# SteelDrive

## Baader SteelTrack Focuser Motor Drive




# Baader SteelDrive Instruction Manual

- ENG ver. 10/2012 –

Copyright 2012 BAADER Planetarium GmbH, Mammendorf

## What’s in the Box

The Baader SteelDrive Motor Drive comes with the below listed items:

- *1 pc SteelDrive unit with aluminium pulley*
- *1 pc Transmission Belt*
- *1 pc CDROM with drivers, software and instruction manuals*
- *1 pc USB cable*
- *1 pc Thermo Probe*

*Optional: 12V* Baader Outdoor Telescope Power Supply #245 7610 and the 5,5/2,5mm adapter #245 7611, for powering the dedicated Hand Controller.

***Important Note: The dedicated Hand Controller must be connected to the SteelDrive BEFORE power is connected.***

## Installing the SteelDrive

The Baader SteelDrive is straightforward to install on to the Baader Steeltrack focuser without any part of the focuser needing to be removed at all.

**Installing the SteelDrive to the Steeltrack Focuser**

1. Screw out the 4 set screws placed each side of the SteelDrive until the black housing can touch the Steeltrack focuser base where there are placed two small dovetails. You do not need to unscrew them completely, just sufficiently so that the Unit can be placed over the Steeltrack.



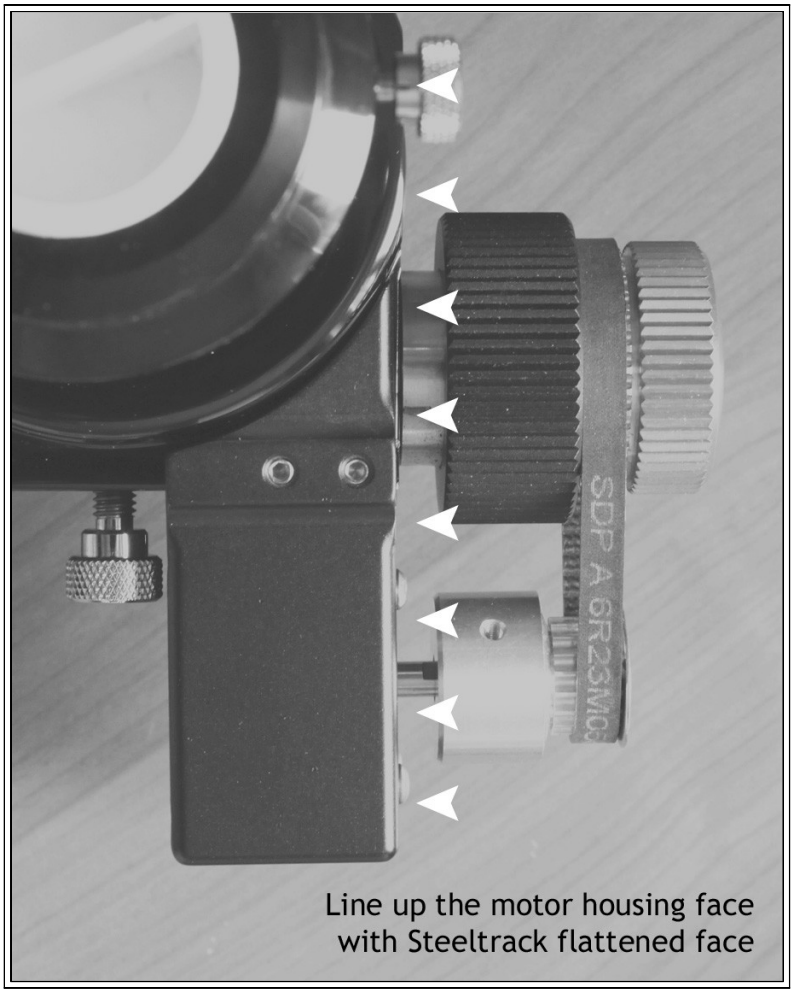

2. Screw in the 4 set screws so that they push against the small dovetails. Do not tighten yet.

3. Wrap the belt around the Steeltrack brass gear and SteelDrive pulley.

4. Align the SteelDrive with the Steeltrack by making sure that SteelDrive motor housing is lined up with the flattened face of the Steeltrack focuser as shown below.

Copyright 2012 BAADER Planetarium GmbH, Mammendorf

5. Tighten the set screws adequately (and not excessively!) until the motor housing is firmly fixed in place with no tilt or rotation with respect to the Steeltrack focuser. The belt should self-tension when the set screws are tightened.



Line up the motor housing face with Steeltrack flattened face

6. Once the set screws are tightened check the belt position to ensure that it is completely free to gently rotate by hand with no force or lateral “escaping” movement, which denotes a poor co-axiality between the two pulleys.

