



## LACERTA MOTORFOCUS

User Manual v1.0.4



Thank you very much for choosing our product!

The **LACERTA MOTORFOCUS** is an **ASCOM** compatible focusmotor controller with position feedback, temperature and backlash compensation and exposure monitoring possibility. It can also be used as a standalone focus controller with advanced features.

## The content of the package:

- LACERTA MOTORFOCUS hand controller
- capsuled Motor unit
- Temperature probe
- USB cable, 1,9m (for PC connection)
- RJ45 cable 2m (for motor unit connection)
- DC power cable 3m with cigarette lighter plug.

Please visit Lacerta Motorfocus' website to check for drivers and additional information, firmware updates (free), or links to user discussions. Download the virtual user CD from the Support Tab:

<http://www.teleskop-austria.at/index.php?produkt=MotorFocusLA>

## Connection details:

Connections on the hand controller



12V DC socket(5,5/2,1mm center positive) \_ Off-On switch \_ USB-B mini \_ RJ45

Connections on the motor unit



upper side: 2,5mm stereo socket (from MGEN's camera port)  
3,5mm stereo socket (to DSLR)  
right side: RJ45 (from handbox)  
3,5mm stereo socket (temperature probe)

## Connection to the focuser:

The Lacerta Motorfocus is compatible to a growing number of focusers. You do not need any additional adaption for follwing focusers: Skywatcher Esprit 80-150, ED120, Lacerta Microfocus unit, Octo60. Please visit the website mentioned above to see a video how to connect properly.

## Technical data:

Size:	79x117x24mm (120gr)
Main power:	12V DC (9-15V) Plug size: 5.5/2.1mm, <b>center positive polarity</b> (with polarity protection).
Fuse:	built-in regenerating fuse
Stepper motor:	200 step/revolution, 2 phase bipolar, 800mA / coil max. current.
Motor connection:	RJ45-8p8c, pinout: 1 = Temperature signal 2 = Motor coil A-Plus 3 = Exposure signal 4 = Motor coil A-Minus 5 = +5V 6 = Motor coil B-Plus 7 = GND 8 = Motor coil B-Minus Only use with 1:1 UTP cable. <b>NEVER use reverse UTP (cross-link) cable!</b>
PC connection:	USB-B mini
Display:	2 row 16 characters LCD, black background, amber-yellow characters.
Temperature Probe	180cm long with hole to be screwed somewhere, 3,5mm stereo jack

**Attention!** Be aware that **Manual turning** of the focuser is possible, but only if UTP cable to handbox is **DISCONNECTED**, otherwise the possibly induced voltage may cause damage of **MOTORFOCUS!**

## Functions and concepts

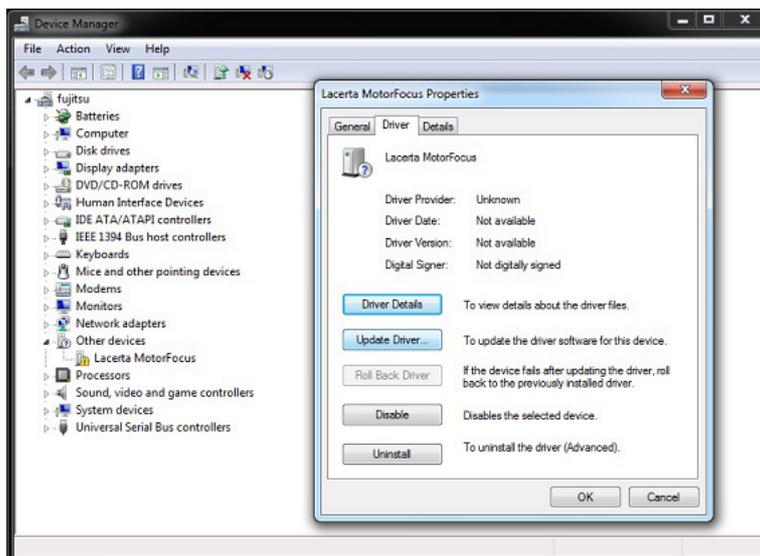
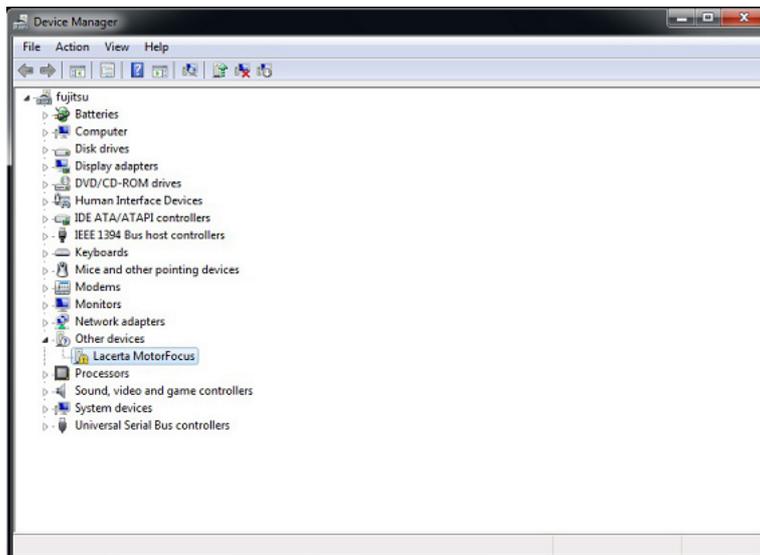
The hand controller is equipped with a digital display that shows a wealth of status informations, like position of your focuser, temperature, direction of movements, backlash compensation, filter slot and so on. You may enter the menu by pressing **Esc** and **Ent** at the same time, and change all important parameters. There are three filter offset positions definable, relative to the main filter position, which step number also can be stored. The Temperature probe can be mounted near the most sensitive part of your telescope (preferably isolated against outside air), to pick up Temp. information from there and automatically compensate for focus drifts. A backlash compensation can be designed to be active from a certain step distance, and your focus position will be reached from one movement direction only. If you use Lacerta MGEN superguider, you may connect its camera control and focus corrections will take place only between exposures. The resulting precision (if your focuser allows for) is usually in 1 micron range (0,001mm). That provides ample possibility to measure V-curves using compatible programs, or watch the Bahtinov pattern at the live screen of your camera, and achieve best possible focus all the time.

