FFC
ALL-IN-ONE T-2 SET



Manual
and Application Tipps

Thank you for your purchase of the Fluorite Flatfield Converter. This manual describes the *FFC All-in-One T-2 Set #2458281*, which consists of both the FFC itself and all necessary acccessories to use it at 3-4x magnification together with eyepieces or cameras with 1¼" nose piece or T-2 thread on almost every telescope with a 2" focuser.

For optimal results and to ensure that the FFC performs to its full potential, please take a few minutes to read this user manual before using the FFC Set.



EN ver. 04/2026

BAADER PLANETARIUM GMBH
Zur Sternwarte 4 • D-82291 Mammendorf • Tel. +49 (0) 8145 / 8089-0 • Fax +49 (0) 8145 / 8089-105
www.baader-planetarium.com • kontakt@baader-planetarium.de • www.celestron.de

Quick Start

Flexible Magnification, easy to use

The *FFC #2458200* is the optical element with four lenses in two lens groups. Two of them are real Fluorite-lenses (CaF_2) in a temperature-compensating lens cell. It was designed for magnifications between 3x and 8x, depending on the distance to camera/ eyepiece; even magnifications between 2.5x and 15x can be used.

This *FFC All-in-One T-2 Set #2458281* already contains all parts so that you can use it out of the box. Inside of the watertight storage case there are two pre-assembled parts. You only have to connect them with the quick changer to start using the FFC.

Once the two parts are assembled, the *FFC All-in-One T-2 Set* can be attached to virtually any telescope with a 2" focuser and used with accessories featuring a 1¼" nosepiece or T-2 thread. You then only need to focus until you see a sharp image. (If you are unable to achieve a sharp image, the available back focus of your telescope may be too short. Please continue reading on page 14.)

You can find many other configuration options – e.g. for DSLR cameras or other accessories – in this manual.

Please note: The exact magnification depends on the position of the sensor of the camera or the field stop of the eyepiece. If you are using a camera with a longer flange focal distance (i.e., the sensor is deeper in the camera body) and mount it with a 1¼" nose piece in the eyepiece clamp, you'll achieve a higher magnification than when you attach it directly to the T-2 quick changer without the eyepiece clamp.

For a lower magnification, simply remove one or more T-2 extension tubes; for higher magnifications, just add more T-2 extensions (available seperately).

We will describe later in this manual, how you can exactly set a desired magnification value. As ususal for barlow lenses, the magnification factor is given for the top of the eyepiece clamp. We have also included examples for several cameras.

Please remember that the FFC must not be exposed to quick, large changes of temperature – you can find more about this in the maintenance chapter on page 19. The carrying case also helps against temperature shocks.

The Features of the FFC

- Apochromatic, multi-coated lenses
- Four lenses – two of them made of real Fluorite (CaF_2) – in two cemented elements
- Temperature compensating lens cell
- 10-times higher line resolution than the world best projection eyepieces
- Flat image, designed for 90mm image diameter and sharpness without compromises
- Connection for T-2 threads and 2" focusers
- Variable setting of the magnification, designed for 3x - 8x (2,5x-15x possible)
- High-Transmission Multi-Coating (HT-MC)

Setup and Contents of the Set

1. FFC – Fluorit Flatfield Converter *# 2458200*
2. 2" Nose Piece with Safety Kerfs *# 2458130*
3. 2x T-2 Extension Tube 40 mm *# 1508153*
4. 2x T-2i Standard Quick Changer 11 mm *# 2456313*
5. 2x T-2a Change Ring w. Zeiss Dovetail *# 24556320*
6. T-2 Extension Tube 15 mm *# 1508154*
7. 2x T-2 Extension Tube 7.5 mm *# 1508155*
8. 1¼" ClickLock® clamp, 32-38 mm *# 2458100*
9. Transport Case (ABS Hard Plastic) *# 2458280*

Part B



Part A – FFC optical unit



The *FFC All-in-One T-2 Set* is made of two pre-configured parts which are stored in a robust, weatherproof case. To use it, simply remove the two parts (A and B) from the case and connect them using the T-2 quick changer.

Once assembled, it provides 3.7x magnification at the eyepiece clamp.

Depending on the camera, you'll achieve a slightly different magnification, as explained on the following pages for several example configurations. You can achieve higher magnifications by adding additional, optional T-2 extension tubes. You can find out more in the chapter "Distance and Magnification".



