

Offer for 1m Trebur Cassegrain Telescope

2001/9/13

Position	Description	
1. Optical Tube		
Optics	<ul style="list-style-type: none"> - Cassegrain f/8 - Accuracy L/7 PtV wavefront - Sitall - Coating Al+SiO2 90% 	
Tube	<ul style="list-style-type: none"> - truss tube, steel - fully baffled against stray light - back-focus focuser, crayford, 200mm diameter - Servo-motor focusing - digital focus display at hand-paddle and Autoslew-computer - Lasalle mirror support 	
2. Mount		
	<ul style="list-style-type: none"> - Equatorial fork mount - Large Worm gear - in-situ back lash correction and PEC controll with Heidenhain-Encoders - DC-Servomotors with high resolution encoders - additional Heidenhain Encoders on axis - Slew-Speed 0.4 degrees per second (software selectable) - Pointing accuracy <30 arc seconds RMS for altitudes > 20° - Guiding accuracy <2" RMS in 5 minutes - full automatic controll via remote computer and Autoslew - full manually controll via Hand-Paddle - Software limits via Autoslew selectable (hour angle, minimum altitude above horizon) - hardware limit switch for altitude limit (10°) 	
3. Telescope Remote Control System		
	<ul style="list-style-type: none"> - operating system Win98 - language english - including TheSky Astronomy Software - Autoslew Telescope controll system - fully compatible with all Software Bisque Packages like Orchestrate 	
4. Finder Scope		
	<ul style="list-style-type: none"> - 152 mm F/5 	

Comments and further description (when necessary)

1. Optical tube

Optical Type

Cassegrain

Main Mirror

outside diameter 1030mm, optical specified diameter >1020mm

edge thickness:

142mm

hole:

280mm

conical constant:

c=-1 (parabolic)

material:

Sitall

focal length:

3000mm

coating:

SiO2

weight:

appr. 223.5kg.

defects:

there is a defect (chip defect) at the central hole that is not in the optical path because it is obstructed through the secondary

There are also some small defects on the mirror with a total area of less than 1.5cm²

Secondary Mirror:

outside diameter 360mm, optical specified diameter >350mm

conical constant:

c=-4.84 hyperbolic

radius of curvature:

-3229mm

thickness:

45mm

coating:

SiO2

System data

Mirror distance	1990.9mm
Focal length	8000mm
Back Focus	700.12mm

Field corrector for 200mm field diameter
Reducing system for f/4 and 40mm field diameter?

Tube

The tube is designed as truss tube and is fully made from steel with some parts like secondary holder made from Al. The new Lasalle-system will be made with roller bearings and computer FEM calculated for minimum mirror stress. The mirror is adjustable from the back side of the telescope. The focuser is a 200mm crayford focuser that is driven with a DC-servomotor, allowing about 40kg load capacity.

2. Mount

The mount is a equatorial fork mount. The mounts are driven with oversized worm gears. The mount is set on a large pole block that is fine-adjustable in azimuth and altitude to make an easy polar alignment.

Drives and Encoders

We use DC-Servomotors with 48V/10A maximum power. The electronic that drives the Servomotors use a PID-controller that is specially modified to make a very smooth tracking even at very low frequencies.

Limiting switches are directly connected to the electronics, so even a PC-failure cannot cause any accidents. If a certain torque is exceeded (if the telescope hits any resistance) there is also an emergency stop of the Servomotors.

We use a total of 2 encoders per axis to controll the telescope and guarantee a safe operation:

a) **Encoders at the Servo-axis**

we have 8000 counts per revolution. Since we use a 4000 total gearing this corresponds to 0.04 arc seconds per count which enables a very smooth tracking without ripples.

b) **Heidenhain Encoder ERA 780C**

These Encoders with 460mm diameter are directly attached to the telescope axis and are the same that are used in the big-size professional ESO-telescopes. These encoders have 36.000 sin-waves that are further subdivided by a factor of 4000. This gives a theoretical resolution of 0.01 arc second. These encoders are used to make realtime-corrections of back-lash, wind-load and all gearing errors. Therefore, PEC or other software approaches are not needed (though possible)