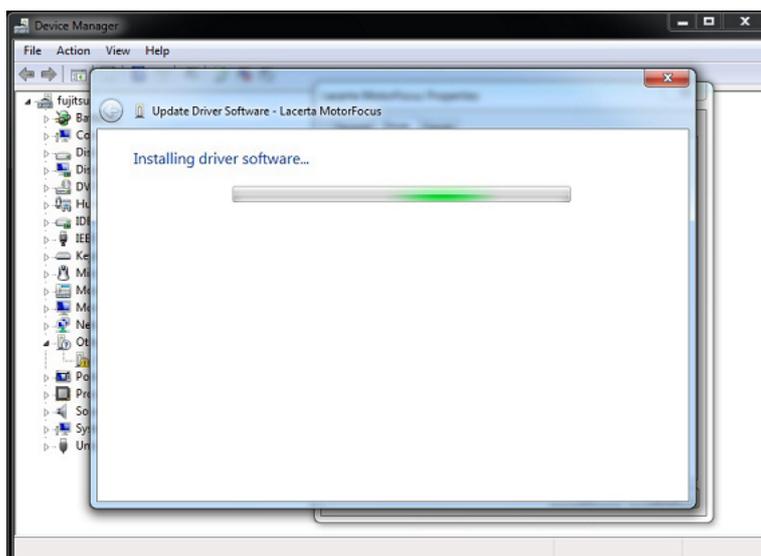
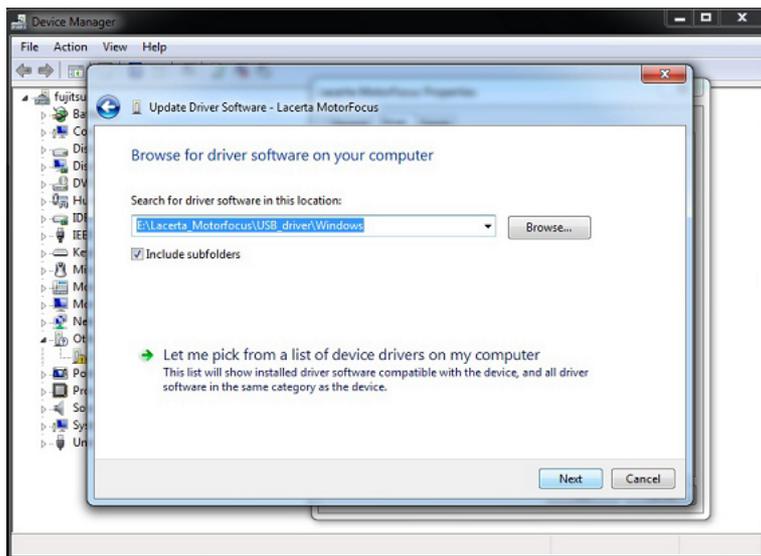
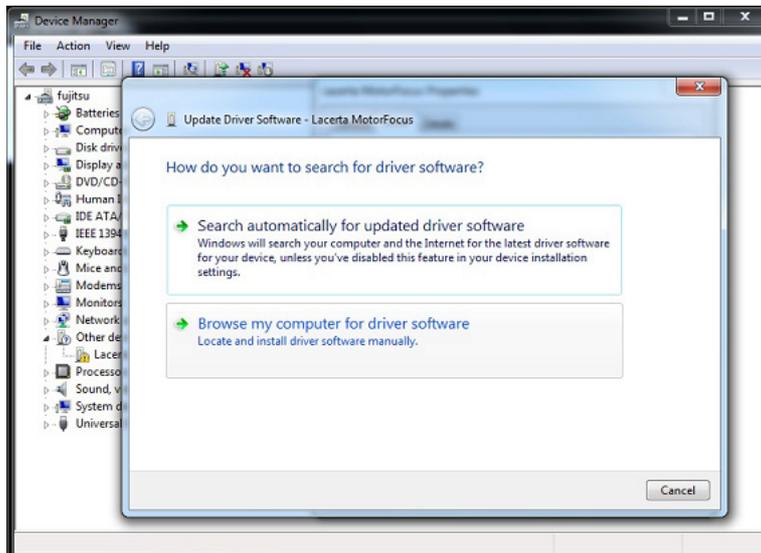
# Installation

