

# Owners manual



## Version I.5/2020

This version replaces the previous versions with lower numbers.

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# Important terms

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helvenco AG assumes that the user has read, understood and accept the terms below before operating the engine. They are helpful for a better understanding of the product and useful to prevent and to minimize the risks.

helvenco AG only supplies OEM's and specialized aviation engine distributors that have sufficient technical knowledge to ensure the AERO products of helvenco AG are installed and serviced/repaired correctly.

helvenco AG emphasizes that the AERO product line is **not certified** and is made for experimental aircraft only. It is important the user understands that the engine can stall/or break with an emergency landing as a result; this can occur to injuries or death! The AERO1000/1500 should be used in open spaces only and during daylight. This product is neither covered by product nor public liability.

Who flies with a paramotor/experimental aircraft/ULM or even just starts it, automatically assumes all the risks inherent to these sports and all the responsibilities for damages to yourself or to third parties, accidents, injuries or death caused by using such products.

To fly with a paramotor/experimental aircraft/ULM always needs great attention. Be aware that you fly at your own risk; always check if your machine is in good condition before use.

helvenco AG doesn't assume any responsibility for damages caused by poor servicing or wrong assembly.

Any modification on the standard AERO product made by any party other than helvenco AG can make the product dangerous to be used and is on own risk.

Wrong mounted, bad balanced or unproportioned propellers can lead to serious damage of the AERO1000/1500 products.

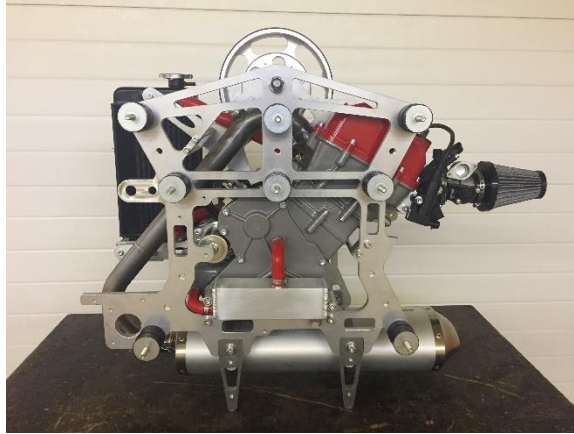
The engine can't be used for acrobatic maneuverings.

Don't use the AERO1000/1500 in bad weather conditions such as rain or snowfall.

Not limitative list of possible reasons leading to premature engine failures:

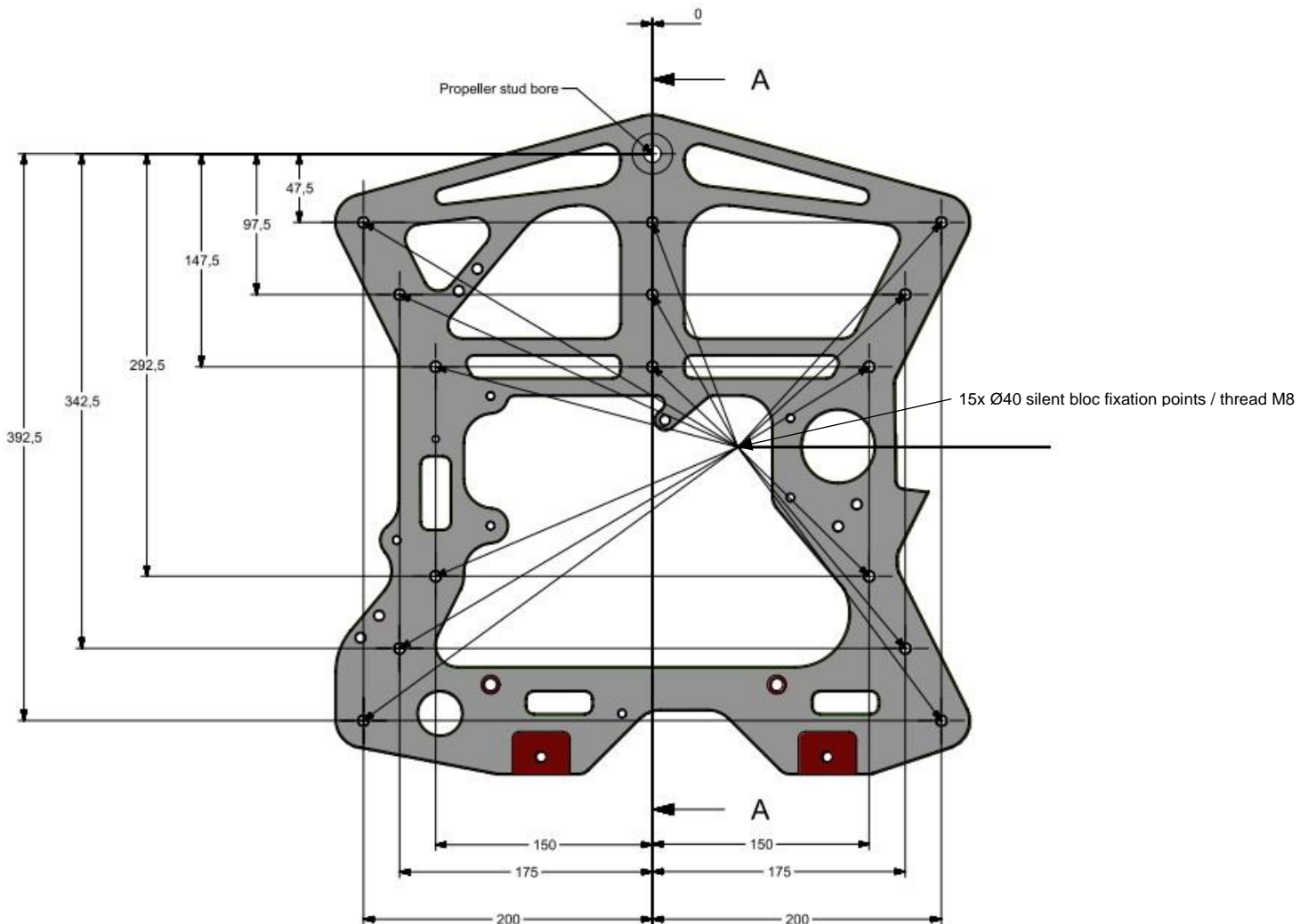
- Engine modifications not approved by helvenco AG.
- Carelessness, lack of servicing, accidents, installations or wrong maintenance.
- Accidental falls or engine drop or drop of its components.
- Improper use or misuse of the engine.
- Assembly of parts or components not specified for the engine use.
- Engine overheating or stop after long usage, beyond the term indicated by helvenco AG.
- Use of improper petrol or oils, presence of dirty parts or foreign bodies in the engine.
- Permanent/ too long running into the rpm limiter.
- Engine or parts deterioration because of improperly storage.
- Wrong engine assembly, including the use of not original helvenco AG parts.
- Damages to the engine caused by foreign bodies.
- Usage of wrong spark plugs.
- Not respecting the manual in general.

