing the deviation from the axis.
  - i. Insert the camera through the barrel and bring it close to the hop-up bucking.
  - ii. You should then see an image similar to one of the four situations.



- iii. The deviations shown above will result in a sudden change in the trajectory of the BB in the same direction as the deviation from the axis. Example: The BBs are drifted to the left - the nozzle is moved more to the left. Solution - you need to move the front of the gearbox to the right, aiming at the centric location of the nozzle in relation to the hop-up bucking.
- iv. Right-left correction will be carried out with the help of the adjustment screws supplied with our gearbox, which should be screwed into these holes marked in the photo and with them change the position of the gearbox. You can secure these screws with thread glue or a specific number of washers. For other gearboxes that do not have such screws, you need to drill holes in the front part of the gearbox on both sides of it, thread these holes, and fasten the screws in them, which should be handled similarly to the case of the gearbox. Otherwise, if this is not an option for you, you can use spacers in the form of various materials.



- v. You will carry out the top correction by shimming something under the gearbox in the area in front of the trigger or by collecting material from the surface in contact with the rear of the gearbox/rear of the replica body around the location of the buffer tube guide.
- vi. You will make the bottom correction by shimming something on the surface in contact with the spring guide or collecting material from under the gearbox in the area in the front of the body.
- vii. In each replica, these values will vary and it may require many hours of correction to achieve perfect alignment of the replica. However, this will bring very good results in the form of stable FPS measurements and a repeatable BB trajectory, resulting in high accuracy.
- viii. If you overcome the problem and improve the axiality of your replica, you can go to precise engine calibration.



**Caution**

The **HPA PULSAR D engine** uses **AEG nozzles** incompatible with **nozzle sleeves**. **Nozzle sleeves** can only be used with HPA engines that use dedicated nozzles to stabilize the nozzle.



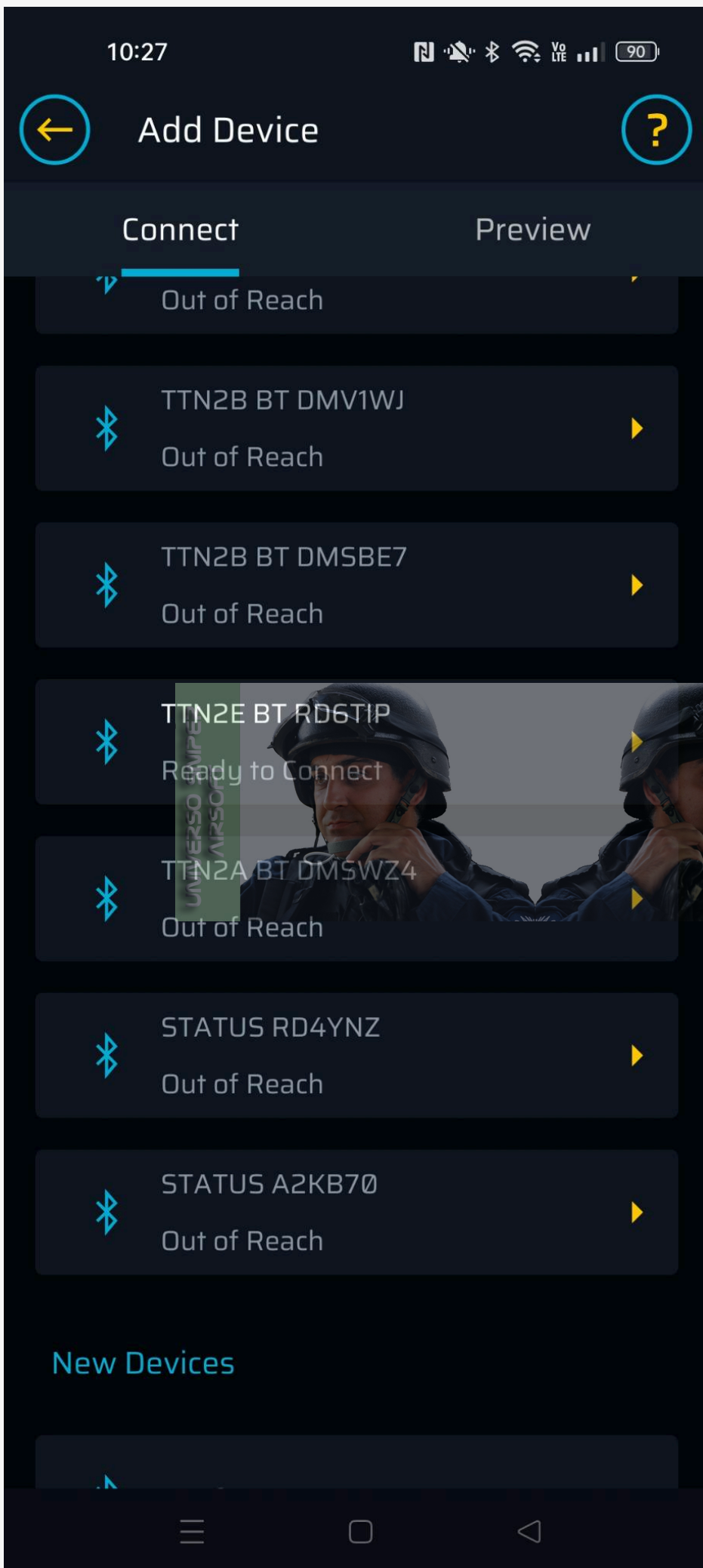
## Calibration of HPA Engine Control Times



1. Connect to TITAN II using the GCS app by selecting "+" in the Dashboard.



2. Select TITAN II Bluetooth® from the list. If this is the first time you connect, you must enter the PIN code that came with the product.

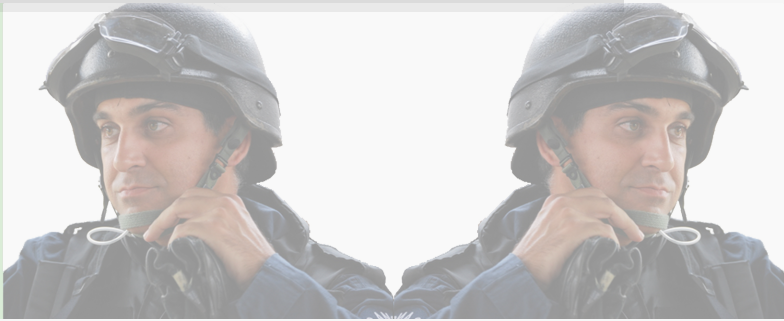


3. After connecting TITAN II Bluetooth® to GCS, tap its icon.





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General



HPA Engine

Single Solenoid Valve



I/O Port Settings

Off



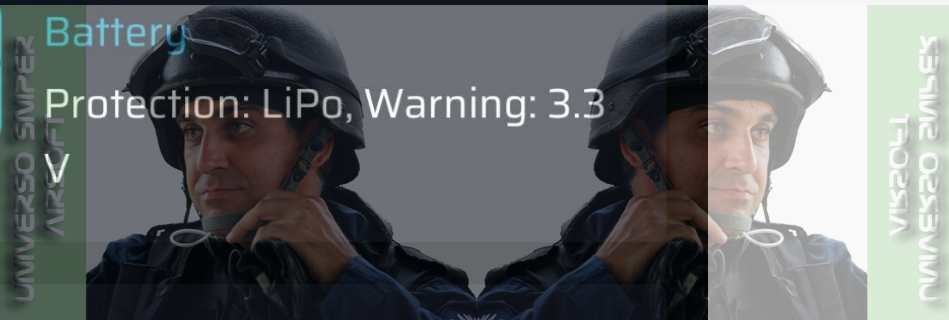
Battery

Protection: LiPo, Warning: 3.3

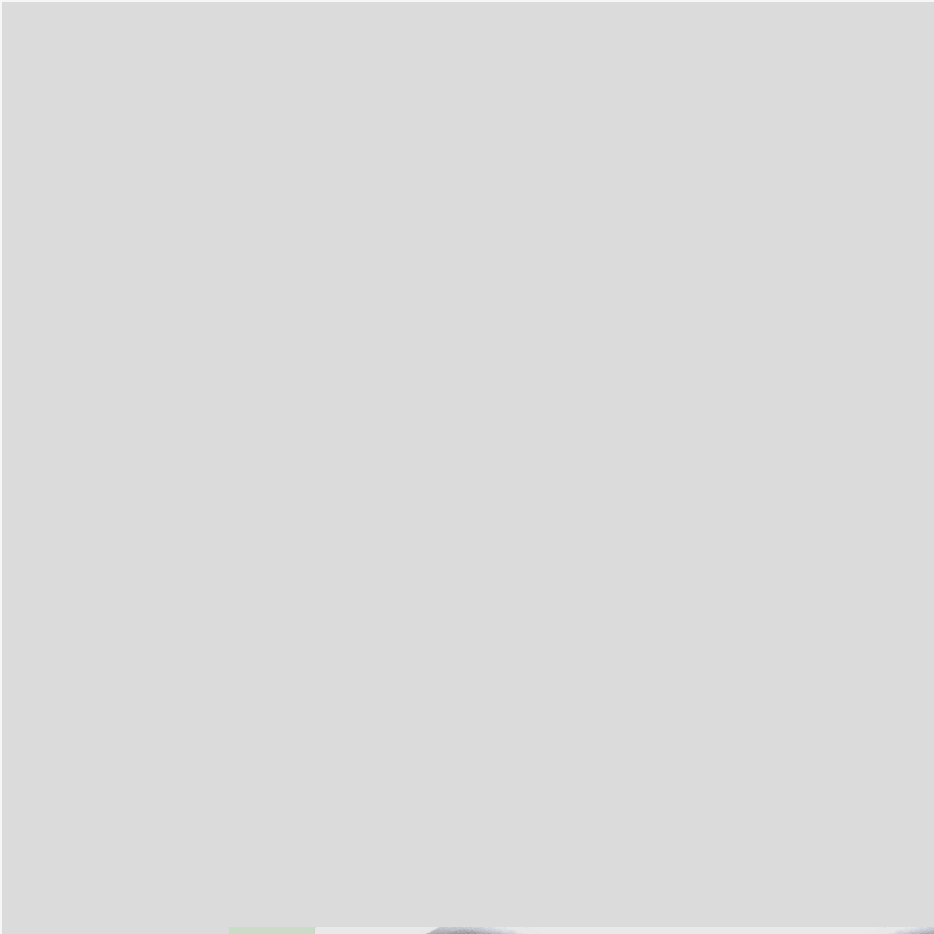


Series Safety Limit

Off



6. Set the correct engine type – PULSAR D.

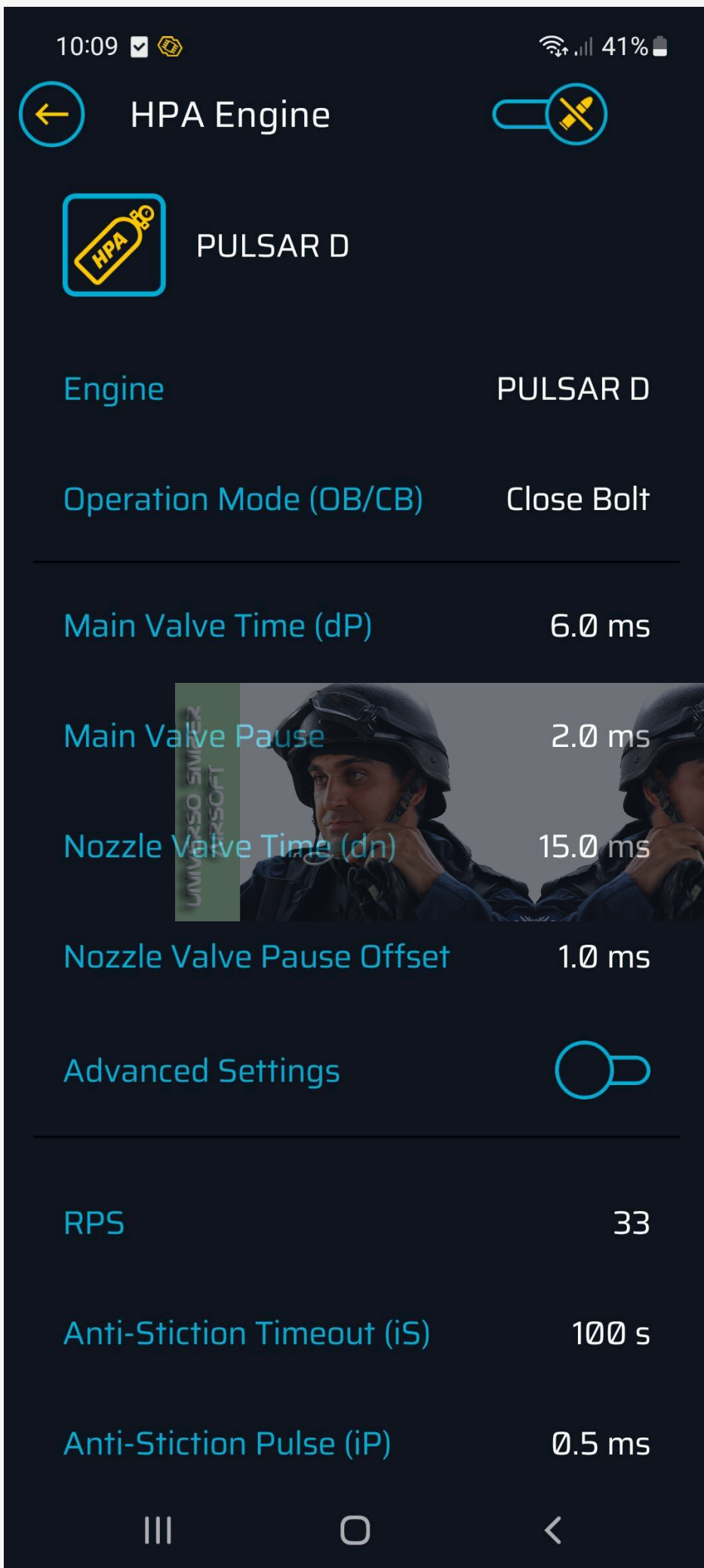


## PULSAR D Engine Calibration





1. Start calibration by restoring the default settings, which should work well in most replicas and will be a good starting point for precise calibration.