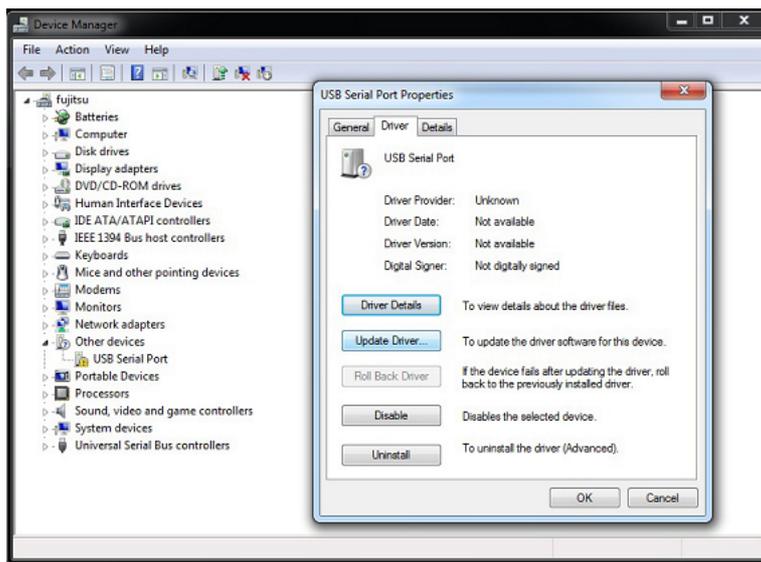
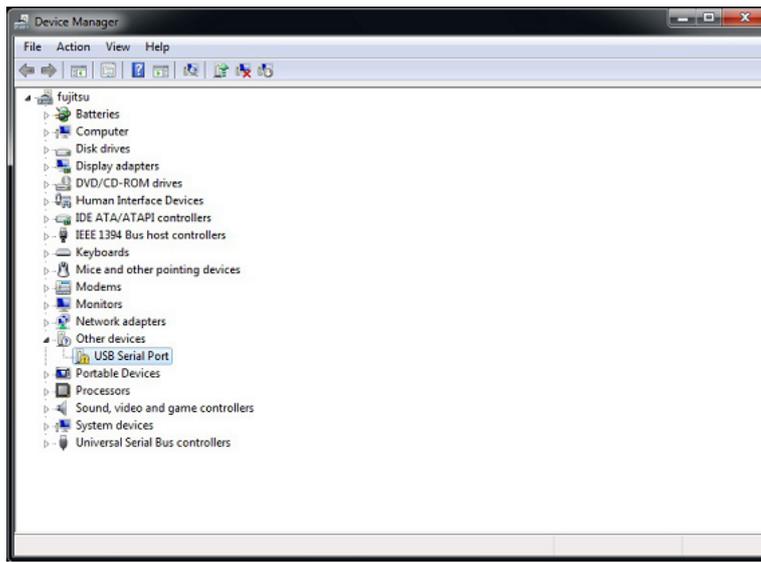
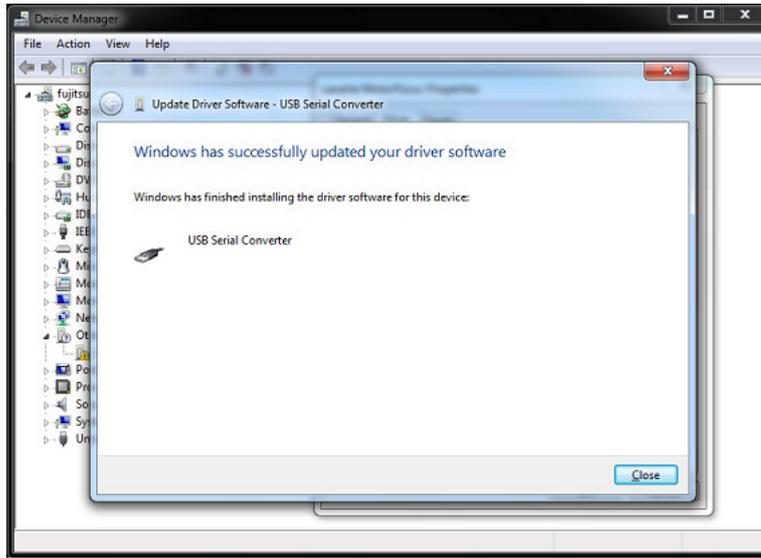
For comprehensive use of device it's necessary to install the USB driver and PC applications first. You can see below the installation steps on a Windows 7 64 bit system

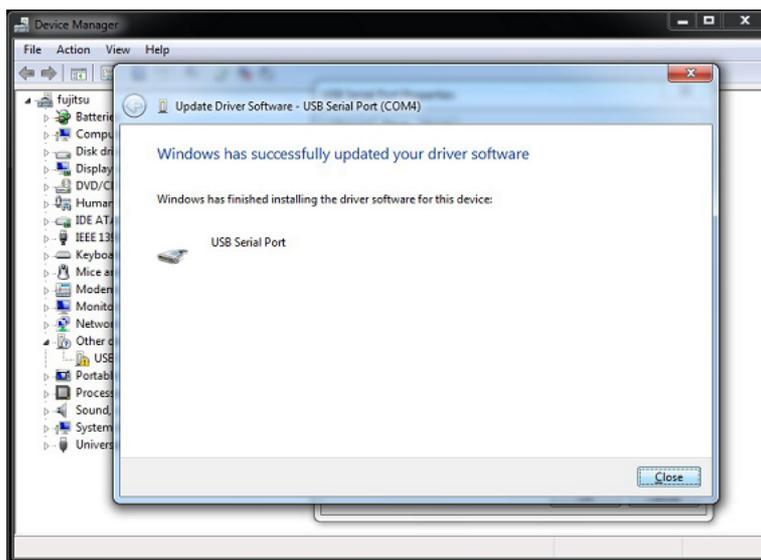
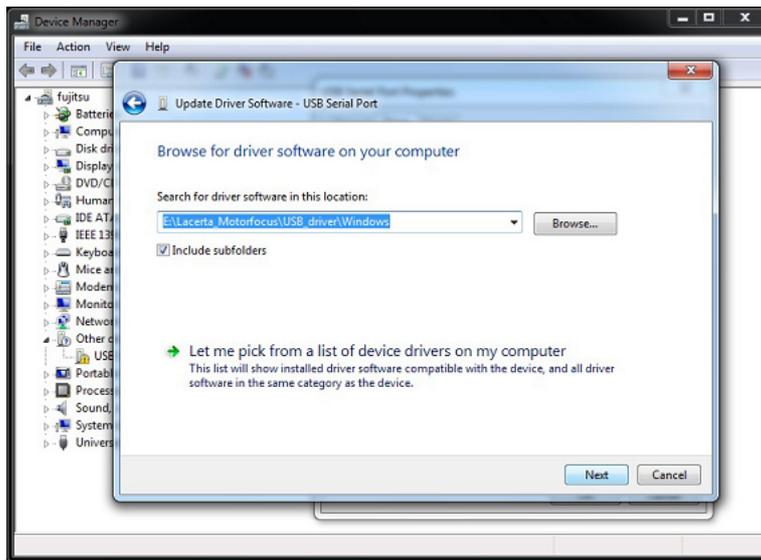
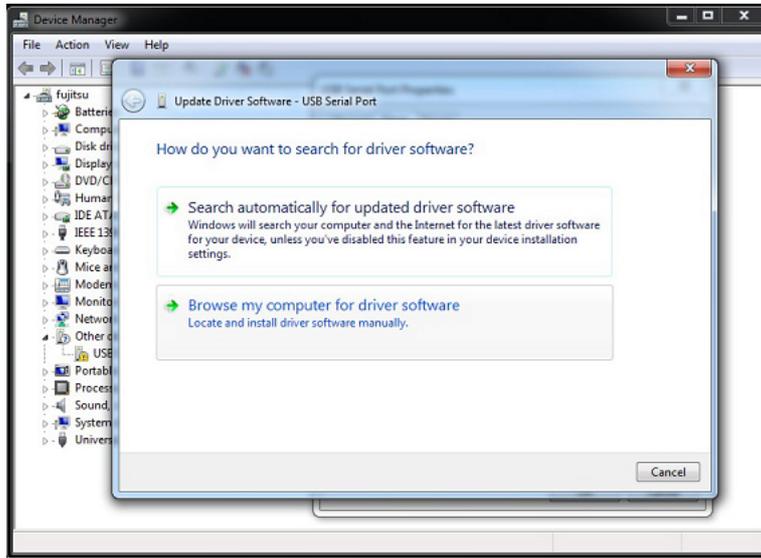
## Installing the USB driver:

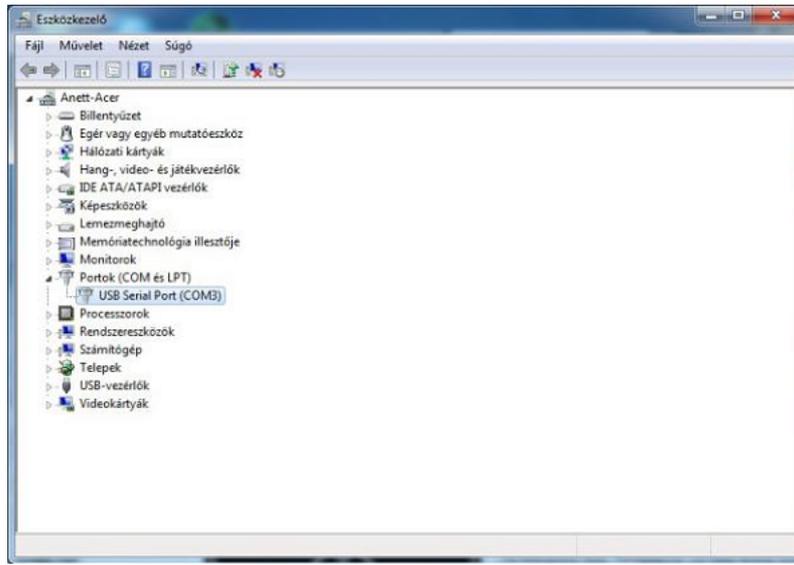
Download the virtual user CD from our website given above, and extract the zip file to a folder. Connect **LACERTA MOTORFOCUS** to PC and power supply using accessory cables. Turn on the device. The Operating System recognizes the device and it's looking for a suitable driver. If it does not find the driver automatically, the screenshots below help you to successful install the driver after opening the Device Manager. USB driver is found at the virtual user CD at the USB\_driver folder.





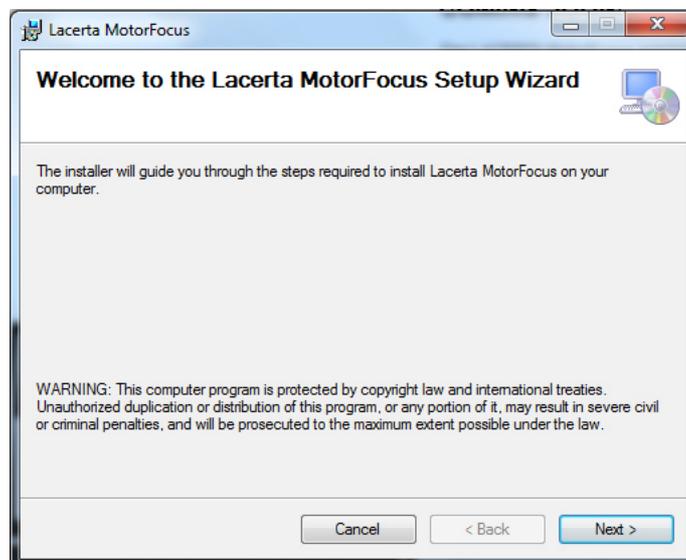


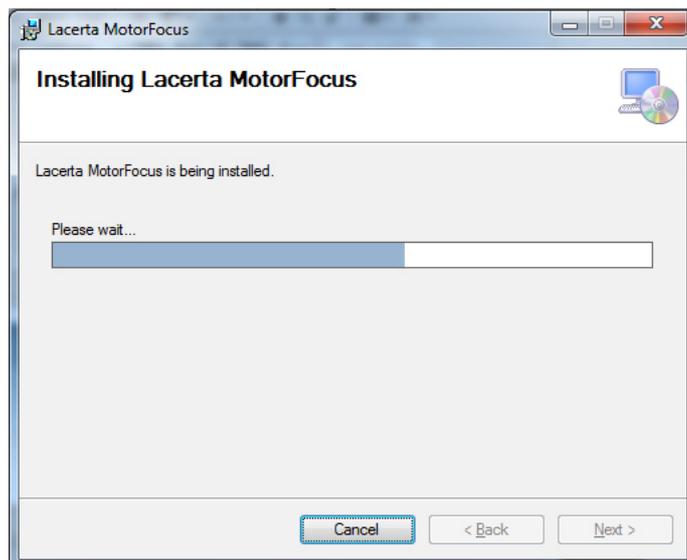
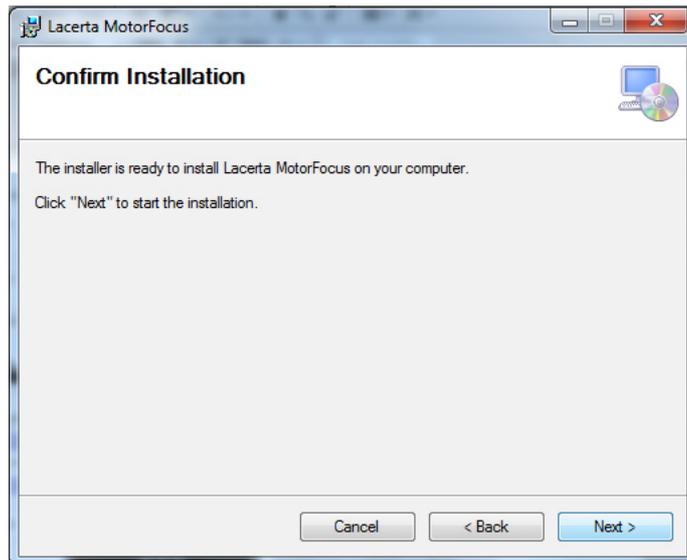
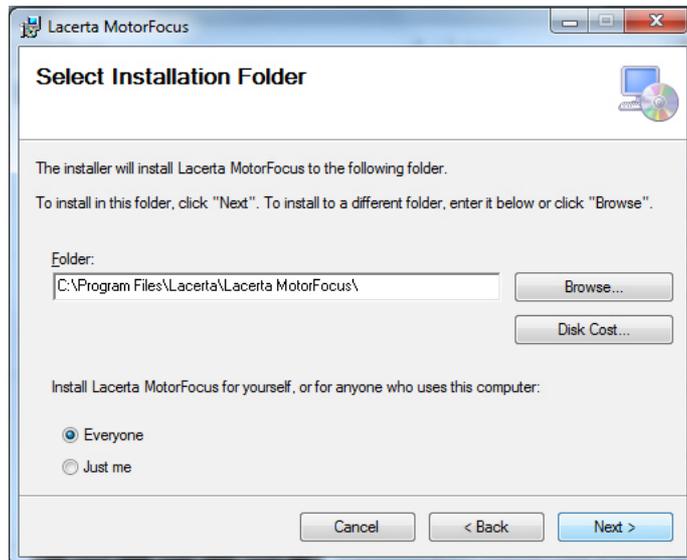




