

Application Notes

Stego Pressure Compensation and Drainage Devices

PREPARED BY: Piotr Dolecki DATE CREATED: 20/08/2018

ACCESS LEVEL: External

VERSION: 1.1

How Pressure Compensation Devices and Drainage Devices Protect Electrical Equipment in Enclosures from Dangerous Climate Change and Satisfy AS3000:2018:

Abstract:

AS/NZS3000:2018 clause 1.7.2 (i) states “*Condensation issues – a breathing/pressure equalization valve shall be installed to assist with changes in humidity and drainage of moisture*”. Thus, the fitting of ventilation devices is now required to all enclosures where condensation is likely to occur. This application note explains how condensation occurs inside electrical enclosures and the available solutions.

Equipment in an enclosure requires that ambient temperature and humidity is maintained within the specified range for correct operation and optimum life expectancy.

Climate control devices such as ventilation fans, heat exchangers, heaters and air conditioning units can, when installed and operating correctly, maintain the enclosure within the specified temperature and/or humidity range. This however, may be insufficient to protect equipment from potential damage. Ambient temperature and humidity changes can cause pressure differentials and condensation to form inside an otherwise sealed enclosure. These changes can be caused by:

- The change between day time and night time temperatures
- Rapid changes in the weather (particularly sudden cooling and rainfall after a hot day)
- Equipment operating under varying load conditions and heating up or cooling down as a result
- The enclosure being subjected to high pressure wash down



Internal top panel of an IP66 enclosure

Such condensation is known as “sweating” and all enclosures are susceptible, regardless of ingress protection (IP) rating. Enclosures are not gas tight. Condensation can cause short circuits and corrosion that can cause equipment inside the enclosure to malfunction, eventually causing permanent damage. Pressure compensation devices and drainage devices can prevent condensation damage to installed equipment by expelling any accumulated water droplets while still maintaining the IP rating.

Note that while anti-condensation heaters are intended to keep the enclosure temperature above the dew point (and thus prevent condensation), they may not always be able to achieve this:

- The heaters may have been sized for the “typical” scenario and may not allow for extremes of temperature or humidity beyond the “typical” range

- Heaters require external power and a correctly adjusted and working thermostat
- Heaters may prevent condensation however the humidity is still trapped inside the enclosure

In summary, all electrical enclosures installed outside and/or subject to rapid ambient environmental changes are at risk of experiencing condensation issues.

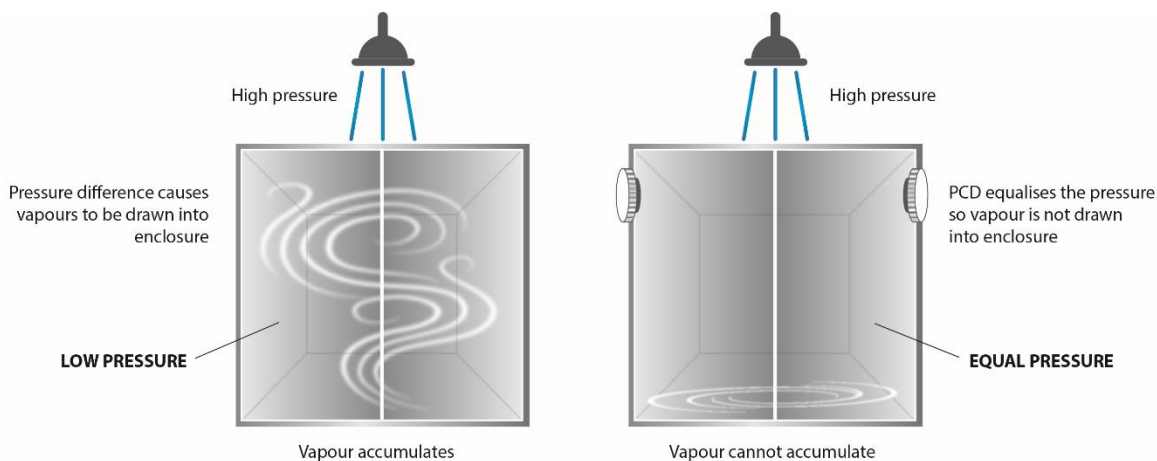
Pressure compensation devices and drainage devices are completely passive and so provide a reliable, low-cost back up to help protect the valuable equipment installed in the electrical enclosure.

Furthermore, AS/NZS3000:2018 Clause 1.7.2 requires that pressure compensation and drainage devices be installed in all enclosures where condensation is a risk.

Principle of Operation – Pressure Compensation Devices (PCD):

The example below is of a small to medium electrical enclosure being sprayed down at a chemical plant:

Without a PCD, there is a large pressure difference between the outside and inside of the enclosure, which creates a (relative) vacuum inside the enclosure. This pressure difference can damage the enclosure sealing. Moisture penetrates at the enclosure sealing points, regardless of the IP rating. PCDs have a special membrane that is impermeable to water but allows air to enter. With a Stego PCD installed on both sides, dry air can enter the enclosure to equalise the pressure inside and out, avoiding damage to the sealing. Note that the PCD should be selected to match the IP rating of the enclosure. If a PCD with a lower IP rating is fitted, then the IP rating of the whole enclosure will be degraded to the IP rating of the PCD.