© Baader Planetarium GmbH

Contents

Quick Start **2**
Flexible Magnification, easy to use 2
The Features of the FFC 2
The FFC – Fluorite Flatfield Converter. **5**
Technical Data 5
Distance and Magnification **6**
Application Examples **8**
Example: Using a Planetary Camera with 1¼" Nose Piece 9
Example: Using a Planetary Camera with seperate 1¼" Nose Piece. 10
Example: Using a Planetary Came with T-2 thread an 12,5 mm Flange Focal Distance 11
Example: Using a Planetary Camera with T-2 thread an 21,5 mm Flange Focal Distance 12
Example: Visual Use with T-2 Star Diagonal 13
Adaptation behind a Star Diagonal 14
Example: Visual Use with a 2" Diagonal or a Newtonian. 14
Available T-2 Extensions **16**
The Development of the FFC **17**
Handling and Maintenance. **19**

© Baader Planetarium GmbH

The FFC – Fluorite Flatfield Converter

The CaF_2 Fluorite-Flatfield-Converter was made with the intention of making the world's best Barlow lens. It can be used at almost every optical system, both for visual observations and photography. The FFC is still the only barlow lens with four lenses in two putty elements using two genuine Fluorite (CaF_2) lenses. The temperature compensating body is made with particular care in our factory in Mammendorf, Germany.

The FFC was designed for an image circle of up to 90 mm at 4x magnification on a f/8 telescope, and it provides uncompromising sharpness in this image circle. As far as we know, the FFC is still unsurpassed in imaging performance today.

Technical Data

Item Number	#2458200
Outer Connection (eyepiece/-camera-sided)	M42 x 0,75 (T-2)
Outer Connection (lens sided)	2"-Housing (50,8 mm) with stop ring
Inner Connection (lens sided)	M42 x 0,75 (T-2)
Netto weight (only single FFC)	0,24 kg
Magnification	3x - 8x (2,5x-15x possible)
Focal Length:	-54,707 mm
Coating	High-Transmission Multi Coating(HT-MC)



© Baader Planetarium GmbH

Distance and Magnification

The magnification of the FFC changes with the distance. The FFC is designed to work optimally between 3x and 8x. Even higher or lower magnifications can be used by changing the distance between the eyepiece/camera and the FFC.

For a tilt-free and light-tight adaptation, the necessary distance is achieved using adapters from our accessory system. The All-in-One-Set contains everything so that you can use it out of the box.

Another important feature of every Barlow lens is that it moves the focal point of the telescope outward. To do this, the lens is placed *in front of* the focal point of the telescope. The graphic below shows how this works.

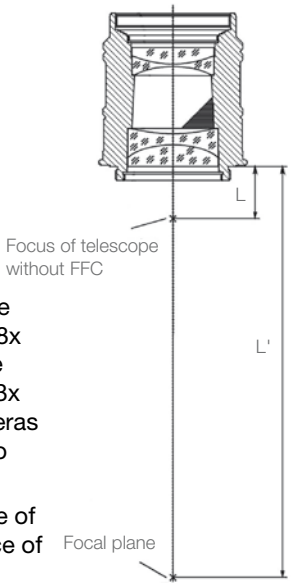
L' The necessary distance between camera sensor or field stop of the eyepiece to the bottom of the connection thread of the FFC for the desired magnification.

L The position of the FFC in front of the telescope's focal point.

Usually, you don't have to worry about L – you only have to put the two parts A and B together, insert them into your telescope, add eyepiece/camera and focus until you can see a sharp image.