### Installing the ASCOM driver:

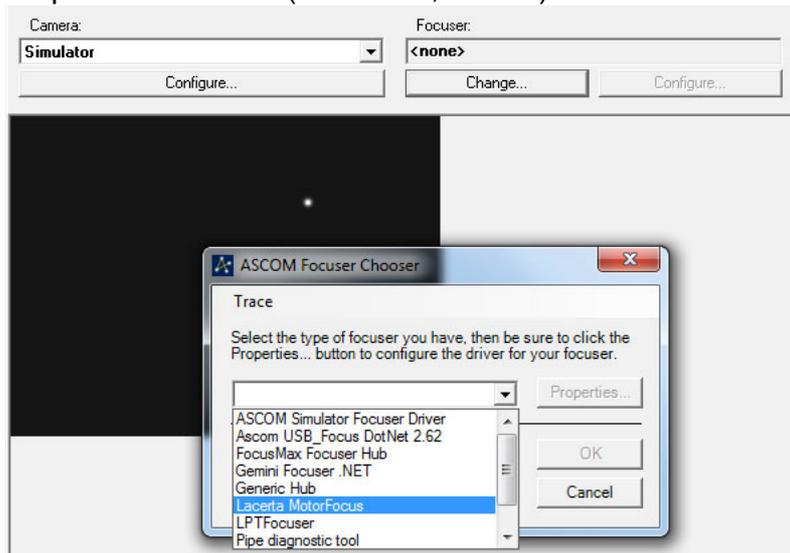
The required **setup.exe** is in the virtual user CD at **x86** (32bit OS) or **x64** (64bit OS) subfolder of **ASCOM\_driver** folder. **ASCOM 6.1** platform is needed! If it's not installed, you can download it from <http://ascom-standards.org/index.htm>



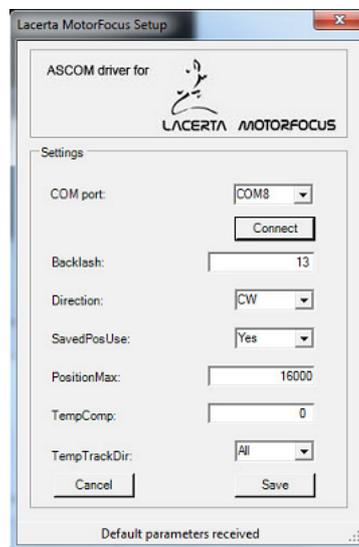


## Settings of the ASCOM driver:

Choose **LACERTA MOTORFOCUS** on the ASCOM Focuser Chooser drop-down panel in your compatible software (MaximDL, APT...).



If the port was chosen previously, the device can be connected by pressing the OK button. A acoustic signal and flashing of device display indicate that the connection is created. „A” character shows in the **MOTORFOCUS** display that the **ASCOM** connection is available. For device parameters press the properties button.

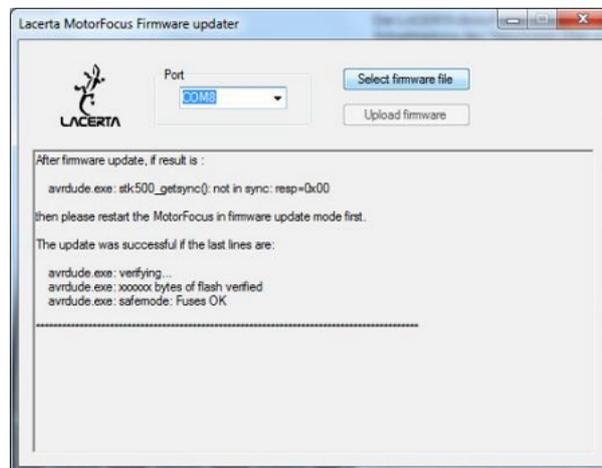


The serial port of **LACERTA MOTORFOCUS** can be selected in the COM port drop-down menu. When the connection is created, parameters are loading from Eeprom. After parameter modification click the Save button to write changes into Controller.

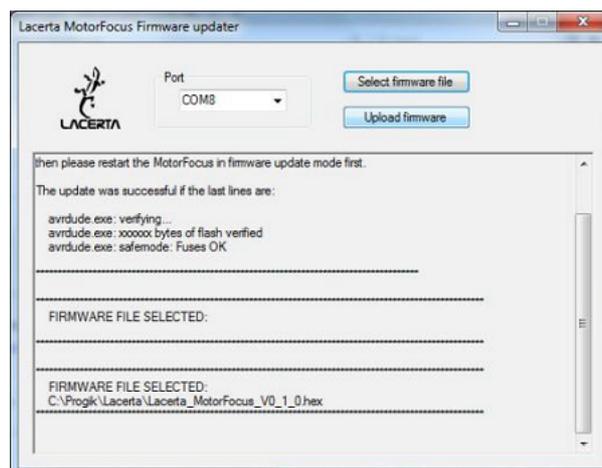
## Installation of Firmware Updater:

Copy whole **Firmware Updater** folder from CD to any folder on your PC. **Select firmware file** button opens this same folder, that's why it's recommended to copy HEX files of the software update file here.

