



Instruction Manual
12V Kerosene Start System
Part Number: KS-1



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Components list

- 1 x Kerosene burner
- 4 x O-Ring 6x1.5mm (seal)
- 2 x O-Ring 2x1.5mm (secure)
- 1 x Festo Y- connector (4mm)
- 1 x Kerosene tube clear (1m)
- 1 x soldering bush
- 1 x shrink hose
- 1 x Blanking plug for the propane line

ECU Requirements

To use the Kerosene Start System in your Behotec engine, the ECU firmware needs to be version **6.15 or higher**, this can be updated by your dealer, or you can send it to Behotec for upgrade.

It is very important to use a good high capacity battery; we recommend a lithium polymer battery with 3 cells and 2500 mAh or more. NiCd and NiMh are also recommended however a pack with 8 cells and 2500 mAh capacity is needed. The ECU will take all these types of batteries automatically.

Please note:

The Kerosene start system must be installed vertically in the model. The Kero Start system must never be inverted or to the side in the model. Failure to do so can cause excessive flames and can cause turbine or model damage.



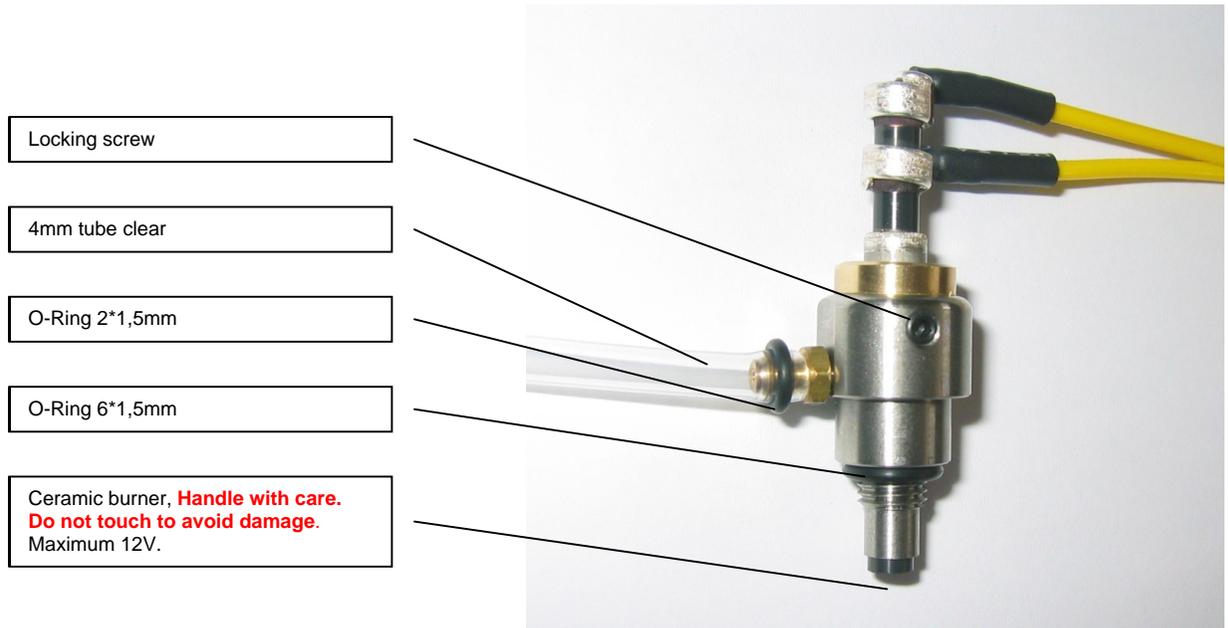
Operation

The Kerosene Start system operates in 4 phases as follows:

