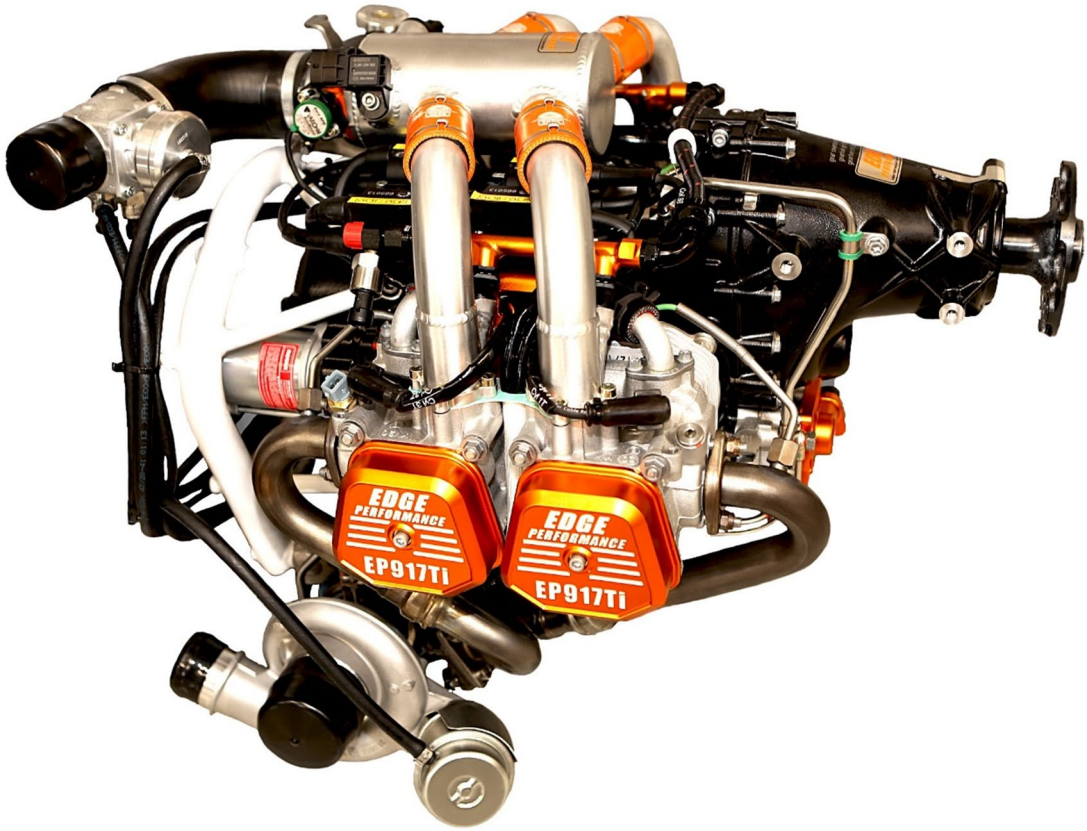
# EDGE PERFORMANCE

# “EP918Ti”

## (185HP)

## (PRELIMINARY)

## Engine Operators Manual




**When Performance Meets Perfection And Reliability.**

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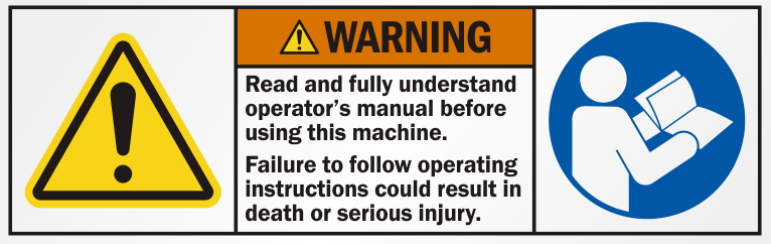


## 1) Safety Information

- This engine is not suitable for aerobatics, inverted flight, sustained zero G or attitudes exceeding 35° pitch and 60° bank.
- The engine has been designed, developed and tested for fixed wing aircraft and gyrocopters in pusher and tractor configurations. Any other usage applications in on the owner's own risk.
- All use of these engines is on the own risk of aircraft manufacturers, installers, users or owner.
- These engines are not certified to any standard norms. They are non-certified experimental engines and should be treated accordingly. Flying over densely populated areas, far across open water and in hostile terrain should be avoided as much as possible.
- EdgePerformance does not grant any warranty on equipment such as propellers, governors, engine monitoring systems or any other third-party equipment used on these engines.
- **Non-Compliance can result in serious injury or death.**
- You should be aware that the engine can seize and stop at any time. This could lead to forced landing or crash and result in injury or death. For this reason, we emphasize the importance of strict maintenance and operation.
- Select and use the proper engine data monitoring system offered or approved by EdgePerformance.
- An engine logbook must be present to log engine operation, maintenance, issues and corrections. The lack of an engine logbook will void the engines warranty.
- Line maintenance can be carried out by the owner\operator, while heavy maintenance should only be carried out by qualified Rotax iRMT technicians, Rotax dealer or EdgePerformance service centers and\or distributors.
- Never operate the engine outside its operating limitations. And although the engine has given limitations, it is not recommended to operate close to the limits over prolonged periods. This will affect achieving engine TBO.
- Always ensure that the adequate amounts of fluids are present.
- Always perform daily inspections meticulously before each flight.
- Do not fly using the improper fuel octane rating, old fuel, fuel with unknown qualities and prevent the use of winter fuel during summertime and vice versa.
- Always allow the engine to cool down for several minutes after each engine run.
- Never run the engine with the aircraft unattended.

