innovative avionics

FLYBOX

Propeller regulator PR2-P

Installation and operating manual

Revision# 2.2 28/7/2008
For firmware version 2.1

INDEX

1. Important notices and warnings

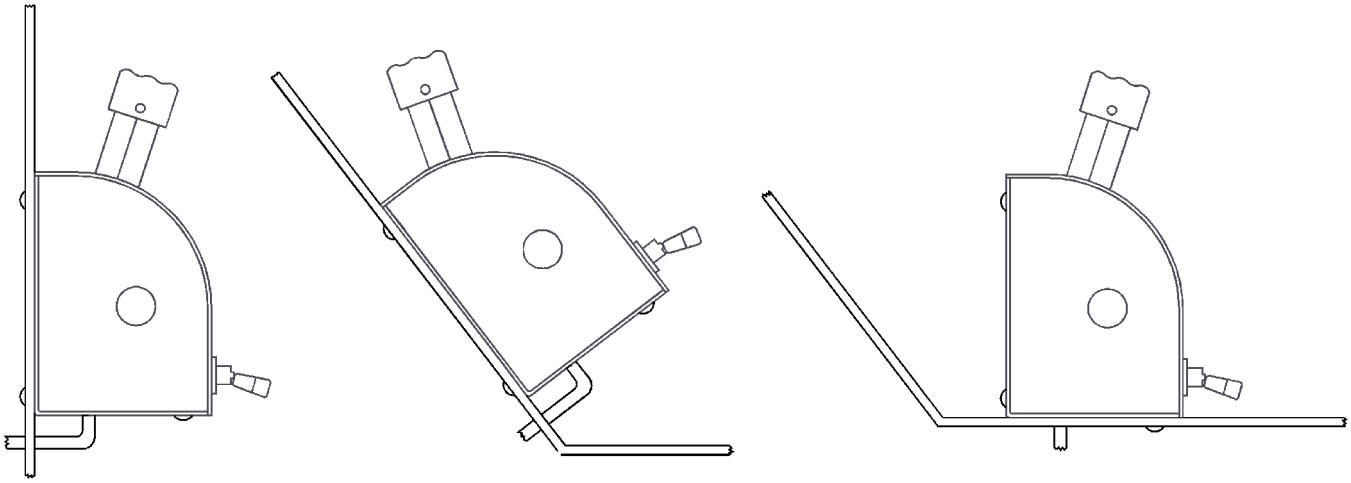
- Read entirely this manual before installing the instrument in your aircraft, and follow the installation and operating instructions described here.
- The pilot must understand the operation of this instrument prior to flight, and must not allow anyone to use it without knowing the operation.
- Keep this manual in the aircraft
- When the cabling is finished you must do a test, prior to flight, turning on all the possible source of electric noise and checking the properly operating of the PR2-P.
- Use aeronautic cable for the wiring.
- **The PR2-P is connected directly to the propeller pitch actuator: the non-respect of the notices above or a damage to the PR2-P may result in unexpected pitch changes.**
- **THE PR2-P MUST BE TURNED OFF IN CASE OF START WITH BOOSTER. OPEN THE CORRESPONDING BREAKER BEFORE STARTING. WARRANTY SHALL NOT APPLY FOR DAMAGE TO THE PR2-P FOR THIS REASON.**

If you don't agree with the notices above don't install the PR2-P in your aircraft but return the product for a full refund.

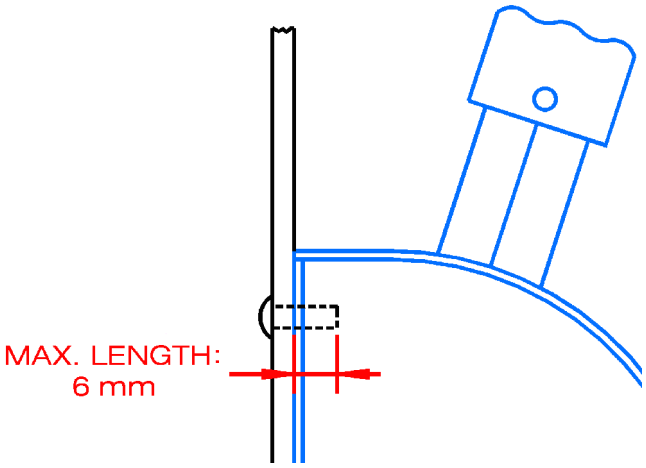
Microel s.r.l. reserves the right to change or improve its products. Information in this document is subject to change without notice.