# System installation



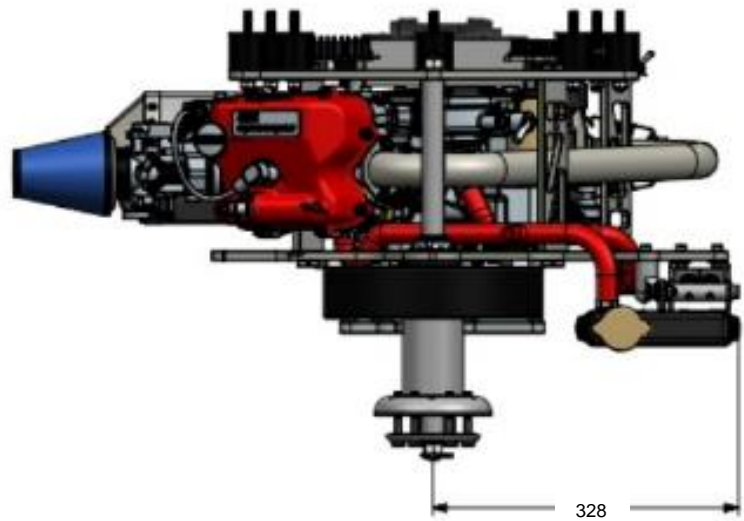
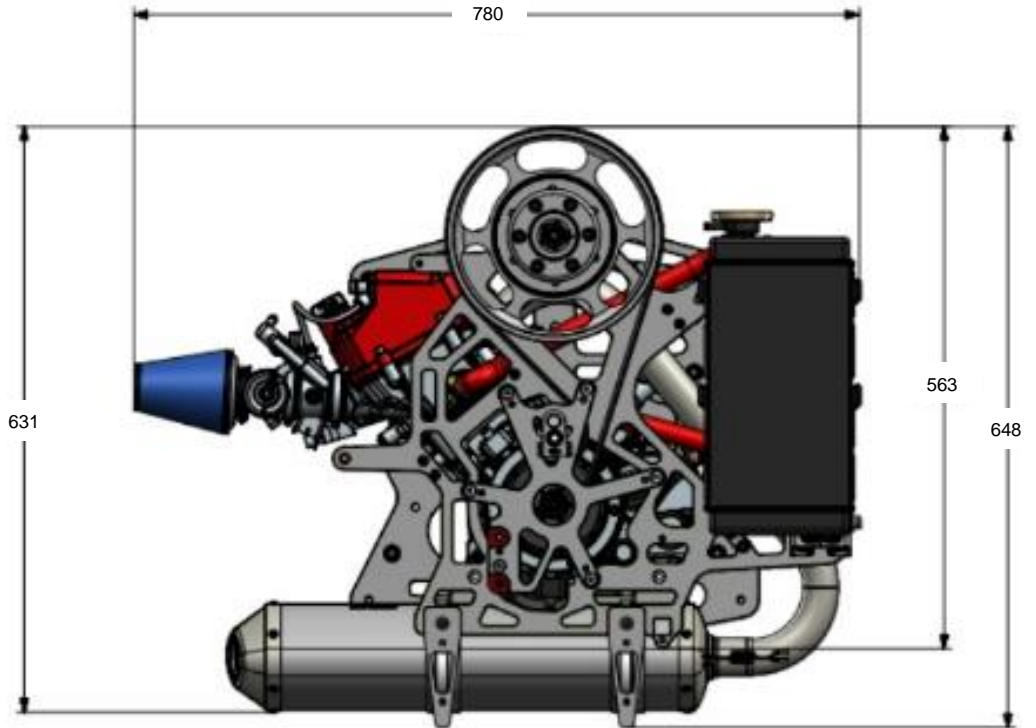
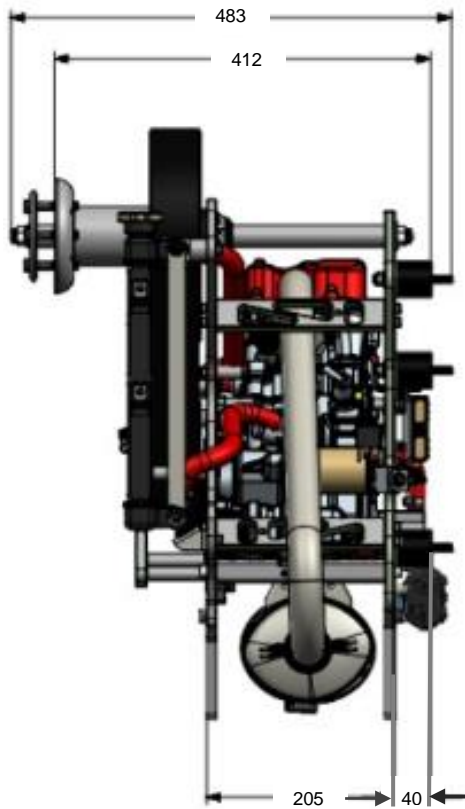
The system comes with 8 pre-installed silent blocks on the front plate. These are the fixation points to install the AERO1000 system on your vehicle! You can change the position of the silent blocks on the front plate. Below you find the dimension sheet!

The OEM must use an optional backup system (Ex. steel tie-wraps or tension strap) between the AERO1000/1500 system and the frame it is attached to. If not, the user must contact the OEM.



Part shall be fixed to Trike/Quad/ULM chassis with minimum 8 silentblocs  $\varnothing$  40 in 68° shore!

# System dimensions





# Engine preparation

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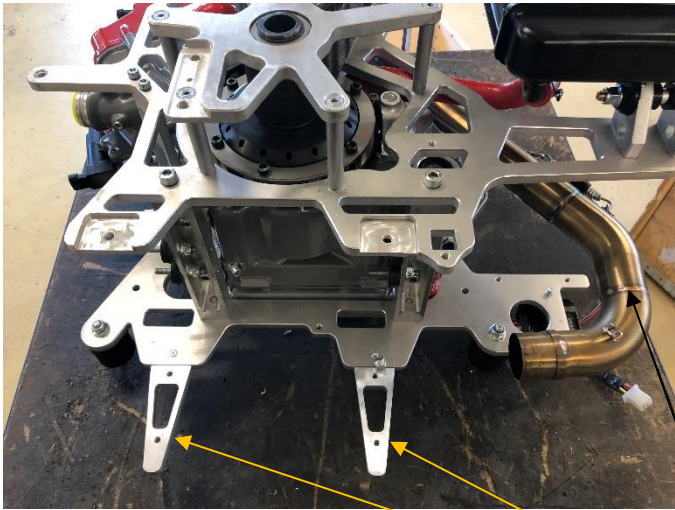


**Remove all plugs:**

- Intake port
- Exhaust port
- Breather tube

# Engine preparation

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Place the system on the table as shown.

Install the 2 feet and the exhaust manifold.



Screw on the 2 self-locking M6 nuts. Just tighten them a little bit so you can still turn the manifold by hand.

Tighten them correctly after installation of the exhaust muffler.

# Engine preparation

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Install the exhaust muffler.



Connect the 2 cradles with the silent blocks below the engine mounts and push the manifold into the exhaust muffler.

Tighten all 4x M6 lock-nuts



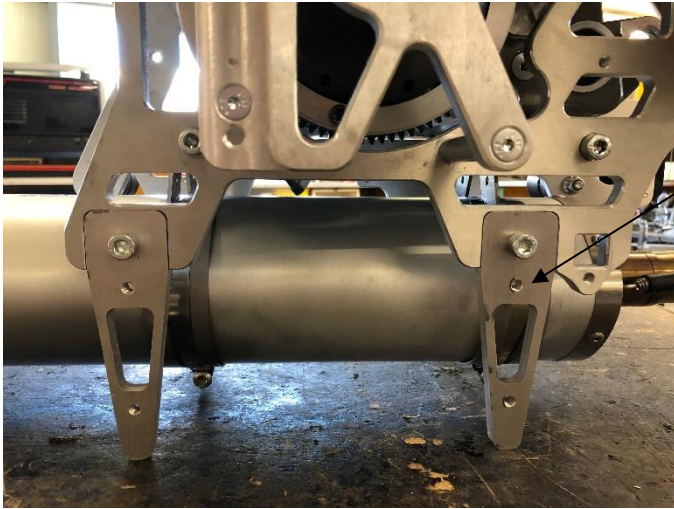
Add the 2 exhaust springs

Finally tighten the 2 M6 lock-nuts at the engine exhaust port.