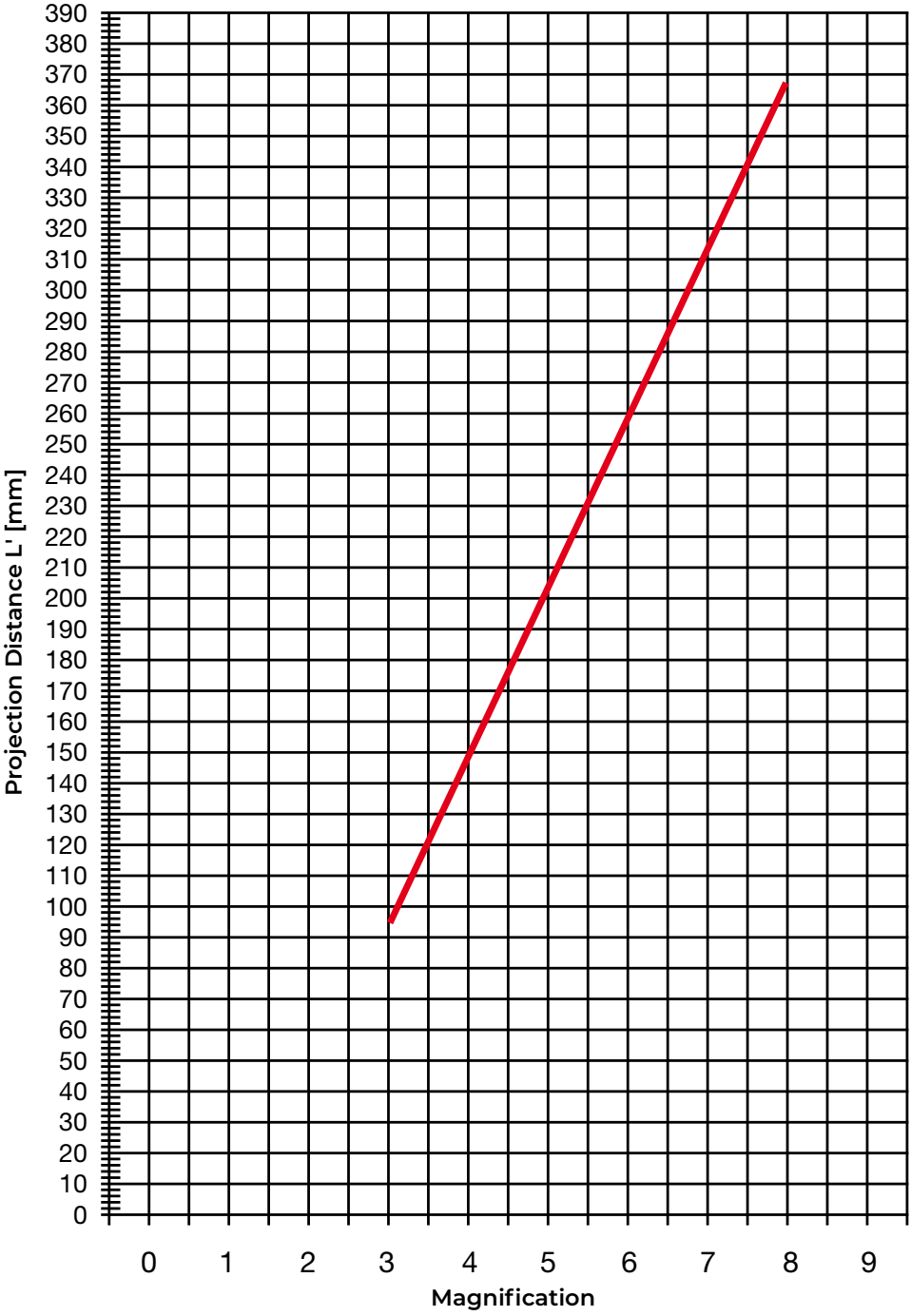
You can find the magnification factor in the diagram on the opposite page or in the following table.

Magnification	Distance L'	Distance L
3x	96.2 mm	14.7 mm
3.5x	122.8 mm	17.1 mm
4x	150 mm	19.5 mm
4.5x	177.2 mm	20.7 mm
5x	206.4 mm	22.0 mm
5.5x	231.6 mm	23.0 mm
6x	259 mm	24.1 mm
6.5x	286 mm	24.8 mm
7x	313.2 mm	25.6 mm
7.5x	340.4 mm	26.0 mm
8x	368 mm	26.3 mm



Example: For a magnification of exactly 3x, the distance between FFC and camera sensor must be 96.2 mm. For 8x magnification, the distance increases to 386 mm, and the focuser must be moved inwards by ~1 cm compared to 3x magnification. Because the flange focal distance of cameras and eyepieces varies a lot, you always have to take it into account, too.

In practice, you don't have to be too precise. A distance of 150 mm corresponds to 4x magnification, while a distance of 151 mm only increases the magnification factor to 4.02x.



© Baader Planetarium GmbH

Application Examples

The examples on the following pages show how the FFC can be used for different applications – for visual use as well as for cameras with various flange focal distances.

The usual parts are:

- 2"/T-2 nose piece and 40 mm T-2 extension tube. These parts are used to reach the necessary distance for focussing on telescopes which are usually used with star diagonals (lens telescopes, Schmidt-Cassegrains). On a Newtonian, the tube can often be removed; in some cases, the FFC may even be placed directly in the 2" focuser without the 2" nose piece. With the nose piece, it may be possible to keep the focuser tube further inwards, which is better for the stability. You can also use it to insert 2" filters into the beam of light, if you don't use a filter wheel or a filter drawer (like our UFC system).
- The FFC – Fluorite Flatfield Converter
- Different T-2 extension tubes to set distance and magnification
- With the quick changer, you can rotate a camera even if the FFC is attached to the telescope with the T-2-thread. With two quick changers like in this set, you can also switch between various sets of extension tubes (and magnifications) easily.
- Eyepiece or camera with 1¼" nose piece or T-2 thread. A DSLR with a standard-T-ring has got a flange focal distance of 55 mm; astronomical cameras often use about 17.5 mm.

The magnification depends on the length of the extension tubes. **Deviations of just a few millimetres result in only minor changes**.