   If this happens then a more adequate SteelDrive positioning must be performed again by adjusting the set screws to ensure good alignment. In addition to this, the tension of the motor and belt can be adjusted below.

**Adjust the Tension of the Belt**

When the belt is correctly aligned with the pulleys but the tension is low or too high, the stepping motor position can be adjusted until a correct tension is found.

1. Use a 2.5mm hex wrench to loosen the four screws keeping the stepping motor safely in place inside the aluminium housing.

2. The SteelDrive pulley position can be adjusted inward or outward until the correct tension is found.

3. When the belt is correctly tensioned tighten the screws.


Move the stepping motor up or down to achieve a proper belt tensioning

Copyright 2012 BAADER Planetarium GmbH, Mammendorf

Correct tension is when the belt is tight but not tense, so that rotation of the brass knob is not impaired. The focuser can still conveniently be moved manually by hand, and the belt does not show any looseness or tendency to jump off the teeth.

**Obtain Perfect Alignment with the Steeltrack Focuser**

The SteelDrive motor position can be adjusted inward or outward for a perfect alignment with the brass pulley of the pinion of the Steeltrack pinion.

1. Using a 1.5mm hex wrench to loosen the 2 set screws keeping the black pulley firmly fixed onto the stepping motor shaft adjust the motor position up and down to obtain perfect alignment.

2. Tighten the set screws once perfect alignment is achieved.

3. When the belt is properly aligned with pulleys but tension is low or too high, the stepping motor position can be adjusted till a correct tensioning is found.

**Backlash**

Focus backlash is excess play in the focus mechanism. This should be resolved where possible on the focuser, or dealt with by using focus backlash compensation which is available in popular imaging control software. Backlash is not caused by the SteelDrive as all the teeth between the focuser unit and SteelDrive are always keeping in touch with each other through the rubber belt.

Focus slip can also occur on the SteelTrack focuser if this is not adjusted properly, more commonly when a heavy load is attached to the focuser. If slippage does occur it is recommend to adjust the SteelTrack focuser to apply more pressure to the pinion, adjusted correctly no slippage will occur.

## Connecting the SteelDrive for Operation

The SteelDrive can be controlled by the dedicated Control Box, an LVI SmartGuider 2 camera or by a PC, either using the supplied SteelGo software or through ASCOM. Furthermore, the SteelDrive is provided with a Thermo probe to compensate for the focal point variation with temperature change.

Copyright 2012 BAADER Planetarium GmbH, Mammendorf

**Connecting the SteelDrive to use with the dedicated Hand Controller or LVI SmartGuider 2**

*Important Note: Be sure to connect all cables first before connecting power to the unit otherwise damage could occur.*




1. Firstly connect the Thermo probe to the THERMO socket on the SteelDrive.

2. Connect the dedicated Hand Controller or LVI SmartGuider 2 to the MGA/HC socket.

3. Provide power to the dedicated Hand Controller or LVI SmartGuider 2.

**Connecting the SteelDrive to use with a PC**

1. Firstly connect the Thermo probe to the THERMO socket on the SteelDrive.

2. Connect the provided USB cable to the USB socket and then plug into the PC.

Power is provided to the SteelDrive through the USB cable. In rare circumstances insufficient power may be provided by your USB to the SteelDrive which is a result of a number of factors. In

Copyright 2012 BAADER Planetarium GmbH, Mammendorf

this situation the unit may not move correctly, not move at all, or stop responding. In order to provide sufficient power to the SteelDrive consider to:

- Use a powered hub to provide more power to the SteelDrive. The SteelDrive can absorb up to 900ma of current.

- Connect the dedicated Hand Controller in parallel to connecting to a PC. The dedicated Hand Controller can be powered in the usual way with the 12v power supply. Movement updates will be provided to both the PC and the dedicated Hand Controller by the SteelDrive so that they stay synchronised. **Power to the dedicated Hand Controller must be connected last.**

- Try using a non-active USB cable to cover long distances. In some cases active cables have shown to cause issues due to the cable itself drawing current for itself leaving less insufficient for the SteelDrive.

## Operating the SteelDrive with the Hand Controller

When plugging the dedicated Hand Controller to the DC 12V power supply, the unit will immediately switch on displaying the BAADER STEELDRIVE starting logo.




A while after the STEELDRIVE logo has rolled off the screen, the **SETUP** menu will appear. Follow the instructions to correctly setup the dedicated Hand Controller for use with your Steeltrack.

### Setup Mode

This option is to choose if to run the setup mode or not. Setup is for setting the appropriate settings for your SteelDrive in order for it to function correctly with your focuser.

