

# Heli-Max<sup>®</sup>

## *Pro*series

### *HM4050 AVCS HEADING LOCK GYRO*



Thank you for purchasing the Heli-Max  
HM4050 Heading Lock Gyro.

Please take the time to read this  
manual fully before installing your gyro.

#### **INCLUDES**

- HM4050 gyro with connectors
- Foam adhesive tape
- Manual

#### **FEATURES**

- AVCS  
(Angular Vector Control System)
- Small size
- Lightweight
- Able to operate in Heading Hold  
as well as Normal flight mode
- Remote or local selectable
- Digital or analog servo capable
- LED power indicator
- Perfect for small,  
lightweight helicopters

#### **SPECS**

- Operating Voltage:** 3.6 to 5.5V
- Precision:** < 1%
- Response:** < 2ms (Digital Servo)
- Operation Current:** < 10ma
- Rotation:** 800 deg per sec MAX
- Weight:** .35oz (9.9g)
- Height:** .437" (12mm)
- Width:** .800" (20.3mm)
- Length:** .800" (20.3mm)

#### **MANUAL SPECIFICATION & DESCRIPTION CHANGES**

All pictures, descriptions, and specifications found in this instruction manual are subject to change without notice. Heli-Max<sup>®</sup> maintains no responsibility for inadvertent errors in this manual.

## HM4050 Switch and Dial Explanation



- 1 Light Emitting Diode (LED):** The LED will glow green anytime the gyro is powered and operating. (NOTE: If the light is blinking the gyro is gathering position information and should not be moved.)
- 2 Limit Dial (LIMIT):** This dial adjusts the rudder servo travel. 100% = maximum travel. One needs to adjust the limit dial so the tail pitch slider does not bottom out on the tail case or the tail blade hub.
- 3 Sensing Dial (SENS):** This dial is used to change the delay time between the gyro and the servo. 0% SENS would mean no delay, or the time it takes for the servo to react to the gyro is at its shortest. 100% SENS would mean the delay time between the servo and gyro is at its longest. The faster your servo, the lower the percentage can be. For instance, digital servos in the .08 sec time range might use 0 to 10% SENS and analog servos in the .22sec time range might use 50% SENS. You will, however, need to adjust the SENS dial to your servo and flight needs. **NOTE: With the SENS ADJ switch in local (ON) this dial becomes your GAIN adjustment (see below).**
- 4 Sens Adjust:** This switch is used to change the gyro from being able to adjust "gain" from the transmitter (Remote) or adjust the gain from the SENS dial (Local). When the SENS ADJ switch is in the ON position the SENS dial now acts as the local gain adjustment.  
  
It's also important to note that when this switch is in the ON position (Local), the gyro works in Heading Hold mode only.
- 5 Direction (DIR):** This switch is used to change the gyro's compensation direction. **NOTE: Incorrectly setting the direction switch can cause an unsafe situation.** As a rule of thumb, when set correctly the back edge (trailing edge) of the tail blades should move into the rotation direction of the tail. It's also important to note this switch does not change the servo's direction regarding your rudder stick input.
- 6 Digital Servo (DS):** This switch is used to select between digital or analog servos. When using a Digital servo, position the switch in the ON position. When using an analog servo position the switch is in the OFF position. Warning: Using an analog servo with the DS switch in the ON position can damage your analog servo.



