Optimum moisture protection
for every application.

The environmental classes of ebm-papst.

ebmpapst

the engineer's choice

H0 to H4:
More reliable by several classes.

Depending on their purpose, electrical devices must be protected against humidity and other external influences to varying degrees. If, however, you only look at the conventional IP protection class, you may be surprised, as the international standard does not differentiate between different sectors or even specific applications. Therefore, it can seldom reliably determine whether a product is suitable for your specific situation.

H as in highest degree of safety for your application.
This was just not specific enough for our engineers. This is why we have developed a moisture-protection concept that does not just consider the product itself, but also the application types. This resulted in the H0 to H4 environmental classes, which as of now mark every ebm-papst product – from a super-small drive for medical technology, all the way to an axial fan for large rooftop air-conditioners. How do we do it? By subjecting every fan and every motor to comprehensive testing at our in-house laboratories. This testing goes far beyond the requirements of the IP protection classes.

Incidentally, the "H" actually stands for "humidity" in our class designations.

IP is good, but practice-oriented endurance tests are better.
In order to determine the IP protection class, simple standardized tests are carried out, for example with dripping water, sprayed water, splashing water and water jets. These last only a few minutes and do not in any way take into account special installation situations, changing weather conditions, extreme temperatures, or other environmental influences.

This is very different to the environmental classes of ebm-papst: In order to replicate actual operating conditions as closely as possible, our engineers use entirely new testing procedures such as the temperature change/rain test (TCR). Here, the product is subjected to various test cycles with alternating rain and high temperature fluctuation – this is carried out continuously for a period of up to 6 months. The test conditions are adjusted individually for every application and simulate a complete product life cycle "with time lapse".

The direct comparison:
The comparison shows, for example, the testing of an axial fan for protection class IP55 and for ebm-papst environmental class H2.

IP 55 testing: Focus is on the product/housing

- Defined test cycle (in accordance with EN60529) with constant stress
- Unit under test is de-energized/OFF (= not connected to the line voltage)
- Test duration: Short-term testing, i.e. a few minutes (water jet) to a few hours (dust buildup)
- Evaluation criteria: Is there water/dust ingress in the housing?

ebm-papst H2 testing: Focus is on the application

+ Defined test cycle (by ebm-papst) with alternating stress (temperature/humidity/direct rain)
+ Unit under test is live
+ Test duration: With time lapse corresponding to typical service life; for environmental class H2: Multiple months of continuous stress
+ Evaluation criteria: Does the unit under test function properly under the test conditions?

Advantages for you when it comes to the ebm-papst environmental classes:

Utmost quality, reliability, and long service life of our products for your specific application.

Would you like to find out more?
We are happy to assist you: Please get in touch with your regional sales contact or email info1@de.ebmpapst.com

Harder, longer, more practical:
This is how we conduct testing.

Lifetime test: Temperature change/rain (TCR)

During the temperature change/rain test, an attempt is made to simulate the real-world environmental conditions of the respective application. All new products from ebm-papst that are intended for moist or wet environments, i.e. H1- and H2 products, undergo this test. However, it can also be used to replicate breakdown situations, and thereby rectify errors.

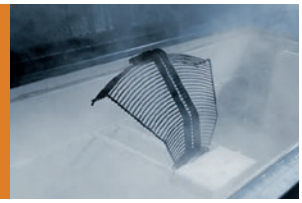
- Temperature fluctuations of –10 °C to +60 °C
- Alternating moisture/rain
- Operating status on/off
- Endurance test of up to 6 months
- 5 alternating test cycles daily, up to 900 cycles in total

Corrosion testing: Salt spray test

The salt spray test is carried out on products that are intended for applications in salty air. During this test, the unit under test is subjected to a 5% salt solution (NaCl) at 35 ±2 °C. The final assessment is made in terms of safety, function, and corrosion.

One version is testing in accordance with Bellcore GR-487 for telecommunications and automotive applications. Here, the unit under test is subjected to a total of 30 days in the salt spray; it is switched off for the last 16 days. Afterwards it is rinsed off and must function properly for at least another hour.

- Simulating a highly corrosive environment
- Visual and functional inspection



Additional tests

In addition to the above-mentioned environmental class tests, a highly accelerated lifetime test (HALT) is carried out primarily during product development, in order to identify weaknesses at an early stage and remedy them.

- Test beyond the scope of the specifications
- Detection of weaknesses
- Improvements during development phase
- Testing conditions: –100 °C to +200 °C at 70 K/min and 50 gRMS (10 Hz to 10 kHz)

You can *rely* on these environmental classes.