***SETUP***

Copyright 2012 BAADER Planetarium GmbH, Mammendorf




Pressing > button (option: **NO**), the dedicated Hand Controller will go straight to the **ZEROING** function. Find more details further in the manual.

Pressing < button (option: **YES**), the dedicated Hand Controller will enter in **SETUP** mode where **MODEL**, **POS. CAL, BACKLIT, T COMP** and **T COEFF.** Functions can be adjusted for a proper functionality.

***MODEL***




Pressing < and > buttons, the following focuser options can be set: **SC2, NT2, RT2, RT3, CUSTOM.** Pressing **MENU**, the selected focuser model is set and **BACKLIT** function will be then displayed.

If the wrong model is set, a wrong trip will be loaded and the focuser will not move to the correct positions.

***POS. CAL.***




If **CUSTOM** option is set in **MODEL** menu, the dedicated Hand Controller will then ask whether to run or calibrate the **CUSTOM** focuser.
Pressing > button (option: **NO**), the dedicated Hand Controller will run the early calculated gear ratio for **CUSTOM** focuser and the **BACKLIT** function will be then displayed.

Pressing < button (option: **YES**), the dedicated Hand Controller will run the **POS. CAL.** to achieve the correct gear ratio with **CUSTOM** focuser.

***Important Note: MAKE SURE THE DRAWTUBE IS COMPLETELY RETRACTED TO ZERO POSITION BEFORE PRESSING YES TO RUN POS. CAL. OR A WRONG CALCULATION WILL BE DONE!***




**POS. CAL.** will move the drawtube outward till a 25mm trip is reached. The dedicated Hand Controller will display the left image and the user will have to set the real trip measured through the vernier scale printed onto the focuser drawtube.

Pressing < and > buttons, the position value will, respectively, increase or decrease by 0.1mm step. Pressing **MENU** button, the dedicated Hand Controller will automatically calculate the **CUSTOM** focuser gear ratio and **TRIP MAX** function will let the user to manually edit the trip with **CUSTOM** focuser.

Copyright 2012 BAADER Planetarium GmbH, Mammendorf

***TRIP MAX***




Pressing < and > buttons, the trip value shall, respectively, decrease or increase by 5mm step.

Pressing **MENU** button, **POS. CAL.** will calculate and save all the useful parameters with **CUSTOM** focuser and the dedicated Hand Controller will lead to the **BACKLIT** function.

***BACKLIT***




**BACKLIT** function allows the dedicated Hand Controller backlit adjustment. Pressing < and > buttons, the following options can be set: **LCD OFF** (the LCD will turn off in a few seconds when the unit will stand by), **FULL OFF** (both the LCD and the pushbuttons will turn off in a few seconds when the unit will stand by) and **FIXED ON** (both LCD and pushbuttons will always stay on). LCD and pushbuttons can be turned on again upon pressing any button.

Pressing **MENU** button, the **T COMP** function will be displayed.

***T COMP.***




Pressing < and > buttons, the following options can be set: **ON** - **OFF** (default: **OFF**). When the function is **ON**, the compensation will be activated, **OFF** will turn it off.

If **OFF** option is selected, **MENU** button will lead the dedicated Hand Controller to the **SAVE** function.

If **ON** option is selected, **MENU** button will lead the dedicated Hand Controller to the **T COEFF** function for further adjustment.

***T COEFF.***




Pressing < and > buttons, the following options can be set: **TC1**, **TC2**, **TC3**, **TC4**, **TC5** and **SET**. TC stands for Temperature Coefficient and the dedicated Hand Controller can save up to 5 values named as printed in the screen.

Copyright 2012 BAADER Planetarium GmbH, Mammendorf

**SET** will allow the Coefficient value editing by pressing < and > buttons.

Range is **0.01-0.50** °C/mm (step: 0.01). For example, a **T COEFF** set to **0.20** will compensate the focuser position by ± 0.20mm when the temperature will change by 1 °C degree. Pressing **MENU** button, the dedicated Hand Controller will lead to the **SAVE?** function.

***SAVE?***




Pressing > button, the dedicated Hand Controller (option: **NO**), will not allow any saving and the dedicated Hand Controller will go through the **STATISTIC** screen.

Pressing < button (option: **YES**), will allow the saving of all the adjustable options within SETUP mode and the dedicated Hand Controller will then lead to the **SAVING** function whenever a **T COEFF** is adjuted. In such a case, the TC number will blink, press < and > buttons to set the saving position, **MENU** button will save the Coefficient in such a position.

***SAVING..***




The TC number will blink, press < and > buttons to set the saving position, then press **MENU** button to save the Coefficient in such a position and permanently store the value for future use. Any previous value is overwritten.