2. Then proceed to chrono the replica. Depending on the weight of the BBs, the length of the barrel and the hop-up bucking, use the pressure regulator to preset the desired bullet muzzle velocity.

3. Then decrease the **Main Valve Time** by **0,1 ms** at a time until the FPS do not start to drop. If you notice a decrease in FPS, return to the previous time value on which there was no decrease in FPS. This means that the **Main Valve Time** has been calibrated correctly.
4. Next, go to the **Main Valve Pause** setting. This value depends on the length of time the BB remains in the barrel. Set this value between **0.1** and **3 ms**, and check which value will give a stable muzzle velocity result for your replica.
5. Next, go to the **Nozzle Valve Time** setting, this value depends on the quality of the magazines you use. The weaker the spring in the magazine, the longer the interval will have to be. Proceed here similarly to the **Main Valve Time** calibration. Set the value around 25 ms, and then decrease it until you notice gaps in the magazine feeding the BBs, then return to the previous time setting. If you continue to observe problems with BB feed, you should increase this time.
6. The last value is the **Nozzle Valve Pause Offset** calibration. Nozzle Offset – is the amount of time added to the TITAN's measured time to move the nozzle to its maximum forward position to fire when the nozzle is already stabilized in the hop-up chamber. This improves focus and FPS stability. For stable operation of the replica, it is worth setting this time between **1-3 ms**.

✔ **Note**

Please note that in the case of dual solenoid engines, it is not possible to connect any extra devices requiring a power supply.

## Tooltips

**Engine** – TITAN II supports different types of engines – here you can choose what type of engine you have so that the program controls it correctly

**Operation Mode (OB/CB)** – Dual Solenoid Valve Engine mode – here you can select the mode of operation of the dual solenoid valve engine:

**Closed bolt** – the engine will always perform a shot cycle with the BB already loaded into the hop-up chamber – this improves the stability of the engine's operation and BB trajectory.

Downsides: the first shot is dry fire, lower ROF

**Open bolt** – the engine will always perform a shot cycle milliseconds after the BB is loaded into the hop-up chamber

Downsides – stability of operation and BB trajectory,

Upsides – higher ROF, the first shot is not dry fire

**Main Valve Time (dP)** – Main Valve Time (Poppet Dwell – dP) – the opening time of the main solenoid valve – with this option you can adjust the muzzle velocity of the HPA replica and gas consumption

**Main Valve Pause** – the interval time between the next shot cycle in the case of a single solenoid valve engine and the interval time between the intermediate solenoid valve cycle and the nozzle cycle in a dual solenoid valve engine. It affects the stability of the hop-up and engine operation (FPS).

**Nozzle Valve Time (dn)** – Nozzle Valve Time (Nozzle Dwell – dn) – nozzle control valve open time, this time defines how long the nozzle will stay in the back position, for weaker magazines this time must be longer

**Nozzle Valve Pause (dr)** – Nozzle Valve Pause (Return to Battery Delay – dr) – the interval time between the end of the nozzle reverse cycle and the next main/intermediate valve cycle, in other words, the sum of the time that the nozzle has to return to its initial position

**Nozzle Valve Pause Offset** – Innovative Nozzle Position Detection and Automatic **Nozzle Valve Pause** Calibration System

In PULSAR D, thanks to the innovative nozzle position detection system, the nozzle return time to the sealed position with the hop-up bucking is measured during each shot cycle. As a result, this time is dynamically adjusted to the real nozzle return time with each shot, as the pressure of the BBs on the nozzle changes. A full magazine results in greater BB thrust and longer nozzle movement time. This allows the maximum ROF to always be achieved and eliminates the possibility of setting the time too short, causing the air to be fed too quickly to release the BBs, which can cause FPS instability and hop-up problems, resulting in the replica's lack of accuracy.

Instead of calibrating the Nozzle Valve Pause, you set the Nozzle Valve Pause Offset which is added to the actual measured Nozzle Valve Pause as an additional time buffer. This is a form of additional protection for the firing delay, which realistically affects the stability of the replica's performance and greater accuracy.

**Anti-Stiction Timeout (iS)** – the time after the last shot is fired after which additional boost time will be added: Anti-Stiction Pulse (iP)

**Anti-Stiction Pulse (iP)** – in cold temperatures after a long pause in firing, the valve cools down and its response time increases; this time allows the pulse for the first shot after a long pause to be extended so that the first shot is exactly like the subsequent shots

**RPS** – Rate of Fire – ROF (RPS) – in this case it is a simulation of the rate of fire based on the length of the times set. After calibrating the engine, the maximum achievable RPS will be displayed. They can be adjusted downward by reducing the number of RPS

## PULSAR D Engine Maintenance Manual

The PULSAR D will require periodic cleaning and maintenance. The frequency of use of the replica and possible dirtiness of the entire system will define the intervals between these procedures. Carry out preventive cleaning once every six months, if you do not notice any incorrect operation before that. If the engine does not work properly, then immediately disassemble it (carefully remove the solenoid valve - its seals are very delicate) and wash it thoroughly, for example, with petroleum ether. This does not apply to the solenoid valve – clean the solenoid valve gently with dust-free paper.

Evaluate the state of wear of the o-rings and, if they are damaged, replace them with new ones (spare o-rings can be found in the kit – this does not apply to the solenoid valve washers). Carefully remove old o-rings and install new ones. Do not use sharp metal tools for this purpose, as they can damage the o-rings or aluminum surfaces of engine components. This may result in permanent damage, which is not covered by the warranty. If you have any doubts or problems, contact our technical support department. Each component is available as separate products for post-warranty support.

## List of Tools

1. PULSAR D engine
  - a. Optional – spare o-rings included in the kit
2. Balystik Premium Grease – Pneumatic or Gun Sav grease from TechT (you can use other ones, but we do not guarantee ideal engine performance)



3. Clean, fine brush for applying the grease
4. Plastic tweezers for removing and installing the o-rings
5. A clean thicker brush for washing the parts
6. A degreasing agent for all components, such as petroleum ether (the agent must not damage the o-rings)
7. A container for washing the components
8. Paper towels

## Maintenance procedure

1. Have all the listed items ready.



2. Remove the air hose.

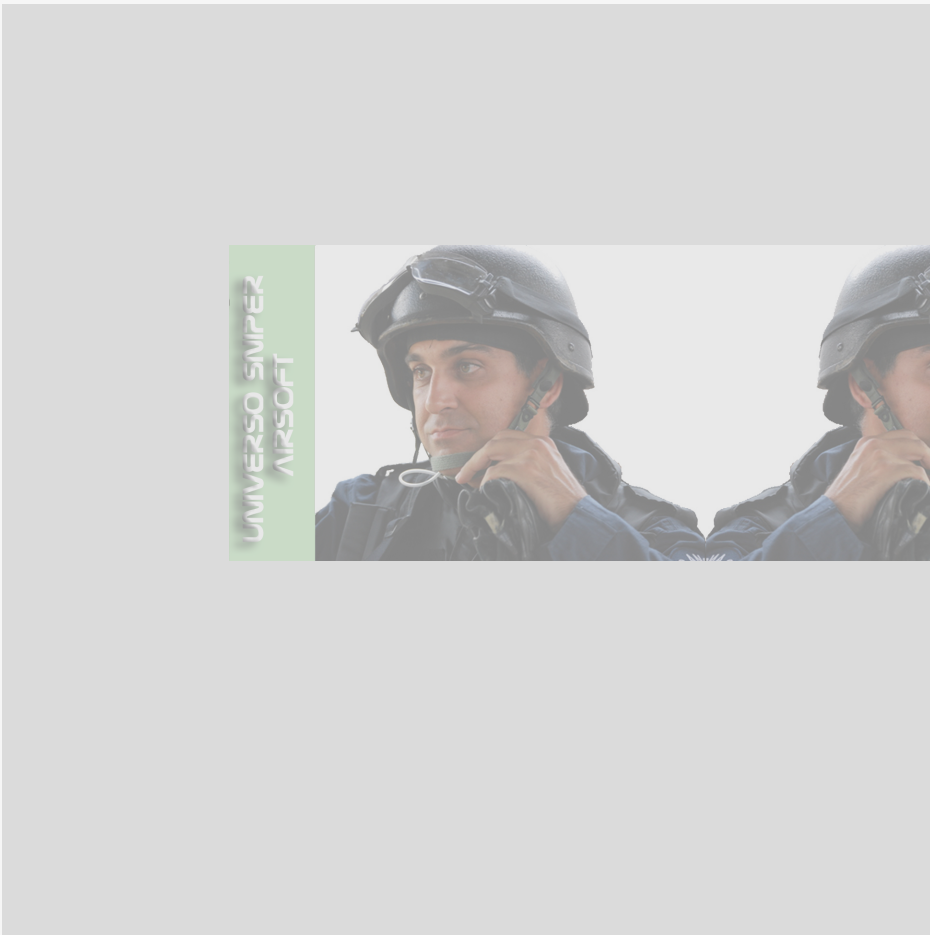




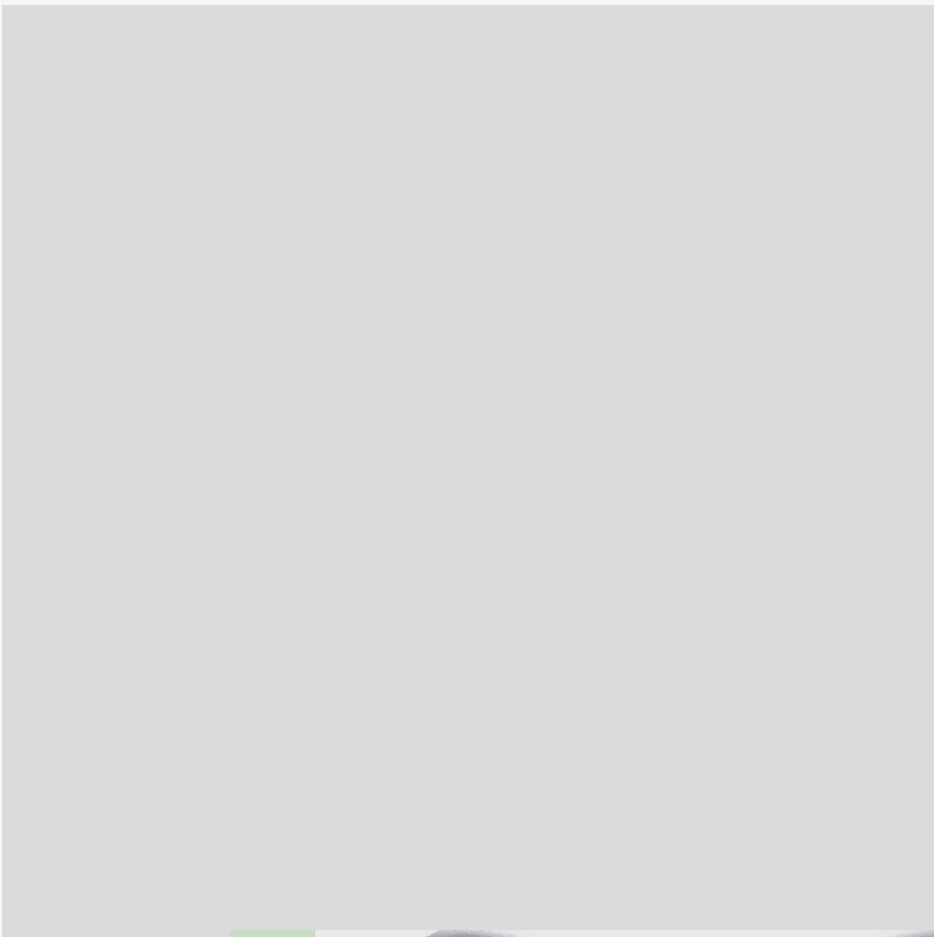
3. Remove the tappet plate spring.