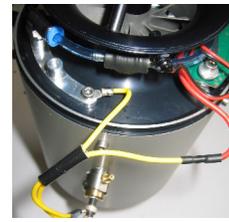
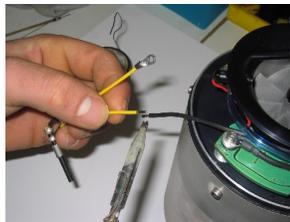
- The start is the same as propane.
- The burner preheats for 15 seconds.
- At this point the starter spins the turbine.
- After one second the pump starts to run (phase 1)
- The turbine accelerates gradually, the temperature climbs to 40°C. At this point, the heat-up phase starts (phase 2), the combustion chamber will be preheated for approximately 30 seconds (time varies from turbine to turbine)
- At the end of the heat-up phase the temperature rises (up to 250-300° C) and also the rpm climbs to 8.000 ~ 10.000 rpm (phase 3)
- The turbine now runs on kerosene from both lines and valves.
- After the start-up procedure, the turbine accelerates to idle (up to 15 seconds)
- ECU shuts off burner valve (phase 4)

The start up will take approximately 1 minute. The long heat-up phase is necessary to ensure a good combustion and no flames come out of the tail.

Installation

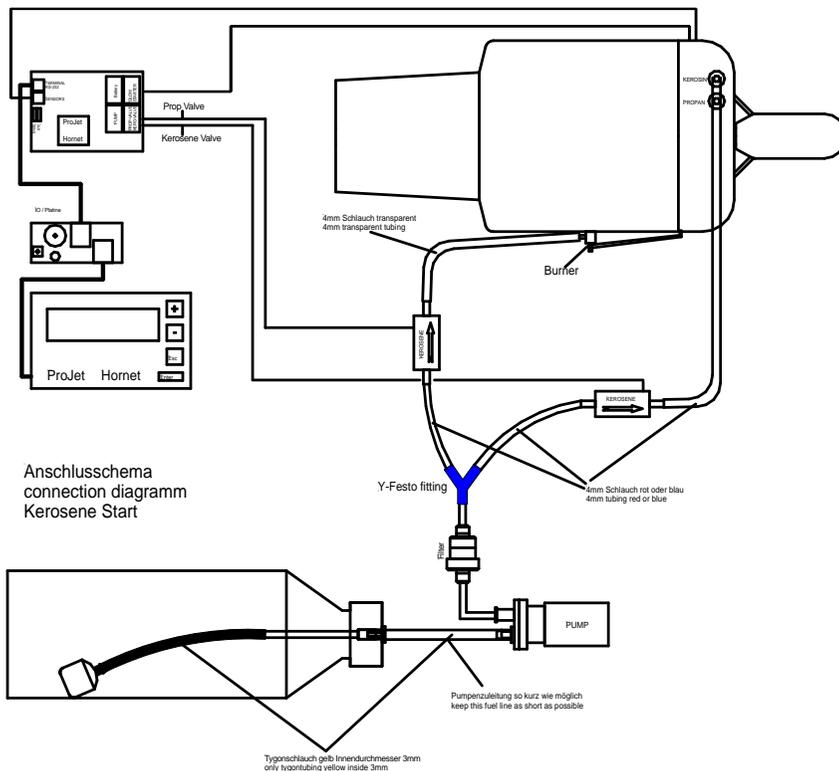


- Caution: Hand tighten Stainless adapter. Do not use tools to avoid damaging the thread
- Remove the glowplug.
- Slide-on one or two O-Rings (6x1.5mm) over the thread.
- Insert the ceramic burner. Carefully tighten the locking screw. Do not over-tighten to avoid damaging the ceramic burner.
- Place assembly on its side where the cables are soldered
- Remove turbine front cover.
- Cut the Glow plug cable and solder the kerosene burner cable. Also connect the ground (-ve) cable to the plate (see pictures below)





- Use the clear tube to connect the burner to the valve, to secure it you have to use the O-ring (2*1,5mm). This fitting does get very hot, it needs to be secured.
- Block the propane port with the blanking plug.