To increase the magnification, simply add additional T-2 extension tubes *Tipp:* If you often switch between different magnifications, e.g. because of changing seeing conditions, we recommend to prepare some sets with different lengths, which you equip with quick changers.

Depending on the flange focal length of your camera and the desired magnification, you'll need different combinations. Especially astronomical cameras have got a shorter flange focal distance than e.g. a DSLR. With different combinations of extension tubes, you can reach almost any distance and magnification.

Please note: Particularly when using multiple extension tubes for high magnifications and with heavy cameras, a significant load is placed on the focuser (and, in the case of Newtonian telescopes, on the tube as well), which the telescope must support without tilting. If you experience problems with tilting, we recommend first checking the mechanics and adjusting them if necessary. If possible, screw the FFC to the focuser. This can be done on suitable focusers (such as our Diamond SteelTrack® focusers) using adapters for the T-2-thread of the FFC or the M48-thread of the 2"-nose piece.

Take also care of the cables: Avoid loose cables, because the load on them may change during the night.

Example: Using a Planetary Camera with 1¼" Nose Piece

For those planetary cameras where the sensor is inside of the 1¼" nose piece, the distance isn't always the same. It depends on the position of the sensor in the camera barrel as well as on how deep it is inserted into the eyepiece clamp.



For this example we use a QHY5-III, where the sensor is 37,5 mm in front of the wider part of the camera. In this case, we need to subtract 37,5 mm from the length of the FFC to determine the magnification. With these distances, we get:

T-2-Changer (16 mm)	T-2 – 40 mm	T-2 – 15 mm	T-2 – 7,5 mm #1	T-2 – 7,5 mm #2	T-2-Changer (16 mm)	ClickLock® (32 mm)	Camera	Total length	Magnification
✓	✓	✓	✓	✓	✓	✓	-37.5 mm	96.5 mm	3x
✓	✓	✓	✓	×	✓	✓	-37.5 mm	89 mm	2.9x
✓	✓	✓	×	×	✓	✓	-37.5 mm	81.5 mm	2.7x
✓	✓	×	×	×	✓	✓	-37.5 mm	66.5 mm	2.5x
✓	✓ + ✓ *)	✓	✓	✓	✓	✓	-37.5 mm	136.5 mm	3.8x
✓	✓ + ✓ + ✓ *)	✓	✓	✓	✓	✓	-37.5 mm	176.5 mm	4.5x

*) requires additional 40 mm extension tubes # *1508153* (not included in the set)

The configuration shown in the image on the right, using all the extension tubes in the set, therefore results in a threefold increase in focal length, as the camera sensor is positioned below the lower edge of the Clicklock® eyepiece clamp.

If all extension tubes except of the 40 mm tube are removed from part B, the magnification is reduced to 2.5x – perfect for bad seeing or cameras with very small pixels.



Many planetary cameras place the sensor in the nose piece, so that the length of the FFC is shorter.

For a camera with 1¼" nose piece, where the sensor is in the nose piece, the magnification of the FFC in its standard configuration is approximately 3x.



© Baader Planetarium GmbH

Example: Using a Planetary Camera with seperate 1¼" Nose Piece



Many planetary cameras, where the sensor is inside of the camera body, have got a *flange focal distance of ~13 mm* when used with a 1¼" nose piece

In this example, we use a ZWO ASI, where the sensor is ~12,5 mm behind the base of the T-2 thread. In this case, we need to add ~13 mm to the length of the FFC to calculate the magnification.

With these distances, we get:

T-2-Changer (16 mm)	T-2 – 40 mm	T-2 – 15 mm	T-2 – 7.5 mm #1	T-2 – 7.5 mm #2	T-2-Changer (16 mm)	ClickLock® (32 mm)	Camera	Total length	Magnification
✓	✓	✓	✓	✓	✓	✓	+13 mm	147 mm	3,9x
✓	✓	✓	✓	×	✓	✓	+13 mm	140 mm	3,8x
✓	✓	✓	×	×	✓	✓	+13 mm	132 mm	3,6x
✓	✓	×	×	×	✓	✓	+13 mm	117 mm	3,4x
✓	×	✓	✓	✓	✓	✓	+13 mm	95 mm	3x
✓	×	✓	×	×	×	✓ **)	+13 mm	68 mm	2,5x
✓	✓ + ✓ *)	✓	✓	✓	✓	✓	+13 mm	188 mm	4,7x
✓	✓ + ✓ + ✓ *)	✓	✓	✓	✓	✓	+13 mm	228 mm	5,4x

*) requires additional 40 mm extension tubes # *1508153* (not included in the set)
**) The eyepiece clamp must be extended by ~ 4 mm

The combination in the image to the right thus results in a 4x magnification, because the camera sensor is inside of the camera body.

To achieve an increase of magnification by 3x, you need to remove the 40 mm extension tube from part B.