2. Installation

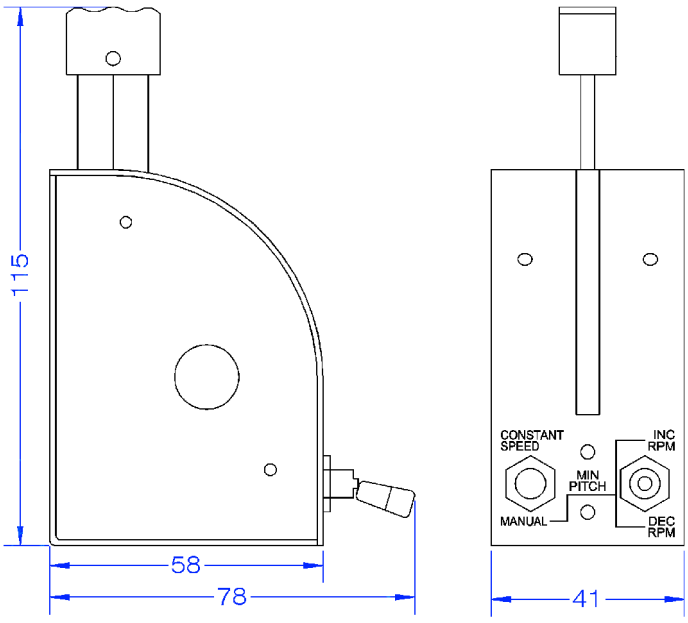
- The PR2-P can be installed either by fixing the back or the bottom panel:



- Use the template included at the bottom of this manual to hole the panel's aircraft.
- If your aircraft's panel thickness is 2mm or less you can use the screw furnished with the PR2-P otherwise use M3 screw with adequate length; **remember to not enter with the screw thread more than 6mm inside the PR2-P:**



2.1 Dimensions



(All dimensions are in millimeters)

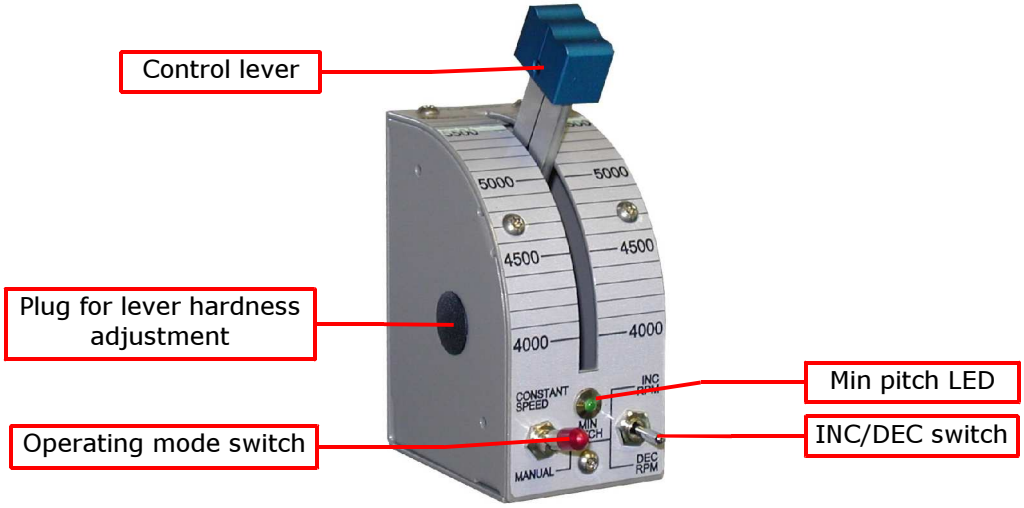
2.2 Wiring installation

On the bottom panel of the PR2-P there is five wire identified by a label; the connections are the following:

GND : GND Main supply
+12 : +12V Main supply
RPM : RPM input signal from the pick-up (for ROTAX912/914 engines)
M - : Motor out (-)
M + : Motor out (+)

- Insert a proper circuit breaker to the power lead (+12).
- WARNING: Voltage peaks that exceeds the operating limits on the supply line can damage the device.
- **The PR2-P must be turned off in case of start with booster. Open the corresponding breaker before starting.**

2.3 Panel indicators and commands



<u>The operating mode switch has a safety lock to avoid accidental operation: it must first pulled on the outside and then moved to the desired position.</u>

