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technical articles

Photography in the cold

INTRODUCTION

It's not too long ago since purely mechanical cameras were available on the market. These cameras often offered an exposure time which could be operated without the DC power of a battery. Even though the exposure meter and other exposure times did not work without any power supply, it was still possible to take pictures. The main problem using analogue cameras in the cold was static discharge on the film when transporting and thus ruining the film and the pictures on it.



From the Folio Snowscapes: Traces in the Snow

ANALOGUE TIMES

Before I'll dive into digital single reflex cameras (DSLRs) and their specific problems with cold temperatures, I'd like to spend some time discussing the analogue SLRs. Everything that moves in a camera could cause troubles when exposed to the cold: either because the power supply gets weak or the lubricants are getting viscous or electrical discharges caused by the dry air as mentioned in the introduction are ruining the film. Lubricants have a limited temperature range where they can guarantee a good reduction of the resistance. If it gets too warm, they will get too fluid to stay in pla-

ce. If it gets too cold, they get too viscous and therefore have a high internal resistance. While temperatures are dropping the viscosity of the lubricants is reduced and at a point the motor or magnet is not able to overcome the extra resistance anymore. The drain from the battery will increase and the camera will not work. Most of the time it will be the motor pulling the film forward that will generate the trouble. I once owned a camera which I had plunged into a river. The camera survived and after two days of drying out the electronics came back to life. However, the lubricants inside the camera seemed to have suffered as

the camera could not be used at temperatures below -15°C anymore, which was not a problem before the contact with the river. After bringing the camera to a warm place it would work as usual. I have to admit that this was not the only camera I owned that came too close to water and I therefore gave the other camera to a repair shop to exchange the lubricants.

LUBRICANTS

As mentioned above, lubricants have an optimal working temperature range. Outside of that range they are getting either too fluid or the viscosity is too high. As different chemical substances can be used as lubricants, it is possible to exchange the lubricants for others to be used at a different temperature range and therefore in different climate zones of the world. Some camera companies offered the service of exchanging the lubricants prior to a trip to the cold. After returning, it was mandatory to re-exchange the lubricants as otherwise the camera would misbehave in warmer environments. It has been years since I have heard of anybody doing this anymore. Perhaps today's lubricants are having an extended temperature range or the cameras are not that delicate anymore. My experience with cold temperatures goes down to -30°C and I never had any issues with my DSLRs.



From the Folio Snowscapes: Long shadows on "Snowwaves"

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DIGITAL SINGLE REFLEX CAMERAS

Digital Cameras rely on batteries. Even though the battery hunger is not as severe as it was when digital cameras first came to market, but still there is nothing going on without DC power supply. At least the number of moving parts has been reduced. The main problem of the film transport has gone, the mechanical shutter and the movement of the mirror has stayed. Magnetic coils to move the mirror have been replaced by motors in some cameras, which seems to be more efficient (and also quieter).

In the past, micro drives were used to store the data. These drives were very cost effective and offered lots of storage space (I'm talking about gigabytes here) which is not an issue to be realised with flash cards nowadays. Therefore, micro drives are not widely used anymore. I also own a micro drive and it showed severe problems with low temperatures. It stops working below -15°C but can be revitalised by warming it up. It seems that -15°C is very critical temperature (see above..). The flash cards used today show no operation

problems at least not down to -30°C . And there is no need to buy the most "extreme" cards (as a manufacturer calls his cards) to withstand the low temperatures.

BATTERIES

I never had any issues with moving parts at low temperatures in modern DSLRs: Perhaps because of better performing lubricants as mentioned above or because the design has changed such, that lubricants are not necessary in the same quantities as in the past. Perhaps all the low temperature excursions to the north have degraded my shutter a little bit. After around 50'000 exposures the shutter on my Canon EOS 20D broke and was exchanged by the service centre. They technical guys said that this is a very typical number and that they would even specify the 20D shutter to that number. I have never heard this number before and to my knowledge was the shutter of the 30D the first one to get a shutter life expectancy specification. However, the shutter is fine again and I doubt that it has anything to do with operation in low temperatures.

The main issue today is the battery. Mainly lithium ion batteries are used. The full capacity of these batteries is not available at low temperatures. It is not correct that they will lose the capacity at low temperatures as they will show the full capacity when warmed up. When a battery that

was "empty" in the cold is brought to a warm room and you try to recharge it you will find out, that the charger shows full, i.e. the capacity is still there. But only a small amount of the capacity stored in the battery is available at low temperatures. At about 0°C only half of the energy is accessible. It is therefore recommended to have a second battery always in your pocket and exchange it for the first when the latter shows low power. The first battery can then be warmed up to make more of its capacity available to the camera.

In a report about the new Canon EOS 5D MK2 I read that their battery type shows better performance under cold conditions. My experiences are quite good. I had the chance to test the battery life on a two week trip to Finnish Lapland with temperatures down to -30° . I bought a secondary battery for the 5D MK2 for that trip but actually never had to use it. It seems that the optimisations carried out by Canon are working.