For a magnification of 2.5x, you have to completely remove the second quick changer. In this case, only place the 15 mm tube between the Clicklock® clamp and the dovetail of the quick changer.



When used with a camera with 1¼" nose piece, where the sensor is in the camera body, the standard configuration of the FFC gives a magnification of ~3.9x.

© Baader Planetarium GmbH

Example: Using a Planetary Camera with T-2 thread and 12,5 mm Flange Focal Distance

Many planetary cameras, where the sensor is inside of the camera body, have got a *flange focal distance of ~13 mm* if you remove the 1¼" nose piece and use the T-2 thread (M42 x 0,75) in the camera body. It is usually better to use this thread instead of a nose piece, because it is sturdier.

In this example, we use a ZWO ASI, where the sensor is ~12,5 mm behind the base of the T-2 thread. In this case, we need to add ~13 mm to the length of the FFC to calculate the magnification. At the same time, the 1¼" Clicklock® clamp (32 mm long) is removed, and the ring dovetail of the quick changer is attached directly at the camera.



Camera with T-2 quick changer (ring dovetail) instead of the 1¼" nose piece.

With these distances, we get:

T-2-Changer (16 mm)	T-2 – 40 mm	T-2 – 15 mm	T-2 – 7,5 mm #1	T-2 – 7,5 mm #2	T-2-Changer (16 mm)	ClickLock® (32 mm)	Camera	Total length	Magnification
✓	✓	✓	✓	✓	✓	×	+12 mm	114 mm	3,3x
✓	✓	✓	✓	×	✓	×	+12 mm	107 mm	3,2x
✓	✓	✓	×	×	✓	×	+12 mm	99 mm	3,1x
✓	✓	×	×	×	✓	×	+12 mm	84 mm	2,8x
✓	✓ + ✓ *)	✓	✓	✓	✓	×	+12 mm	155 mm	4,1x
✓	✓ + ✓ + ✓ *)	✓	✓	✓	✓	×	+12 mm	195 mm	4,8x

*) requires additional 40 mm extension tubes # *1508153* (not included in the set)

The combination in the image to the right thus results in a 4x magnification, because the camera sensor is inside of the camera body. Please note that the eyepiece clamp has been removed.

If you keep only the 40 mm extension tube in part B, you can achieve a magnification of only 2.8x.



When used with a camera with T-2-thread, where the sensor is 12.5 mm in the camera body, the standard configuration of the FFC gives a magnification of ~3.3x.

Example: Using a Planetary Camera with T-2 thread an 21,5 mm Flange Focal Distance



High-end planetary cameras like the Moravian C1x, where the sensor is inside of the camera body, often use a longer ***flange focal distance of ~21,5 mm*** behind the T-2 thread (M42 x 0,75).

In this example, we use a Moravian C1x, where the sensor is 21,5 mm behind the base of the T-2 thread. In this case, we need to add 21,5 mm to the length of the FFC to calculate the magnification. At the same time, the 1¼" Clicklock® clamp (32 mm long) is removed, and the ring dovetail of the quick changer is attached directly at the camera.

With these distances, we get:

T-2-Changer (16 mm)	T-2 – 40 mm	T-2 – 15 mm	T-2 – 7,5 mm #1	T-2 – 7,5 mm #2	T-2-Changer (16 mm)	ClickLock® (32 mm)	Camera	Total length	Magnification
✓	✓	✓	✓	✓	✓	×	+21.5 mm	123.5 mm	3,5x
✓	✓	✓	✓	×	✓	×	+21.5 mm	116 mm	3,4x
✓	✓	✓	×	×	✓	×	+21.5 mm	109 mm	3,2x
✓	✓	×	×	×	✓	×	+21.5 mm	93.5 mm	3,0x
✓	×	✓	×	×	✓	×	+21.5 mm	68 mm	2,5x
✓	✓ + ✓ *)	✓	✓	✓	✓	×	+21.5 mm	163.5 mm	4,2x
✓	✓ + ✓ + ✓ *)	✓	✓	✓	✓	×	+21.5 mm	203.5 mm	5,0x

*) requires additional 40 mm extension tubes # *1508153* (not included in the set)

The combination in the image below thus results in a 3.5x magnification, because the camera sensor is inside of the camera body. Please note that the eyepiece clamp has been removed.

If you keep only the 40 mm extension tube in part B, you can achieve a magnification of 3x. For 2.5x magnification, keep only the 15 mm extension between the two quick changers.



When used with a camera with T-2-thread, where the sensor is 21.5 mm in the camera body, the standard configuration of the FFC gives a magnification of 3.5x.

© Baader Planetarium GmbH

Example: Visual Use with T-2 Star Diagonal

Like any Barlow lens, the FFC can be used for visual observations as well as for photography. The usable image field is limited by the field stop of the eyepieces used.