4. Unscrew the screw securing the tappet plate.



5. Remove the tappet plate.



6. Remove the nozzle.



7. Gently unscrew the solenoid valves – be careful with the very delicate O-rings on the valve.



8. Using the dedicated wrench included in the kit or Seger-type safety pliers, unscrew the nozzle guide. The first engine release may not have had them included, but they are available in our [store](#).



9. Using tweezers or a screwdriver, gently remove the poppet from inside the body.

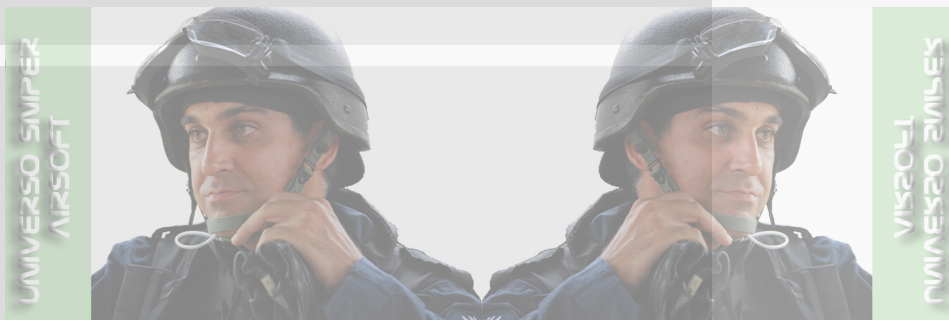




10. Remove the tappet plate piston (you can use tweezers or a sharp knife for this, paying attention not to damage the piston).

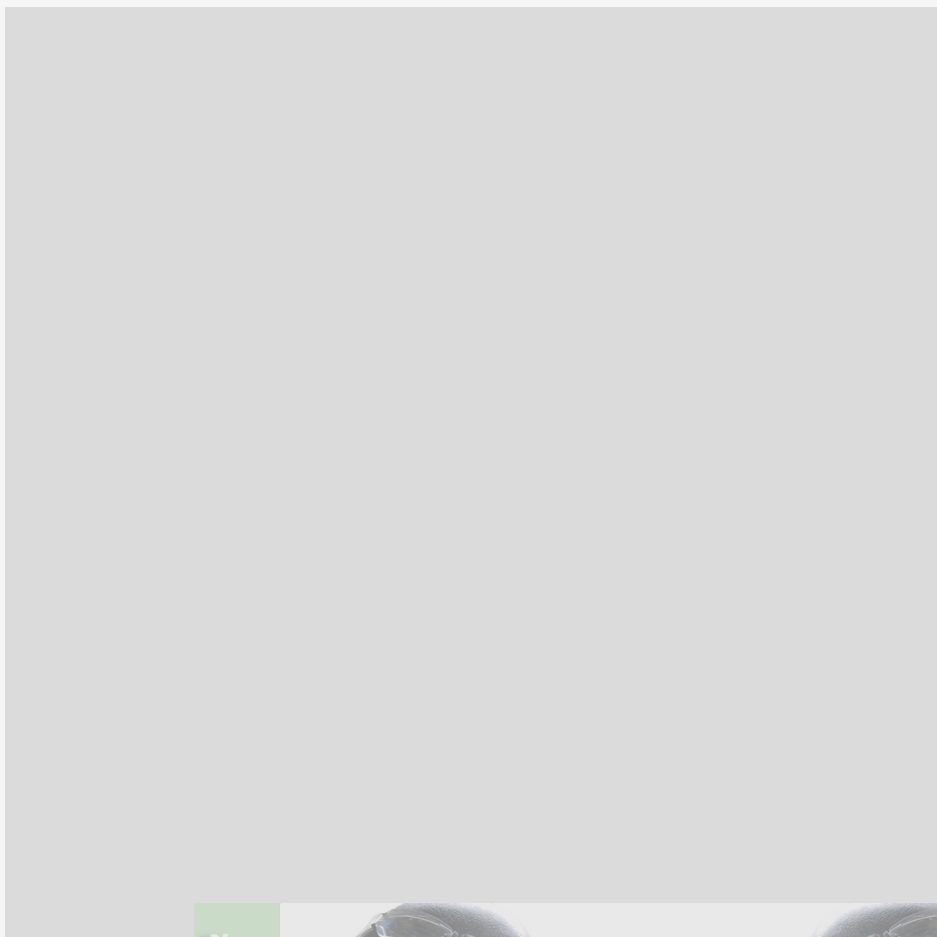


ii. Remove all the O-rings from the engine components except the solenoid valve (it is best to use plastic tools for this so as not to damage the aluminum surfaces of the engine – this is not covered by the warranty).

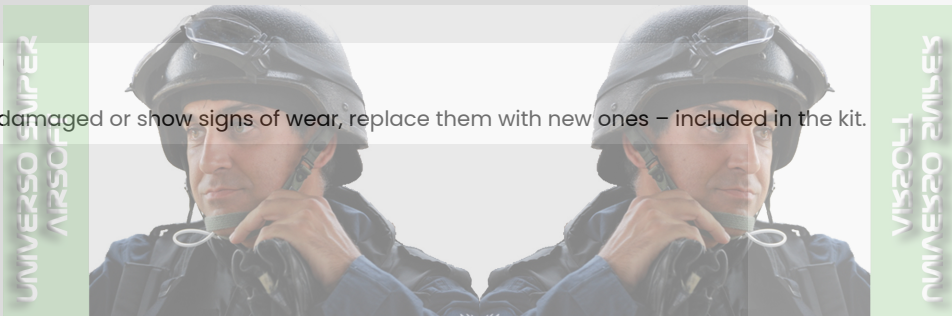
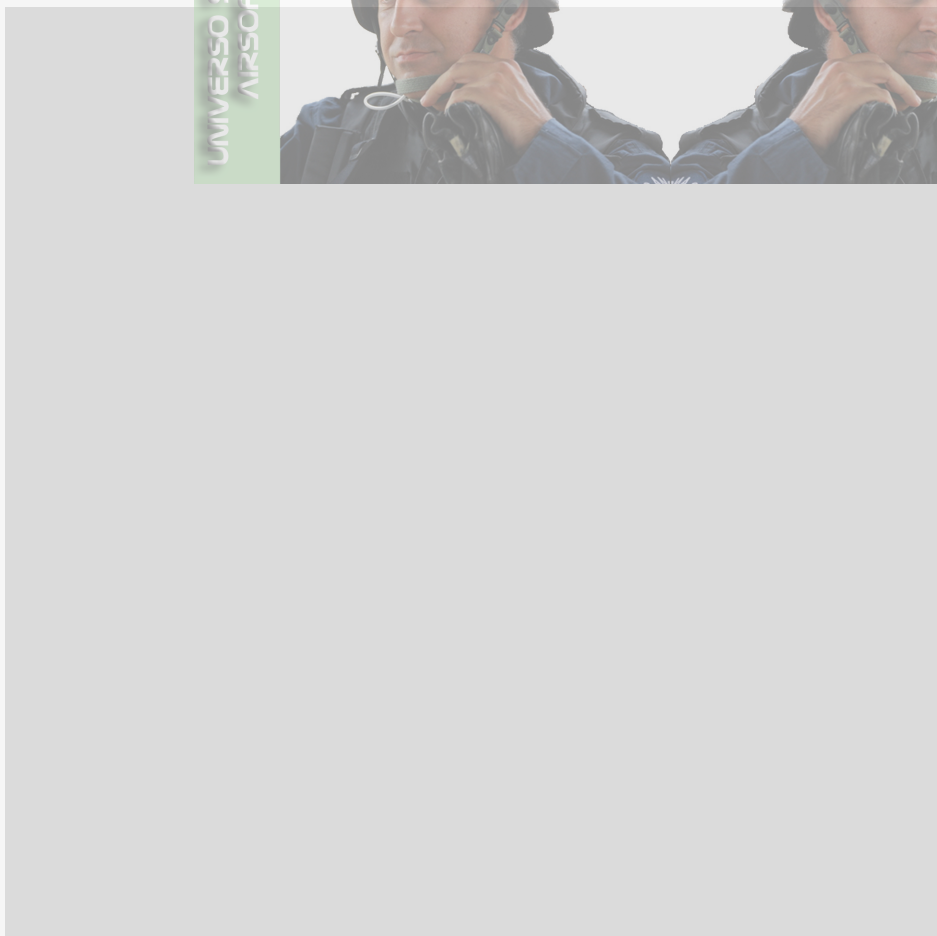




a. If the o-rings are not damaged, you can reuse them after cleaning them with a paper towel – it is best to avoid washing the o-rings with detergents.



b. If the o-rings are damaged or show signs of wear, replace them with new ones – included in the kit.





12. Place the engine components in a dish with petroleum ether (NOTE – does not apply to the solenoid valves. Avoid immersing them in cleaning agents).



13. Using a thicker brush and tweezers, thoroughly clean the engine components.



14. For solenoid valves, gently wipe the O-ring surfaces and remove visible dirt with a dry brush.



15. Set the washed parts aside on a paper towel to dry completely (you can speed up the process by blowing the parts with compressed air).

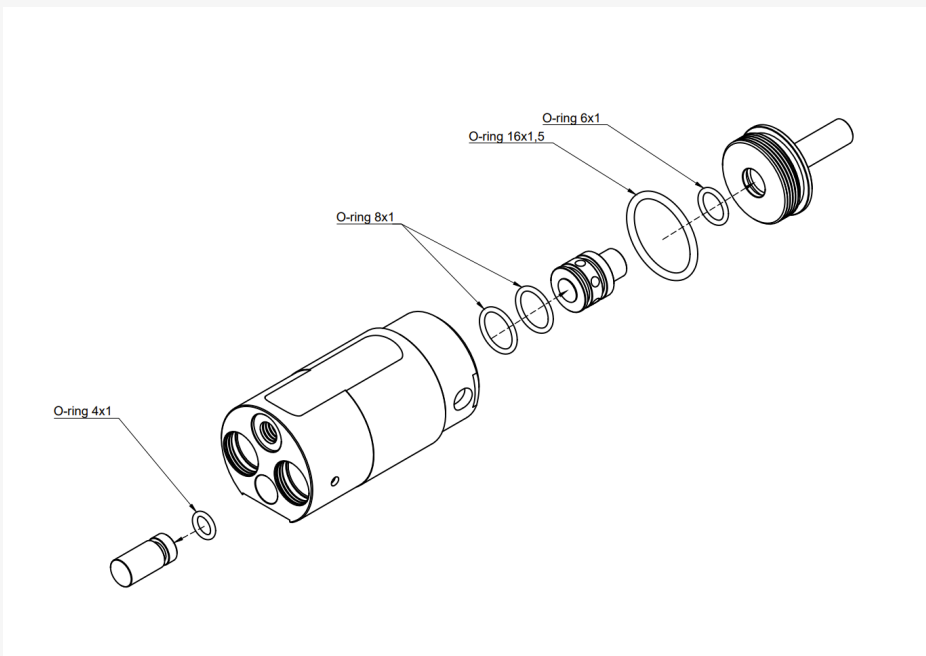




16. Reinstall the o-rings (you can lightly grease them before installation):



a. Install the o-rings according to the diagram below:

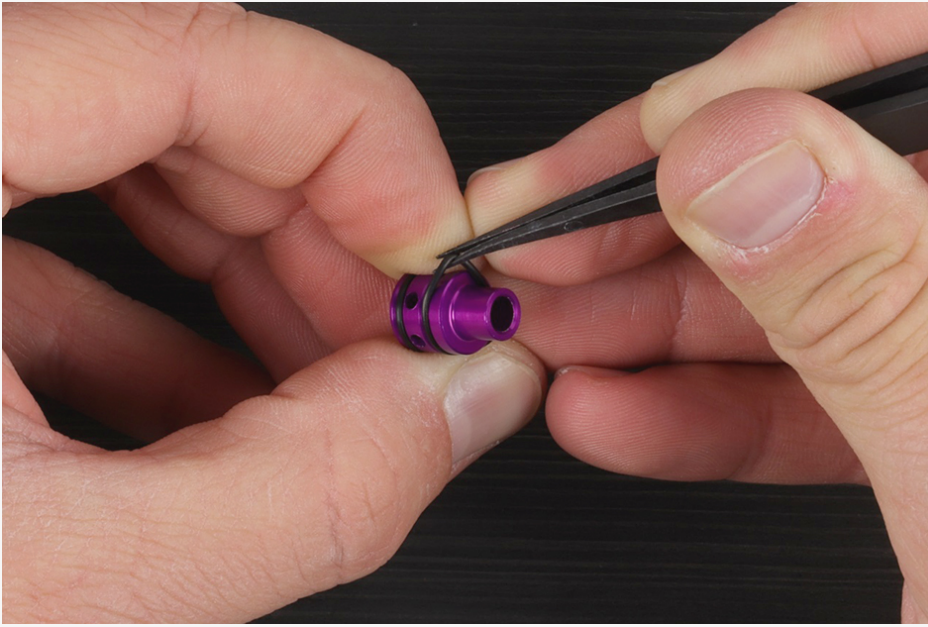


b. 1 o-ring 16x1.5 mm and 1 o-ring 6x1 mm in the nozzle guide.





c. 2 o-rings 8x1 mm for the poppet.



d. 1 o-ring 4x1 mm for the tappet plate piston.



