

Cleaning and Maintenance of Optics



ATTENTION: please read before cleaning
For all cleaning operations – really „less is more“

Never apply any cleaning fluids directly onto mounted lenses

(Lenses of refracting telescopes, Schmidt-correctors, eyepieces, reducers, flatteners...)

Otherwise, the fluid may soak through the lens cell, transport dirt into the inside of the optics, cause stains or harm sealing rings. These stains can only be removed if you disassemble the unit – and reassemble it afterwards workmanlike, with perfect collimation of all lenses.

All the good advice given below has been derived from observing "old hand" opticians at Carl Zeiss Jena, who had cleaned optical surfaces for more than a lifetime (and like always in life; one must "steal with the eyes – not with the fingers").

Our heart stood still when we saw the "Final Touch" procedure (see below) first time, performed on a priceless giant APQ triplet lens at Zeiss, but the workers there were really kind to explain all the "to do's and not to do's", so that we can pass them along to you here.

Preliminaries:

Don't let any "Putzteufel" ("cleaning devil".....) ever come near to your optical surfaces! As long as you do not want to observe the ever so faint solar corona itself (which is almost impossible through modern, polluted air anyway), there is absolutely no reason at all to meticulously remove any dust grain on the lens as soon as it touches it. Give your lenses a rub only once a year and in the rest of the time try to save them from receiving fingerprints and other forms of fat mixed with weak acids.

Fingerprints and pollen are about the only contaminants which would have to be removed quickly to not alter the coating. Both contain weak acids ("urine acid" in the case of the fingerprint).

Normal dust would have to accumulate into a real thick layer until it gets noticeable during nightly observations to reduce contrast. A little more care is to be given during solar observation with narrowband-filters. That is about the only occasion when a lens should be kept free of heavy dust build up.

Again – don't kill your lenses with aggressive cleaning! We have run tests on this for 25 years.

The myriad of scratches due to wrong cleaning methods causes thousand times more damage to the contrast than a heavy layer of dust! Series of parallel scratches on your objective can work like a grating and even cause color error (!), while dust can only take some transmission away.

We have tested it on the sun during using a new, totally clean piece of BAADER AstroSolar Safety Film against three years old AstroSolar filters, which had been left unprotected on purpose all the time.

There was absolutely no visible difference on image contrast or resolution, not even with the highest of magnifications; between using a new or old and totally dust covered AstroSolar filter. At any magnification, even when observing solar granulation image detail and contrast was exactly the same.

Cleaning Eyepieces, filters, reducers, barlow lenses, correctors and similar items:

The only exemption might be the lenses of your eyepieces.

The eye-lens is the one and only optical element which has to withstand the most abuse of any part of the telescope's optical system (closely followed by the stardiagonal).





The eyepiece eyelens must be cleaned more frequently to remove fat from eyelashes inevitably touching the glass. Fortunately the small lenses of an eyepiece can more easily be heated up for receiving a real hard coating – at least much easier than larger objective lenses. There the technicians often are much more reluctant to use very hard coating processes to not end up with a broken lens due to excessive heat stress.

Usually – if the eyepiece quality is any good at all – the eyelens can be cleaned quite frequently without getting harmed (very similar to modern acrylic lenses with hard coated surfaces, these also are being cleaned almost daily). Use our Optical Wonder Fluid™ without fear and apply some pressure on the glass during wiping it with Optical Wonder Cloth™, indeed, use your fingernail to press the cloth into the area between the rim of the lens and the lens cell in order to remove any residue there.

The only absolute "not to do" on an eyepiece is to soak it with cleaner until it fills all the lens spacings – inside the eyepiece! It is the very "exitus" for many a (very expensive) eyepiece, to suffer a "sudden death", when the everloving owner fills it up with Isopropyl Alcohol or Acetone – and then desperately tries to unmount the eyepiece to get the inner lenses clean again.

Most of the time, the "cleaned" eyepiece looks like Jim Chroche's "Jigsaw puzzled Leroy Brown". After assembly, such an "assortment of lenses" will never ever perform as before and between the lenses you will see dust and dirt in any stage of magnification, more than you ever thought possible.

So – when cleaning an eyepiece, always make sure to apply the cleaning fluid onto the cloth – or purified cotton wool – being used for the procedure, never onto the eyepiece itself.

Filters can be cleaned like eyepieces, especially if they are hardcoated (e.g. all Baader Filters).

The lens surface facing towards the telescope should not be cleaned with fluids. Only if you see dust particles when looking through the eyepiece, you may use pressurised air from a pair of bellows – but keep a long distance from the eyepiece. If the air stream is too strong, you may even blow the dust inside of the housing! A good alternative is a clean, soft brush (camel hair).