## 2) Available Documentation

- Operators Manual
- Installation Manual
- Maintenance Manual
- ASB – Alert Service Bulletins
- SB – Service Bulletins
- SI – Service Instructions
- SL – Service Letters
- All the latest manuals and documents can be downloaded here: https://www.edgeperformance.no/downloads

## 3) Standard Operation

**Topics in this chapter**
**3.1 Operating limits**
**3.2 Operating media-Coolant**
**3.3 Operating media-Fuel**
**3.4 Operating media-Lubricants**

### 3.1 Operating Limitations

- **Idle speed:** 1800-2000rpm
- **Max rpm:** 5800rpm (max 5 minutes)
- **Max cont. rpm:** 5500rpm
- **Cruise rpm:** 4000-5400rpm
- **Critical Altitude:** MAT max 50°C – 15.000' ***Note*** – *The max.cont. power is available up to critical altitude.*
- **Operating Altitude**: 23.000'
- **Acceleration**: -0.5G (max 5 seconds)
- **Static roll angle**: 60°
- **Intake air temp**: 50°C (120°F)
- **Manifold pressure:** Max 55In/Hg *(Max.cont. 42In/Hg)*
- **Fuel:** AKI 93 / 98 RON Or greater (Alternatively AVGAS 100LL)
- **Oil pressure below 3500rpm:** 0.8-5Bar (11.6-72.5psi)
- **Oil pressure above 3500rpm:** 2.0-5Bar (29-72.5psi)
- **Oil temp ground ops:** 100°C (-4 – 212°F)
- **Oil temp:** min 50°C before max power, limit 120°C (120 – 248°F)
- **Coolant temp ground ops:** -20 – 90°C (-4 – 194°F)
- **Coolant temp normal operations:** 40 – 120°C (104 - 248°F)
- **Fuel pressure:** 2.5-4.2Bar (36-61psi)
- **EGT limits:** 950°C (1742F°)
- **Normal EGT range:** 800-900°C (1472-1652°F)

- **EGT-split:** 200°C below 3ltr/hr, 500°C above 3ltr/hr
- **Ambient temperature:** Ground -20 – 50°C (-4 – 120°F)

- **Ambient temperature:** Flight -40 – 50°C (-40 – 120°F)
- **Oil consumption:** Max. 0.06 l/h (0.13 liq pt/h)

**3.2 Operating media-Coolant**

- Use only pre-mixed 50\50 water glycol mix. Ensure to use silicate free coolant. If using concentrated glycol anti-freeze, ensure to only use deionized water to avoid engine cooling system corrosion.

**3.3 Operating media-Fuel**

- **AKI 93 / 98 RON** Or greater (Alternatively AVGAS 100LL)
- *This engine is approved for E10 – 10% Ethanol content in MOGAS.*

- NOTE - Use of winter fuel during summer operations increases the risk of vapor lock, and can cause engine damage, loss of engine power, catastrophic engine failure and cause injury or death.

**3.4 Operating media-Lubricants**

- Use only one of the following engine oils listed below:
  - Rotax XPS 5W-50
- **Oil consumption:** Max. 0.06 l/h (0.13 liq pt/h)

## 4) Abnormal Operation

**4.1 EMS**
**4.2 Failure of internal generators**
**4.3 Engine not responding to throttle position commands**
**4.4 Engine fire on ground**
**4.5 Failures during engine start**
**4.6 Engine re-start during flight**
**4.7 Sprag clutch fails to disengage from the starter**
**4.8 Engine operation limitations exceeded**
**4.9 Fuel pressure outside limitation range**

**4.1 EMS** - There are two Caution\Warning lamps. One for Lane A and one for Lane B. They will illuminate if certain critical values are exceeded, if there are any failures with either sensors, generator charging circuits or the ECU.
NOTE - If either lamp is triggered, reduce power to minimum power setting required for sustained flight, and consider based on engine running performance to make either a precautionary landing on a suitable site or a landing at the nearest airfield.