17. Prepare all parts with the O-rings installed, as well as grease and a smaller brush.



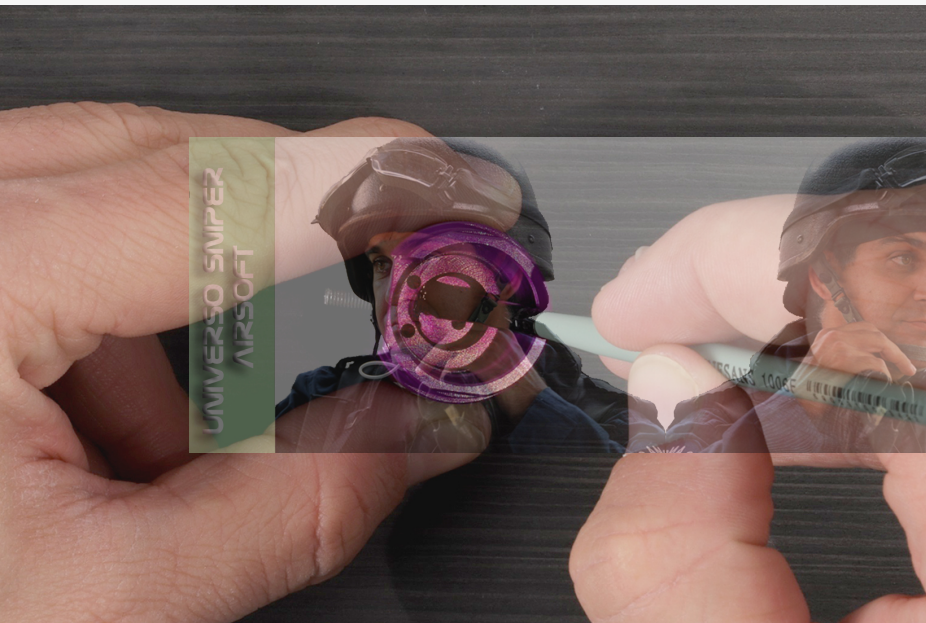


18. grease two places in the rear of the engine body:

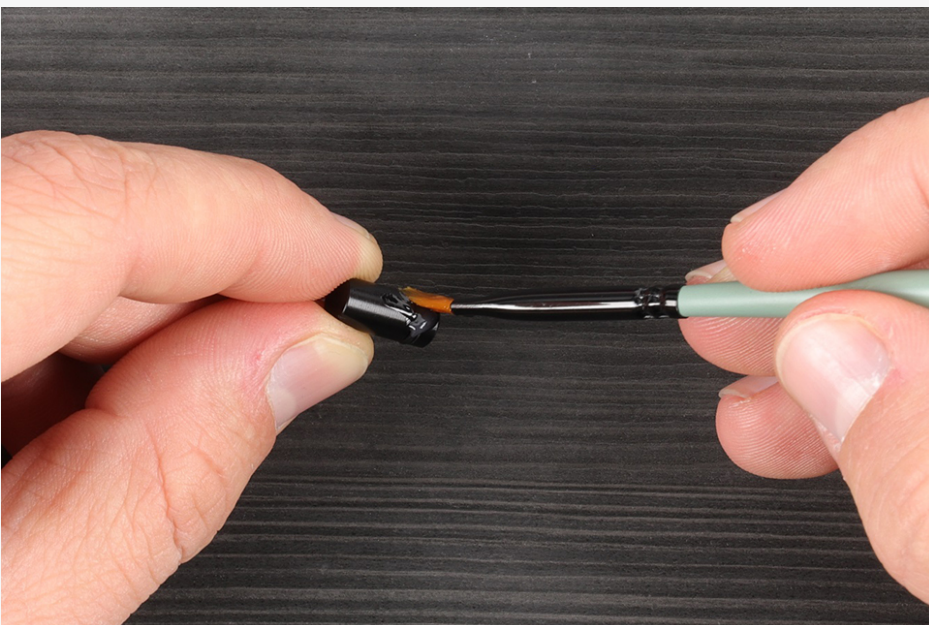
a. The cylinder where the piston moves (take care not to grease the bottom of the cylinder).



b. Then the vertical surfaces of the cylinder where the poppet moves. Try not to grease the bottom of the cylinder. This can have a negative effect on engine performance.



19. Grease the o-ring on the piston and the piston.



20. Place the piston in its cylinder and collect excess grease.





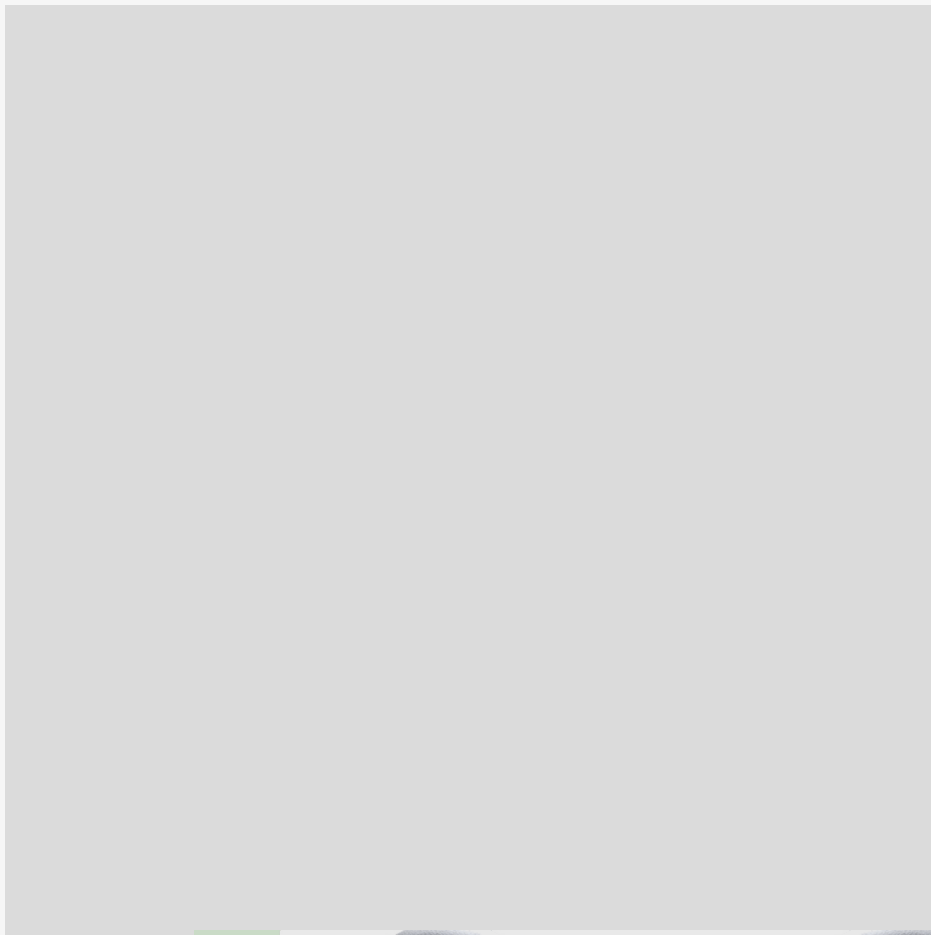
21. Grease well the two o-rings in the nozzle guide (you can remove the excess with a paper towel).



22. In the poppet, also grease two places:

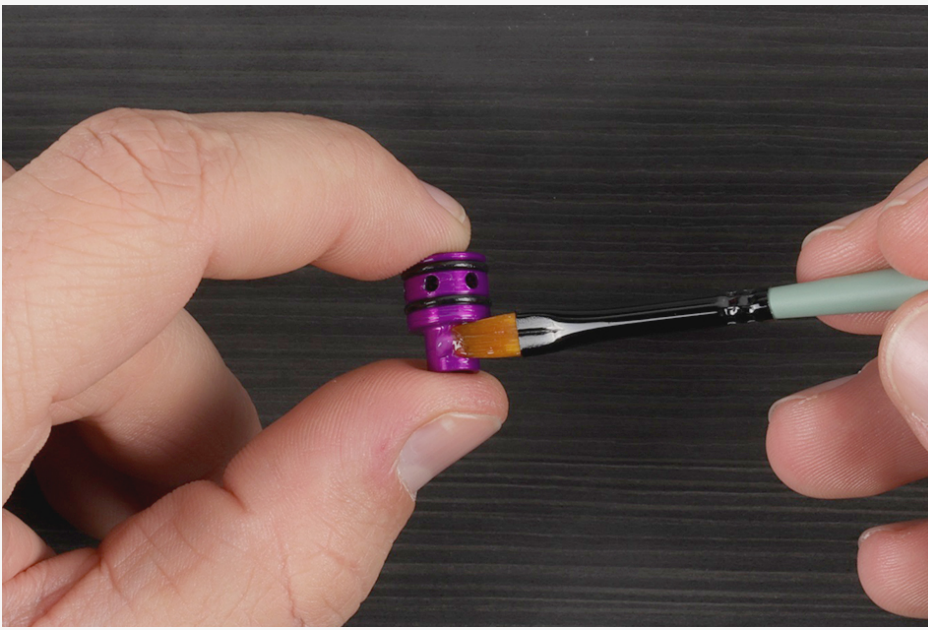


a. Both O-rings. As with the rear of the engine, be careful not to leave grease on the flat rear surface of the nozzle.