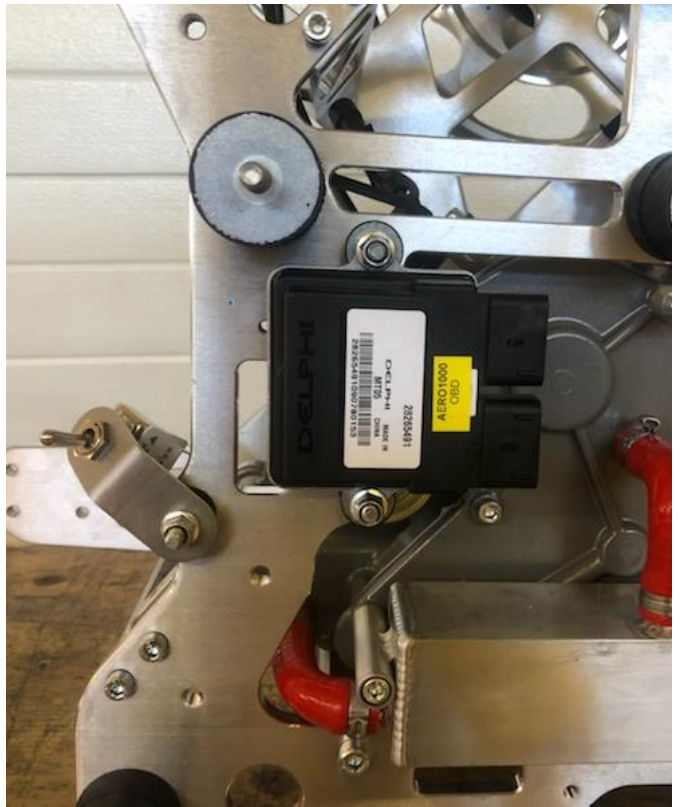
# Engine preparation

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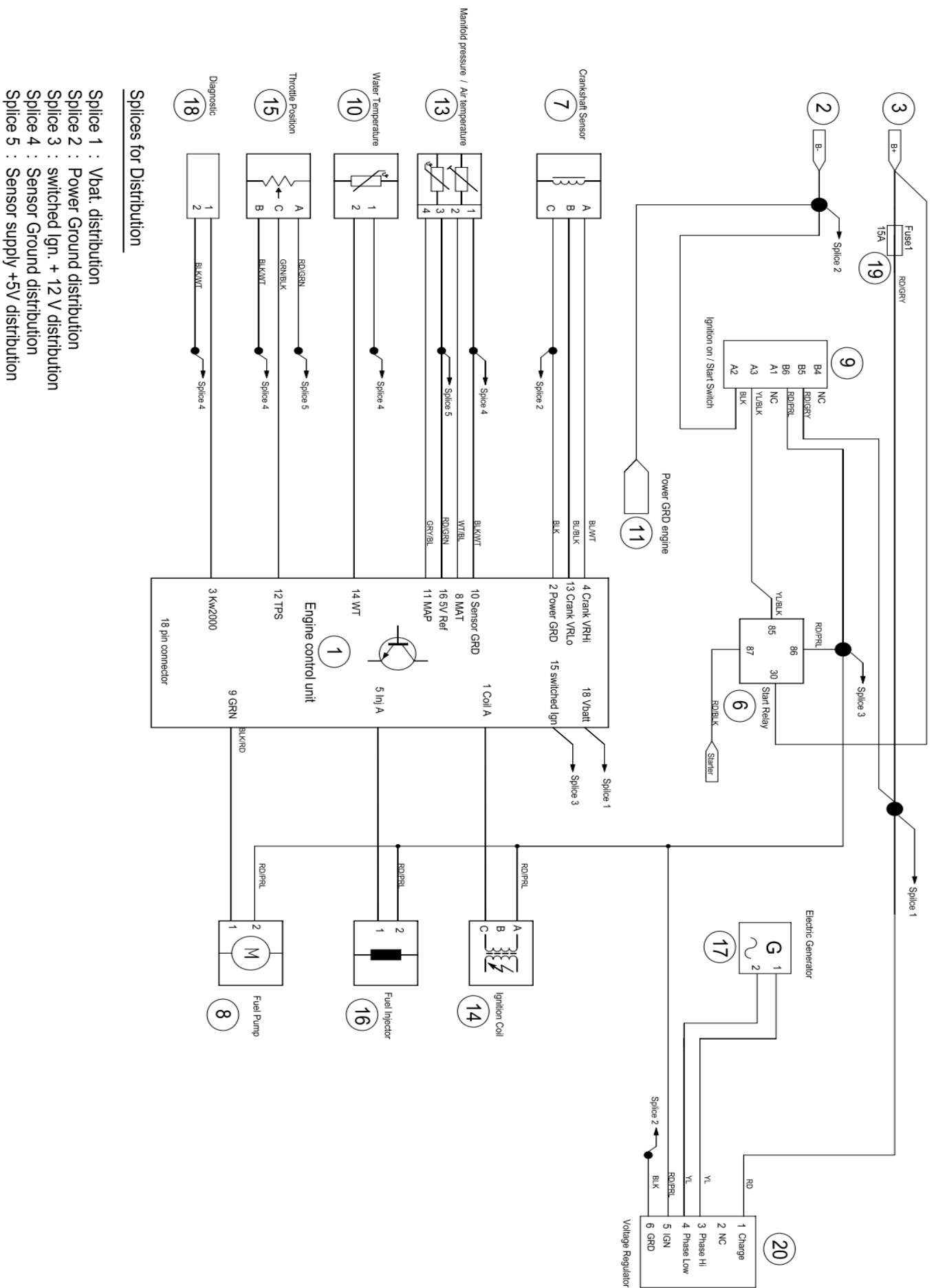
Install the other 2 feet. Now you can place the engine upright.

Once the engine is installed on the frame you can remove the feet.



We have prepared installation points for the start/stop switch and the ECU. You see them on the photos above. They are not installed!  
Don't install the starter relay on the engine frame. Fix it with a tie-wrap somewhere on the frame of the trike to avoid damage caused by vibrations.  
Depending to the installation setup you have the choice to go for our positions or to your own installation.

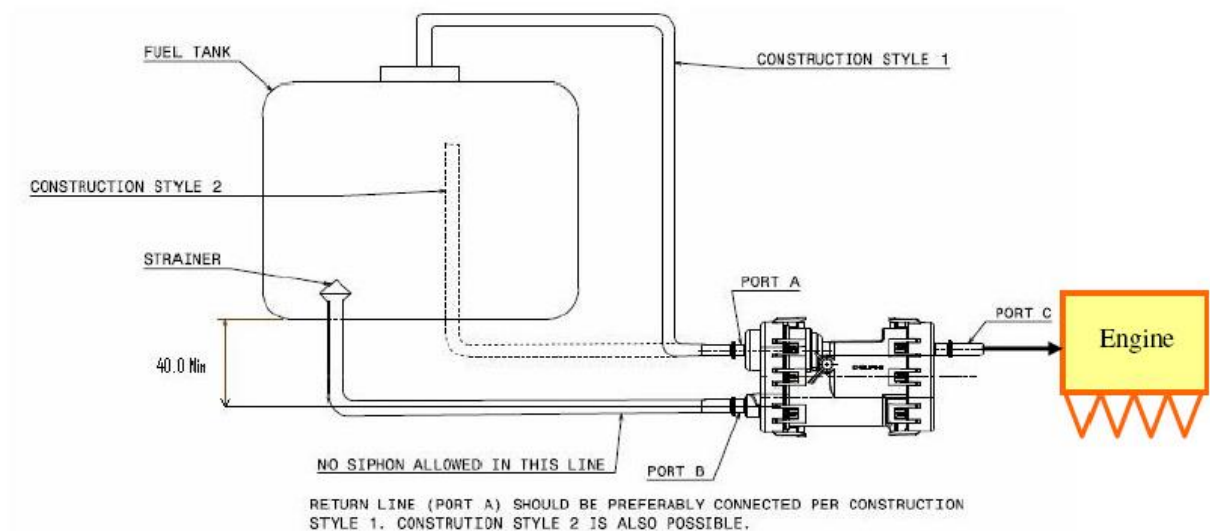
## Wiring diagram



# Fuel pump installation

## Self Regulated In Line Pump Installation guidelines

### ♦ Installation recommendations



**DELPHI**

### **The fuel pump isn't self-bleeding!**

Pump and all fuel hoses must be filled with fuel before running. Else the pump gets damaged.