For 2" eyepieces you need to replace the included 1¼" Clicklock® with a 2" Clicklock® to T-2 eyepiece clamp *#2956242*. Depending on the field stop diameter of your eyepiece, you may want to use the larger M48-system behind the star diagonal. Tipp: The 2" Clicklock® to T-2 eyepiece clamp *#2956242* also includes an M48 adapter ring and can therefore be used with both the T-2 and M48 systems. With the 2" to 1¼" Pushfix reducer *#2408151*, you can use 1¼" eyepieces without significantly increasing the overall length and thus the magnification.

In both cases, you can use a T-2 diagonal directly behind the FFC. However, please note the focus position to determine whether this adaptation is possible. In principle, the prism can also be mounted in front of the FFC, but this will increase the overall length and leverage.

In the case of a prism, mounting the FFC in front of the prism also prevents color dispersion in the prism, as the aperture ratio is already slower due to the FFC.

In the case of a Newtonian telescope, the star diagonal must be replaced with extension tubes in order to achieve the desired magnification factor.

1¼"-Eyepieces 4x Magnification

1¼" eyepiece,
e. g. 18 mm Classic Ortho
#2954118



ClickLock® clamp,
length 32-38 mm
#2458100



40 mm T-2
extension
#1508153



T-2 quick change
system 16 mm
#2456321







2"/T-2 nose piece
with filter holder
#2458130



40 mm T-2
extension
#1508153



FFC – Fluorit
Flatfield Converter
#2458200



T-2 quick change
system 16 mm
#2456321





T-2 star diagonal, e.g.
T-2 BBHS® mirror diagonal,
length 43 mm
#2456103

The example configuration on the previous page results in a distance of approximately 150 mm, which corresponds to a fourfold extension of the focal length. Just as in photographic use, you can achieve different working distances and thus magnifications by adding or removing extension tubes. The quick-changer can also be replaced by a 15 mm extension tube.

If you remove one quick changer and the 40 mm extension tube, the magnification factor is 3x.

Please note that the precise magnification is not so easy to determine for visual use, as the field stop is not located exactly at the transition from the eyepiece body to the barrel on all eyepieces. The field stop on our Classic eyepieces, for example, is located three millimeters inside the barrel. The technical data for our eyepieces can be found on our website; for other manufacturers, please contact your dealer if necessary – however, not all manufacturers provide this data. You can also find the optical lengths of our star diagonals on our website.

In practice, however, every millimeter does not matter – it makes little difference whether you are observing at 103x or 105x magnification, and especially with catadioptric telescope systems with primary mirror focusing, such as Schmidt-Cassegrains and many Maksutows, the telescopes focal length changes when focusing.

Adaptation behind a Star Diagonal

If you can`t move the focuser far enough outwards to reach focus, you have two options:

1. Use additional T-2 extensions between nose piece and FFC
2. Place the FFC behind the T-2 star diagonal and set the correct distance to the eyepiece with T-2 extension tubes.

Example: Visual Use with a 2" Diagonal

Of course, the FFC can also be used behind 2" star diagonals, or directly on the focuser for a straight view on reflecting telescopes. In this case, the 40 mm extension tube in front of the FFC may be removed and can be used behind the FFC.

With the configuration shown to the right, you achieve 4x magnification. For other magnifications, you need to change the length as described before. For 3x, e.g., replace the two 40 mm tubes with the three shorter tubes (1x 15 und 2x 7,5 mm).

For 2" eyepieces, you need to replace the included 1¼" Clicklock® clamp with an optional 2" Clicklock® to T-2 clamp *# 2956242*.