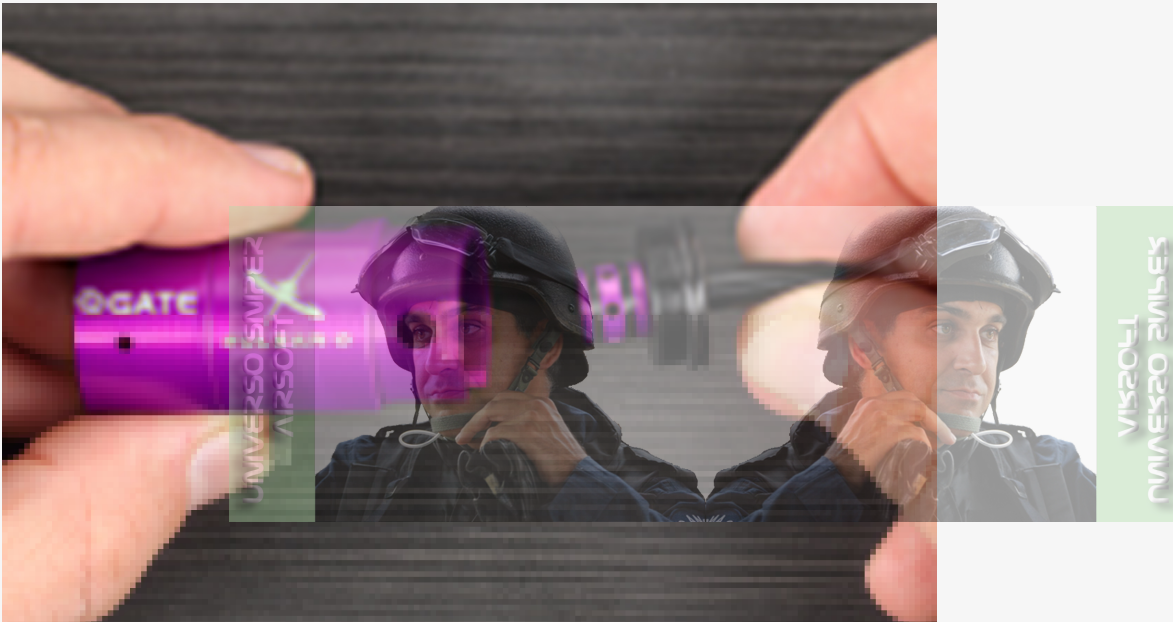




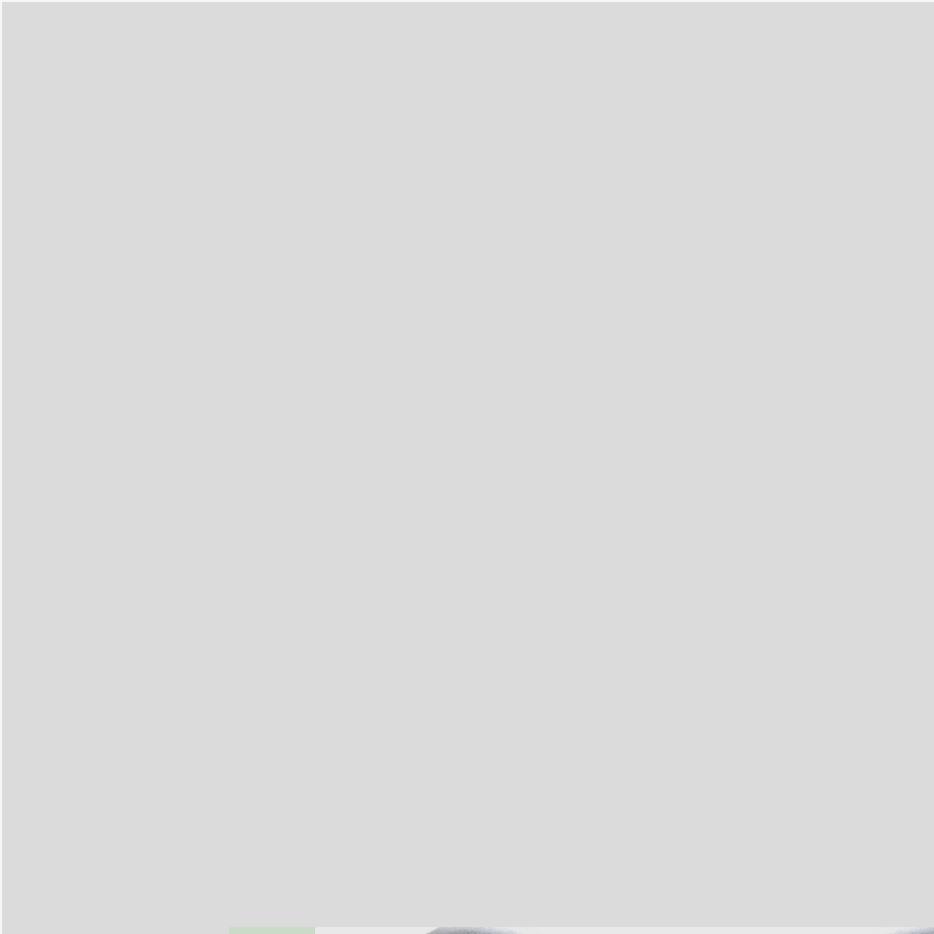
b. And the narrowed poppet surface.



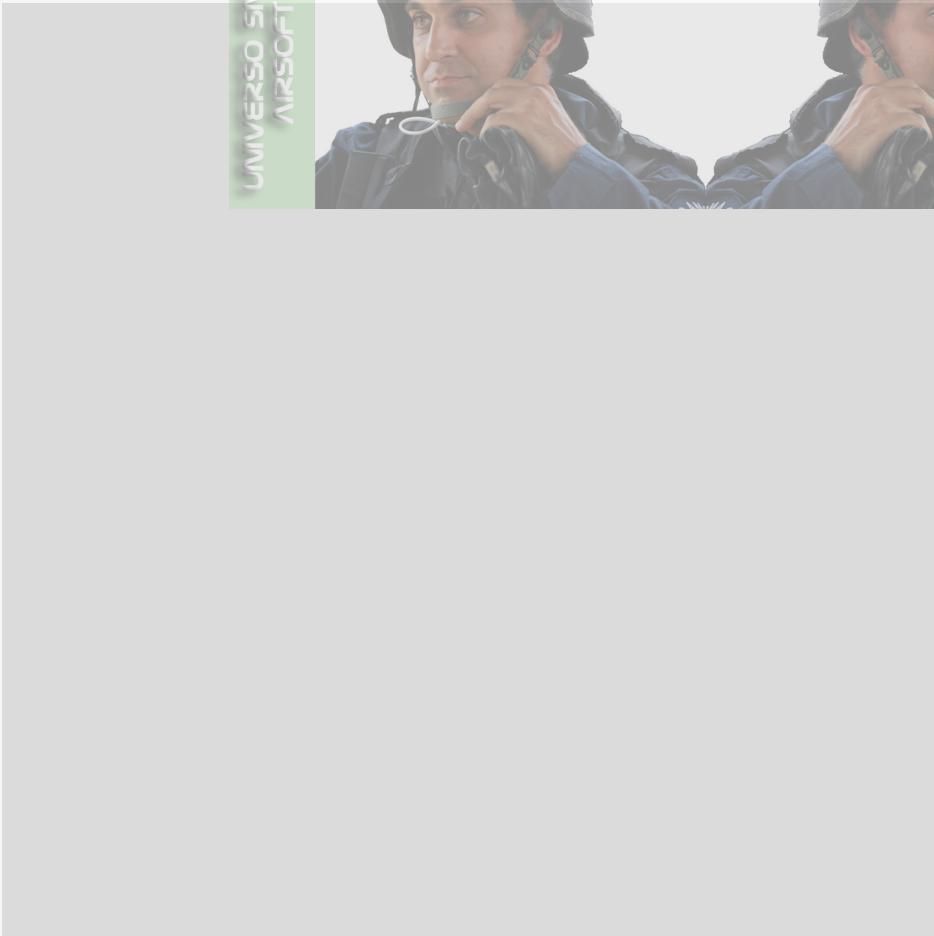
23. Place the greased poppet in the inner part of the nozzle guide.



24. Then screw the nozzle guide into the engine body using a wrench or the aforementioned pliers.



25. Grease the nozzle guide.

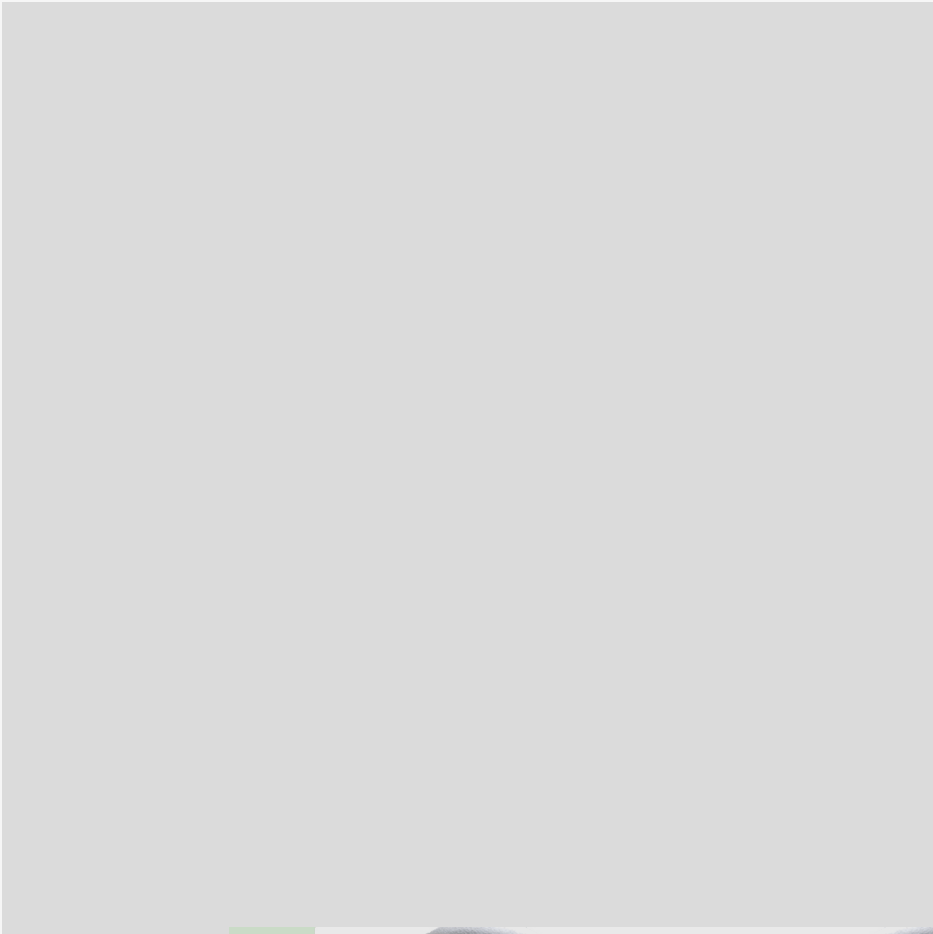


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26. Grease the nozzle from the inside in the o-ring area.



27. Install the nozzle on the guide.

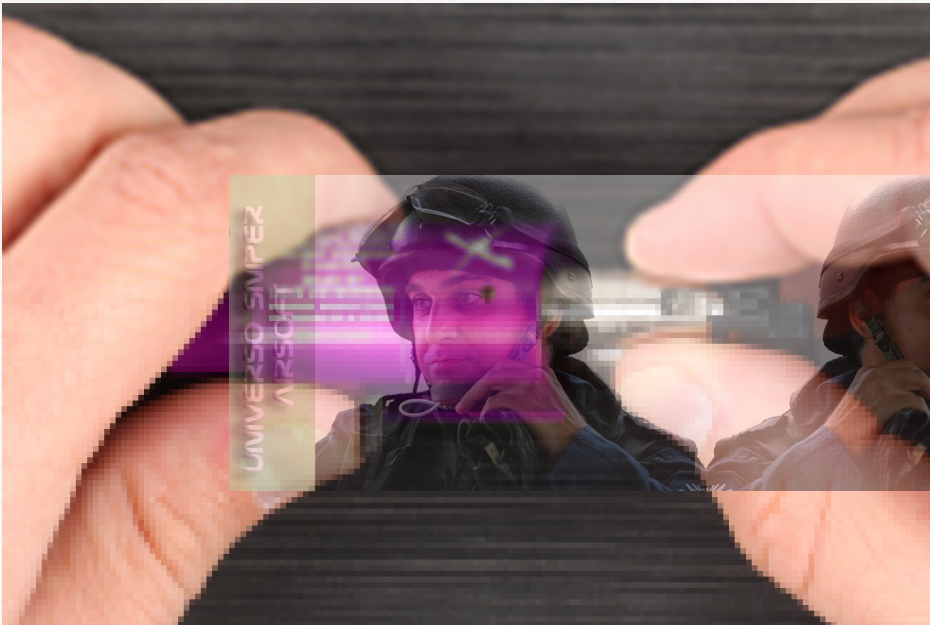




28. Gently grease the thread and O-rings of the valve with a flat brush. Avoid getting grease into the moving parts of the valve.



29. Gently, while taking care of the solenoid valve's o-rings, screw it into the valve socket. Just do it with your bare hand, do not use tools for this.



30. Grease the surface over which the tappet plate moves.



31. Install the tappet plate. Press it well against the nozzle.



32. Secure the tappet plate with the screw. Tighten the screw until you feel resistance in the operation of the tappet plate and then loosen the screw so that the tappet plate can move freely and without resistance.





33. Install the tappet plate spring.



34. Screw on the air hose.



35. The engine is once again ready for use.



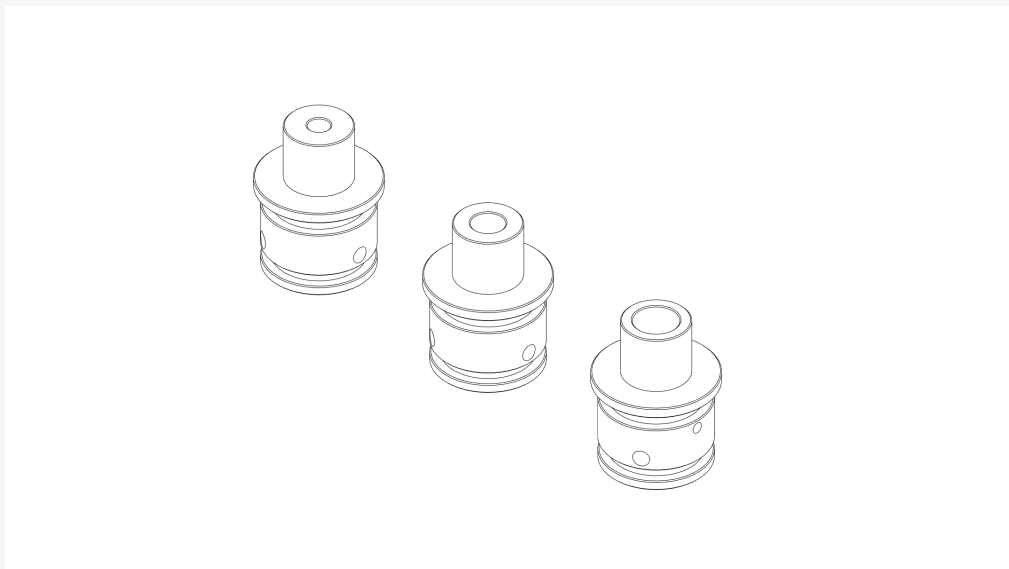
## Poppet Replacement



## What poppets are available?

There are three variants of poppets with different flow diameters:

- $\varnothing 2$  mm
- $\varnothing 3$  mm
- $\varnothing 4$  mm



## How does a reduced-flow poppet work, and when should it be replaced?

A reduced-flow poppet limits the amount of air propelling the BB while maintaining the proper operating pressure of the PULSAR D engine. These poppets are ideal for replicas used in CQB games and in regions with very low FPS limits, even as low as 0.5 J.