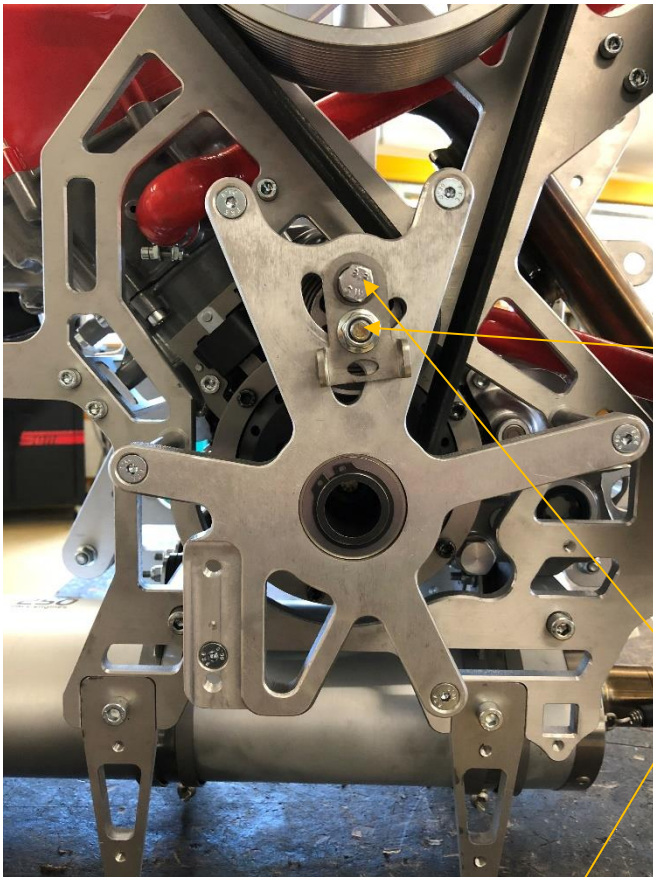
**The pump must be installed below the fuel tank in the shown orientation!  
To avoid engine stall, Port C must be higher or equal level with Port B!**

Only use the quick release connectors that came along with the fuel pump.

**The pump creates 2,5bar on the pressure line Port C!** Only use the supplied pressure hose and secure it on both sides with hose clamps to the connectors.

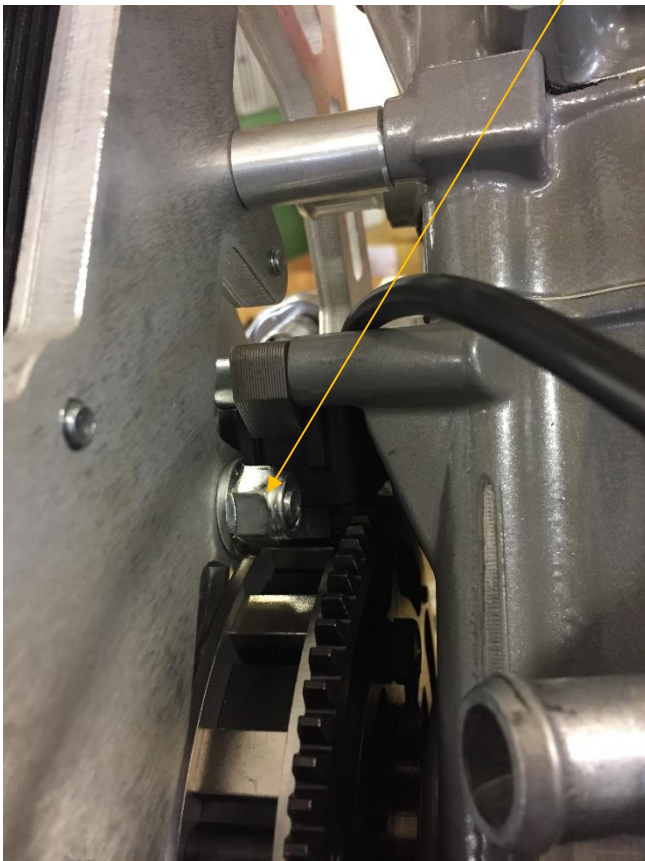
# Exchange of PTO pulley

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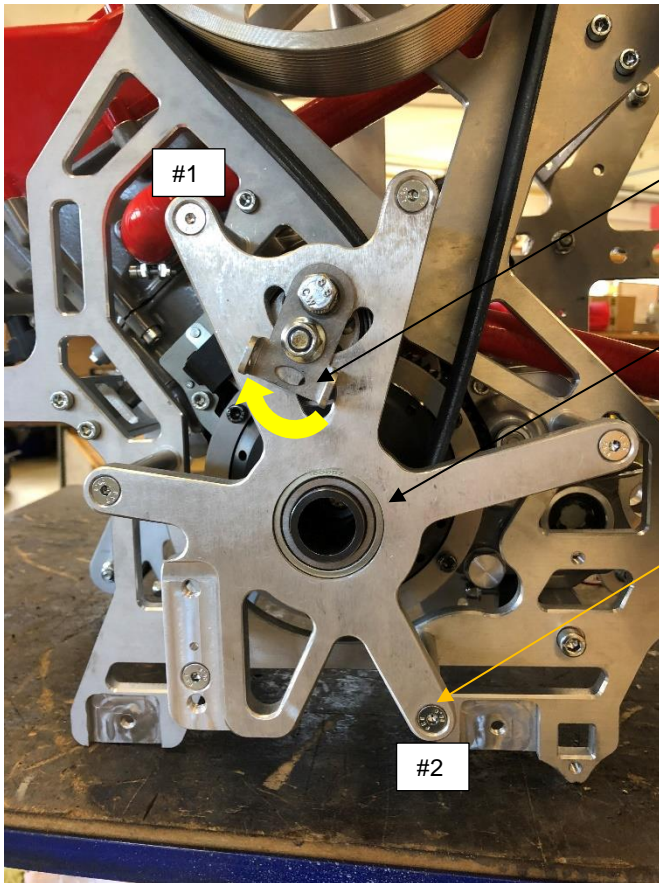
Unbolt the M8 self-locking nut  
(Don't remove)

Remove the M8 self-locking nut at the  
back of engine back plate.





# Exchange of PTO pulley



Release the belt tension by moving the belt tensioner lever.

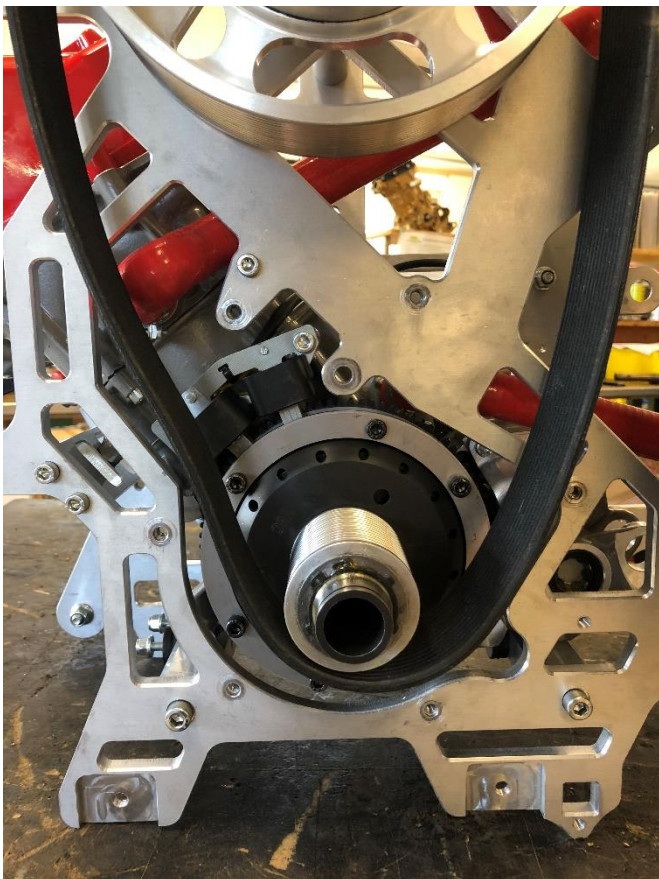
Remove the circlip and the distance shim from the PTO shaft.