1¼" eyepiece,
e. g. 18 mm Classic
Ortho *# 2954118*

2" eyepiece,
e. g. 36 mm Hyperion
Aspheric
 # 2454636

1¼" eyepiece,
e. g. 18 mm
Classic Ortho
 # 2954118

2" to 1¼"
adapter,
e.g. Pushfix
 # 2408151

1¼" ClickLock® clamp,
length 32-38 mm
 # 2458100

2" ClickLock®
eyepiece clamp T-2,
length 36 mm
 # 2956242

T-2 quick change
system 16 mm
 # 2456321

7,5 mm T-2 extension
 # 1508155

40 mm T-2 extension
 # 1508153

40 mm T-2 extension
 # 1508153

T-2 quick change
system 16 mm
 # 2456321

FFC – Fluorit
Flatfield Converter
 # 2458200

2" star diagonal, e.g.
BBHS® mirror diagonal
 # 2456105

2" Focuser on Refractor,
e.g. BDS-RT Diamond
Steeltrack® *# 2957210*

2" Focuser on New-
tonian, e.g. BDS-NT
Diamond Steeltrack®
 # 2957230







© Baader Planetarium GmbH

Available T-2 Extensions

Product	Item Number
40 mm Extension Tube	*# 1508153*
15 mm Extension Tube	*# 1508154*
7.5 mm Extension Tube	*# 1508155*
Varilock 20-29 mm	*# 2956929*
Varilock 29-46 mm	*# 2956946*
Finetuning Rings (0.3/0.5/1 mm, Set)	*# 2457910*
T-2 Standard Quickchanger	*# 2456321*
T-2 Heavy Duty Quickchanger	*# 2456322*
camera-sided adaption to M48	*# 2958553*
camera-sided adaption to M54	*# 2958553 + # 2958751*
Tilter (0-1°)	*# 2958855*

You might think that there is nothing simpler than an extension tube. Since the founding of our company in 1966, we have developed numerous accessories for telescopes, and we have seen even more accessories from various manufacturers which do create more or less the right distance, but at the same time cause internal reflections or introduce unnecessary wobbling. These many years of experience and the numerous feedbacks from our customers have been incorporated into the development of our own adapters. The aim was to create adapters that fulfil their purpose without being an additional source of error.

Our adapter families are characterised by:

- *High-quality, reflection-reducing internal baffles & blackening* – Stray light inside the telescope causes reflections and loss of contrast. Our extension tubes are not simply painted black, but use a reflection-reducing coating and, where possible, internal baffles for maximum contrast.
- *Short adapter lengths are made possible thanks to 3 mm threads* – Short threads are used on many adapters to make very short extension tubes possible, or to connect to cameras with low-profile inner threads
- *Maximum flexibility* – Fine-tuning rings and adjustable VariLock extensions let you set any distance
- *Highest precision* – no tilting, no twisting
- *Precise threads and surfaces* for a perfect fit
- *UV-resistant external anodisation* against signs of wear
- *Easy loosening* thanks to flat knurls, slots or holes for hook spanners
- *Complete adapter and accessory system* – Tilters, filter drawers and much more

The Development of the FFC

The FFC is the result of the desire for uncompromisingly sharp images of the moon, the planets and the sun in white light at highest magnifications. That's why we finally asked one of the designers of the Zeiss APQ lenses to calculate the ultimate projection system ***with a flat image plane*** in 1997. To actually make this design become reality, extreme types of glasses were needed. In this case, two lens groups were needed, each with a fluorit lenses, which is – at that time and until today – a nightmare to produce. Especially the broadband coating of these lenses is hard to do.

The result, however, was a uniquely transparent and sharp optical system with ten times the line resolution of a Zeiss Abbe eyepiece. Even though the days of analogue film cameras are long gone, this lens system remains the "sharpest Barlow ever produced".

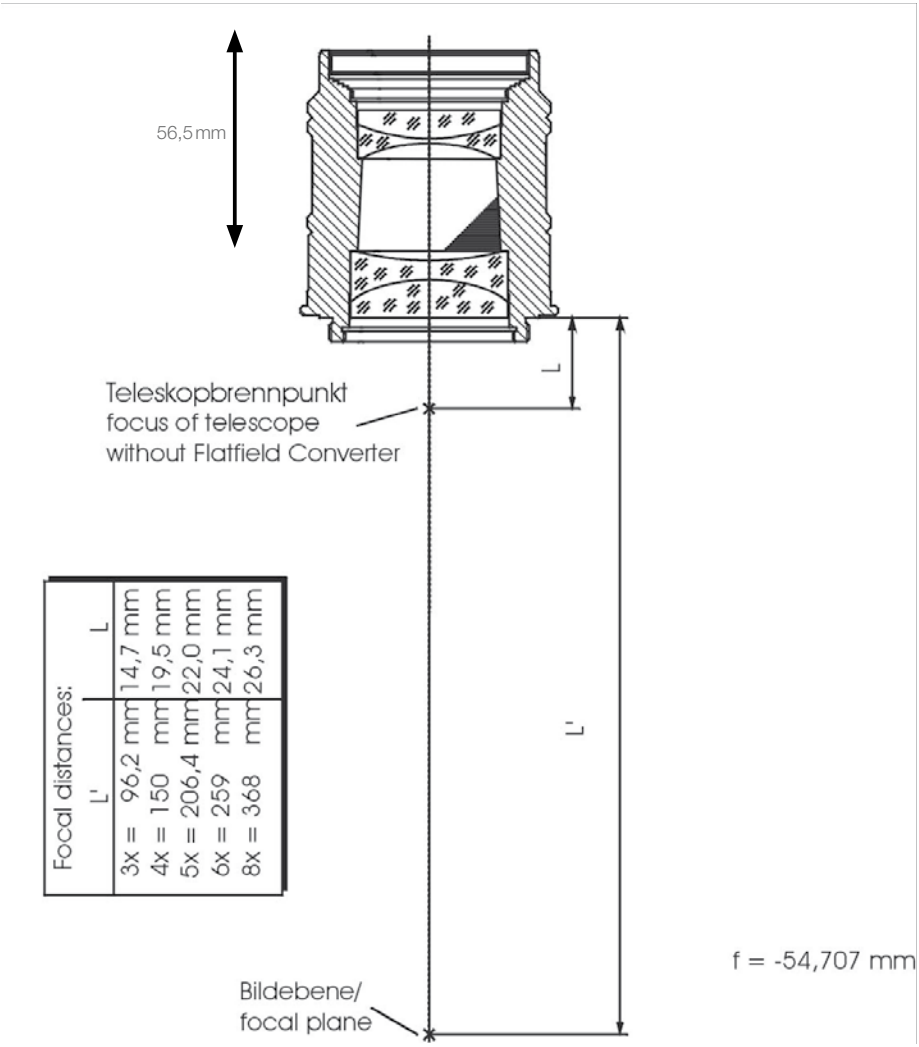
By changing the distance to the camera sensor, you can vary the magnification between 3x and 8x. The optimum resolution is achieved at 4x magnification, then you have the full sharpness over an image circle of 90 mm diameter. On the axis, the sharpness is only limited by your telescope – even at a magnification factor between 2.5x and 15x. We have tested this at an AstroPhysics lens telescope.