Replacing the poppet is necessary when you need to reduce the replica's muzzle velocity but cannot do so because you have reached the lower operating pressure limit of the PULSAR D engine. Using a reduced-flow poppet allows you to increase the operating pressure while maintaining a lower power limit for the replica.

## Which poppet should you choose?



- $\varnothing 4$  mm – perfect for DMRs, assault replicas, and support replicas where maximum effective range is a priority
- $\varnothing 3$  mm – an ideal compromise for players aiming for power levels between the limits for assault and CQB replicas
- $\varnothing 2$  mm – best suited for CQB games where the replica's power must be reduced to an absolute minimum

## Poppet replacement and list of required components:

- Selected poppet with the appropriate flow

✓ The PULSAR D engine comes with a  $\varnothing 4$  mm poppet pre-installed. Available variants include:

- $\varnothing 2$  mm
- $\varnothing 3$  mm
- $\varnothing 4$  mm

- Clean, fine brush for applying grease
- Tool for unscrewing the nozzle guide
- Balystik Premium Grease – Pneumatic or Gun Sav by TechT

## Optional tools and materials:

- Paper towels
- Clean, thicker brush for cleaning components
- Container for cleaning parts
- Plastic tweezers for removing and installing o-rings
- Degreasing agent for all parts, e.g., extraction gasoline (must not damage o-rings)

1. Disassemble the PULSAR D engine from the replica.

2. Prepare the components shown in the photo.



3. Remove the tappet plate spring.



4. Unscrew the screw securing the tappet plate.



5. Remove the tappet plate.





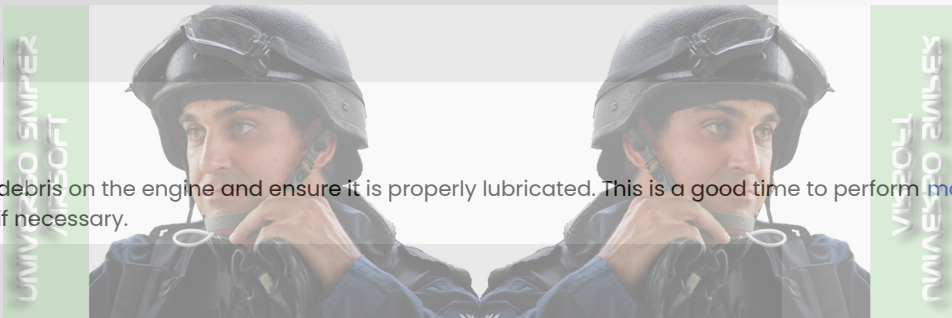
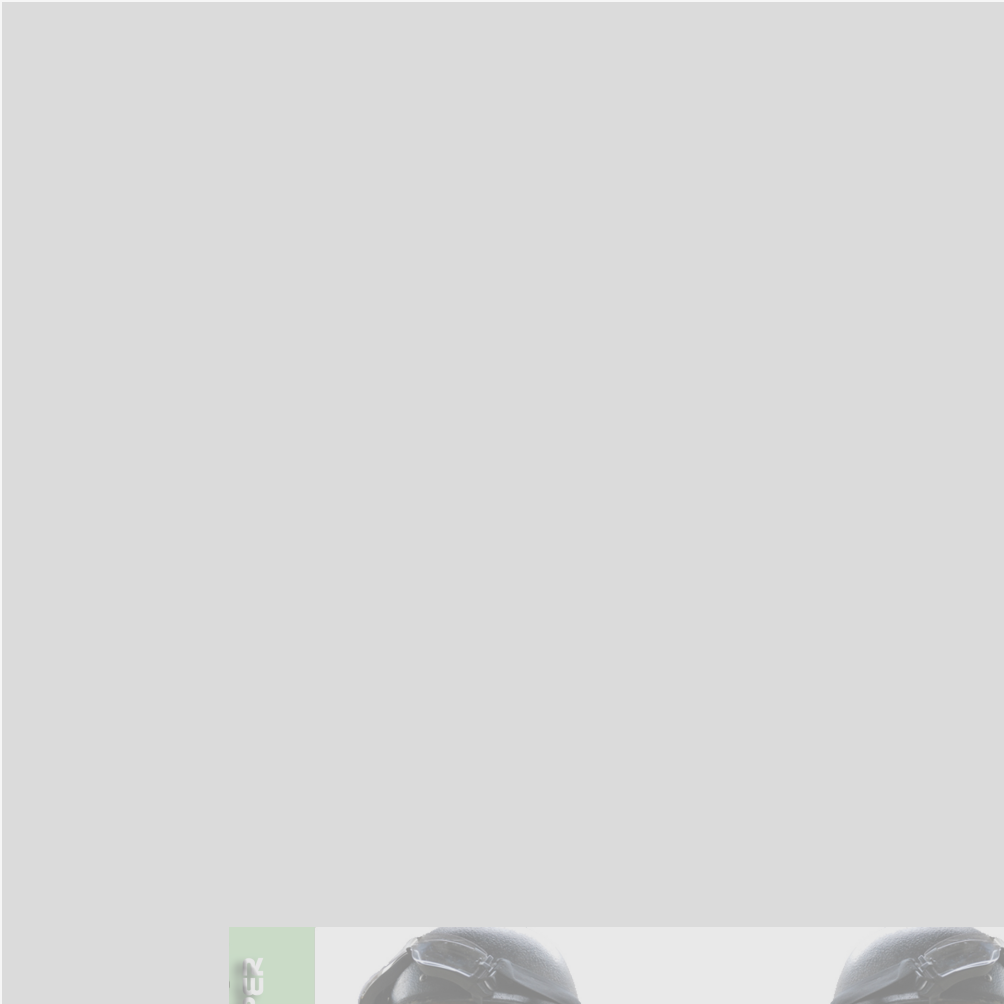
6. Remove the nozzle.



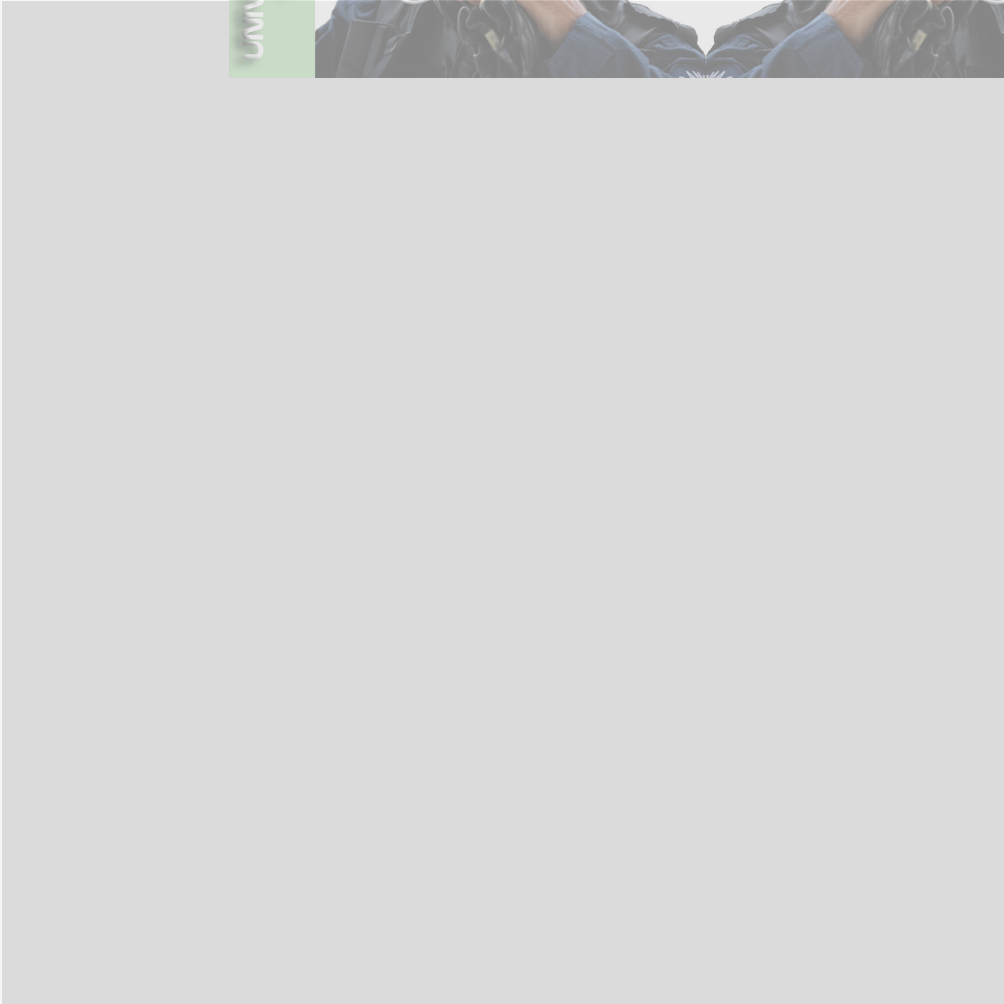
7. Use the tool attached to the PULSAR D to unscrew the nozzle guide. If you don't have the tool, use circlip pliers or needle-nose pliers.



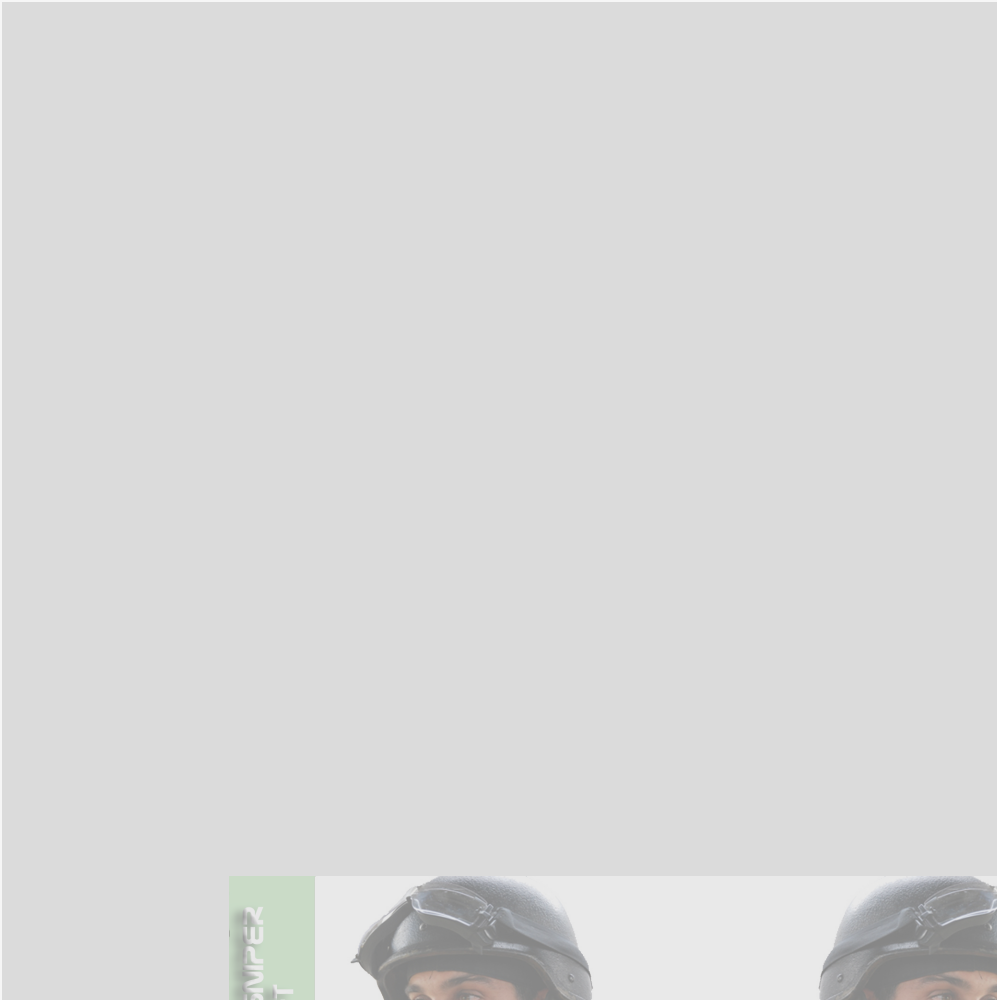
8. Using tweezers or the back end of a brush, gently remove the poppet from inside the body. Set the poppet aside.