The only work around with today's batteries is therefore to keep their temperature as warm as possible. One easy solution is to always keep the camera in the camera bag when not taking pictures. Especially photo bags that are directly worn on the body such as a photo rucksack or a sling bag will keep the equipment at a much higher temperature than outside. Depending on how much equipment is arranged inside the bag and how good the insulation of the bag will be the temperature differs more or less between the inside and the outdoors. A difference of 10°C difference is easily reached. Find out more about camera bags in the dedicated article about [photo bags](#). I have never used heat bags in the camera bag but this could further increase the temperature in the inside. These heat bags can be activated clicking a metallic clip inside a chemical fluid and the heat bag will then get quite hot for at least an hour. The chemical substance will harden and generate heat. After that, the heater can be reactivated by cooking it for 10 minutes in water.

Another possibility is holding the camera in your hand. The battery compartment in most cameras is



From the Folio Snowscapes: Crystal-Tree

placed inside the grip and therefore the battery will directly benefit from the warmth of your hand. This way I once tried to reanimate my frozen micro drive which did lead to cold hands; this method is not really a practical one.

For really cold temperatures, an external battery can be used. The external battery is then kept inside the jacket and the camera is fed by a DC-cable. You will find more information on external batteries below.

DRY AIR

As mentioned in the beginning, dry air causes problems as electrical discharges on the film are more frequent in dry, cold air. The discharge on the film does ruin the picture as it exposes the film locally. With DSLRs this is not an issue anymore but dust is a more severe problem the dryer the air gets. It is therefore recommended to carry a sensor cleaning device with you. A good alternative to cleaner kits which require fluids (which are not allowed on planes) is the Arctic Butterfly from Visible Dust which is operated purely with batteries (don't worry about the battery, you will use this device inside in the warm room). Cameras with ultrasonic dust removers built in will be less dependent on such cleaning devices. Most

smaller particles will be very efficiently removed by this technique but bigger ones may still remain on the sensor surface. It is therefore required to check the sensor from time to time.

CONDENSATION

Cold air cannot carry as much water as warm air. If you enter a warm room carrying cold equipment, the air that approaches cold metallic surfaces will cool down, cannot hold the water anymore and will condense. The same thing will happen to your glasses when entering a warm room. To prevent the equipment from getting wet it is therefore required to pack it into a water tight bag outside prior to getting into the heated room. The equipment should then be given enough time (some hours) to warm up before you can take it out of the bag without any condensation. If you are leaving the room before the equipment is warmed you, just take it out of the bag as soon as you are outside. Alternatively, you may leave the equipment outside, for example if you just get in to warm up and will continue later on. It is then recommended to take the battery with you to also give it a short warm up. But remember to take it with you when getting out again!

EXTERNAL POWER SUPPLY

If you are relatively stationary, for example when taking pictures of auroras (see the dedicated articles on [aurora photography](#)) an external power supply is a good and very reliable alternative to exchanging batteries from time to time. The easiest way is to use a camera adapter readily available for many camera models. You could also build one by yourself. How to do this is explained in the article [external power supply](#). The benefit to build such a unit on your own is not only saving some money but also being flexible in extending the system. You could for example extend the system to either use an AC/DC adapter or an external battery for your camera. The external battery could be a unit which has a much higher capacity. It makes sense to place this battery in a separate bag hanging on your tripod. Place a warming bag in the same bag that will keep the battery at a good operation temperature.

I extended my system such, that I can power a star guiding system (an AstroTrac) and the camera from the same device. While the AstroTrac requires 12 VDC from a car or motorcycle battery, the camera requires 8VDC. I use a DC/DC converter to bring



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the voltage for the camera down. The DC/DC converter is built into the camera DC adapter. I'm now able to either use a battery or an AC/DC converter to power these devices either separately or together. As all power adapters, device adapters, cables and batteries have the same connector, I can easily exchange the units.

As I frequently travel to northern Lapland in the winter time, I use this set up quite a lot. It is very reliable. An AC plug is not always available. I therefore use a long cord of 10 meters which gives me some radius from the AC plug. Sometimes I can use the AC plugs found on the parking lot to heat the cars in the winter time. Alternatively I can now use the external battery which gives me quite good operation times. Such, I could also leave the camera outside for series of photographs, for example to create time laps movies from hundreds of exposures. Such, the external power supply serves double duty and the time laps set up also makes sense in the summer.

TRIPOD

The tripod needs to fulfil some criteria for optimum use in the cold, especially isolation pipes on the legs and snow shoes to prevent the tripod from sinking into the snow. All this will be covered in the article on the [optimal tripod](#).



From the Folio Snowscapes: Waves



From the Folio Snowscapes: Hidden Pine Trees

ABOUT THE AUTHOR

Bernd Margotte is an active photographer since more than 20 years. His focus areas are landscape and street photography.

Bernd's technical knowledge is based on a master in technical photography and years of experience.

On his web page www.berndmargotte.com you'll find a wealth of technical articles, photo galleries and folios.