H0

Dry – temperature-controlled indoor spaces

Products are exposed to low levels of moisture. During operation and storage there are only moderate temperature changes which do not lead to condensation.

No exposure to water, no condensation

Max. relative humidity (%):	≤85
Corrosion requirements:	no
Example applications:	– Air purifiers in living spaces – IT/telecommunications cooling in indoor areas – FFUs and precision air-conditioning units

H1

Moist – occasional or constantly high level of humidity

Quick temperature changes also occur during operation and storage. Condensation forms at least occasionally. It is assumed that no dripping water can directly or indirectly reach the motor, electronics, or other live parts of the product.

Water exposure from condensation

Max. relative humidity (%):	100
Corrosion requirements:	yes
Example applications:	– Outdoor applications without direct rain, e.g. under canopies – Heat recovery devices – Evaporators in refrigeration units and cold storage

Note:
In general, the design of the engine/fan, in particular the design of the ball bearings, has to be defined in accordance with the real-world humidity and environmental stress.

H2 Wet – direct exposure to water

Very quick temperature changes occur during operation and storage, and there is constant condensation. The acceptable relative humidity is 100%. Water can lead to corrosion.

Direct exposure to water from outside through rain, snow or ice formation

Max. relative humidity (%):	100
Corrosion requirements:	yes
Example applications:	– Condensers and heat exchangers, outdoors without protection against rain – Heat pumps, outdoors without protection against rain

H3 Rail – direct exposure to water, certification in accordance with EN 50155

Quick temperature changes also occur during operation and storage. Condensation forms at least occasionally. It is assumed that no dripping water can directly or indirectly reach the motor, electronics, or other live parts of the product.

Water exposure from condensation

Max. relative humidity (%):	100
Corrosion requirements:	yes
Example applications:	– Condensers in rooftop air conditioners – Evaporators in air conditioners

H4 Transportation – direct exposure to water, certification in accordance with ISO 16750

During application, cold water can be sprayed via a hot system; this creates negative pressure which can draw in the cold water. During operation and storage, very quick temperature changes occur, and there is constant condensation. Water can lead to corrosion. Additionally, the system is suitable for cleaning via steam jet cleaners and high-pressure cleaners.

Direct exposure to water from outside through rain, snow or ice formation

Max. relative humidity (%):	100
Corrosion requirements:	yes
Example applications:	– Condensers in rooftop air conditioners – Heat exchangers in the engine compartment

"+" marking – additional stress

If an application's stress goes beyond the conditions specified in the environmental classes, it must be described in addition and checked. The underlying environmental class is then marked with a "+".

Special classes have already been defined for certain application types; they are marked with a "+" and a specific letter. These special classes are described below.

H2+A Agriculture

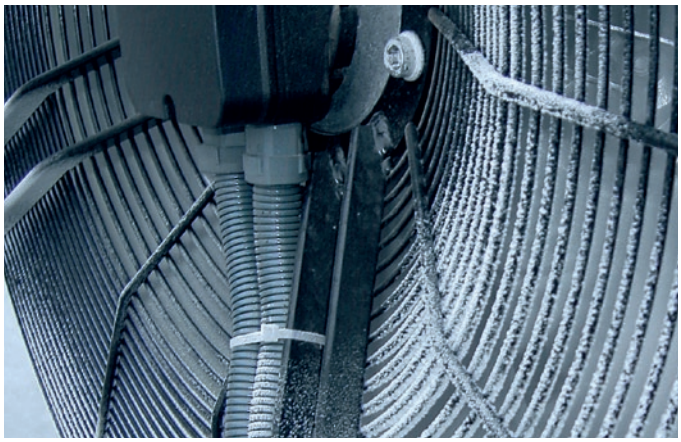
In addition to the conditions of environmental class H2, stresses resulting from ammonia, cleaning agents or disinfectants occur, as is typical in agriculture. Here, the exact chemical composition (concentration and exposure time) is assessed on a case-by-case basis.

H2+C Cooling towers

In addition to the conditions of environmental class H2, stresses resulting from cleaning agents, de-mineralized water, biocides and anti-rust agents occur, as is typical in industrial cooling. Here, the exact chemical composition (concentration and exposure time) is assessed on a case-by-case basis. Contaminated water has an additional corrosive effect.

H2+S Salt spray resistance (720 h)

In addition to the conditions of environmental class H2, the applications are exposed to increased salt spray exposure (720h), e.g. through direct weather conditions near coasts. The components are correspondingly tested and protected.



H2+T Transformers

When it comes to cooling large transformers, in addition to the conditions of environmental class H2, increased salt spray exposure (720h) occurs as a result of the air. The safety measures for this application are in accordance with the DIN standard EN 50216-12.

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the engineer's choice

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