**Run Mode**

When powered up, the dedicated Hand Controller can promptly run the **ZEROING** function a while after the starting BAADER STEELDRIVE logo has rolled off the screen.

***ZEROING***




The **ZEROING** function will completely retract the focuser drawtube to achieve the absolute zero position. Pressing the **MENU** button, the **ZEROING** can be stopped in any time.

*Important Note: Be aware that the Vernier scale on the focus drawtube is set outwards slightly. If you want the value reported by the SteelDrive through the dedicated Hand Controller to match*

Copyright 2012 BAADER Planetarium GmbH, Mammendorf

*this scale, stop zeroing and manually align the Focuser drawtube to the zero position on the Vernier scale. In most situations it is not important to align the scales.*

***STATISTIC***




The top line displayed on the screen is showing the absolute position of the focuser drawtube, in mm unit. The bottom line is showing the temperature detected by the probe supplied with the STEELDRIVE, in Celsius degree.

The ***** symbol displayed on the left side of the temperature will advise the **T COMP** is on and the STEELDRIVE will automatically compensate the focus shift due to the temperature variation during the night.




When compensating, the dedicated Hand Controller will switch in a few seconds the absolute position into relative by showing the variation of the tube position during the stand-by period.

Pressing **<** and **>** buttons, the absolute position will be again displayed and the focuser drawtube will move back and forth within the position range determined by the focuser model.
Pressing **MENU** button, the dedicated Hand Controller will lead to the **SETUP** mode.




Keeping **MENU** button pressed for 2 seconds, the dedicated Hand Controller will display the **POWER** message for a short time while saving all the parameters, then it will power off the device.

Copyright 2012 BAADER Planetarium GmbH, Mammendorf

## SteelDrive Software and Drivers

**Supplied Drivers**

The CDRom supplied with SteelDrive includes all the required files for a complete PC control.

Files included in the CDRom:

- **EXAR Driver (Focuser driver)…….ver. 1.8.0**
- **ASCOM Platform (ASCOM platform)……..ver. 6 SP1**
- **ASCOM SteelDrive Focuser Driver (ASCOM driver)…….ver. 1.0.6.1**
- **STEELGO Controlling Software (dedicated software)…….ver. 1.1.15**
- **Instruction manual…….ver. 10/2012**

## Installing the Software and Drivers

Earlier versions of ASCOM Platform 6 may not work correctly; the latest version is 6 SP1 and is required for a correct control of the SteelDrive through the PC.

Drivers should be installed into the PC according to the below listed sequence.

1. Install EXAR Driver
2. Install ASCOM Platform V6 with SP1
3. Install ASCOM SteelDrive Focuser and SteelGo Software

**Install EXAR Driver**

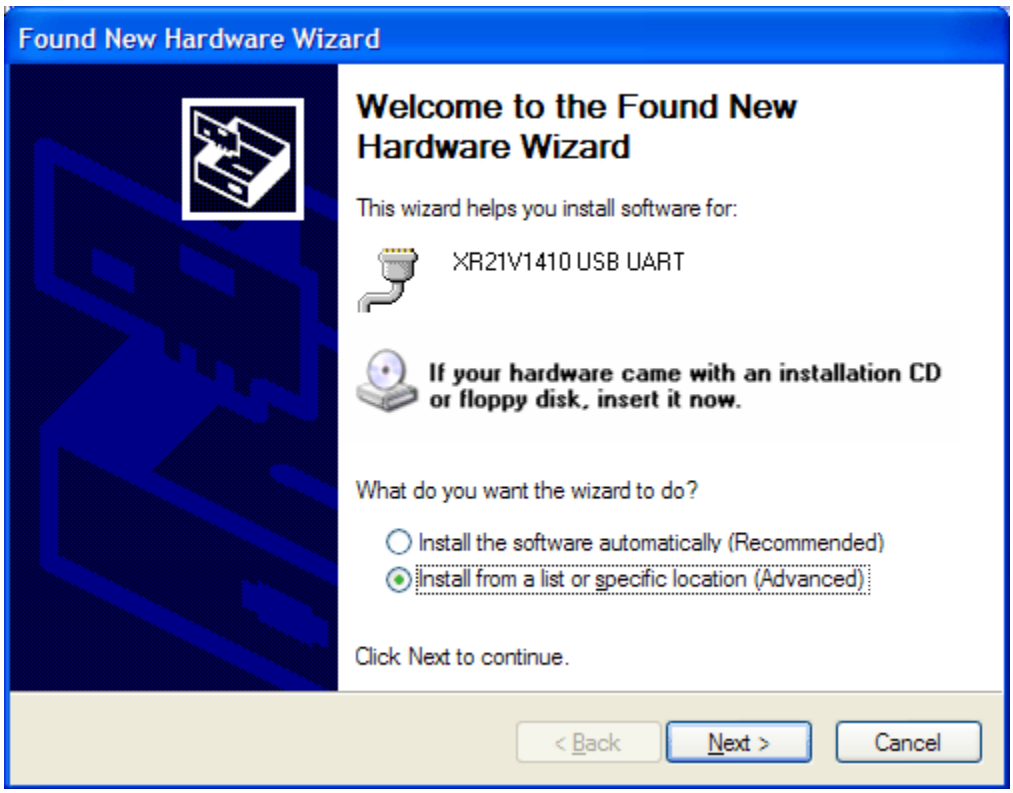
1. Plug the SteelDrive to the PC through the USB cable supplied following the correct connection sequence described in section 3 of this manual.