Optical elements like reducers, coma correctors, flatteners or other units which are mounted inside of a telescope are better protected from pollen or finger prints, so you don't have to clean them very often – but they usually aren't hard-coated, so you must apply the same care as when cleaning the lenses of a refracting telescope.

Cleaning Objectives:

This is an entirely different story. Cleaning an objective requires peace of mind, time – and a cloudy day, where you can't observe anyway, with all your kids and spouses being off to other grounds.

Refracting and Schmidt-Cassegrain telescopes

Refracting telescopes usually do not need much care. You only need to clean it sometimes – and that can be done in long intervals, if you store the telescope carefully.

In the course of time, there will be dust or moisture on the lens. You must be careful to avoid damages when cleaning the optics. You can remove dust either with a soft brush made of camel hair or with pressurised air. Apply the air in a flat angle over the lens for some seconds. To remove the remaining dirt which sticks to the surface, you can use Optical Wonder™ by Baader Planetarium and a soft tissue (Kleenex – nothing else!). Swipe from the center of the lens outwards, to remove all remaining stains. Do not swipe in circles! **Never apply the cleaning fluid directly onto the lens! The lenses are airspaced, so that the fluid might get between the lenses. Spray the fluid onto a cleaning cloth and use the cloth to clean the lens.**

Newtonian mirror-telescopes

The mirrors of a Newtonian telescope should only be cleaned rarely, when they are really dirty. There is no need to clean them every year! Each cleaning process causes scratches which are more harmful than some dust. Also, you need to remove the mirrors from the telescope tube and collimate them afterwards – but this can be done by every skilled amateur.

Blow the dust from the mirror with a bag bellow – **never** use a can with pressurised air! Then you can use a fine camel-hair brush, which you have cleaned before from fats with the help of Acetone, to remove the dust. (* see the note at the end of the document).

Then soak the mirror with Optical Wonder fluid, so that it can solve the remaining stains. Afterwards, wipe the mirror dry and clean with a lot of clean Kleenex-tissues, which have also been moistened with cleaning fluid.

You need concentration and quietness for this procedure. Wait, until you are alone, turn off the telephone, put the mirror under a bright lamp after you have removed it from the telescope tube, soak it with a lot of cleaning fluid and use a new tissue (moistened with Optical Wonder fluid) every time when you swipe it dry.

The high number of new tissues decreases the risk of scratching the mirror with dust grains, which you have picked up before with the tissue. You can easily use a whole package of Kleenex for cleaning one mirror.

It is important for a successful cleaning that you perform this procedure without breaks and that you swipe over the part of the mirror as seldom as possible.

The Final Touch:

On older camera objectives you certainly have seen optical surfaces with ragged coatings, where obviously fungi and bacteriae have literally eaten up the coating down into the very glass itself.

Our Optical Wonder™ Cleaning Fluid does address this problem. Not only does it clean most thoroughly like heavy armature as – for instance – "Acetone". But since it is not an aggressive fluid, unlike Acetone, it dries off without leaving any residue, striae or color hue on the coating!

The formula contains ingredients to actively kill mycelia, fungi and bacteriae, analyzed to foster on optical coatings.

Use Optical Wonder Fluid™ for cleaning your lens surfaces and protect them from all known organic malevolent enemies, from "pollen" – containing very aggressive aetherical oils (which can indeed penetrate into the coating layers), from dust laden moisture, and any other "impurities" like fingerprints, waterstains and the like.

Carefully use your breath for "The Final Touch", it is the finest source for totally clean (body-) distilled water.

After having thoroughly cleaned the optical surface twice with OW-Fluid as detailed above, put an ever so gentle "hue" of your own breath across the area on the lens which you want to have completely cleaned. Don't "spit" on the glass though! – this would have an entirely adverse effect.... Too much haste during exhaling would put a spray of "sputum" across the glass – and that of course definitely is not distilled water. Just slowly breathe the air from the depth of your lung, with your mouth wide open. This will absolutely evenly fog a small area of the glass which you would wipe clean quickly and decidedly (not too "hesitant"). After applying the "distilled water", You will rightaway look into the atomic layers of the fogged coating and for a moment you will clearly see all the changes / perturbations which environmental forces already have done to the coating layers. Fortunately modern coatings can withstand a lot of mistreatment. When the surface has been wiped dry, the coating will look completely smooth again.

Quickly wipe the hue with your Super Microfiber Cloth until you have a cleaned area, totally free of striae and any other residues. Proceed with this until all the surface looks entirely clean.

Due to the pretreatment with the antibacterial "OWF", you can be reassured to protect your lens for a long time!