Pre-start setup

ECU settings

Change the parameter settings from the Set-up Menu 60

- Menu Nr.61-1 to ON
- Menu Nr.61-2 to 40-50%
- Menu Nr.61-3 to 20%
- Menu Nr.61-4 to 40° C
- Menu Nr.61-5 to 7000 rpm
- Menu Nr.61-6 to 15.0 s
- Menu Nr.61-7 to 9 V
- Menu Nr.61-8 to 1.0 s
- Menu Nr.61-9 to 15 s

Change the parameter settings from the Set-up Menu 50

- Menu Nr.51 to 2.0 V
- Menu Nr.52 to 6.5 V
- Menu Nr.53 to 3.5 V
- Menu Nr.54 to 26.000 rpm
- Menu Nr.55 disabled
- Menu Nr.56 to 140° C
- Menu Nr.57 disabled
- Menu Nr.58 to 15.0 s
- Menu Nr.59 to 15.0 s

Then change the parameter settings from the Adjust and System Menus 70 and 90

- Adjust Menu Nr.70 to 12.0 V
- Adjust Menu Nr.71 see Pro Jet manual
- Adjust Menu Nr.72 see Pro Jet manual
- System Menu Nr.90 to 8 Cells
- System Menu Nr.93 to Optic (J66HP, JB130, JB165, JB180)
- System Menu Nr.98 to 2.0 V



Pre-start setup

Pump start voltage

Before starting the turbine you have to set the pump start voltage. This is normally done when a fuel pump is replaced in the system or when you switch to the kerosene start system. If you have a new turbine with kerosene start system, this is already done for you. And these values are recorded on the run certificate.

- Disconnect the kerosene line on the turbine and burner and place them in a container so fuel does not spill
- Set throttle and throttle trim to the off position, prime the system by pushing the button on the I/O board so both lines are primed with kerosene.
- Go to the test menu and run the pump by pressing the check mark. Fuel will begin to flow since the pump test voltage is set to 1V. Using the down key, reduce this voltage until the fuel just drips out of the fuel lines. Write this voltage down. Change the value back to 1V and exit the menu
- Go to **menu 41** and enter the value you recorded but add 0.05V to it. Select the check mark to accept.
- Connect the kerosene lines to the turbine and burner

Priming the Kerosene line

Priming the kerosene lines is only necessary on the first start or if the fuel tanks and lines are empty after running out of fuel following a flight.

- Disconnect the kerosene lines from the turbine and burner and place them in a container so fuel does not spill
- Set the throttle and throttle trim to the off position, prime the system by pushing the button on the I/O board so both lines are primed with kerosene
- Connect the kerosene lines on the turbine and burner



First Start

- Make sure fuel lines are connected and primed as described above
- Make sure all the parameters are set as described above
- Ensure a fire extinguisher (CO2 or equivalent) is accessible in case of emergency
- Initiate a start as you would normally start your Behotec turbine system (refer to operation above for details on the 4 phases)

Troubleshooting

If the Turbine does not start:

- Bad battery voltage under 9 volts - **change battery**
- Start-up aborted (phase 1) after the turbine spins - No fuel at the burner, the ECU cannot detect any acceleration (about 5,000rpm) no temperature increase (about 40°). **Prime the kerosene and the burner lines**
- Start up aborted (phase 1) after the turbine spins. No fuel at the burner, the ECU cannot detect any acceleration (about 5,000rpm) no temperature increase (about 40°) - **Set the pump start voltage a little bit higher**
- Normal Start-up, at the end of the heat-up phase no temperature increase and no acceleration (phase 3) - **No fuel or fuel flow too little on the vaporiser sticks. A: Increase the kerosene valve setting by 5 ~ 10% B: set the pump start voltage a little bit higher**
- Normal Start-up, at the end of the heat-up phase only a little temperature increase and acceleration (phase 3) with a lot of smoke - **Not enough fuel flow to the vaporiser A: Increase the kerosene valve setting by 5 ~ 10% B: set the pump start voltage a little bit higher**
- Start up (phase 1) and (phase 2) with heavy flames and a lot of smoke - **Pump start voltage much too high or the setting in menu # 61-3 is wrong – Reduce pump start voltage and/or correct menu 61-3**