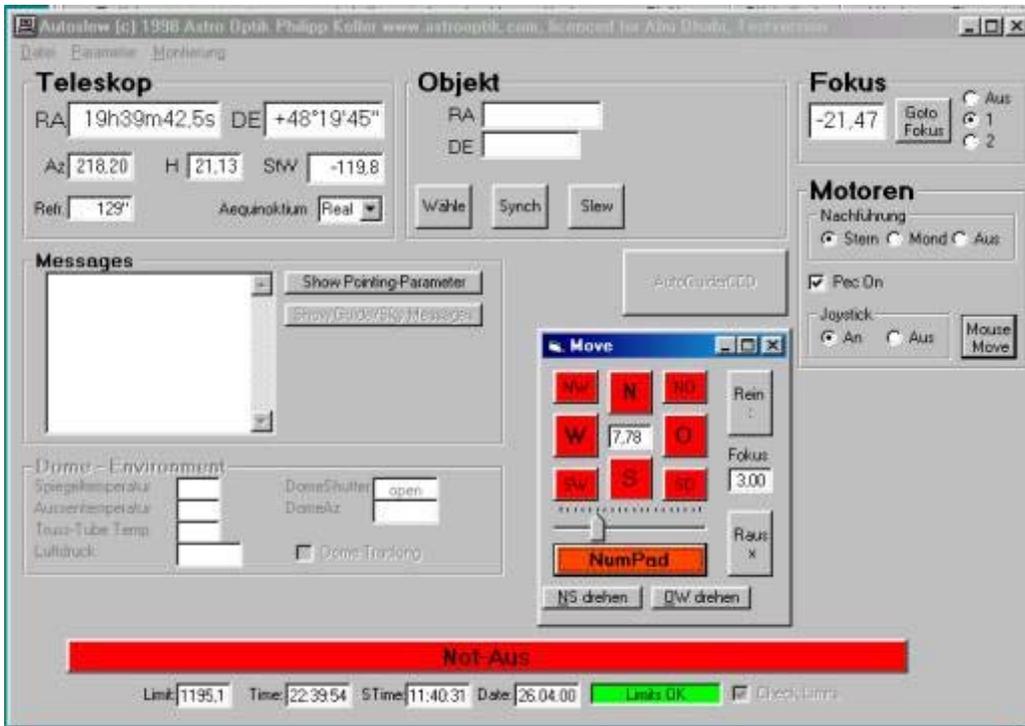
The encoders have reference marks in 5° distances.

3. Telescope Remote Control System

The TCS (telescope control software) that we use is Autoslew. Autoslew is now running on several 60 and 80cm telescopes and the 1.1m EXPO2000 telescope.

Some important features of Autoslew:

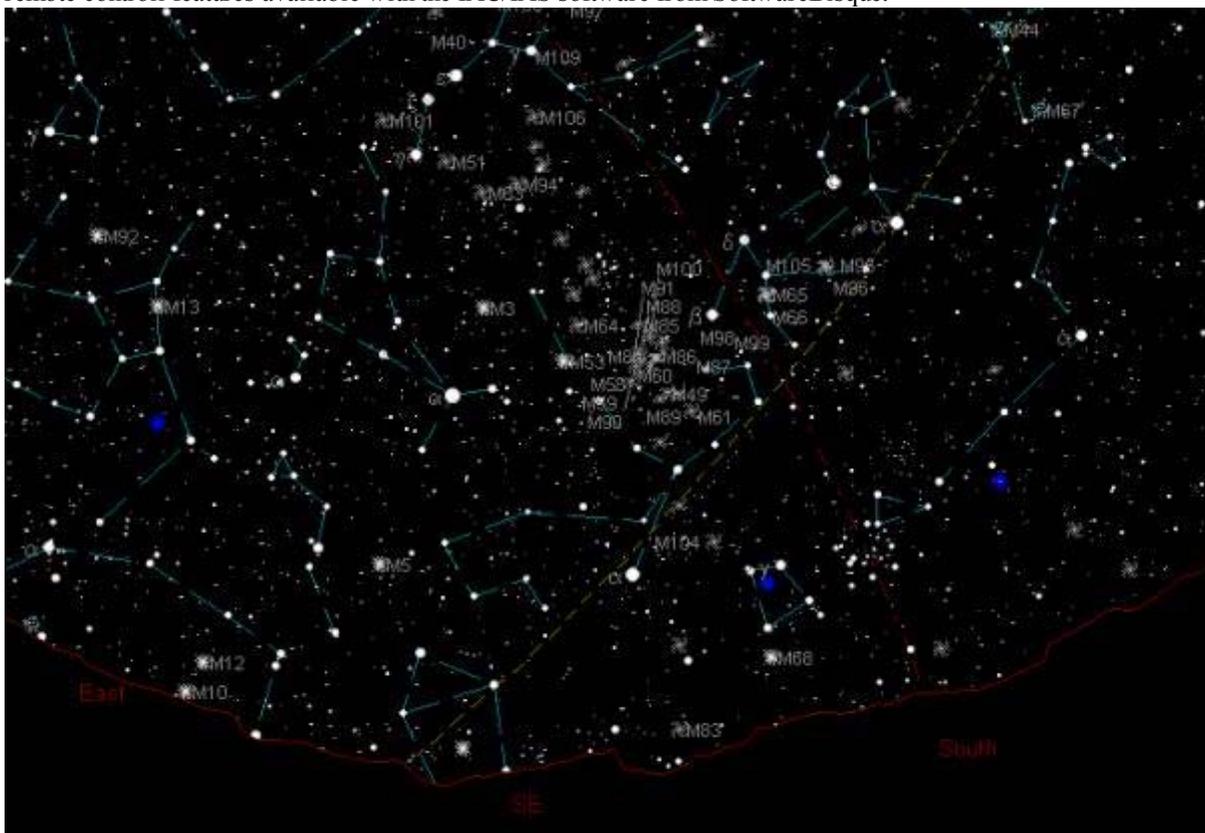
- : 32-bit Windows-Software
- : Full slew, synch and track compatibility with TheSky.
- : PEC periodic error controll
- : Fourier transform slewing optimization (increases pointing accuracy by a factor of 5)
- : Hand-Paddle with LCD-Display, speedselector and focus controll.
- : Slewing speed up to 4°/second.
- : Average pointing accuracy 30 arc-seconds
- : Automatic Dome-controll
- : Full controll via TheSky and Orchestrate (Software Bisque) possible.



Below you can see a typical view of the screen (screen-shot is of our German version, but we will supply english-version).

(please note, that RA And Dec are displayed at the Hand control)

Object-lists can be made before observation and run automatically. Autoslew runs together with TheSky (Software Bisque) and uses the ACL-protocoll (astronomical command language), the same protocoll that is used with the Mount Wilson observatory. One mouse-click on the desired object and the telescope starts to move and you will have it in your eyepiece / ccd. The picture above shows a typical view of your screen if you are running TheSky. If you want to change settings you can change to AUTOSLEW by pressing Alt-Tab. Another big advantage of the full compatibility with TheSky with the ACL protocoll is the remote controll features available with the IAC/IAS software from SoftwareBisque.



The user will usually work with TheSky and will only turn to Autoslew if he needs to change settings or view weather or dome conditions.

Since Autoslew always knows the azimuth of the telescope it is easy to control the dome. In the case of an order we would have to define the dome-control and weather-instruments. We assume here, that we can send and get information about weather and dome-control via RS232.

Hand-Paddle

Our Hand-Paddle is very sophisticated. It uses its own little micro-controller and LCD-Display. The goal was, that the user does not need to run to the computer to slew to the next object. He can input object numbers from any known catalogue or coordinates directly in the hand-paddle and star to slew the telescope. Of course, he can also move the telescope in all 4 directions with user-selectable speed and control the focus. Please note, that even the focus position is displayed at the hand-paddle. You can also make an observing list before starting observing and download the list from the computer to the hand-paddle. Then you will only need one key-stroke to get to the next object.

History of LOT

[T1T - English Version](#)