Do not clean too much!

Silica Gel, orange drying agent with environmentally friendly coloured indicator

If you do not want your expensive optics, optical accessories, eyepieces, CCD cameras or the interior of your telescope tube to suffer from humidity when in their closed containers, then it is recommended to take the same precautionary measures as is common practice in research labs with expensive instruments, placing a small bag or pouch of drying agent into the telescope tube or into the accessory cabinet.

This can help to prevent the extremely annoying build up of condensation in the interior of eyepieces, telescope lenses, mirrors or Schmidt corrector plates – especially if one can prevent fresh humidity getting into the telescope tube later when changing accessories by the use of a prism diagonal or a plain glass filter to keep the telescope tube closed.

Condensation – dew – can also form on the optics when you are star-gazing. A dew shield can reduce this to a high degree. Once there is dew on the optics, point the telescope to the ground or remove the dew with a hair-dryer. If there is dew inside of the telescope, remove eyepiece, star diagonal and/or visual back and point the front lens in a dust-free environment to the ground. So the moisture can escape from the telescope.

Note:

- We offer a 2" filter holder for SC telescopes into which any 2" filter can be inserted (e.g. clear glass, UV/IR cutting filters, nebula filters UHC-S) to prevent moisture from getting into the interior of the tube.
- Narrowband Solar filters (LUNT, Daystar H-alpha, SolarSpectrum, etc.) are particularly susceptible to moisture.

Baader Silica gel with coloured indicator

After some searching, we have discovered a particularly reliable drying agent which is foolproof. in indicating its remaining effectiveness...

- The beads of drying agent are a bright orange/pink colour when dry, but are white and transparent when saturated.
- The beads become paler in the transitional phase, so that you can easily estimate the level of saturation.



START



AFTER 2 HOURS



AFTER 4 HOURS



Silica Gel
Drying Agent #1905160

To re-use, simply put the beads on a plate, put the plate into an oven and slowly heat it up to a temperature of around 150 degrees Centigrade (do not pre-heat the oven as this can cause the beads to burst). After about five or six hours, the silica gel is once again bright orange/pink and may be used further.

WARNING: Drying in a Microwave oven is **NOT** possible.

This procedure can be repeated indefinitely. Nothing needs to be thrown away, as is unfortunately often the case with normal drying agents.

NOTE: We do not offer other package sizes or larger quantities of this special silica gel. We have tested the outstanding effectiveness for use at telescope OTAs and expensive narrowband solar filters over many years. We do not have experience with other applications and we do not recommend the material for other applications.

By the way, another tip:

For keeping moisture off from single eyepieces in closed containers you can use normal rice grains even for drying. However, this is nowhere near as effective as our silica gel, and of course there is no colour indicator so you are unable to tell when the rice grains are saturated.

We have some final tips, so that you don't have to clean too often:

1. Avoid finger-prints on all optical surfaces. They contain fats and acids which harm and destroy optical coatings.
2. Clean optical surfaces as seldom as possible.
3. Only use soft, clean tissues like Optical Wonder Cloth by Baader Planetarium GmbH.
4. Remove dust with a fat-free brush before using cleaning fluids. Avoid dust in general.
5. Avoid hard shocks or blows against the telescope. Do not move any parts with force. All mechanical or electrical movements have to be without force.
6. Do not leave the telescope in the rain. If possible, keep it safe from other environmental influences like car exhausts etc.
7. Avoid dusty places. Cover telescope and telescope e.g. with a bag, when you don't use them for a longer time.
8. Cover front lens and eyepiece holder with the dust caps – keep them clean, then you don't have to clean them.

Dewing

In spring and autumn and at unfavourable locations (in valleys or close to rivers) there is a high probability for your telescope to become wet because of dew. This can also happen when you bring the telescope from the cold outside into your house. In that case, move the telescope into a horizontal position. Do not attached the dust caps while the telescope is still wet.

***) Note:** Pressurised air from cans by some manufacturers contains alkaline ingredients which are shot like splashes out of the can, if you do not hold it properly. We have seen several mirrors which were destroyed by such droplets. The main mirror of a Newton can turn into streusel cake in some weeks after such a treatment. The mirror surface was etched away wherever a drop had hit it. There were literally thousands of holes in the mirror. Unfortunately, we can't give you any advice about which types of pressurised air can be used, so we must give you this general warning.



Optical Wonder
(OW) Cleaning Fluid
#2905007



Optical Wonder Cloth
#2905000



Optical Wonder Set #2905009
consisting of OW-Fluid and OW-Cloth



Optical Wonder Set #2905010
consisting of OW-Fluid, OW-Cloth
and Lens-Pen



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