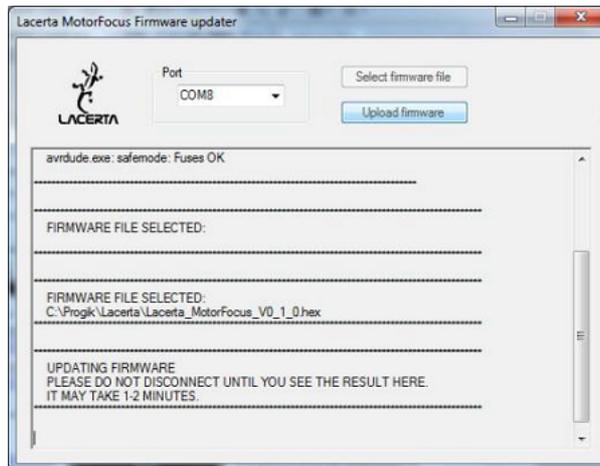
At first, connect device to your PC, after that push and hold down **In** and **Out** buttons at the same time and then turn on the device. Release the buttons after you can hear the acoustic signal and you can read **Buttons released** on the display. After some seconds you can hear the signal again and the display reads: **Programming mode**. Now start the **Updater** program **LacertaMotorFocusFirmwareUpdater.exe** in the install folder. It may occur that your antivirus software prevents the operation of **Updater** program. In this case you need to turn off antivirus.



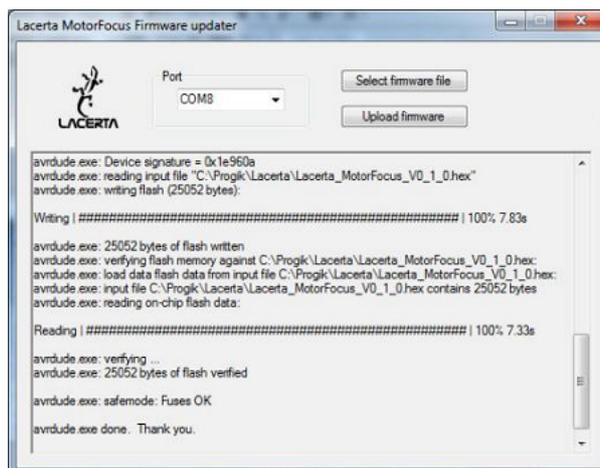
Select the port which is in use by the device (consult Device Manager if you don't know). Load the new firmware file with **Select firmware button**.



The name of the selected HEX file is shown at the bottom side of window.



To start uploading, press the **Upload firmware** button. An uploading message at the bottom of the window shows the process status. When the uploading is in progress, the display of the Hand Controller is dark and the LED light of the serial communication is flashing. Red flashing is the sign of back reading.



When the process is complete, the device is restarting and the display shows the new version number. Please use the factory reset function to fully install the new FW!

# Usage of LACERTA MOTORFOCUS

## Informations on the screen:

The device name appears after turning on



1,5s later the version number with acoustic signal



again 1,5s later the normal main screen is displayed



It shows some important Informations:

- '1' - 1 step/button pressing active or '\*' if the user stepping number is active.
- 'A' - **ASC**OM connection is active or '\_' if inactive.
- 'B' - Backlash compensation is active or '\_' if inactive.
- 'T' - Temperature compensation is active or '\_' if inactive.
- 'E' - Exposure is in progress or '\_' if not.
- '3' - **Offset** number for active filter.
- 'T:' - Current temperature. (Without temperature sensor: 'NC!')
- 'Pos:' - Current position.
- 'D:' - Direction of last movement (In / Out)

## the Menu structure – Overview

There are two menus available: The **Main Menu** contains all settings for backlash, step size, initial position, light and sound, motor currents, temperature compensation. The **GotoSelect Menu** contains the main positions and filter offset settings, so you can reach your important positions easily.

GOTO quick menu (press GOTO button 1sec)		
1	GoStartPos (GotoPos)	After Ent ("Set" is displayed) change value with In/Out. Press "Ent" button to confirm, and once more and the motor moves to the desired position.
2	GoFilt0Pos	Only works if you're one of the "Offset" positions.
3	Go Offset1	
4	Go Offset2	
5	Go Offset3	
6	Save Pos	Save the current position to the "GoStartPos" function. After Ent ( "Set" displayed) change value with In/Out. press "Ent" button first to confirm, and once more, and the motor moves to the desired position. ***
7	SetOffset1	input value to offset the Go menu choices. Difference to Filt0Pos!
8	SetOffset2	input value to offset the Go menu choices. Difference to Filt0Pos!
9	SetOffset3	input value to offset the Go menu choices. Difference to Filt0Pos!

\*\*\* If you want the position to be shown at startup, set the StartSavedPos to "Yes". Main Menu/Handcontrol/StartSavedPos and set to "Yes".

Main Menu (press Esc and Ent 1sec)		
Focuser	HandControl	Motor
Backlash	Step/Click	hold current
BacklChg	Backlight	move current
BacklMultp	Contrast	Direction
Pos.Max	Volume	
TempComp	StartSavedPos	
TempTrackDir	FactoryReset!	

<b>Shortcuts</b>	
Esc (Press 1sec)	Change the shaved and single Stepsnumber (display * or 1)
Ent (Press 1sec)	Switch TempTrack function (display T or _)

## Direction buttons ( In / Out)

The position counter starts from 0 normally, but this value is modifyable in the Menu. Normally, one time pressing the in/out buttons means the motor takes 1 step. If you would like to switch to the user defined **StepsPerClick** mode, just press the **Esc** button for 1 second. Then, on the display the first character at the upper row will change to '\*' with acoustic signal, and pressing in/out now takes the **StepsPerClick** value which can be set in the menu (the default value is 50). If you would like to return to 1 push / 1 step mode, just push again the **Esc** button for 1 second. The '\*' character will become '1'.) If you push down the direction button permanently, the motor will accelerate continuously until it reaches terminal velocity. After releasing the button the motor slows down continuously until it stops.

The position cannot take values below 0, and also not more than the **PositionMax** value, which is setable in the Menu (default value is 15000). If the motor reaches the position limits, an error message will be shown on the display with sounding a signal. Use the In and Out buttons for scrolling up and down the menus, and for changing values. In some menus the value input is dynamic: With continuously pressing the button, and the value steps are more than 10, the counting will be in tens. If the value steps are more than 100, the counting will be in hundreds. If the value steps are more than 1000, the counting will be in thousands. If the counting reaches the limit, the opposite limit will be the next value. (Example: In case of **GoStartPos** menu the next value after 65535 is the 0 and inversely.)