# Installing the HM4050 in Your Helicopter

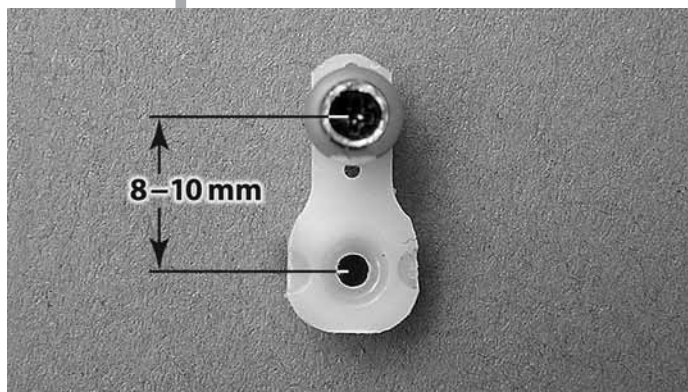


## Rudder Servo Preparation

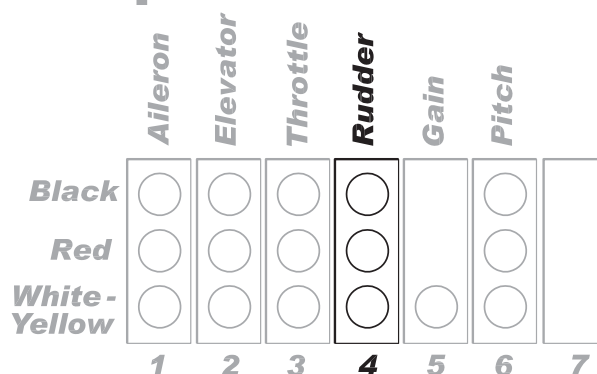
**! WARNING:** In this step it is best to unplug the motor or move the motor pinion gear away from the main gear or you might risk injury.

We are going to concentrate on a 400/450 size helicopter but the same basic principles apply for other sizes.

**1** Install the ball connector on the servo arm. We have found a ball link spacing of 8mm to 10mm from center of the servo output shaft to the center of the pushrod ball link to be a good overall length for most 400-450 size helicopters.



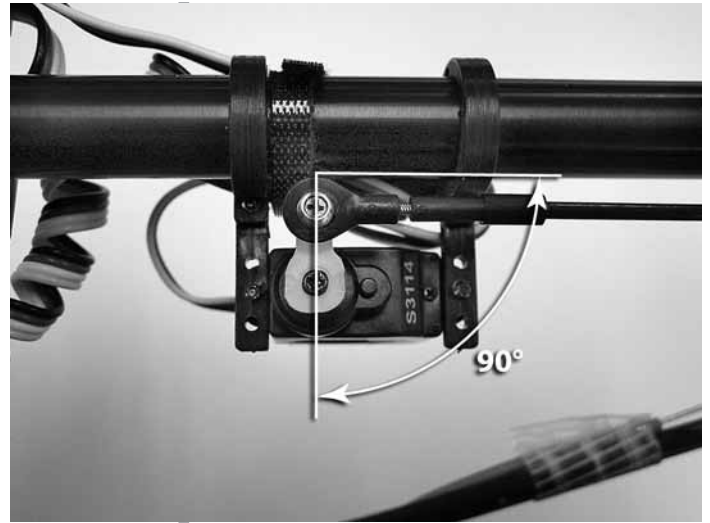
**2** With the servo installed in the mount, plug the rudder servo into channel 4 of your receiver. Turn the radio system on and plug the main power battery into the motor controller.



**3** Adjust the trim switch (located under the rudder stick) to the centered or zeroed position. Also, if you have a computer radio, enter the radio's sub trim menu and make sure channel 4 is zeroed.



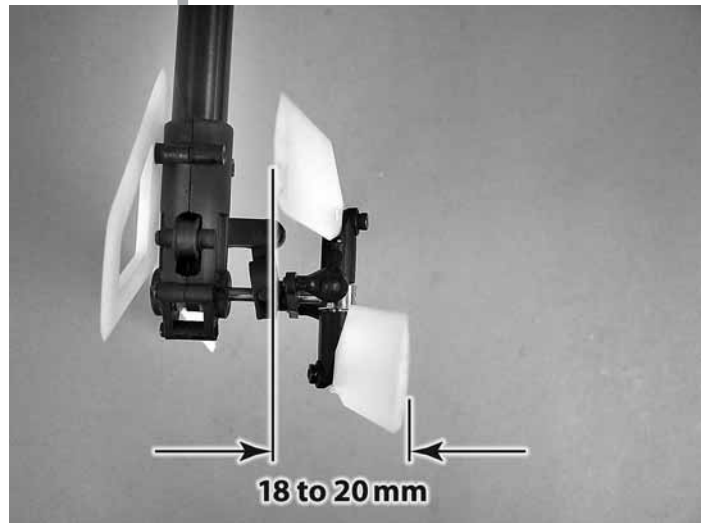
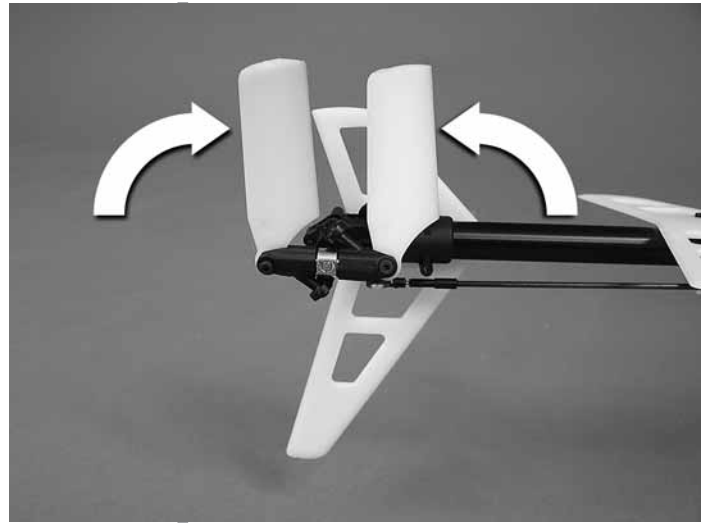
- 4 Install the servo arm such that the arm is 90 degrees to the tail boom. If you cannot obtain 90 degrees, try a few different servo arms or wheels until you feel you can get the ball connector as close to 90 degrees to the tail boom as possible.