2. When the ‘New Hardware’ wizard will pop up, follow instructions step by step as pictured here below

Copyright 2012 BAADER Planetarium GmbH, Mammendorf

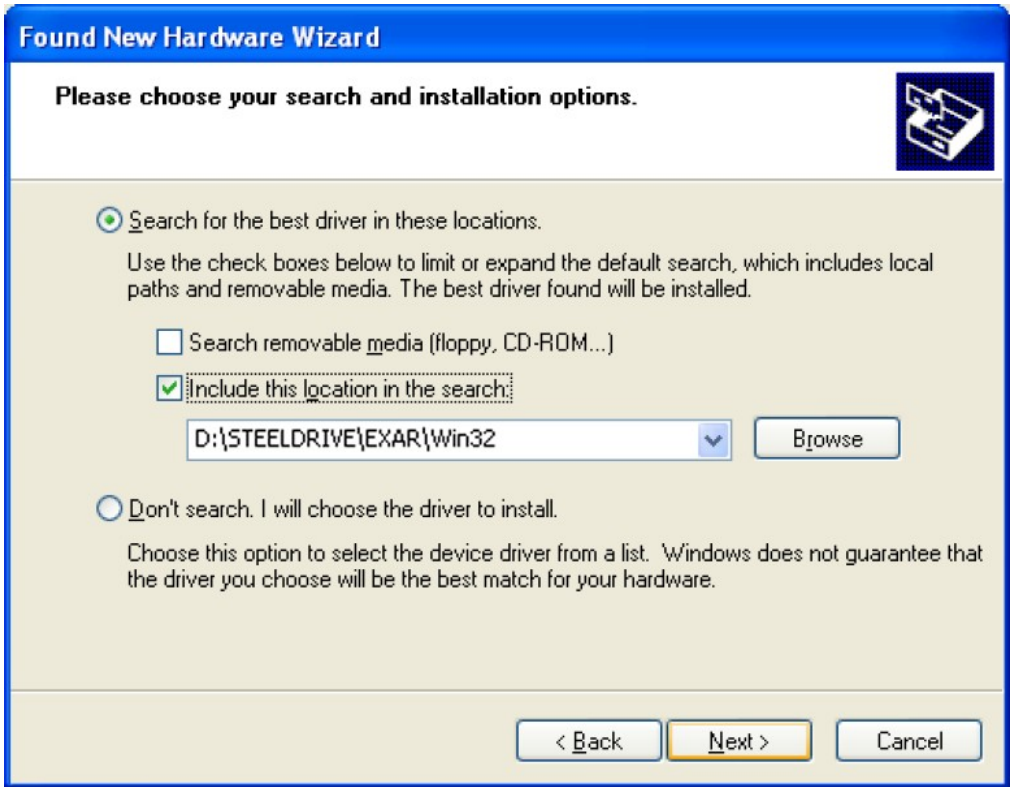



3. Click **NO, NOT THIS TIME** and click **NEXT**




Copyright 2012 BAADER Planetarium GmbH, Mammendorf

4. Select **INSTALL FROM A LIST OR SPECIFIC LOCATION** and click **NEXT**




5. Select **INCLUDE THIS LOCATION IN THE SEARCH**

6. Press **BROWSE** to locate the <DRIVE LETTER>**:\STEELDRIVE\EXAR\Win32** or **Win64** directory according by your 32 bit or 64 bit Windows system. Once this directory is selected press **NEXT** and follow instructions prompted on the screen.




Copyright 2012 BAADER Planetarium GmbH, Mammendorf

7. When the driver has been successfully installed, click **FINISH** and the SteelDrive will be ready to be used and controlled by the PC through the ASCOM driver.