9. Check if there is any debris on the engine and ensure it is properly lubricated. This is a good time to perform [maintenance](#) and lubricate the engine if necessary.



10. Check the visual condition of all seals and o-rings. If necessary, replace them with the ones included in the repair kit.

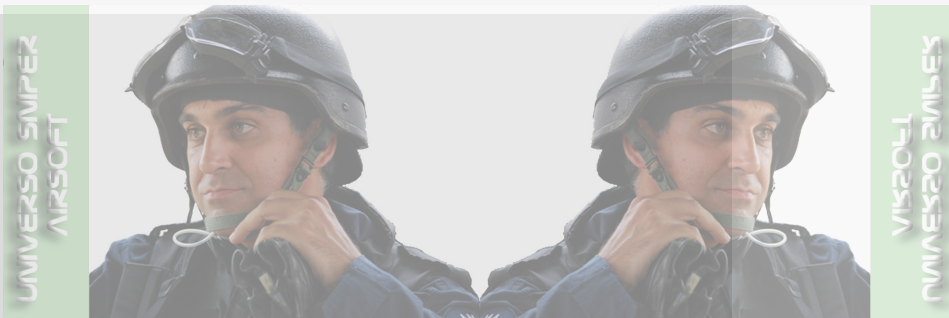
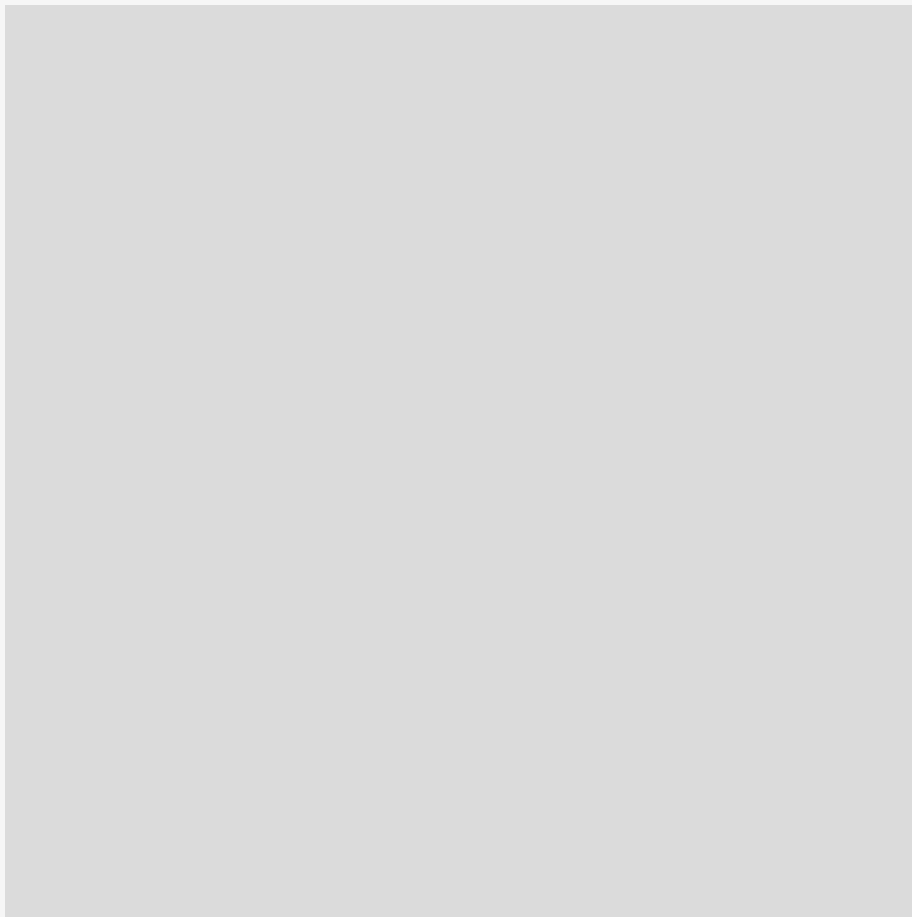




11. Prepare the new poppet for installation by applying a thin, even layer of grease. The areas to grease on the poppet are:



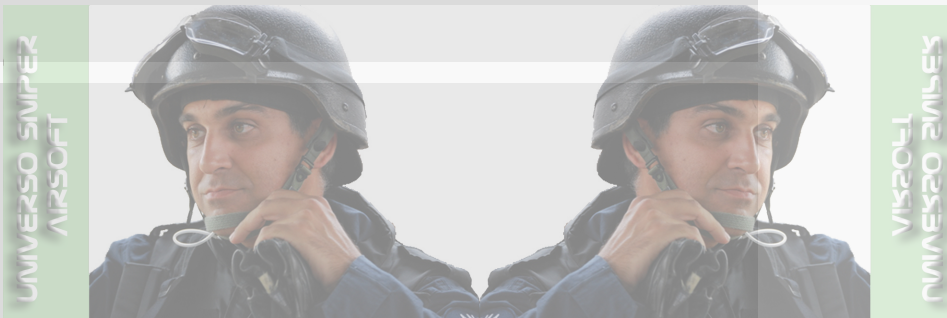
a. Both o-rings. Be careful not to leave any grease on the flat rear surface of the poppet.



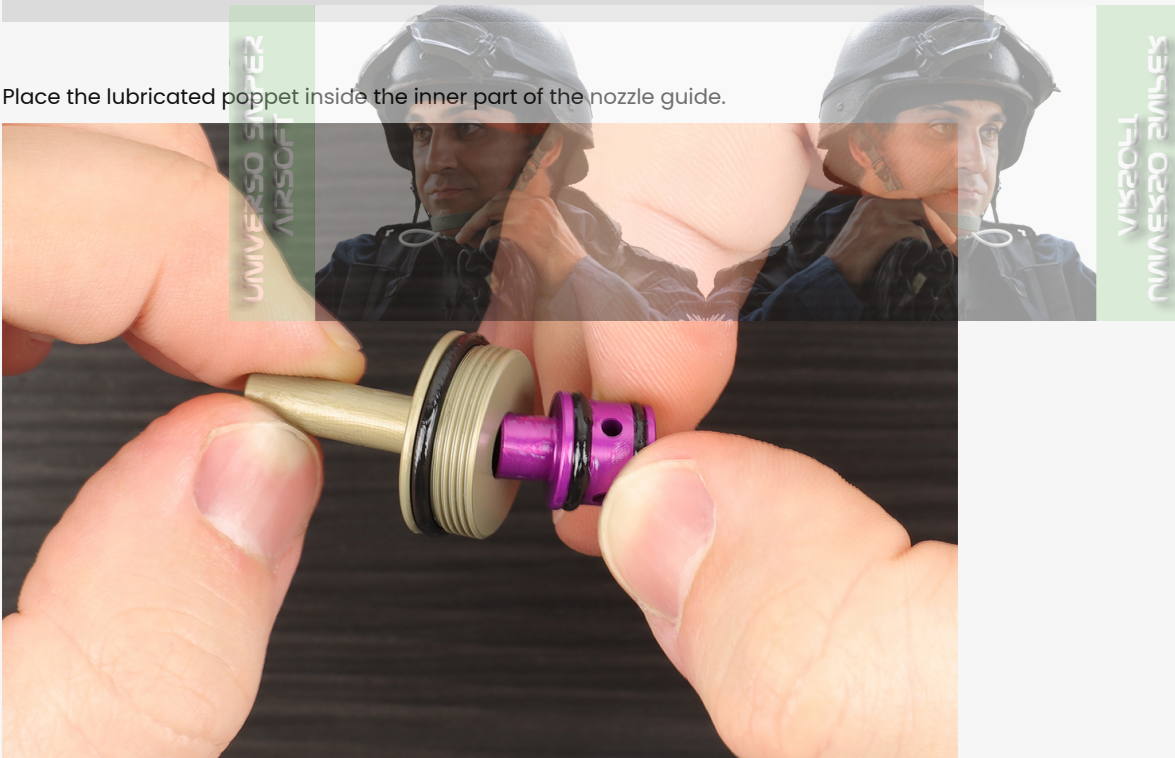
b. The tapered surface of the poppet.







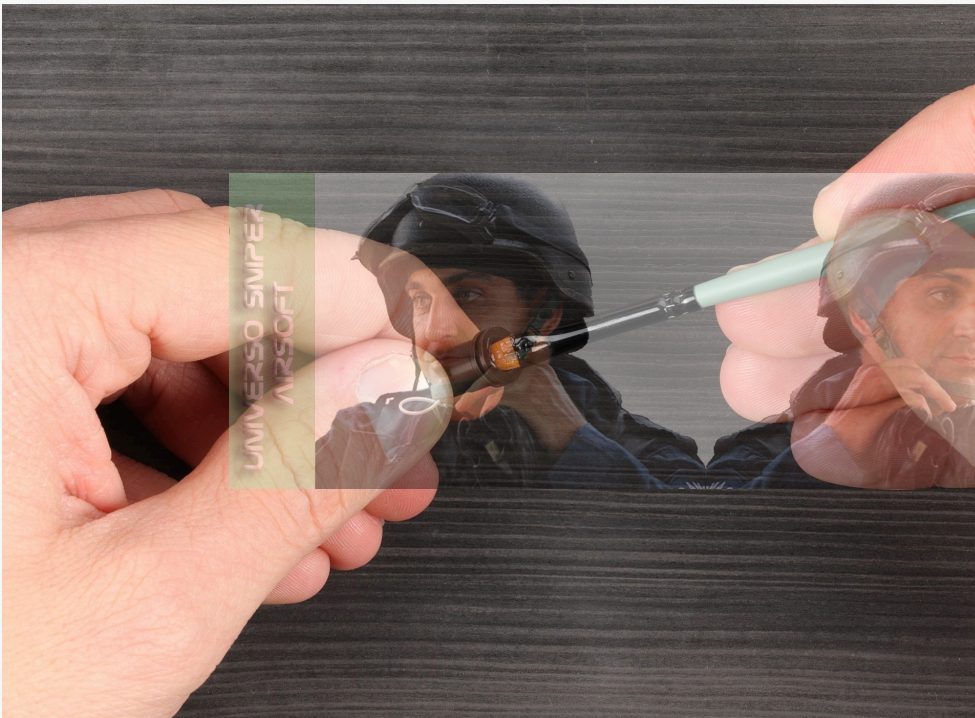
13. Place the lubricated poppet inside the inner part of the nozzle guide.



14. Screw the nozzle guide into the engine body using the tool.



15. Lubricate the inside of the nozzle where the o-ring is located.





16. Install the nozzle onto the nozzle guide.



17. Lubricate the surface where the tappet plate moves.



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18. Install the tappet plate. Press it firmly against the nozzle.



19. Secure the tappet plate with the screw. Tighten the screw until you feel resistance from the tappet plate, then loosen the screw slightly so that the tappet plate can move freely without any obstruction.

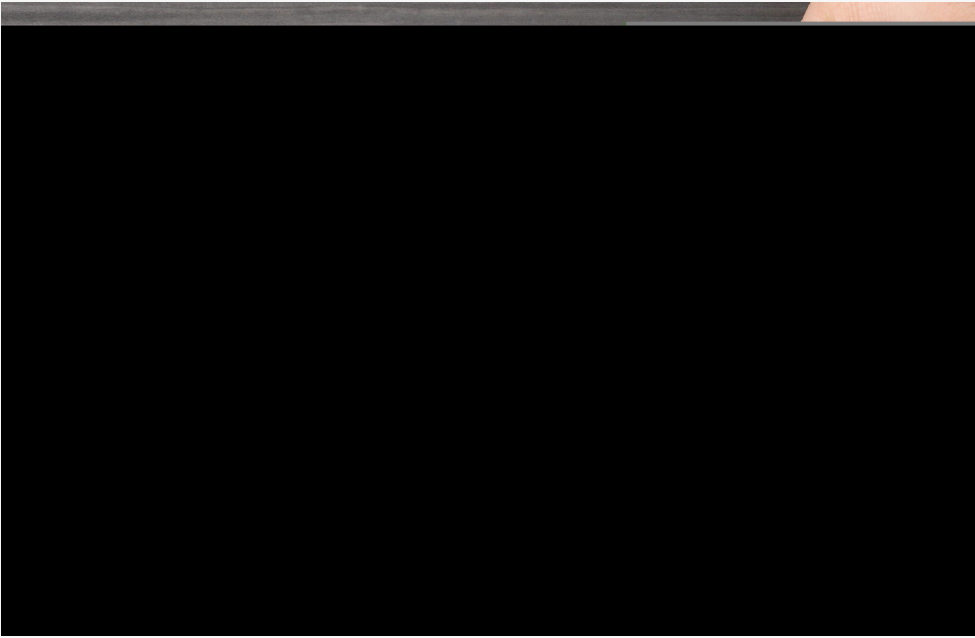


20. Check if the tappet plate can move freely forward and backward. If necessary, tighten or loosen the screw to ensure smooth movement.