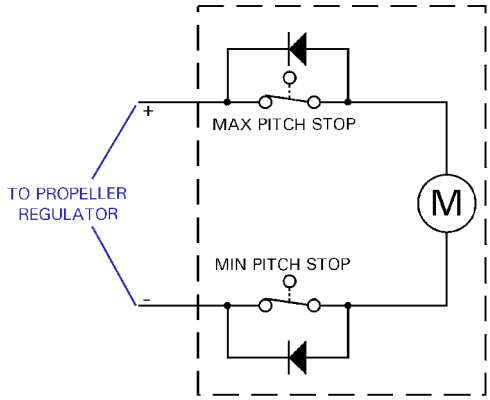
2.4 Wiring check

Before using the PR2-P in flight for the first time you must execute this checklist (with the engine not running):

- Put the operating mode switch in the "Manual" position
- Turn-on the PR2-P
- Move the "INC/DEC" switch in the "INC RPM" position (increment RPM) and check that the propeller pitch decrease; check also that the "Min pitch" LED will go on when the propeller reach the min pitch stop.
  If the propeller pitch change in the wrong direction (towards the max pitch) you must invert the two motor out cable (**M+** and **M-**).
- Move the "INC/DEC" switch in the "DEC" position (decrement RPM) and check that the propeller pitch increase.

NOTE:
- Refer to the propeller constructor's manual if you need to adjust the mechanical min and max pitch stop of the propeller

- PR2-P works only with propellers with this type of electrical pitch stop:



3. Operating instructions

The PR2-P has two operating modes: "Constant speed" and "Manual": you can select the operating mode using the corresponding switch on the frontpanel.
For normal operations use always the "Constant speed" mode; the "Manual" mode must be used in case of emergency or failure of the PR2-P because it exclude the electronic system and drive directly the pitch motor using the INC/DEC switch.

3.1 Use in "CONSTANT SPEED" mode

- To change the target RPM move the lever in the desired RPM position: the PR2-P will automatically keep constant the engine speed by varying the propeller pitch.

- The RPM range is 4000 to 5800 RPM; the maximum value (5800 RPM) is indicated by the "TAKEOFF" position.

- When the propeller reach the min pitch stop the corresponding LED is turned on.

3.1.1 In case of failure/emergency

If during flight you notice that the PR2-P don't adjust correctly the propeller pitch or don't respond to the control lever turn immediately the operating mode switch to the "Manual" position; **this switch has a safety lock to avoid accidental operation: it must first pulled on the outside and then moved to the desired position.**

3.2 Use in "MANUAL" mode

The "Manual" mode must be used only when testing the propeller system and in case of failure or emergency.
In this mode the propeller pitch is adjusted using exclusively the INC/DEC switch: move in the "INC RPM" position to increment the engine RPM and move in the "DEC RPM" position to decrease it.

NOTE: To adjust the propeller pitch in "MANUAL" mode you must use exclusively the INC/DEC switch because the lever has no effect.

4. Advanced settings

In this chapter we explain the procedure to change some parameters useful to optimize the PR2-P working mode.

⚠ This parameters are already set in factory with preset that fits the majority of the propellers; it's recommended to modify it only if the PR2-P don't work correctly during the propeller pitch regulation; **the parameters must be modified only by qualified persons and must not be modified during the flight.**

To modify the parameters follow this steps:
1- With the operating mode switch in "Constant speed" put the lever in the "TAKEOFF" position (min pitch position)
2- Press more times the INC/DEC switch in this sequence: 1 click in INC position, 2 in DEC position, 2 in INC and 1 in DEC (that is 1-2-2-1); now the PR2-P has entered the programming mode and the LED flash one time to indicate that you are adjusting the first parameter.
3- If you need to change this parameter (see table 1 and following explications) put the lever in the desired value, wait few seconds and press the INC/DEC switch in the INC position; otherwise if you don't need to change this parameter simply click the INC/DEC switch in the DEC position.

4- Now the LED flash two times to indicate that you are adjusting the second parameter. Follow the same rules as above to change all the six parameters.
5- When you have programmed the last parameter put again the lever in the "TAKEOFF" position to exit the programming mode.

Parameter # (# of LED flashes)	***Name***	***Range Min-Max***	***Programmed value***
1	Kp INC	4000-5800	
2	Ki INC	4000-5800	
3	Kp DEC	4000-5800	
4	Ki DEC	4000-5800	
5	Dead band	4000-5800	
6	RPM filter	4000-5800	