**Install ASCOM Platform V6 with SP1**

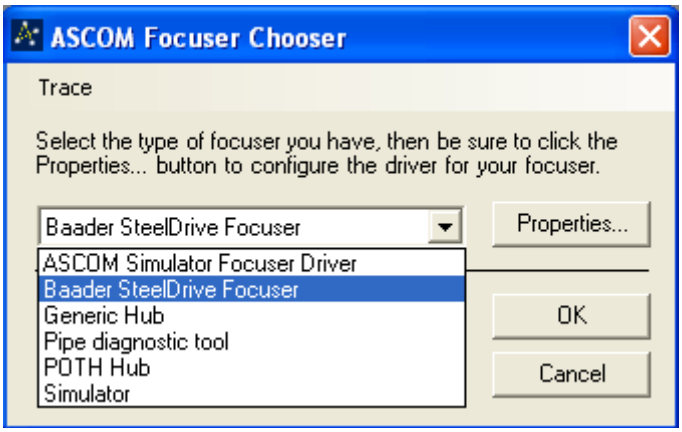
1. Double click above **ASCOM Platform 6SP1 setup** file and follow instructions displayed on the screen to install the ASCOM Platform v. 6. If this platform is already installed into the PC, there is no need to remove it to install this version unless you are coming from an earlier version which is below the requirements.

**Install ASCOM SteelDrive Focuser Driver and SteelGo Software**

1. Double click above **ASCOM SteelDrive Focuser Driver Setup** file to install the dedicated ASCOM driver and STEELGO Software which will let the SteelDrive PC control by all the ASCOM compliant software in the market.

2. Click **NEXT** to get started with installation, then follow the on-screen instructions.

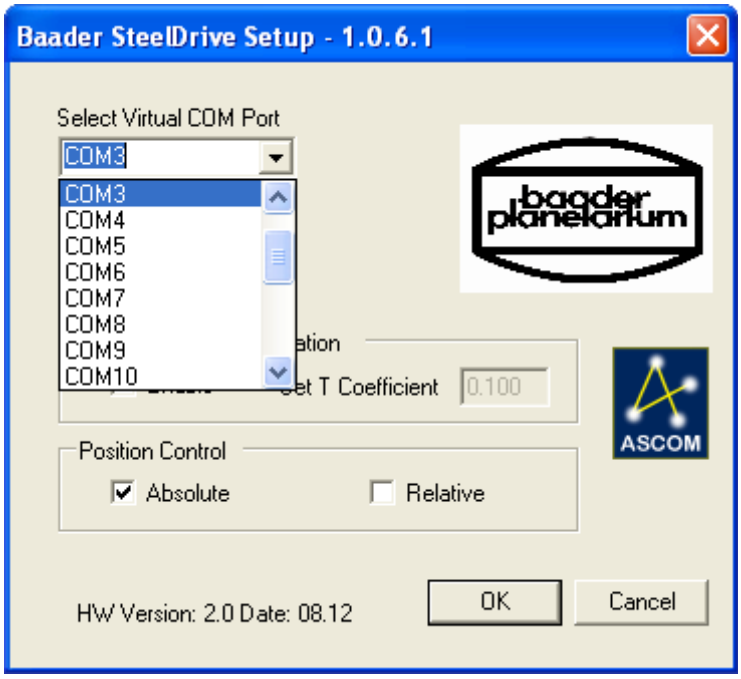
3. When the driver has been successfully installed, the **Baader SteelDrive Focuser** option will be listed among other ASCOM devices installed in the PC as pictured here.




4. Select **Baader SteelDrive Focuser** option and click above **Properties** to set correct model.

5. Select the **Virtual COM Port** as seen in the Device Manager, then the pre-set **Focuser model** will be automatically loaded together with pre-set T Coefficent.

Copyright 2012 BAADER Planetarium GmbH, Mammendorf




Please note, the latter two Position Control parameters are called back from SteeldDrive device, so there is no need to manually set them.

Nonetheless, both the **Model** and **T Coefficent** can be adjusted in any time and these will be then stored into the SteelDrive device for future re-use ith bot the PC and with the deciated Hand Controller.

6. The SteelGo Software will be then installed and accessible from the **Windows Start Menu**.

## Using SteelGo Controlling Software

Copyright 2012 BAADER Planetarium GmbH, Mammendorf

**Requirements**

The SteelGo Controlling software allows the SteelDrive Focuser control through the PC. The SteelGo Controlling software requires only the EXAR driver to be installed and does not rely on ASCOM.

**Updating SteelGo**

SteelGo software is installed when you install the ASCOM SteelDrive focuser driver. However, the program doesn't require any installation as it is a standalone executable. To update the software just decompress the latest zipped EXE file and replace the older EXE version saved in **Windows Start Menu**.