## Function buttons (Ent, Esc, Goto) and menus

### **Ent** button

Generally use for entering to menus and confirming.

Switch on/off Temperature compensation (**TempTrack**) by pressing down for 1 sec. If **TempTrack** is active, „T” character will be shown in the upper row on the display.

Enter the Main menu by pressing **Ent** together with **Esc** button.

### **Esc** button

Generally used to exit from menus, or cancelling changes.

Switch between 1 step/button pressing and **StepsPerClick** stepping mode by pressing down **Esc** for 1 sec. „1” or „\*” is shown at the upper row on the display.

Enter the Main menu by pressing **Esc** together with **Ent** button.

### **Goto** button

To reach the **Goto** quick menu, press this button for 1 sec.

## Goto menu

This menu contains often used functions and position settings.

Press the **Up** (or **Down**) button to scroll through the menu items in a circle, and finish by **Esc**:

### **GoStartPos:**

Movement to the stored position. After pressing **Ent** button ("**Set**" is shown on the display) this value is modifiable by the **In/Out** buttons. *GoStartPos* text becomes **GotoPos**. after modification. You can move the focuser to the selected position by pressing again **Ent** button. If you would like to exit from this menu, press **Esc** button. When the focuser is under movement, the position value on the screen becomes „**Move**". The focuser moves dynamic. Long voice signal indicates when the focuser reaches required position, then the controller leaves the **Goto Select** menu automatically. The focuser stops immediately when you push **Esc** button for 0,5 seconds! (Emergency stop)

### **GoFilt0Pos:**

Movement to Clear filter (base filter) position. This menu always shows the initial (or modified) base position. The modified position is calculated by filter the wheel position and **TempTrack** corrections if it's activated. This is the default filter position and this is the base from which the **Offset** values are calculated. This way filters of slightly varying thickness can be programmed. e.g. there are 2 filter using Pos0, 3 filters using Pos1 and 1 filter using Pos.2. There are this base position and 3 user defined offset positions possible – 4 altogether.

### **Go Offset1, Go Offset2, Go Offset3:**

Moves the focuser by this pre-set value, when changing the filter wheel manually. If this is the active Offset, the device exits from menu without movement.

### **Save Pos.:**

This position is the stored value for the **GoStartPos** menu. If **StartSavedPos** function is activated, it will be shown as the wake up position after turning on the device. It's also possible to modify the stored value by **In/Out** buttons. Press **Esc** button to exit without modification.

### **SetOffset1, SetOffset2, SetOffset3**

To compensate focus deviations with different filters, you can set an offset of +/- 50 steps in this menu. If you push **Esc** or **Ent**, the device doesn't exit from whole **GotoSelect** menu to reach other **Offset** settings faster.

# Main menu

Push **Esc** and **Ent** at the same time to reach the Main menu, Use **In/out** to select an entry and press **Ent** to enter it. Here you can find the following settings:

## Focuser menu:

### **Backlash:**

The value of basic backlash compensation (the value can be between 0 and 255). Backlash compensation takes place only when the rotational direction of the motor is changing (in/out). The movement of motor increases by this value, without counting the backlash steps, when the direction of motor rotation is changing. The idea is to correlate the counter with the focuser position, not the motor position.

*The process when the direction of motor revolution is changing:*

*Backlash (position uncounted) + Steps (position counted)*

If this function is activated (the value is not 0) the '**B**' character will appear at the upper row of the display.

Of course it is necessary to determine the backlash of your system first. You can measure the correct value of backlash using the following simple method indoors, or use a star instead:

Mount a Dial indicator to your focuser, then move focuser to any position (e.g. **Pos: 1000**). Reset dial indicator and **Backlash** value. Activate single stepping mode, than move focuser further in the same direction (e.g **Pos: 1050**). After that move back the focuser, until the dial indicator reaches 0 again. Read the position on the display (e.g **Pos: 975**). Because the motor needs 25 more steps to reach the absolute position, write 25 to Backlash value and repeat the process to recheck.

### **Tip!**

*This process is also suitable to define the resolution of our system (mm/step). Do this calibration method at focus position, because the backlash is not equal in every focuser position due to deviations of gear teeth profiles and motor stepping angles (approx. +/- 5% at full step).*

### **BacklChg:**

The Backlash change is the **step limit** of switching between two backlash compensation modes (the value is from 0 to 50). The „**Basic**” backlash compensation is accurate in case of small motor movements at specified position (functionally around the right focus position), but it's not working with enough accuracy in case of large movements. That's why the method in case of large movements is approaching the desired position from **one direction only** (in or out) to eliminate any backlash. To move 15 steps out it would move e.g. 100 steps out and 85 in, to reach the position. This is very precise. Below

the limit the „basic“ backlash compensation is in use, above the limit the „approaching from one direction only“ is in use.

**Attention:** Please use „basic“ backlash compensation exclusively when the **Temperature compensation** is active without **Exposure monitoring**, because the photo may defocused due to focusmotor movement while an exposure is going on!

### **BackMultp:**

(Backlash Multiplier, the value is from 1 to 10) is a factor determining the "overdose" of backlash correction for the „approaching from one direction only“ method. (**Backlash** value is multiplied with **BackMultp**). The movement to the **Out** direction is as usual without compensation. But if the movement is to the **In** direction, the step number of the motor is increased by the given value, and then the motor moves back in the **Out** direction by this same value to reach the desired position from the **Out** direction only. Because backlash appears in both directions, these two backlashes in different directions cancel out each other precisely and the focuser position can be reproduced exactly.

*No compensation to **Out** direction.*

*To **In** direction the formula of the compensation is the following:*

$$\mathbf{In} = \mathit{Step} + (\mathit{Backlash} * \mathit{BackMultp})$$

$$\mathbf{Out} = (\mathit{Backlash} * \mathit{BackMultp})$$

*In this case the final movement direction is only **Out**.*

*If the last movement direction was **In** using „Basic backlash compensation“, and the motor steps at movement to **In** direction exceed the **BacklChg** value, then the compensation formula is the following:*

$$\mathbf{Out} = \mathit{Backlash} \text{ (position uncounted)}$$

$$\mathbf{In} = \mathit{Step} + (\mathit{Backlash} * \mathit{BackMultp})$$

$$\mathbf{Out} = (\mathit{Backlash} * \mathit{BackMultp})$$

### **Pos.Max.:**

Limits the maximal focuser position. This value is adjustable dynamically between **300** and **65535**. (The default value is 15000, the maximum travel of Octo60 focuser.)