- 5 Attach the pushrod to the servo. Then, check the servo direction; simply place the transmitter near the back of the helicopter. Move the rudder stick slowly back and forth. The trailing edge of the tail blades should move the same direction as the rudder stick. If not, use the servo reverse option located on or in your transmitter.



**6** Next, pivot the tail blades so both blades are pointing up. Adjust the length of the rudder pushrod so the distance between the blade tips is 18 to 20mm. Also double check that the pitch slider is centered on the tail shaft. Note: If the rudder servo mounts to the tail boom (Typical), loosening the clamp screws and sliding the servo forward or back on the boom achieves the same adjustment.



7 Check the mechanical limits by moving the rudder stick all the way to the right and then all the way to the left. Adjust end points (left and right) using your transmitter's...

**ATL** (Adjustable Travel Limit)

*or*

**ATV** (Adjustable Travel Volume)

*or*

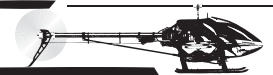
**EPA** (End Point Adjustment)

Make sure the servo does not bind (over throw) the pitch slider at the extents of the movement. If you have the ball link the correct distance from the center of the servo output shaft, the pitch slider should just touch the extents of the movement with the transmitter's EPA at 100% left and 100% right.

Unplug the main power battery from the controller and turn off the radio. Unplug the rudder servo from the receiver.



## Gyro Installation



1 To install the Gyro select an open area on the helicopter away from the motor and motor controller. Your installation position should be with the gyro in-line with the main shaft. Typically, most gyros are installed on the frame set over the tail boom mounting area.



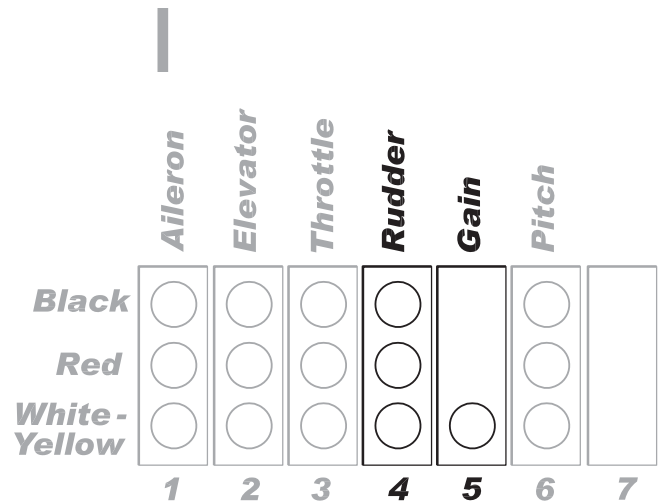
**2** The orientation of the gyro's sensor is such that the label of the gyro faces up. Clean the area with an alcohol pad and attach the gyro using the supplied foam tape. Press down firmly to secure the gyro. To be consistent mount the gyro so the face plate wording is legible from the back of the helicopter.



**3** Attach your rudder servo connector to the open female connector leading from the gyro.



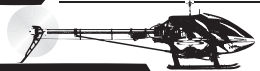
4 Attach the 3 wire male connector (rudder) from the gyro to channel 4 of your receiver (Futaba®). Also, plug the one wire plug from the gyro (gain) into channel 5 (Futaba), making sure the yellow wire is aligned with the white wire (signal) of the other servo plugs.