**4.2 Failure of internal generators** - If during normal operation (Generator 1 is supplying the EMS) Generator 1 fails, the ECU automatically switches over to supply the EMS by using Generator 2. If the engine is supplied by Generator 2 the engine is able to deliver full performance. No performance drop can be recognized while the engine switches the supply from Generator 1 to Generator 2.

If during normal operation (Generator 1 is supplying the EMS) Generator 2 fails, the ECU is not able to detect this condition.

NOTE - If Generator 2 is used for supplying the EMS, the airframe will not be supplied with electrical power by an internal generator. If Generator 2 fails, the Airframe will not be supplied with electrical power by an internal generator

Aircraft Manufacturer is responsible for defining a procedure for this failure condition.

**Failure of both generators** A failure of both Generators (Generator 1/Generator 2) will result in engine stoppage unless the EMS is powered by an external power source (12 V voltage drop between X3 Terminal 1 and Aircraft ground).

**4.3 Engine not responding to throttle position commands -** In case the throttle position does not respond to throttle movement, there is likely to be a damage on the wiring harness, TPS connector, connector terminal or the TPS sensor itself. Flight must not be performed and a technician or the engine manufacturer should be contacted immediately before next engine start attempt. If shutting down the master and re-powering the aircraft does not make the issue go away, proceed with contacting your nearest distributor.

**4.4 Engine fire on ground** – Cary out emergency check list for engine fire on ground or in flight immediately. Determine the cause of engine fire, rectify it, inform your maintenance facility, EdgePerformance and ensure to make a logbook entity.
Emergency Engine Shut Off – Switch off both Lane switch A and B. Switch off fuel pumps. Switch off back-up power switch and lastly the Master switch. Turn of the fuel valve and exit the aircraft. Always follow the airplanes emergency check lists for engine fire on ground or in flight.

**4.5 Failures during engine start**
**Engine does not start:** Insufficient power supply from the start battery. Determine why the battery has inadequately power, and recharge is necessary before further starting attempts. A weak battery can cause starter damage and violent engine kick back. An external power source or GPU can be used.
**Insufficient fuel supply:** Ensure that both the main and aux fuel pumps are working. Verify fuel pressure 3.0Bar. Check battery voltage. Ensure the fuel selector valve is in the ON position. Ensure sufficient fuel quantity. Inspect and\or replace fuel filter(s).
**Starting at low temperature:** Use a suitable oil for winter operations, and always pre-heat the engine below 5°C (40°F)

**4.6 Engine re-start during flight**
If the propeller continues to rotate during flight by windmilling, but the speed is not sufficient to start the engine, the electric starter can be used. It is not required to wait until the propeller stops rotating.

**4.8 Sprag clutch fails to disengage from the starter**
Immediately shut down the engine to prevent catastrophic engine failure, fire and electrical damage.

**4.9 Engine operation limitations exceeded**

Any exceeding of an operating limit has to be entered by the pilot into engine logbook, stating duration of this omit condition. Unscheduled maintenance action may be required. Aircraft Manufacturer is responsible for defining an abnormal operation procedure for each operating limit.
NOTE – When exceeding engine operating limitation, immediately reduce engine power to regain normal engine operation condition.

**4.10 Fuel pressure outside limitation range**

NOTE - Reduce engine power setting to the minimum necessary and carry out precautionary landing.
• If the pressure is too high, switch the AUX- pump OFF. If this has no effect, then limited flight operation with reduced power if possible.
• If the pressure is too low, switch the AUX-pump ON. If this has no effect, then limited flight operation with reduced power if possible.
• A maintenance inspection should be carried out and a logbook entity made.

## 5) Standard operation

**Topics in this chapter**



### 5.1 Daily check

- Always ensure that the coolant level is above the minimum mark, and not above the maximum mark.
- Visually inspect the engine, check for free throttle movement and damage to the throttle cable.
- Check for any signs of exhaust leaks or cracks in the exhaust system.
- Visually inspect electrical components, connectors and wiring.

### 5.2 Pre-flight checks

- Remove the oil cap, ensure that the ignition is off, turn the propeller in the direction of rotation until you hear a gurgling sound from the oil tank. Remove the oil dip stick, dry it clean with a clean piece of paper and verify the oil level. The difference between min and max on the dipstick is 0.6 liter.