Remove all 6x M6 screws from the PTO support plate.

## **ATTENTION!**

**Hold the distance sleeves when remove the 6x M6 screws else the will drop!**

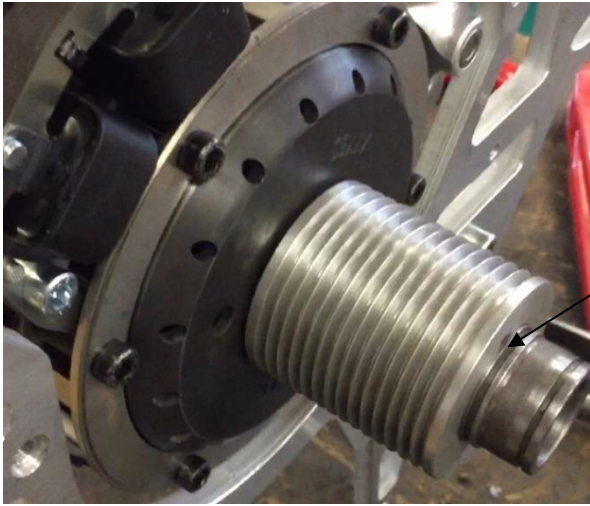
**At re-installation of the PTO plate:  
For correct outlining, always  
tighten first screw #1 & #2 before  
all others!**



Remove the PTO support plate incl. belt tensioner.

Remove the belt.

# Exchange of PTO pulley



Remove the circlip and the distance shim from the PTO shaft.



Remove the pulley and add the new one.

**ATTENTION!** For correct belt alignment mount the offset at the pulley to engine side.  
Always put **anti-seize grease** or **copper grease** on the PTO shaft before adding the pulley and PTO plate.



Re-mount distance shim and circlip.

Install the PTO support plate inclusive the belt tensioner.

Add the 6x M6 screws inclusive its distance sleeves.

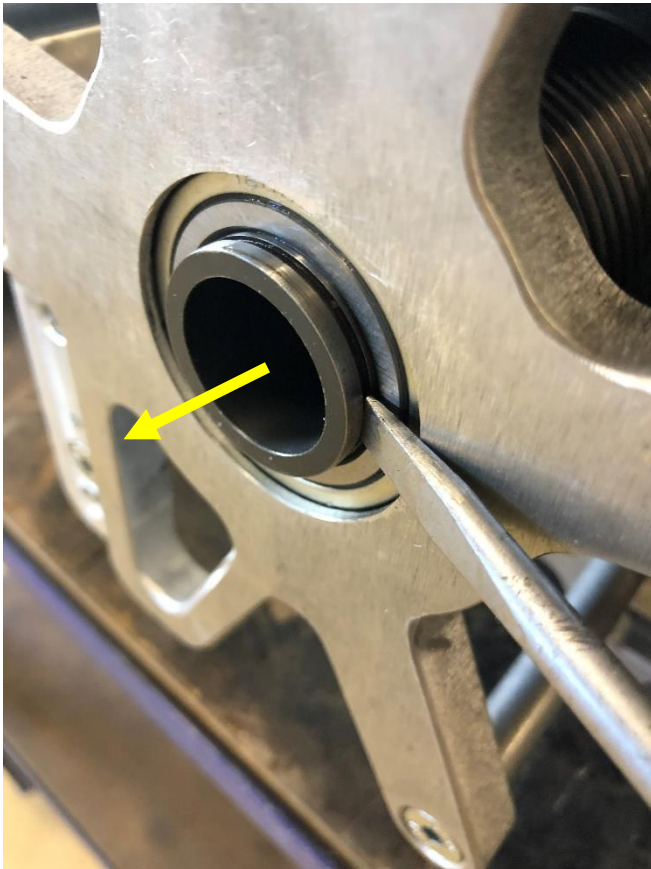
Fit the M8 self-locking nut at the back of engine back plate.

Tighten the 6x M6 with following torque: **10Nm / 7,37 ft-lb**

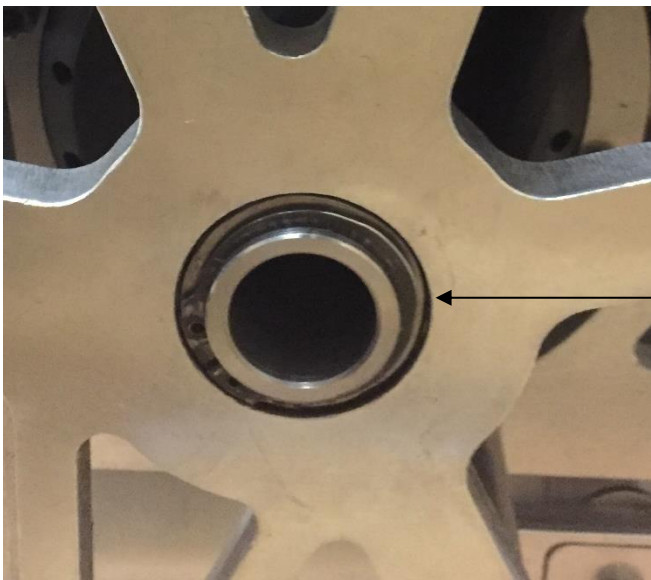


# Clutch drum position

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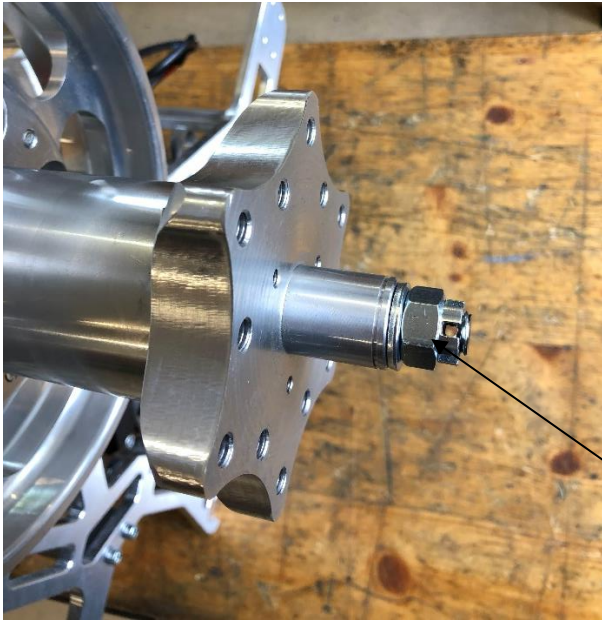
For correct alignment of the clutch drum use a screw driver and pull out the PTO shaft as shown. It should easily move  $\pm 0,5\text{mm}$  / 0,02 inches.



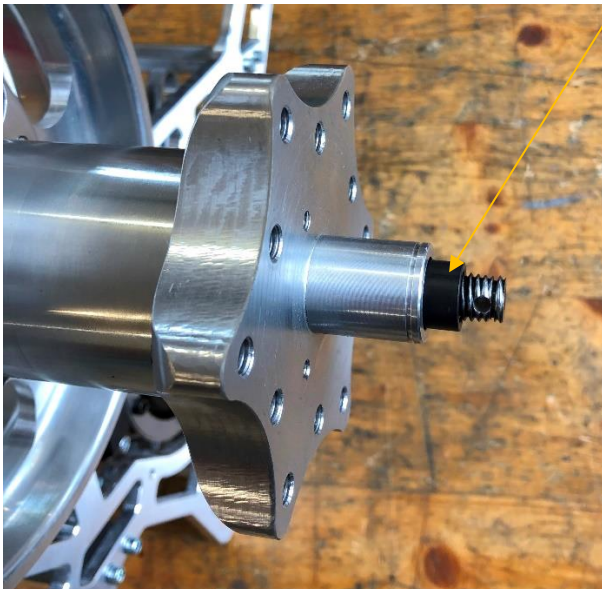
Now you can add the distance shim and the circlip.