5 Neatly secure the wires to eliminate any chance of damage.



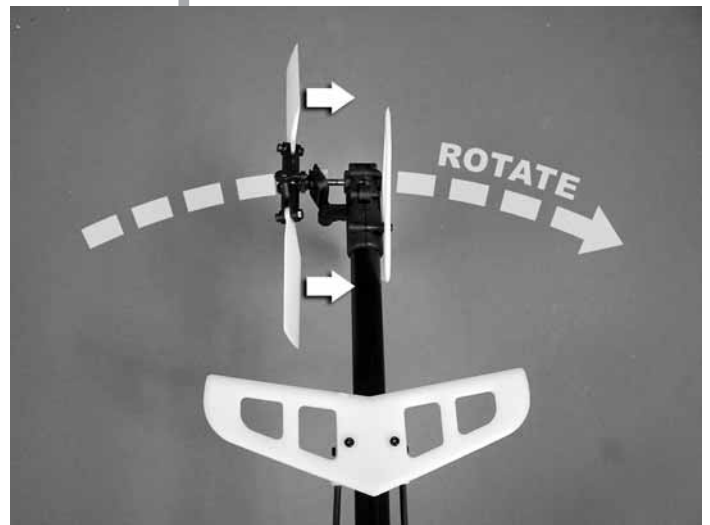
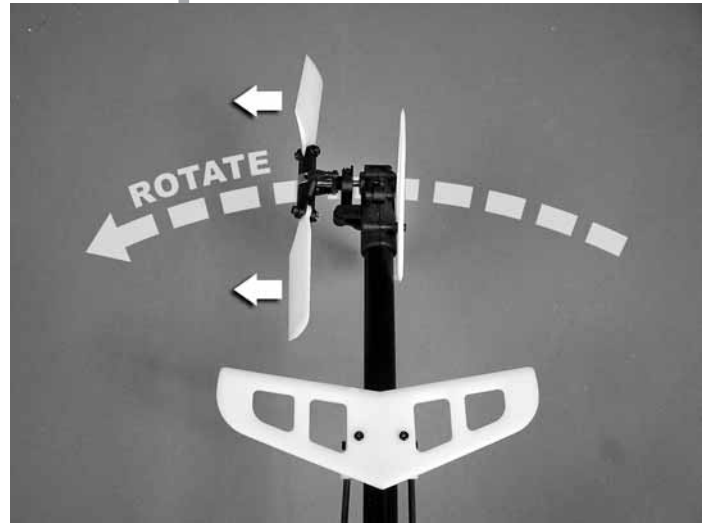
## Gyro Setup



- 1 Turn on your transmitter.
- 2 Enter your radio's menu and check to make sure REVO MIX (Revolution Mixing) is disabled.
- 3 Plug the main power battery into the controller. **Again, it is best to unplug the motor or move the motor pinion gear away from the main gear or you might risk injury.**
- 4 Wait at least 5 seconds before moving the helicopter. This is important as the gyro is reading its current position and should not be disrupted at this time.
- 5 Moving the rudder stick left and right, adjust the LIMIT dial so the tail pitch slider does not bottom out on the tail case or tail hub. Start at 50 percent and work the dial either a lesser percentage or larger percentage to complete the adjustment.



- 6 Adjust the DIR switch so the gyro provides the proper compensation. To check this, grasp the helicopter holding the tail away from you. Swing or rotate the helicopter left to right. The trailing edge of the tail blades should move the same direction as your rotation direction.



## Gyro Use

### *Explanation of the SENS ADJ Switch*

#### **Flying using "LOCAL" mode (SENS ADJ Switch On)**

If you choose to use the gyro in local mode it will automatically be in heading hold. It's important to note that when in heading hold the servo arm will not center when you release pressure of the rudder stick. This is normal. To adjust the gain you must do this manually using the SENS dial located on the top of the gyro.

To start, adjust the SENS dial to 50%.

Hover the helicopter and look for any tail wag or fade. If you are a skilled pilot you will want to put the helicopter in forward flight and review the tail's performance.



Adjust the SENS (gain) dial to a higher percentage for more gain or lower for less.

