Assured **moisture protection** in missile containers

Desiccant bags remove moisture from missile containers to assure moisture protection at all stages of the missile's life

Sensitive military electronics and electro-optic equipment need to be manufactured and stored in conditions where the impact of moisture is minimised. The sensitive components that make this technology so powerful are all located in the nose of the missile. This therefore becomes the part of the missile most affected by the presence of moisture.

Moisture protection has to be guaranteed in all the stages of the missile life, including manufacturing, storage and during military operations. Sophisticated military equipment is exposed to harsh operating conditions and it experiences extreme temperatures. Missile seekers have to function 24/7, 365 days a year in all climates, therefore the internal conditions have to be kept below the dewpoint to prevent a change of state. In some circumstances, if the temperature is very low, frost can form on the surfaces.

However, this is not the only cause. The presence of moisture in the air is hazardous also because the ambient temperature does not need to fall beyond the dewpoint temperature for this phenomenon to occur. When the equipment is exposed to the solar radiation, the temperature of the external surfaces increases but this does not result in a homogeneous warming up of all the surfaces. The consequence of different rate of heat transfer is this temperature difference, hence the 'migration' of moisture to the cooler components of the equipment. In fact, the formation of condensation or of small ice crystals on the lenses of the optics inside the head of the missile is caused by the difference between the temperature of the lenses and the temperature of the adjacent surfaces. The nose of the seeker acts as a window between the optics inside the missile and the target. Condensation on the lenses and mirrors of the seeker may blind the optics and obscure the target image, affecting the missile's capability and efficiency.

When not in use, missiles are stored in specific containers. Desiccant bags are placed inside the missile container in order to create a benign environment for the weapon. If the missile has an open-frame configuration, the desiccation process takes place entirely inside the container. For this reason, Brownell developed ultra clean desiccant bags that have filtration efficiency ranging from 0.2 to 1 micron and can resist high and low temperature exposure.

A very dry environment will preserve the missile; hence Brownell always recommends using molecular sieves for the protection of optical equipment. Molecular sieves have a marked tendency towards moisture adsorption. In other types of missiles, the frame is sealed and the requirements are less demanding that the previous case. In this situation, desiccant bags can be filled with silica gel Envirogel instead, more economically convenient.

In both configurations, humidity indicators are recommended to easily check the humidity level inside the container and the saturation level of the desiccant inside the container.

Pressure build-up inside the container may occur as a consequence of diurnal temperature cycling or air transportation. This situation should be prevented by installing a two-way pressure valve on the container. The desiccant within the storage container is there to lessen the duty cycle on the missile internal desiccant solution. Therefore once on the rail and called into action, the seeker will not fail due to the effects of excessive moisture levels.

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Slimline **motor controllers** create space in enclosures

Small drives for machines and equipment are typically powered up to 9.0 A, and are protected by conventional motor circuit breakers. However, when space in the enclosure is limited, it is very difficult to find room for significant numbers of protective components. Rittal's new motor controllers for its RiLine Compact power distribution system offers a sophisticated solution. To assist the engineer Rittal has also produced a 3D configurator that reduces the time required to generate Compact RiLine busbar systems.

Following the successful launch of the busbar system RiLine Compact at the beginning of the year, Rittal is now expanding the product range. Until now, the small 125-A-max busbar system consisted entirely of shock-hazard-protected boards, which form the basis of the system, along with assembly components such as connection adapters for busbar infeed and component adapters for the easy set-up of switchgear and protection devices produced by other manufacturers.

Rittal will shortly be launching new motor controllers into the range. These can be fitted directly and easily onto the board in a one-step installation, to minimise the time and effort spent on wiring.

Rittal offers motor controllers in three staggered current ranges. These combine the functions of direct starter and reversing starter within one single device. Its slimline profile – just 22.5mm wide – is particularly impressive and frees up around 50% more space compared to the standard 45mm-wide switching device in the range, and as much as 75% more space compared to the 90mm-wide reversing combinations.

The three-phase motor controller is a high-performance hybrid switching device with a current monitoring function, offering a longer lifespan and low-loss operation. The principle behind it is simple: first, the electronics are switched on using the input signal, and then the mechanical contacts takeover for the duration. The motor controller also provides diagnostics, which to detect internal and external errors. The operating statuses and error messages can then be evaluated through the four different illuminated LEDs. To assist the engineer Rittal has also produced a 3 D configurator that reduces the time required to generate Compact RiLine busbar systems. A series of easy to follow steps produces detailed drawings, the ability to select component adaptors, and a bill of materials.

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