### **TempComp:**

Step numbers per 10 degrees temperature difference, this value may be between +/-5000.

### **Comment:**

The temperature data refreshes about every 30 sec., or at the end of exposure. The initial temperature and **Focuser position** will be saved, these will be the base of **Temperature compensation**. If the **Focuser position** is modified manually or by **ASCAM**, this new position will be the base of **Temperature compensation**.

### **Tip – how to calculate the TempComp value**

*Adjust focus at two different temperatures. E.g the accurate focus position is at position 540 when the temperature is 18,2°C. Later, the accurate focus*

*position is at 558 position at 15,5°C. Calculate the compensation value with the following formula:  $((18 \text{ steps} / 2,7^\circ\text{C}) * 10^\circ\text{C} = \underline{66 \text{ steps} / 10^\circ\text{C}}$*

**TempTrackDir:**

Direction of temperature compensation, to prevent the activation of backlash compensation in a certain direction if the temperature changing is only small and probably random:

- **In**
- **Out**
- **All**

e.g. when temperatures are generally dropping during the night, a refractor will only need **In** compensations, and any **Out** compensation can be ignored. Select **In**.

Activate temperature compensation with pressing **Ent** button for 1 sec (or with **ASCOM**). In this case 'T' character will be at the upper row of display.

***Comment:** This function is switchable by **ASCOM** compatible software! (MaximDL, FocusMax) If the motor reaches the limit, the TempTrack function will switch off automatically! This function is inactive after swiching on the device, but it has function button (**Ent**) to reach faster this function. Do not forget to set enough time between exposures for temperature compensation!*

A speciality of **LACERTA MOTORFOCUS** is, that it has the possibility of **exposure monitoring** when using **Lacerta MGEN autoguider**. Plug in the camera cable from MGEN into the plug at the motor side, and plug in another camera cable to go to your camera. The motor then recognizes the shutter signal, and that prevents temperature compensation movements while an exposure is going on. Only at the end of the exposure, when the shutter signal is off, the controller starts temperature compensation if it's necessary.

**Handcontrol menu:**

**StepsPerClick:**

Steps per pressing the In/Out buttons once. This value is adjustable between 2 and 255.

**Backlight:**

Display brightness adjustment, from 1 to 10.

**BeepVolume:**

3 options for adjusting sound volume:

- Mute**
- Silent**
- Loud**

**Contrast:**

Display contrast adjustment, from 1 to 10.

**StartSavedPos:** yes or no

Turn on/off position usage in **GotoSelect/Save Pos** menu as initial position after turning on the device.

**FactoryReset:**

Restore setting to factory default. Restart is needed!

**Motor menu:**

**Cur.Hold.:**

Setting of motor holding current:

160mA, 400mA, 600mA, 800mA

Motor holding current gets active one minute after last movement.

**Cur.Mov.:**

Peak of motor moving current:

160mA, 400mA, 600mA, 800mA

**Direction:**

Direction of motor revolution in **Out** direction. (**CW** or **CCW**)

Clockwise or counter clockwise. To correlate the revolution of the motor with the focuser movement.

**ASCOM mode:**

**LACERTA MOTORFOCUS** is controllable by **ASCOM** compatible software on PC (tested with Astroart 4, Astro Photography Tool 2.82, DSLR Focus V3, FindFocus 1.2.0.0, FocusMax 3.8.0.20, Maxim DL 5.15, SharpCap 1.5.0.344). After connection the 'A' character will be at the upper row of display. **ASCOM** reads current position of **LACERTA MOTORFOCUS**, the measured temperature and the value of **FocusMax**. All buttons on the handbox are functionable. Operations of different softwares are different. E.g. the AA4, APT, FocusMax and MaximDL refresh position data every second, so the position adjustment on **LACERTA MOTORFOCUS**, the position change appears immediately in program. Other tested programs refresh values only after giving a command for movement to a new position, so you can't see changes of values on the PC screen after position adjustment on the device directly.

Some of **ASCOM** compatible softwares support **Backlash compensation** and **Temperature compensation**.

If you would like to use **Backlash compensation** from PC software, set this value to 0 in **LACERTA MOTORFOCUS** menu! DSLR Focus, FocusMax and MaximDL use **approaching from one side** method to eliminate backlash. Approaching direction is adjustable (In or Out).

The temperature compensation function of suitable **ASCOM** compatible software use the feature of **LACERTA MOTORFOCUS**, which is activatable or not. Device settings will be overwritten by **ASCOM**. Some **ASCOM** compatible software have a custom algorithm for temperature compensation. If you would like to use this custom method, set 0 value in **TempComp** menu and deactivate **TempTrack** on device.

## Tips for usage

For mobile astrophotographers we recommend to set the **StartPos** to a middle value, and set the focuser to the approximate focus position before connecting. After switching on start to measure the star profile, V-curve or use your Bahtinov mask to achieve best focus. Set this position as **StartPos**, and now you can switch on **TempComp** and **Backlash**.

For permanently deployed telescope systems, use the stored position in **MainMenu / Handcontrol / StartSavedPos** menu. You should always end of last observation with **GotoSelect / GoStartPos** command to have this position ready.

**Filter offsets:** Mostly the filtersets aren't quite precisely homofocal, but near together so you can build groups which are referred to the 4 available positions. Mostly, the Lumi filter will be convenient to serve as a base and takes Filter 0 position. If you change filter, choose the appropriate offset position.

If the focuser is oscillating, ignore the compensating to opposite direction of thermal expansion trend in **MainMenu / TempTrack / TempTrackDir** menu.

At the end of the work, mobile users can turn just off the device, stationary users should go back to the **StartPos**. **Attention! Be aware that Manual turning of the focuser is possible, but only if UTP cable to handbox is DISCONNECTED, otherwise the possibly induced voltage may cause damage of MOTORFOCUS!**

We wish you clear skies and great success using **Lacerta Motorfocus!**