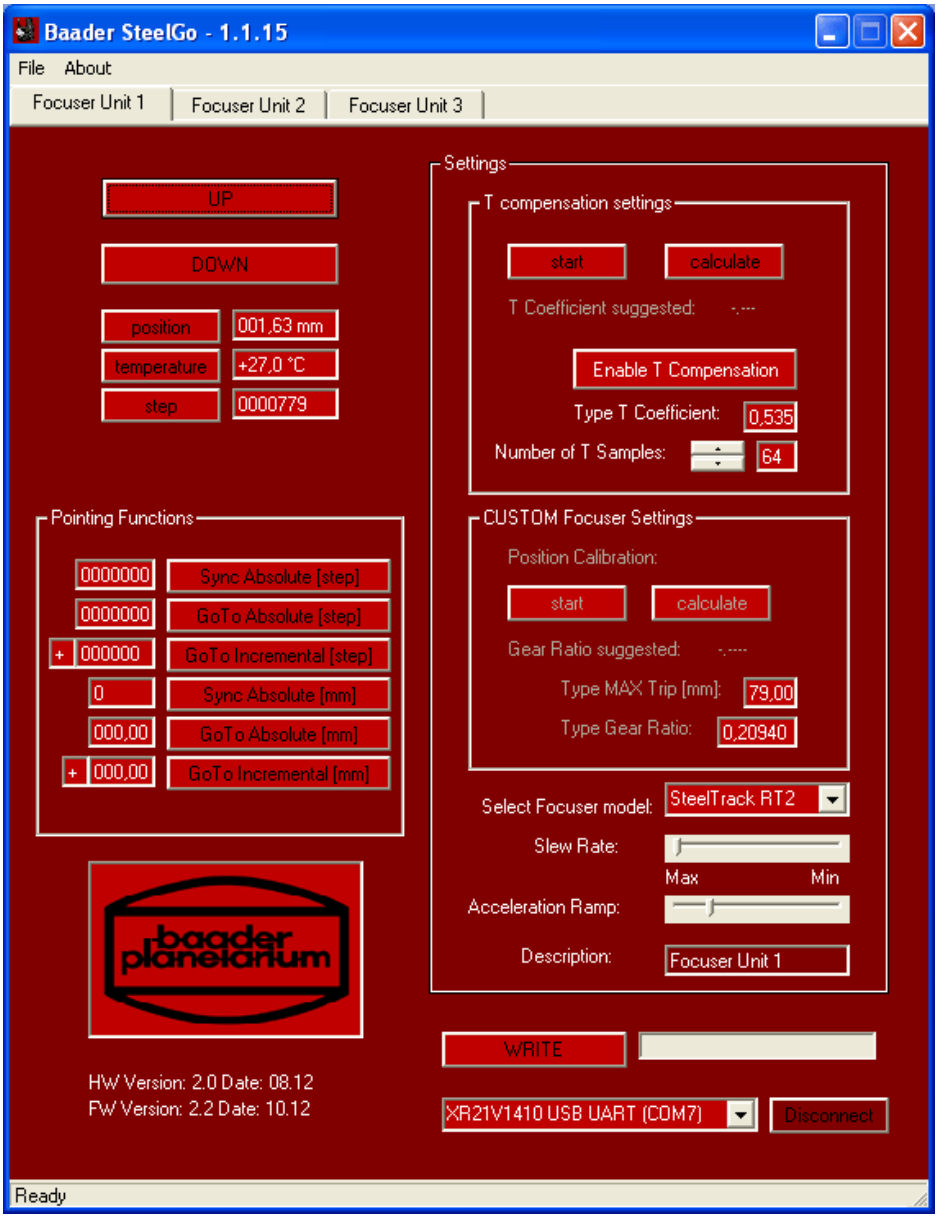
Future software releases and further documentation is available for free download here:
http://www.baader-planetarium.de/updates/steelgo.htm

**Controlling the SteelDrive with SteelGo**

SteelGo allows complete control of up to three SteelDrives. With SteelGo you can:

1. Move the focuser inwards and outwards.
2. Move the focuser to an absolute position
3. Move the focuser using defined incremental steps
4. Sync the focuser Vernier scale with the software
5. Enable and disable temperature compensation
6. Set the temperature compensation coefficient
7. Set parameters for custom focuser

Copyright 2012 BAADER Planetarium GmbH, Mammendorf




Copyright 2012 BAADER Planetarium GmbH, Mammendorf

**UP**

The focuser is moved outward.

**DOWN**

The focuser is moved inward.

**POSITION**

The position value In mm unit) is displayed real-time updated every two seconds.

**TEMPERATURE**

The temperature value is displayed real-time.