TABLE1

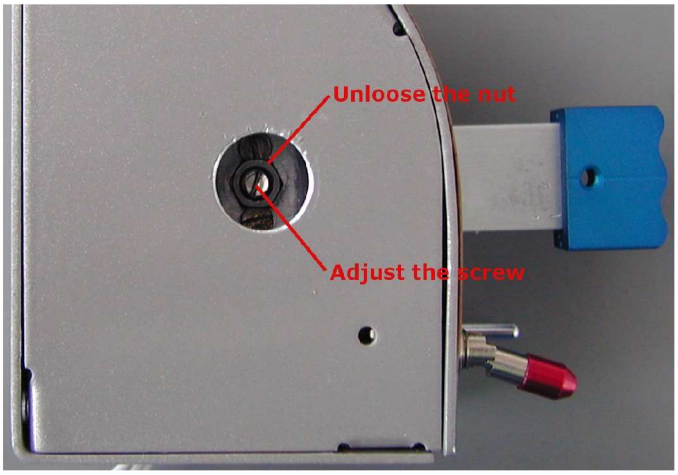
The parameters have the following meaning:

KP INC: adjust the pitch speed variation when the PR2-P is increasing the RPM (decrease the pitch). Increasing this value means increasing the response speed of the system but if the value is too high the response become inaccurate, unstable and the regulation may oscillate. Modify this value in step of 50 units and then check the effect in flight.
KI INC: this parameter affect the response regulation when the system try to increase the RPM without manage to reach the setpoint. If this value is too high the regulation may oscillate. Modify this value in step of 100 units and then check the effect in flight .
KP DEC: adjust the pitch speed variation when the PR2-P is decreasing the RPM (increase the pitch). Increasing this value means increasing the response speed of the system but if the value is too high the response become inaccurate, unstable and the regulation may oscillate. Modify this value in step of 50 units and then check the effect in flight.
KI DEC: this parameter affect the response regulation when the system try to decrease the RPM without manage to reach the setpoint. If this value is too high the regulation may oscillate. Modify this value in step of 100 units and then check the effect in flight.
Dead band: To prevent continuous actions of the propeller pitch electric motor it's possible to use this parameter: if the difference between the measured RPM and the desired RPM (RPM set with the lever) is lower than this parameter there will be no pitch regulation.
Setting this parameter to the minimum value (4000) means that there will be no dead band and the PR2-P will continuosly regulate the propeller pitch; setting it to the maximum value (5800) means a dead band of +/- 100 RPM.
RPM filter: setting this parameter to the minimum value means a faster system response to the RPM changes, but the system may begin to oscillate or become unstable. Increase the value until you have a good stability with a correct response speed (not too fast and not too slow).

5. Lever hardness adjustment

It's possible to adjust the lever movement hardness in this way:

- Put the lever in the 4000 RPM position
- Remove with a screwdriver the plug on the left side
- Unloose the nut using the socket wrench furnished with the PR2-P
- Turn lightly the screw:
  clockwise to decrease the lever hardness
  counterclockwise to increase the lever hardness
- Tighten again the nut to lock the mechanism at the desired lever hardness
- Put the plug on the panel



6. Technical specifications

- Dimensions: 115 x 41 x 78 mm
- Weight: 200 g
- Operational temperature range: -20 ~ +70°C
- Humidity: 90% max
- Supply voltage : 11 ~ 15 V=
- Supply current: 70 mA
- Maximum motor supply current : 7A
- RPM input for **ROTAX 912/914** engines

7. Warranty

This product is warranted to be free from defects for a period of 12 months from the user invoice date.
The warranty only covers manufacturer defects and shall not apply to a product that has been improperly installed, misused or incorrect maintenance, repaired or altered by non-qualified persons.

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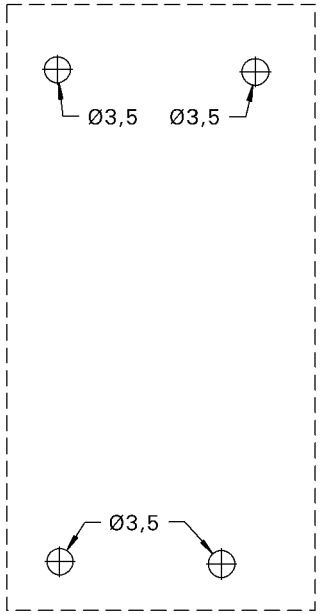
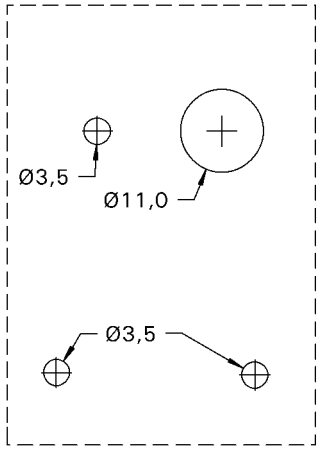
TEMPLATE FOR BACKPANEL INSTALLATION



TEMPLATE FOR BOTTOM PANEL INSTALLATION



NOTE: don't enter with the screw thread more than 6mm inside the PR2