# Exchange of propeller pulley

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Remove the pin, unbolt the M12 crown-nut.  
Remove washer and the black pressure bush.



Now it is possible to remove the complete propeller hub from the shaft by pulling.



# Exchange of propeller pulley



Remove the circlip and the distance shim on the back of the propeller hub.

**Attention! Circlip is curved; the circlip must give an axial force to the shim!**

(If wrong assembled the circlip is loose)



Push the propeller pulley away from the hub.

Now you can exchange the pulley.

## **ATTENTION:**

**Remove the 6 rubbers from the old pulley and install them into the new one.**

**Lubricate the rubbers and the bolts before assembly by using white grease.**

Push the new pulley on the hub!

**The bolts must be positioned into the rubbers!**

Re-mount the distance shim and the circlip.

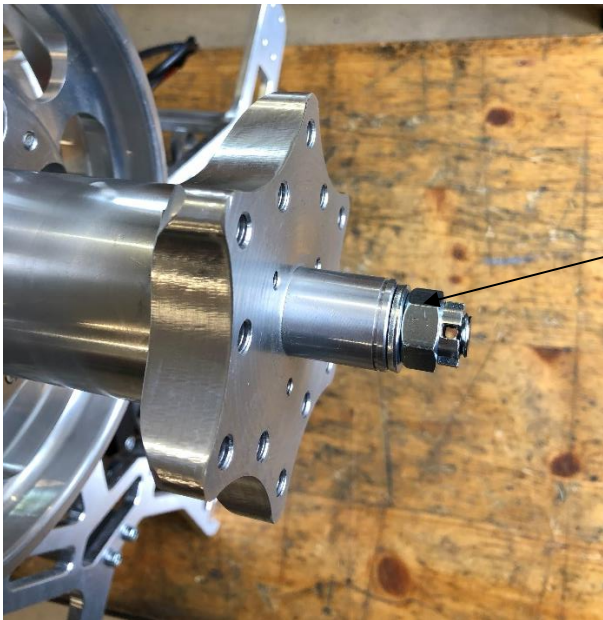
**Ensure the circlip is correctly fixated into the groove!**

# Exchange of propeller pulley



Push the propeller hub back on the propeller shaft.  
Use white grease to lubricate the inner ring of the oil seal before mounting.

**ATTENTION:**  
Don't forget to install the black distance sleeve into the hub before adding the shim and the M12 crown-nut



Tighten the M12 with following torque:  
**40Nm / 30 ft-lb**

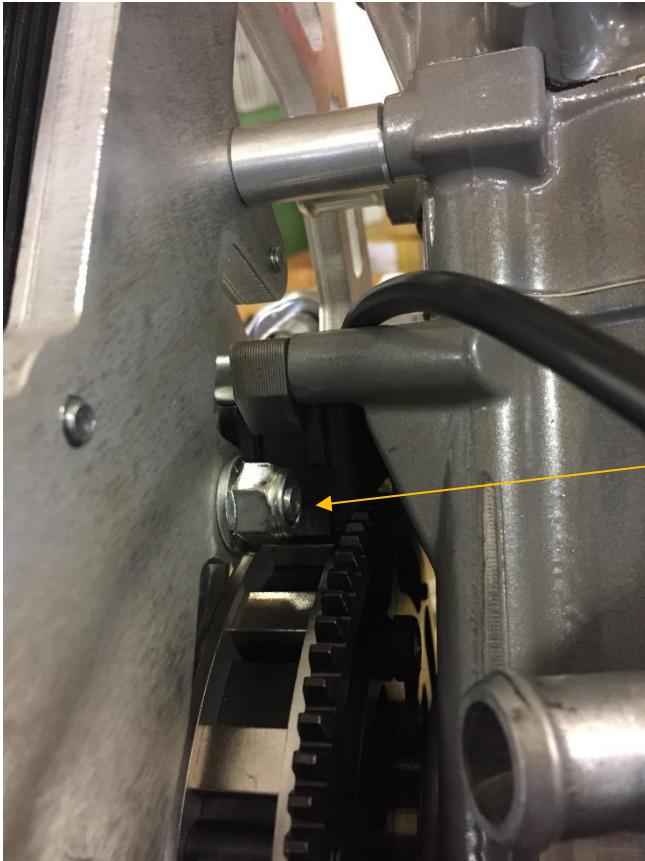
Turn the nut for- or backwards until one of cut-outs of the crown-nut is in line with the hole in the stud to place the pin.



Install the pin as shown.



# Belt tension



Place the M8 self-locking nut at the back of engine back plate. Don't tighten it yet.



Use a screw driver and place it into the tensioner lever as shown.

Push the lever down to tighten the belt. (The tension is OK when the belt in the center between both pulleys can be twisted between 90° & 45°)

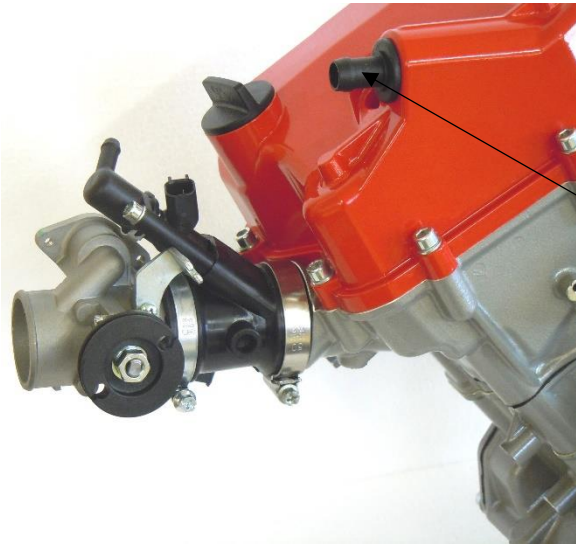
Once the belt tension is set tighten the M8 lock-nut.

Remove the screw driver and tighten the M8 bolt with the self-locking nut on the back plate.

Tighten the M8 with following torque:  
**24Nm / 17,7 ft-lb**

# EFI installation guide

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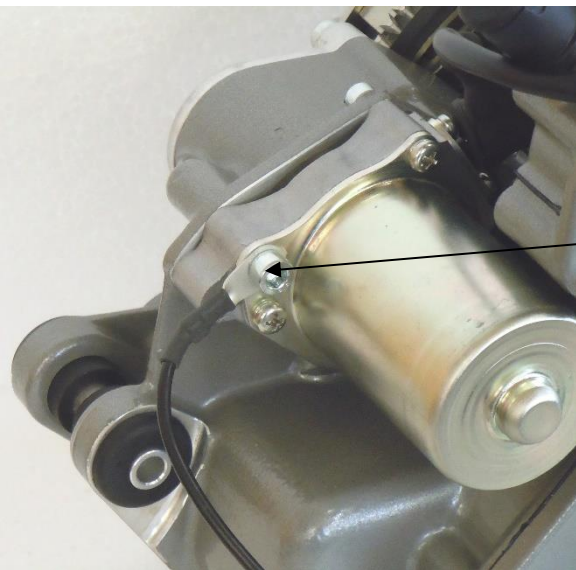


Push the throttle body on the intake port and tighten the clamp. (Use the clamp from the carb rubber)

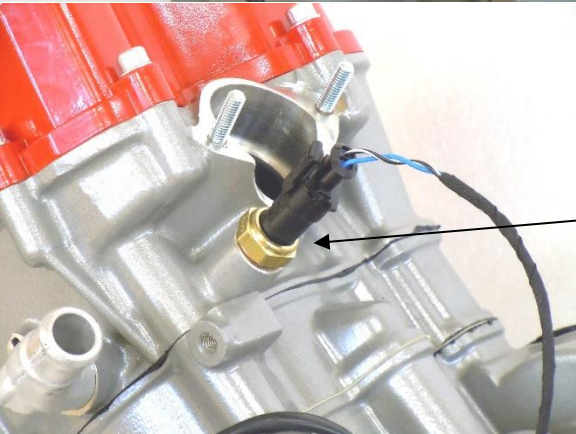
Put on the air filter on the throttle body and use the supplied hose to connect the engine breather tube with the air filter.