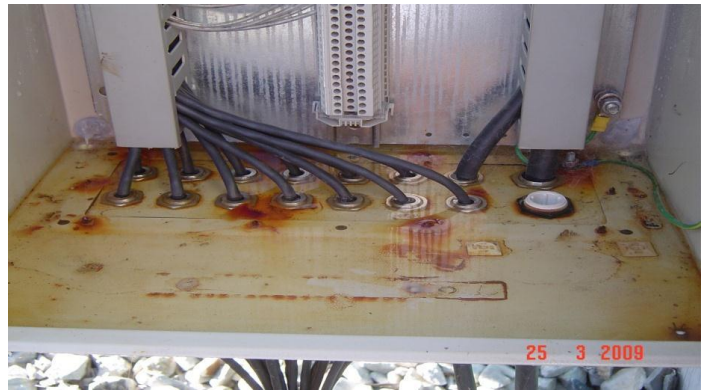
Pressure Compensation Devices should always be fitted in pairs, on opposite sides of the enclosure

NOTE: if the enclosure is fitted with ventilation fans and/or grilles (like the Stulz/Cosmotec TB or GSV, GSF series) then a PCD is not required since the ventilation fans will allow for pressure equalisation.

Application Notes

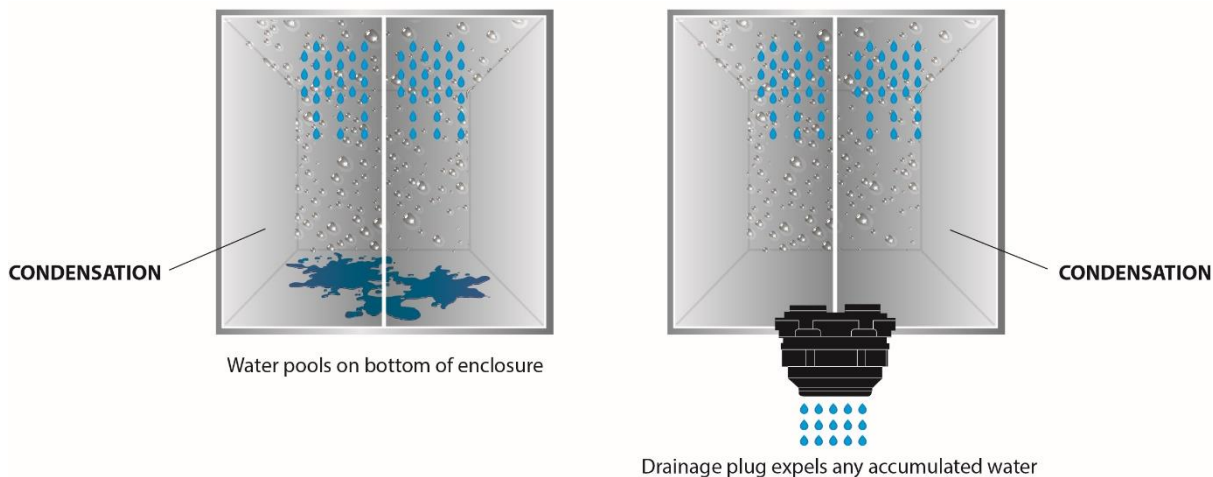
Principle of Operation – Drainage Devices (DD):

The example below is of a small to medium outdoor electrical enclosure in a region where condensation prevention is impossible due to the prevailing ambient conditions. A good example is a hot, humid day with an abrupt cool change accompanied by rain or thunderstorms rapidly cooling the enclosure – under these conditions condensation inside the enclosure is more likely and any installed heater may not be able to remove it quickly enough. Likewise, water inevitably pools near the sealing points and may penetrate the seal. Eventually the water will pool at the bottom of the enclosure:



Bottom gland plate of an IP66 enclosure

With no way to exit the enclosure, the accumulated water is an electrical shock and fire hazard and may cause corrosion. A Stego DD has a special membrane that allows drainage through capillary action and can remove up to 200mL/hr of water to drain out of the enclosure, thus safely removing the hazard.



The Drainage Device should always be mounted vertically in the lowest part of the enclosure

Application Notes



Pressure compensation plugs are available in plastic (DA284xx, left) and stainless steel (DA28455, middle) and both will maintain an IP66 rating. The DD084 drainage device (right) is available in plastic



DA28400 plastic PCD

DA28455 stainless steel PCD

DD084 plastic DD

Ordering Information

Part Number	Size	Description	Enclosure Size / Recommendation
DA28400	M40	Pressure compensation device, plastic, M40, IP66/X9K, two units per pack	Enclosures H600 x W600 or larger NOTE: need 1 pack per enclosure
DA28406	M12	Pressure compensation device, plastic, M12, IP67/X9K, two units per pack	Enclosures smaller than H600 x W600 NOTE: need 1 pack per enclosure
28402001	M12	Pressure compensation device, 303 stainless steel, M12, IP66/X9K, one unit per pack	Enclosures smaller than H600 x W600 NOTE: need 2 packs per enclosure
DA28455	M40	Pressure compensation device, 303 stainless steel, M40, IP66/X9K, one unit per pack	Enclosures H600 x W600 or larger NOTE: need 2 packs per enclosure
DD084	M50	Drainage device, plastic, M50, IP66/67/69K, one unit per pack	Enclosures smaller than H600 x W600 NOTE: need 1 pack per enclosure



Every enclosure mounted outside should have a pair of pressure compensation devices and a drainage device fitted, as required by AS/NZS3000:2018

Application Notes



Conclusion:

The fitting of pressure compensation and drainage devices is now mandated by AS3000:2018 clause 1.7.2 to all enclosures where condensation is likely to occur.

Pressure compensation devices and drainage devices are an inexpensive and easy-to-install solution to prevent condensation and moisture build-up in electrical enclosures while satisfying the wiring rules.

These completely passive devices require no power and are essentially maintenance free for the life of the enclosure.