**!** **NOTE: Dialing back the SENS (gain) dial too far will limit the travel of the servo. The goal is to adjust the gain so the tail does not wag but holds the yaw axes in all flight directions. It's also important to note that if you are using a radio system with limited programming capabilities, this might be the best mode for your application.**

### **Using the gyro in "REMOTE" (SENS ADJ Switch Off)**

With the SENS ADJ switch off, you will enter the GYRO menu of your transmitter to adjust the gain.

To get an idea of how this works, let's step through setting up the gyro using the Futaba 6EX radio system in our Heli-Max AXE™ 400.

First make sure your rudder trim setting is centered on the transmitter. Leave it at center; you do not want to make any adjustments to the trim with the gyro in heading hold anytime the helicopter is in use.

Check your electronic EPA (end point adjustment) in the transmitter.

To start you want those values (rudder stick left and rudder stick right) at 100%. To do so, with the transmitter on (the helicopter need not be powered up for this adjustment), press and hold the Mode/Select buttons simultaneously. The system will enter the main menu. Press the Mode button until EPA appears. Press the select button until you bring up channel 4. Move the rudder stick left to right to view the end point percentages. Set the value to 100% using the +/- button if needed.

### ***Setting the Gyro Gain Percentages (Remote Mode)***

With the radio on, again enter the main menu by pressing and holding the Mode/Select buttons simultaneously.

Press and hold to scroll to the GYRO menu. If the GYRO menu is INH (Inhibited) shift the arrow key positive + and hold until the GYRO menu says ON or OFF.

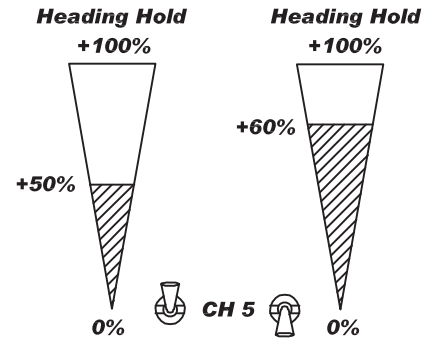
Press the select button; here you will see a number percentage with a small arrow to the left. NOTE: Switch H is the GYRO switch on the 6EX (CH: 5). Flipping this switch ON or OFF will cause a small arrow to change from up to down based on the position of the switch. You will also see a plus or negative symbol to the right of the small arrow. You will use the +/- button located to the right of the screen to change the gain value.

If you set both values to a positive percentage, switch up and switch down, you can obtain two heading hold gain values in the same flight program; for instance one value for hover (typically a higher gain percentage) and one value for forward flight or 3D (typically less gain). Again, it's important to note that in Heading Hold the servo arm will not center when you release pressure on the rudder stick. We find this to be the most common gain setup. That being said, 55% to 60% gain is a good starting point.

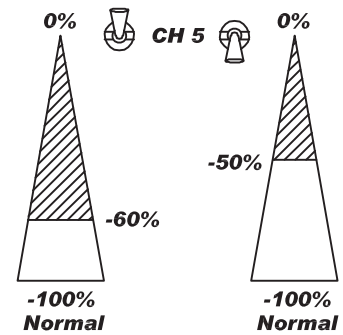
If you have both percentages at a negative value the gyro will operate in normal mode and also provide you with two possible "normal" fight gain conditions. This is the least common gain setup.

If you choose, you can have the heading hold switch position (up) and a normal switch position (down), with different values at the same time – a combination of the two gyro gain setups. Most call this style of set up a "trim setup"; one can easily toggle from normal to heading hold to review the installation and setup of the rudder servo.

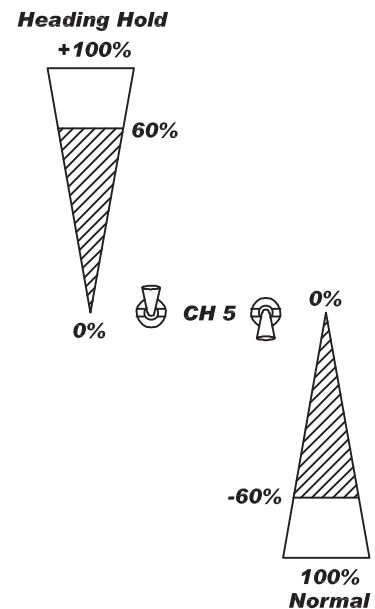
## Remote Gain IN Heading Hold



## Remote Gain IN Normal



## Remote Gain In both



## ***Other Adjustments***

### **Dual Rate**

This is used to add or subtract how far the tail blades deflect. Using dual rates one can have two (or more depending on the transmitter's programming options) rate settings: A lower rate for new pilots and higher rate for more advanced pilots. (NOTE: Although EXPO can also be used to mimic this, we prefer to only use EXPO to soften or sharpen the feel of the helicopter's tail around center stick). Expo does not reduce or limit the total travel of the servo like Dual Rates.