Cut the tube to correct length.

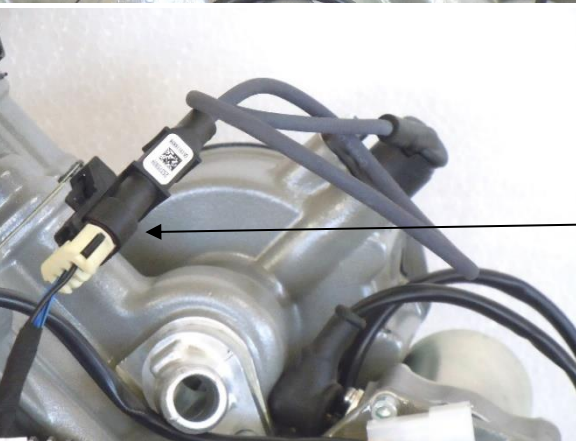
**ATTENTION: Be sure there is no blocking in this breather tube to avoid engine failure!**



Connect the engine ground cable to the engine or the aluminium frame.



Connect the water temperature sensor.

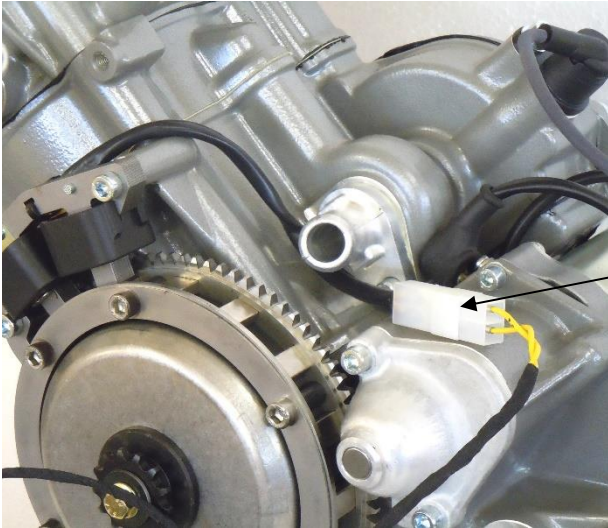


Connect the crank trigger sensor.



# EFI installation guide

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Connect the generator stator to the wiring harness.

**It's absolutely necessary to have a full equipped generator containing all 16 magnets.** (Otherwise the battery will not charge what will cause the engine to stop)



Connect the injector nozzle, throttle position sensor, MAP sensor and the ignition coil to the wiring loom.



Install the ignition coil as shown.  
Use the M6x40mm screw and tighten it with following torque: **10Nm / 7,37 ft-lb**

# Start-up

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## OIL:

Break-in: Fill in **0,9l / 0,23 gal** helvenco W-001 racing oil 0W30

**Note:** To avoid overfill, it is better to start with **0,7l / 0,18 gal** and add oil after first idle run when necessary.

Normal use: See service plan

## Coolant:

Fill the radiator with  $\pm$  **0,7l / 0,18 gal** of antifreeze coolant.

## Fuel:

Use unleaded fuel with minimum RON 95 octane or alternative Avgas 100LL

## Battery:

Only use 12V lead batteries with minimum 4Ah! Ideally we recommend a 12V-8Ah (type: YTX9-BS) or similar!

## Knowledge:

Although the battery is charging during engine run, it is recommended to charge it before every flight (Reason: The battery always discharge itself slowly)

## First start (after oil fill):

Starting the engine is done by placing the metal switch in the middle position and wait for 5 seconds to allow the pump to build up sufficient fuel pressure. Then proceed pushing the switch until the engine runs. If it is new (and after each oil service) let it idle run (**DO NOT REV IT!**) for about 15 seconds; then turn it off and check the oil level again.

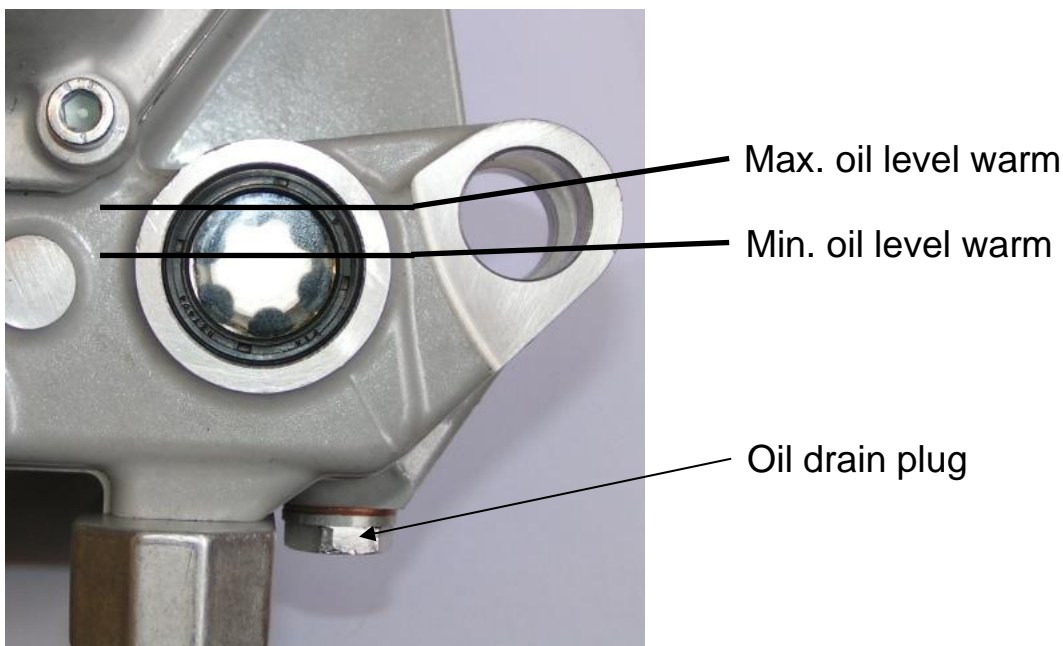
In case the oil level is not slightly above the middle of the oil show glass, add extra oil and repeat the previous action.

# Start-up

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Slightly too much oil in the engine isn't a problem; in this case the engine will eject some oil by the breather tube into the air filter. Although excess amounts of oil must be removed! Practical: if the oil is hot, the oil level should never pass the upper edge of the oil inspection glass. (It is important that an air bubble stays visible at the upper edge.) If this is not the case, then remove the excessive oil until the reference level is reached (see picture below).

**Important: Check oil before every flight; too less and excessive oil will both lead to massive engine failure!**



The cooling system is self-venting. However, it is recommended to check the radiator's surface during warm up in order to check if both, upper and lower parts of the radiator, are heating simultaneously.

During load(flight), the ideal cooling water temperature should be:

- Summer: between 60°C & 75°C or 140°F & 165°F
- Winter: between 75°C & 90°C or 165°F & 195°F

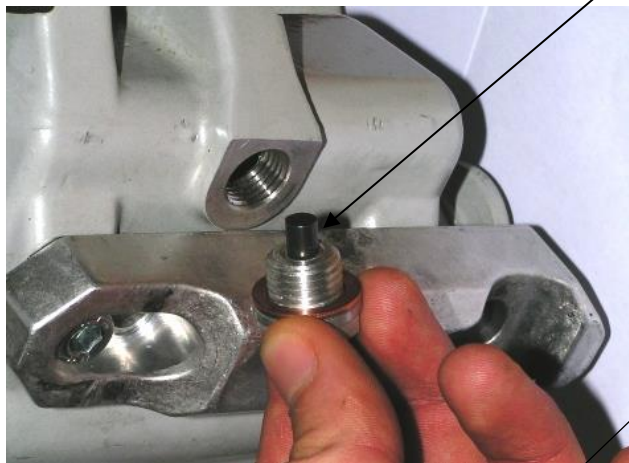
If the engine temperature is too low, cover the radiator in such a way that you achieve to run it within the above mentioned temperature range.