By adjusting the projection distance, the magnification factor can be set from 3x to 8x. The optimal design focus is on a 4x focal length extension. In this configuration, sharpness is available across an image diagonal of 90 mm. On the axis, the sharpness performance – even at extensions ranging from 2.5x to 15x (!) – is limited only by the telescope optics themselves. We tested this on an AstroPhysics refractor.

The FFC can be connected to every T-2 thread and its 2" main body likewise fits into every 2" eyepiece clamp. With the help of our Astro T-2™-System you can connect it to a whole world of telescopes.

For best results, you need to keep a certain distance to the original focus point.





Focal distances:	L
L'	
3x = 96,2 mm	14,7 mm
4x = 150 mm	19,5 mm
5x = 206,4 mm	22,0 mm
6x = 259 mm	24,1 mm
8x = 368 mm	26,3 mm

Handling and Maintenance

The Baader-FFC contains lenses which are made of real Fluorite-crystal. CaF_2 has got an impressive refractivity which makes the construction of the ultimate lens system possible, which can deliver an incredible amount of sharpness across a very broad spectral range. No other barlow lens design can combine a similar sharpness with such a large image.

Unfortunately, such sophisticated optics are ***very sensitive to tension caused by temperature differences. Under no circumstances must CaF_2 be exposed to sudden or high changes in temperature.*** E.g., do not bring the FFC without protection out of your +20 °C warm house into an icy winter's night with -20 °C.

To compensate for such large temperature differences, we have taken great care to design the transport case in such a way that it can protect the FFC from such rapid temperature changes. Ideally, therefore, leave the FFC in the closed transport case whilst you set up the telescope and allow it to cool down. The greater the temperature differences, the longer it should be left in the case to acclimatise. In the event of very large temperature differences (e.g. from +20°C to -20°C), the FFC should be left in the case for up to an hour before you use it.

After using it, please put it back into its box before bringing it back into your warm house. The box ensures that the FFC has got enough time to acclimatise to the warmth. Just make sure that there is enough drying agent *(# 1905160)* in the box, so that moisture is removed.

However, it is no problem to store it in an observatory without climate control – the problem are only fast changes in temperature.

You can also use the FFC for photographing the Sun ***behind*** a solar filter made of Astro Solar ND 3.8 (only for photography, e.g. 20x29 cm, *# 2459278*) or ND 5 film (photography and visual use, e.g. 20x29 cm, *# 2459281*) or a Baader Herschel prism *(# 2956510P/# 2956510)*.

Only ***Solar projection without a front filter*** will immediately destroy the optical system. The extreme and fast temperature changes would crack the fluorite lenses. For projecting the sun, we recommend the Baader Solar Projection Screen (BSPS) *# 2420400* instead.



www.baader-planetarium.com

© Baader Planetarium GmbH. All Rights reserved. Products or instructions may change without notice or obligation. Images and illustrations may differ from the original products. We reserve the right of errors. Reproduction of this instruction manual, complete or in parts, only with written permission by

BAADER PLANETARIUM GMBH
Zur Sternwarte 4 • D-82291 Mammendorf • Tel. +49 (0) 8145 / 8089-0 • Fax +49 (0) 8145 / 8089-105
www.baader-planetarium.com • kontakt@baader-planetarium.de • www.celestron.de