### 5.3 Engine start

DO NOT USE THE USB COM CABLES WITH A COMPUTER CONNECTED TO THE ENGINE WHILE FLYING

- If engine temp is below 5°C, always pre-heat the engine with a suitable engine pre-heater.
- Master ON
- Fuel selector ON
- Main fuel pump ON
- Lane A ON
- Lane B ON
- Propeller area CLEAR

- Advance the throttle to 5%, 10-15% may be required for cold start
- Hold down the momentary start button, starter engage
- Release the momentary start button

**5.4 After engine start**

- Verify oil pressure, if not present after 3 seconds after starting up, shut off the engine to avoid engine damage
- Ensure the backup battery switch is in the OFF position
- Monitor lane warning lights that neither is blinking or illuminating 10 seconds after engine start
- Verify both generators are active

**5.5 Engine run-up**

- Set 2000 rpm for 2 minutes
- Set 2500 rpm for engine warm-up until the oil reaches 50°C
- Set throttle back to idle
- Set full power to ensure that the engine achieves full take-off power
- Set throttle back to idle
- Verify no lane lights are ON
- Set throttle to 2500 rpm and perform the lane check
- Turn off lane A, wait for min. 5 seconds, turn lane A back on
- Turn off lane B, wait for min. 5 seconds, turn lane B back on
- Check for caution\warning lights after 10 seconds
- Check EMU\EIS for engine parameters, and verify they are all in the green
- Turn on the AUX fuel pump, turn off the main fuel pump, verify fuel pressure
- Turn the main fuel pump back on and the AUX fuel pump back off

  **NOTE** *Lane A and Lane B have different sensor inputs. During Lane and Ignition check, some sensor values are not displayed, depending on the activation of the Lanes.*

  Following sensor values are not available if Lane A is turned OFF and Lane B is activated:

  • Exhaust gas temperatures from cyl. 1-4
  • Ambient temperature
  • Oil temperature
  • Oil pressure
  • Fuel pressure

**5.5 Engine shut-off**

- Normally the engine cools down sufficiently enough during decent and taxi. If the engine is very warm, let it cool down at idle for 2 minutes before shutting it down
- Bring the throttle back to idle
- Lane switch A OFF
- Lane switch B OFF
- Fuel pump(s) OFF

## 6) Performance and fuel consumption

### 6.1 Performance data and fuel consumption

### 6.2 Performance graphs

### 6.1 Performance data and fuel consumption

- The EP917Ti runs very efficient below a certain throttle and power setting. Above a certain limit it run richer for maximum performance. The Lane B ECU runs in power mode with a richer setting and reduced power. The EP917Ti is available in both 160HP and 180HP @5800rpm. The engine has a POWER and ECO mode, which is user selectable via a ON\OFF toggle switch. The ECO mode produces less power and runs more efficiently, while the POWER mode runs with a richer setting and with more boost. The POWER and ECO modes can be selected any time during ground or flight ops.
- The fuel consumption will greatly vary based on rpm and power output. The attached graphs show fuel flow at various rpm and power settings.

### 6.2 Performance graphs

- The performance graphs below show the performance of the Lane A in POWER mode, ECO mode and the Lane B in its normal mode. Performance will vary based on fuel quality, intake air temperature, ambient temperature, density altitude and several other factors.

**7) <u>Technical Engine Data</u>**

- **Engine Displacement:** 1352ccm3
- **Bore x Stroke:** 84.00x61.00mm
- **Compression ratio:** 8.2:1
- **Gearbox reduction ratio:** 2.54:1
- **Engine dry weight w/gearbox, overload clutch, turbocharger, intercooler, exhaust syst: 79.5Kg** / 175lb
- **Engine suspension frame:** 2Kg / 4.4lb
- **External Alternator:** 3Kg / 6.6lb
- **Air Guide Baffle:** 0.4Kg / 0.8lb
- **Fuel Pump Assy:** 1.6Kg / 3.5lb
- **Power output:** 185HP (133Kw) @ 5800rpm
- **Torque:** 241Nm (177ft/lb) @ 5800rpm
- **PTO Torque:** 612Nm (420ft/lb) @ 5800rpm

**Description & Key Features**

- Model 2 for fixed pitch, ground adjustable or electric VP propeller

- Model 3 for hydraulic or SLPC propeller
- Fully sequential ignition and fuel control
- Closed loop EGT control
- Adaptive knock control
- High Boost / Low Boost function (POWER \ ECO MODE)
- CAN Aerospace data stream
- EFIS, EMU, EIS compatible
- 4-Cylinder
- 4-stroke liquid-/air-cooled engine with opposed cylinders
- Dry sump forced lubrication with separate oil tank, automatic adjustment by hydraulic valve tappets
- Redundant electronic fuel injection and ignition
- Fully programable dual Engine Management System
- Dual alternators (15/35Amp)
- Electric starter (12 volt)
- Propeller speed reduction gearbox (2.54:1)
- Flow optimized equal lenght air intake system / intercooler
- Turbocharger / stainless steel exhaust
- TBO 2000 hrs
- Maximum operating altitude 23.000 feet
- Maintenance in accordance with the Rotax® 915iS LMM/HMM. (Supplementary EP917Ti MM)