**STEP** – The position value (in step unit) is displayed real-time.

**POINTING FUNCTIONS**

**SYNC ABSOLUTE [STEP]** – Sync the step to be the value you define.
**GOTO ABSOLUTE [STEP]** – The focuser is moved to the position defined (in step unit). Sign + means a positive increment (outward). Sign – means a negative increment (inward)
**GOTO INCREMENTAL [STEP]** – The focuser is moved with the increment defined (in step unit). Sign + means a positive increment (outward). Sign – means a negative increment (inward)
**SYNC ABSOLUTE [MM]** – Syncs the SteelDrive position in mm
**GOTO ABSOLUTE [MM]** - The focuser is moved to the position defined (mm unit)
**GOTO INCREMENTAL [MM]** – The focuser is moved with the increment defined (mm unit)

**SETTINGS**

***T COMPENSATION***

**START** – The self-learning T COEFF function will start by saving the present temperature.
**CALCULATE** - When the temperature will be significantly changed during the night (0.5°C or more), the STEELGO will suggest the T COEFF by pressing this button.
**WRITE T COEFF** – This button will save the T COEFF into the SteelDrive device for future re-use.
**ENABLE T COMPENSATION** – The T compensation can be enabled or disabled.

Copyright 2012 BAADER Planetarium GmbH, Mammendorf

**NUMBER OF T SAMPLES** – The SteelGo will take this amount of samples to be averaged for a smooth (128 samples) or rough (16 samples) T compensation.

*Important Note: Once the temp compensation is enabled the focuser can continue to compensate even when disconnected from the software providing the SteelDrive remains powered via USB.*

***CUSTOM FOCUSER***

**START** – The self-learning Position Calibration will move the focuser outward till a 25mm trip is reached.

**CALCULATE** – When the motor has stopped, the absolute 25.00 mm position will be displayed. Adjust this value by typing the effective trip measured.

**TYPE MAX TRIP [MM]** – Type the effective trip measured into the SteelDrive device.

**CALCULATED GEAR RATIO** – This is the gear ratio of the focuser calculated by SteelGo.

***OTHER FUNCTIONS***

**SELECT FOCUSER MODEL** – Set the proper model of the SteelTrack focuser.

**SLEW RATE** – Adjust the max speed with GoTo and manual movement with UP and DOWN buttons.

**ACCELERATION RAMP** – Adjust the speed profile when the SteelDrive is speeding up.

**WRITE –** Push this button to send any new value with T COMPENSATION, SLEW RATE and ACCELERATION RAMP to the SteelDrive device.

**VIRTUAL COM PORT** – Select the COM Port where the SteelDrive is plugged in.

*Important Note: ALL THE CHANGES WILL ONLY TAKE EFFECT WHEN WRITE BUTTON IS PRESSED*

Copyright 2012 BAADER Planetarium GmbH, Mammendorf

## Technical Specifications

**STEELDRIVE**

Focuser supported.....SteelTrack NT2", SC2", RT2", RT3", CUSTOM

Power Supply.....USB port or Jack 3.5mm stereo, 6-14V DC

Maximum current absorption.....900 mA

Minimum Drawtube Feed.....2.3 microns

Maximum Drawtube Speed.....1 mm/sec

**MOTOR**

Size and Model.....Nema 14 - 1.8° Stepping motor

Bipolar Torque.....9.9 Ncm

Voltage and Current.....4.2V – 700 mA

Resistance and Inductance.....6.0 Ohm – 7.5 mH

Housing material.....Aluminum CNC machined

Color.....Black, hard coating with silky gloss finishing

Total Weight.....225g

Dimensions.....(HxLxW) 78x58x30mm

Material.....Aluminum CNC machined

**PULLEY**

Material.....Aluminum CNC machined

Color.....Black anodized

Dimensions.....(DxL) 24x26mm

Number of teeth.....18

**TRANSMISSION BELT**

Material.....Neoprene, Fiberglass reinforced

Dimension.....wide: 6mm, length: 168mm, pitch: 3mm (HTD)

**CONTROL BOX**

Housing.....ABS, black colour

Keypad.....Membrane, 3 red backlit pushbuttons

Display.....2x8 characters, red backlit

Power Supply..... Jack 3.5mm stereo, 6-14V DC

Maximum current absorption.....900 mA

Weight.....110g

Dimensions.....(LxWxH) 105x72x25mm

baader planetarium

**BAADER PLANETARIUM** GMBH

Zur Sternwarte • D-82291 Mammendorf • Tel. +49 (0) 8145 / 8089-0 • Fax +49 (0) 8145 / 8089-105

Baader-Planetarium.de • kontakt@baader-planetarium.de • Celestron-Deutschland.de