### **Exponential (Expo)**

Expo might be used to soften the feel of the tail coming off of center stick. Futaba calls this Negative (-) expo, or it can be used to sharpen the feel of the tail coming off center stick, positive Expo (+). Most pilots use some reduction of sensitivity (Negative Expo). Expo can add to the smoothness of your flight or allow extreme pirouette rates yet still have an "easy" to fly tail in and around center stick.

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## ***Trouble Shooting Guide***



### ***The gyro indicator LED does not come on.***

Check to see you have the gyro wires plugged into the appropriate sockets and that the polarity is correct.

### ***After liftoff, the helicopter abruptly spins out of control.***

First check to make sure the servo's direction is correct by checking the stick movement to the tail blades, like we mentioned in the setup part of this manual – OR- It is likely you have the DIR switch in the wrong position. Re-check the compensation direction.

### ***After liftoff, the helicopter's tail control is slow to react.***

Check for any binding. Also check to see if you have the transmitter's dual rates set too low or gyro's LIMIT dial set too low.

### ***After lift off the tail wiggles back and forth.***

Reduce the gain.

### ***The rudder trim constantly changes in flight.***

First check for binding, then check to make sure you have the rudder trim at zero as well as channel four's (Futaba) sub trim centered in the programming.

In flight the tail of the helicopter rotates too fast for me: Reduce the dual rates or add a touch of EXPO to soften the tail.

## ***The helicopter rotates faster in one direction than the other.***

Check the installation of the servo to make sure it's properly installed as well as double check the EPA, making sure they have the same left and right value.

## ***Definitions and Conditions to be Aware of***



### ***Vibration***

If your helicopter has any vibrations it can confuse the gyro, therefore reducing its performance.

### ***Binding***

Binding can cause inconsistent tail performance. It is important to remove any binding in your tail control system.

### ***Slop***

It is best to replace any worn tail parts from time to time. Worn parts can also reduce your gyro's performance.

### ***Wag***

When the tail rapidly cycles back and forth: This is due to having the gain set too high or the SENS dial adjusted too fast (0) for the servo you are using.

### ***Fade***

When the tail moves away from the holding yaw: This is due to having the gain set too low.

### ***Locked In***

When the tail does not over react or under react to your flight: This will take some testing and tuning, but you will know when it's right.

### ***Heading Hold***

With your Gyro switched into Heading Hold the RC helicopter will attempt to maintain its yaw (rotational flight position) in a cross wind or awkward flight direction.

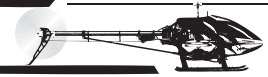
### ***Normal***

In Normal, the gyro will compensate the helicopter's yaw, adjusting for any torque changes due to the addition or subtraction of power or increase - decrease in pitch.

### ***Gain***

In RC helicopters it is a term used to add or subtract gyro compensation sensitivity to the tail control of the helicopter.

## **Warranty Service**



Heli-Max® will warrant your Gyro for 90 days after the purchase from defects in materials or workmanship of original manufacture. Heli-Max, at their option, will repair or replace at no charge, the incorrectly made part. This warranty does not cover damage caused by crash, abuse, misuse, alteration or accident. To return your Gyro for service you need to provide proof of purchase, your store receipt or product invoice will suffice. IN NO EVENT SHALL THE PURCHASER BE ENTITLED TO ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE OR INABILITY TO USE THE PRODUCT OR FROM DEFECTS IN THE PRODUCT. This warranty gives you specific legal rights and you may also have other rights, which vary from state to state.

### **Hobby Services**

3002 N. Apollo Drive, Suite 1

Champaign, Illinois 61822

Attn: Service Department

Phone: (217) 398-0007 9:00 am - 5:00 pm Central Time M-F

E-mail: [hobbyservices@hobbico.com](mailto:hobbyservices@hobbico.com)

Outside USA and Canada, contact local importer for warranty information.

# Heli-Max<sup>®</sup>

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