21. Install the tappet plate spring.



22. Screw in the air hose.



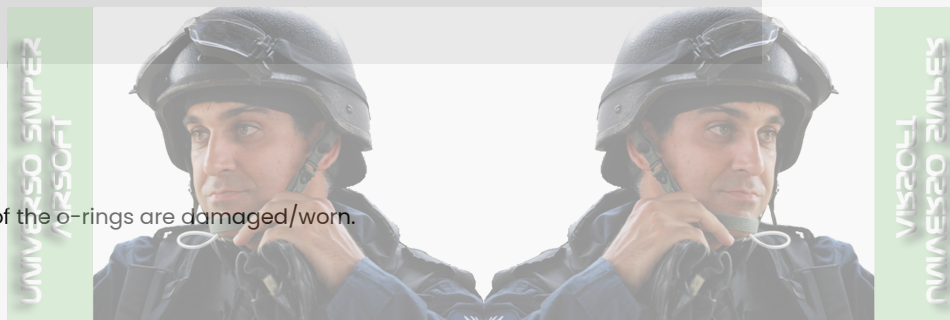
23. The engine is ready for reuse.

## Repair Kit

Use the repair kit if any of the o-rings are damaged/worn.

Contents:

- O-ring 16x1.5 x1
- O-ring 8x1 x2
- O-ring 6x1 x1
- O-ring 4x1 x1



## Troubleshooting

Low FPS

- **Misaligned replica**

1. Check the position of the nozzle relative to the barrel. To do this, we recommend using either an endoscopic camera or a flashlight.

**⚠ Warning**

Remember to disconnect the pressure and the power supply from the replica for the time of observation for safety reasons.

2. If the nozzle is not in the center of the barrel, you need to do an adjustment of the gearbox position in the replica, as deviations from the axis can cause leaks.

- **Leak at the hop-up bucking/nozzle connection**

1. Plug the barrel with your finger and fire one shot with the pressure connected in **Single Solenoid Valve Engine** mode. Make sure there is no bullet in the chamber and the magazine is not inserted. After firing, the nozzle should remain closed and pressure should remain in the barrel until you remove your finger from the barrel muzzle.
2. If you hear a hiss of air coming from the chamber, it means that the hop-up bucking is not properly sealing with the nozzle. In such a case, follow the steps below to see if they have solved the problem
  - a. Make sure the hop-up chamber is pressed against the face of the gear – we recommend using 8 x 1 mm o-rings placed on the barrel in front of the hop-up chamber.
  - b. Use a longer nozzle.
  - c. Use different hop-up bucking.

- **Bent air hose in gearbox**

1. Open the gearbox and check if the air hose is bent/broke.
2. Connect pressure and check for air hissing around the hose. If so, tighten the air hose to the engine body.

- **Non-optimal engine settings in GCS**

1. Restore the default settings of the HPA Engine.
2. Increase Main Valve Time.



There is no nozzle cycle – TP NM warning pops up in GCS

- **Shots fired without pressure connected**

1. If your replica fires correctly, you can either ignore the error or delete it by clearing the DTC.
2. If the problem persists, first check if the wires are connected in the correct order to the solenoid valves.
3. The engine works correctly from about 60–70 PSI. If there is no full nozzle cycle, you can increase the pressure on the regulator and reduce the nozzle cycle time. If this does not help, you can install a tappet plate spring with a smaller force.
4. Check for the correct connection of the solenoid valves' wires with the unit. Improper connection will result in incorrect operation of the nozzle.

Unstable FPS

- **Broken tappet plate spring**

Replace the tappet plate spring.



1. Disassemble the replica and remove the gearbox.

2. Open the gearbox.

3. Remove the damaged tappet plate spring and make sure that no part of it is left in the gearbox – a part of the spring left behind may cause malfunction of the tappet plate.

4. Install a standard nozzle tappet plate spring from an AEG replica – we suggest using soft springs e.g. Retro Arms.

5. Reassemble the gearbox and the replica.

#### • **Hop-up bucking collar curls up**

1. If you have an EON hop-up chamber, use an offset clip.

2. Use different hop-up bucking.

3. Use a shorter nozzle.

### Sudden drop in replica accuracy – scattering of BBs

#### • **Broken tappet plate spring**

Replace the tappet plate spring.

1. Disassemble the replica and remove the gearbox.

2. Open the gearbox.

3. Remove the damaged tappet plate spring and make sure that no part of it is left in the gearbox – a part of the spring left behind may cause malfunction of the tappet plate.

4. Install a standard nozzle tappet plate spring from an AEG replica – we suggest using soft springs e.g. Retro Arms.

5. Reassemble the gearbox and the replica.

### Muffled firing sound – significantly different from the regular one

#### • **Broken tappet plate spring**

Replace the tappet plate spring

1. Disassemble the replica and remove the gearbox.

2. Open the gearbox.

3. Remove the damaged tappet plate spring and make sure that no part of it is left in the gearbox – a part of the spring left behind may cause malfunction of the tappet plate.

4. Install a standard nozzle tappet plate spring from an AEG replica – we suggest using soft springs e.g. Retro Arms.

5. Reassemble the gearbox and the replica.

#### • **Hop-up bucking collar curls up**

1. If you have an EON hop-up chamber, use an offset clip.

2. Use a different hop-up bucking.

3. Use a shorter nozzle.

### No BB feed

#### • **Broken tappet plate spring**

Replace the tappet plate spring.

1. Disassemble the replica and remove the gearbox.

2. Open the gearbox.

3. Remove the damaged tappet plate spring and make sure that no part of it is left in the gearbox – a part of the spring left behind may cause malfunction of the tappet plate.

4. Install a standard nozzle tappet plate spring from an AEG replica – we suggest using soft springs e.g. Retro Arms.

5. Reassemble the gearbox and the replica.

#### • **Excessively low operating pressure**

In some cases, (e.g. because of low outside temperature or replacing the tappet plate spring with a harder one), it may be necessary to set a higher operating pressure, which will result in a higher firing rate. You will then need to shorten the Main Valve Time (DP) to achieve lower FPS. Follow these steps.

1. Increase the pressure on the regulator until the BBs are properly fed.

2. Decrease the Main Valve Time (DP) until the desired muzzle velocity is achieved.

#### • **Wrongly connected solenoid valves to the unit**

Connect the wires to the unit according to the manual, paying special attention to the correct order of connection. Connecting them in reverse will result in incorrect operation of the nozzle and engine.



Nozzle does not return to the front position when it is depressed

- **Broken tappet plate spring**

Replace the tappet plate spring.

1. Disassemble the replica and remove the gearbox.
2. Open the gearbox.
3. Remove the damaged tappet plate spring and make sure that no part of it is left in the gearbox – a part of the spring left behind may cause malfunction of the tappet plate .
4. Install a standard nozzle tappet plate spring from an AEG replica – we suggest using soft springs e.g. Retro Arms.
5. Reassemble the gearbox and the replica.

## FAQ – Frequently Asked Questions

### Which Hop-Up bucking should be used with the PULSAR D engine?

Everything always depends on the chamber, the power of the replica and the BBs used. In general, we recommend testing individually in your configuration, because there is no rule that any bucking will always work. From our experience, most often such as these work correctly:

- Maple Leaf Mr. Hop (rubber version)
- Madbull Blue
- TNT Black with nub
- Poseidon Air Cushion (after modification)
- G&G green
- 4UAD 4QUANTUM FRICTION PRO-HIGH
- LayLax PROMETHEUS Straight Chamber Hop Up Bucking Soft (Blue)
- others

We do not recommend using silicone Hop-Up buckings with PULSAR engines. Silicone buckings have lower resistance to friction and wear, causing them to wear out faster. Additionally, silicone tends to change its properties in extreme temperatures, which negatively affects the consistency of BB spin.

### Which medium can I use for the power supply of the engine?

You can safely use high pressure air. Bear in mind the use of CO2 may cause permanent damage to the device, which is not covered by the warranty.

### What is the air hose thread?

M5 thread 0.8 mm pitch.

### What is the nozzle length installed in the engine?

The PULSAR D engine comes factory-equipped with a 21.25 mm long nozzle.

### Do all IGL air hoses fit the engine?

Probably not, all engines on the market have inch threads. Our air hose is robust enough due to the fact that a bolt-on threaded end has been used in it, and there is no need to replace it with IGL, as with other engines.

### Is the PULSAR D engine closed-bolt or open-bolt?

The PULSAR D is a dual solenoid valve engine and operates in a closed-bolt system, and optionally in an open-bolt system.

### How much maximum pressure can I set with the PULSAR D engine?

The engine is designed to operate with a maximum pressure of 140 PSI.

### What regulators are compatible with PULSAR D?

PolarStar MRS

Redline SFR

Wolverine STORM

### Fitting PULSAR D in a G&G Gearbox

- Tappet plate needs modification

Modify the tappet plate as shown in the photos below.







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## User Manual – TITAN II Bluetooth® EXPERT for V2 GB [HPA]

### ✔ Note

In case you have any difficulties while installing or using this product:

- contact us via <https://help.gatee.eu>
- send us an email: [support@gatee.eu](mailto:support@gatee.eu)
- join [GATE Airsoft Community Discord Server](#) ☞ Dołącz do serwera GATE Airsoft Community na Discordzie!

## Technical Specifications

The design and production of the device is based on harmonized standards.

<b>Solenoid Voltage Range</b>	5-8.4 V
<b>Operating Pressure</b>	60-140 PSI – high pressure only
<b>Gas Consumption</b>	For 90 PSI and 48 ci/0,8 l 300 bar/4500 PSI tank – 0.7 PSI per shot
<b>Dimensions (Length x Diameter x Height)</b>	102 mm x 25.4 mm x 38.5 mm



<b>Finished Product Weight</b>	90 g
<b>Operating Temperature Range</b>	min. -15° C, max. +50° C
<b>Relative Humidity</b>	≤ 80%

## Legal Notice

Please read the Legal Notice before operating your device and keep it for future reference. This document contains important terms and conditions with respect to your device. By using this device, you accept these terms and conditions.

## Exclusion of Liability

GATE Enterprise sp. z o.o. sp. k. is not liable for any damages, injuries or accidents of any kind resulting from the use of this product or airsoft gun with the product installed, including (but not limited to) incidental or special damages to airsoft gun, airsoft gun parts and batteries.

## Disclaimer

GATE Enterprise sp. z o.o. sp. k. takes no responsibility regarding compliance of the product with the requirements of any law, rule or airsoft restrictions pertaining thereto.

## Intellectual Property

Intellectual Property owned by GATE Enterprise sp. z o.o. sp. k., including (but not limited to) devices, accessories, parts, software, documentation, is proprietary to GATE Enterprise sp. z o.o. sp. k. and protected under Polish laws, EU laws and international treaty provisions. You may not violate the rights of the Intellectual Property and you will not prepare derivative works of or reverse engineer the device or software. No ownership in the Intellectual Property is transferred to you.

## GATE Limited Warranty Policy

GATE Enterprise sp. z o.o. sp. k. warrants that its Product is free from manufacturing and material defects at the date of purchase and for a period of two (2) years from the date of purchase and it is nonextendable. This Limited Warranty is conditioned upon proper use of Product by Purchaser.

1. This Limited Warranty is valid provided that the owner provides a proof of purchase and properly completed warranty form.
2. This Limited Warranty does not cover: (a) defects or damage (e.g. mechanical, thermal or chemical) resulting from accident, misuse (misinterpretation of the instructions), abuse, neglect, unusual physical, electrical or electromechanical stress, water immersion, repairs or structural modification of any part of Product, or (b) the Product that has its serial number removed or made illegible; (c) defects or damage from improper operation, maintenance or installation, (d) installation of the products.
3. Requests for warranty are processed as soon as possible, not exceeding seven (7) working days. The company's obligation under this Limited Warranty shall be limited to providing replacement of parts only.



### Note

The product warranty form is available here: <http://www.gatee.eu/warranty>.



## Product Disposal Instructions

The symbol shown here means that the product is classified as Electrical or Electronic Equipment and should not be disposed with other household and commercial waste at the end of its working life. The Waste of Electrical and Electronic Equipment (WEEE Directive 2012/19/EU) has been put in place to recycle products using best available recovery and recycling techniques to minimize the impact on the environment. Purchasers shall take any old electrical equipment to waste recycling public centres or points of sale.



## Product Compliance

### Declaration of Conformity

GATE Enterprise sp. z o.o. sp. k. hereby declares under its sole responsibility that PULSAR D HPA Engine is in conformity with the essential requirements of the following directive: 2011/65/UE.



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[Aún no le ha gustado a nadie](#)