**Break-in the engine during 3 hours.**

# Maintenance & Oil change

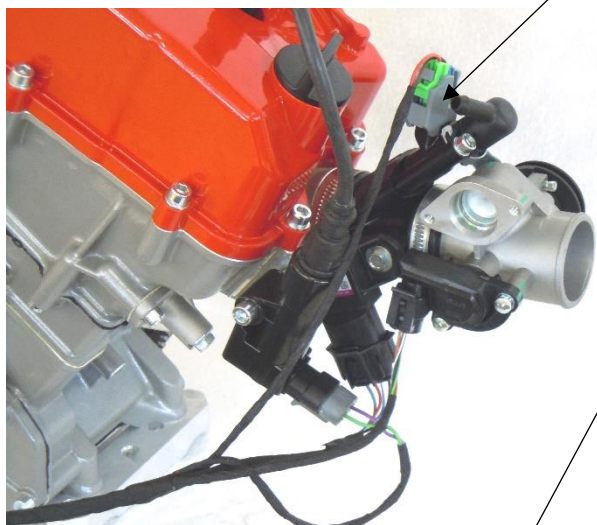
The maintenance of the "AERO1000" is substantial for the lifespan of it. If maintenance is carried out incorrectly or insufficiently the longevity of the engine might be reduced; therefore a basic mechanic knowledge is required. So if there are points which are not clear, always contact your local dealer.

## Oil change:



1. Remove both oil plugs, engine front & oil tank, and drain oil. Clean the magnets of the oil plugs end. Note: In case you observe excessive wear contact your dealer.

**Important! DO NOT drain oil via the oil filter screen.**



2. Remove injector cable and spark-plug cap.
3. Press starter switch to pump oil from active chamber to passive oil chamber ( $\pm 100\text{ml}$ ) so the remaining oil can run out.
4. Remove oil screen to clean.
5. Remount both oil screen and oil drain plugs and tighten these with **26Nm / 19,5 ft-lb.**

**Important: Be careful not to damage the oil screen by hitting the internal suction tube inside the passive oil chamber!**



6. Fill in oil confirm the explanation on page 18 of this manual.
7. Re-install injector cable and spark-plug cap and start the engine.
8. Control the oil level conform the explanation on pages 18 & 19 of this manual.



## Service plan for engine AERO1000

Maintenance works	Every use	after 3 hours	all 25 hours	all 100 hours	500 hours
Check all bolts conform to the technical sheet	•				
Throttle smooth to full and return to idle, idle must hit stop	•				
Spark plug cap all the way in and tight	•				
Visual control on leakage (fuel, coolant and oil)	•				
Check the condition of the frame silent blocks / belt and control belt tension	•				
Check the condition of the exhaust system (springs and cradles)	•				
Oil change ZDDP rich (break-in) oil type helvenco W-001		•			
Oil change 0,9l Mobil1 FS 0W-40 full synthetic engine oil			•		
Oil filter cleaning		•	•		
Check magnet at drain plug for magnetic debris		•	•		
Check valve clearance conform to the technical sheet		•	•		
Check wear of camshaft and chain-wheel(s)				•	
Replace spark plug and exhaust springs				•	
Replace air filter and oil filter screen				•	
Remove and clean out external oil tank				•	
Optical check of the complete engine incl. exhaust silencer and primary tube				•	
Replace the 6 shock absorber rubbers in propeller hub				•	
Replace clutch friction plates and check drum condition				•	
Change drive belt				•	
Complete engine re-build (AP500) at the local dealer					•
Recommended Flat Rate Time (1 FRT = 10min)	1	3	3	9	45

This service plan can only be used as a guideline and is not binding. Although it is based on the technical experience of the manufacture and can be altered at any moment.

All parts defined as "wear and tear" such as clutch, belt, drive train bearings, rubbers and air filter etc. are not part of the service schedule and should be replaced when necessary.

Above listed summary is not limitative.

Note: In case of significant power loss, stop the engine ASAP and contact your local dealer.

# Speed Conversion table

Propeller pulley	PTO pulley	Ratio	Engine rpm							Aera of maximum Torque
			7000	7500	8000	8500	9000	9500	10000	
230	50	4,60	1522	1630	1739	1848	1957	2065	2174	Propeller speed
	52,5	4,38	1598	1712	1826	1940	2054	2168	2283	
	55	4,18	1674	1793	1913	2033	2152	2272	2391	
	58,25	3,95	1773	1899	2026	2153	2279	2406	2533	
	61,75	3,72	1879	2014	2148	2282	2416	2551	2685	
	63.70	3.61	1939	2077	2216	2355	2493	2632	2770	

## Reset ECU DTC codes

When a sensor or its connection fails, a DTC (Diagnostic trouble code) is written into the ECUs memory. This error code can create mal behaviour of the software, therefore it can be helpful to do the following procedure:

1. Turn on the ignition by moving the start witch into the middle position.  
The fuel pump should run now for 5 sec. if not check if ECU is connected!
2. Wait 5 seconds before to go to the next action!
3. Turn ignition off
4. After 5 seconds move start switch 3 times as follow:
  - Ignition on/off + on/off + on/off
5. Wait 10 seconds
6. Ignition "On"
7. Wait 5 second to start.

This is just a reboot of the ECU, the mapping will not be removed or erased!

# Goodwill and warranty regulations

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## What concerns the engine:

The helvenco250 race engine is developed for national and international racing purposes only; it is a high-performance product, even if it's solely used in recreational activities.

From this point of view, the company helvenco AG declares that the race engine and all belonging genuine spare parts are not covered by any warranty even if the engine has been rebuilt or maintained by an authorised dealer (Also the service plan is no warranty agreement and is not mandatory, so the service times and intervals can only be used as a guideline towards the customer).

Although, in case of damage, every customer has the right to claim a goodwill request within the first 6 months following the date of invoice. To activate the possibility for goodwill the client must fill in and return the voucher: "Warranty and goodwill regulation read confirmation" immediately after purchase to helvenco AG.

This document can be found back on the last page of this manual.

Note that the official invoice with corresponding engine number must also be included.

We also point out that the run time of the engine is not determining for the goodwill decision because it can't be checked by helvenco AG. (So even if it ran only 10 minutes, past 6 months goodwill requests will be invalid).

Once the goodwill request is accepted we can go to the next step. Here it must be clear that only helvenco AG is authorised to recognize an assembling or material defect and this in all cases. For verification purposes, the engine must stay completely closed and must contain the oil that was used when the problem occurred.

Engines that are modified, tuned and/or contain non-genuine spare-parts will be disregarded.



## What concerns the AERO1000 components:

What concerns the AERO1000 cage we can offer you a warranty of 12 months starting from the date of purchase on condition the end user has signed and returned the voucher with the original invoice in addition to helvenco AG. It's must be clear this warranty is limited to the cage and his components only and not to the engine!

In both cases, engine goodwill and AERO warranty, the coverage is limited to the spare parts needed to repair it. Labour costs, oil, freight costs (go and return) and eventual custom clearance will be charged to the customer.

If clear that the damage is caused by improper use/handling, wrong installation/assembly, accidents or lack of servicing by the user, helvenco AG will refuse all warranty/goodwill request and an extra cost of CHF 250,- for inspection will be charged if the client decides not to rebuild it.

Excluded are all wear and tear parts (ex. the clutch and its components, the spark plug, all components made of rubber or silicones, belts and bearings etc.)

Note that helvenco AG reserves itself the right to refuse any goodwill request/warranty claim without notice; this decision can't be contested by the customer.



# Voucher

## Warranty and goodwill regulation read confirmation

Purchasing date (invoice):

Customer (first & last name):

Signature:

Dealer:

Engine number:

This document must be sent to helvenco AG within 5 days following the date of purchase. By absence of this act, no goodwill or warranty request will be granted.

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