



5 KEY FACTORS TO CONSIDER WHEN BUYING DYNAMIC CLIMATE CHAMBERS IN THE AUTOMOTIVE AND ELECTRONICS INDUSTRY

BUYER'S GUIDE

Standardized test results are absolutely essential when it comes to testing materials. This applies even more to challenging use cases, such as long-term measurements, or under constantly changing conditions. Read our Buyer's Guide to find out about the things you need to consider when buying a dynamic climate chamber.

Dynamic climate chambers are suitable for an extremely wide range of applications, giving them a level of universality that standard heating chambers can simply not compete with. The following areas of material testing are among the tasks that can be tackled with the help of this measuring technology:

- Aging tests
- Stress tests
- Environmental simulation

The detail-oriented world of the automotive industry

Requirements for the materials in use don't get much higher than those within the automotive industry, with every screw, cable, hose, and connection being subject to rigorous testing.

The responsibility for material testing lies largely or at least increasingly with the suppliers – predominantly medium-size companies of all different types. The choice as to which dynamic climate chamber is used to test subcomponents will depend on the size of the objects to be tested as well as the data required, which might include temperature, humidity, and rate of change.



Many manufacturers will opt for the deepest possible test chamber but in actual fact that won't always necessarily be the most beneficial solution from a practical point of view. Experience shows that wide dynamic climate chambers are the preferable option for testing hoses, cables, and certain fittings parts, for example. There is also then the option of technical upgrades to have additional access ports added.

A viewing window ideally affords the opportunity of performing a visual test while the overall testing is ongoing. Are there any cracks? Discolorations? Detachments? Leaks? If there is no viewing window, it's difficult to determine at which point the problem with the material began and which parameters it was the result of later down the line.

Dynamic climate chambers regulate temperature and humidity

The fully automated simulation of external environmental conditions is the perfect example to use to consider all of the key factors at play when buying a dynamic climate chamber. Alongside the technical requirements, such as the temperature range and humidity regulation, the measurement precision is one of the main crucial factors. If you want a guarantee of this, you should consider one factor that is often underestimated: homogeneous temperature distribution when fully loaded. Operation not being intuitive can also lead to test results being incorrect, so you should always ensure that a dynamic climate chamber is practical to use before you buy it.

The aim of this guide is to inform you about the key properties of this measuring technology. How important certain requirements are will, of course, depend on the intended applications. However, in the case of more or less universal use under constantly changing conditions, including long-term measurements, all of the criteria should be considered to be roughly equal.



Openings in the side wall ensure that the samples on the plates are ventilated horizontally from both sides. This means that you can rest safe in the knowledge that every sample will be tested under the same temperature conditions, even when the unit is fully loaded.

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When buying your dynamic climate chamber, be sure to consider the following properties:

- 1. Temperature range**
- 2. Humidity regulation**
- 3. Homogeneous temperature distribution**
- 4. Measurement precision**
- 5. Operation and safety**

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1. Temperature range

As you might well imagine, the higher the temperature range rating of a dynamic climate chamber, the wider the range of applications it will be suitable for.

- Temperature range for MK and MKF: -40°C to 180°C
- Temperature range for MKT & MKFT: -70°C to 180°C

Standard models usually manage to reach a high temperature range with corresponding heating up and cooling down periods.

But a high temperature range is not enough on its own to meet all the requirements of modern testing procedures. The following questions should help you assess the performance of a dynamic climate chamber in terms of temperature:

- How is the temperature accuracy guaranteed?
- Is there a safety device to prevent overheating?
- Is the unit also designed for cyclical temperature tests?
- How exactly is the temperature displayed?

Environmental simulation chambers from BINDER have been developed specifically for cyclical temperature tests and they boast impressively high temperature accuracy and reproducible results. The simulation of natural temperature fluctuations using preheating chamber technology is unique within the industry.



Environmental simulation chambers in the MK series from BINDER never fail to impress with their rapid changes in temperature and dynamic temperature profiles. Cold tests reaching temperatures as low as -40°C (or even -70°C with the relevant extension) and heat tests up to 180°C alike can be performed with precision.

2. Humidity regulation

The simulation of environmental conditions in particular usually takes place over very long periods of time. In this case, humidity regulation is hugely significant if the quality of the measured data is to be assured.

Test scenarios within extreme climatic ranges with a high humidity level place huge demands on the technical capability of standard dynamic climate chambers. Plus, there has to be the option of controlling climate values that shift frequently with set tolerances.

If cyclical environmental simulations are something else you need from your dynamic climate chamber, make sure you consider the following questions:

- How is the water supply guaranteed?
- Is humidity generated in the interior (usable space) or on the outside?



With environmental simulation chambers from BINDER, the water supply is provided independent of location via a storage tank. Humidity is regulated using a capacitive humidity sensor and steam humidification. There is also a condensation protection system you can program to further guarantee the quality of your measured data.

Stress tests for electronic components

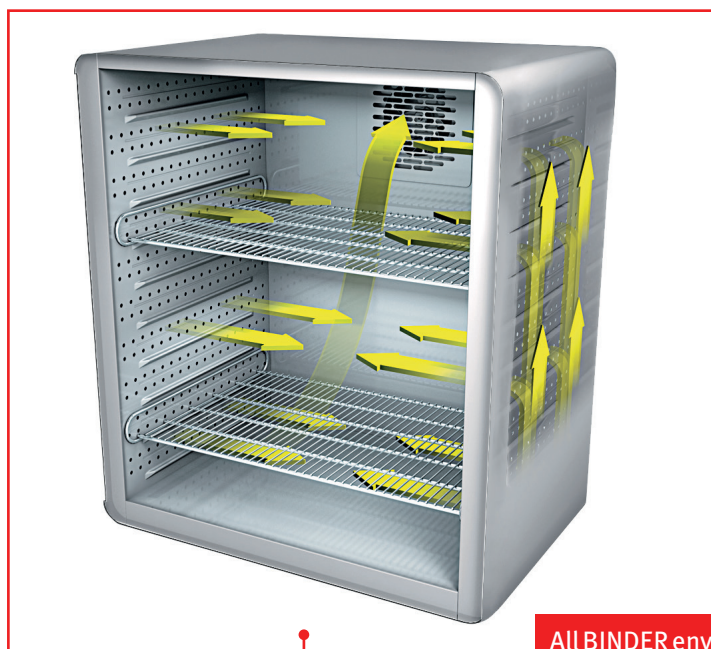
Special dynamic climate chambers also allow for moisture to be removed at ambient temperature. This kind of process is particularly important when it comes to testing and storing electronic components. Stress tests, on the other hand, involve even the most sensitive technology being pushed to its limits. Just imagine a navigation system in a vehicle that has got lost in Death Valley. The corresponding conditions can be recreated in the dynamic climate chamber – ideally during operation. A dynamic climate chamber requires an access port for the unit's power supply and, of course, a viewing window to allow for electronic systems to be tested in full.

3. Homogeneous temperature distribution

Homogeneous temperature distribution is crucial – above all when the test chamber is fully loaded but also during all long-term tests in general. As having different temperature zones inside the test chamber can deliver incorrect measured values, it is important that dynamic climate chambers have technology like BINDER APT.line™ to rule out this problem.

The average heating-up rate as per IEC 60068-3-5 [K/min] and the average cooling down rate as per IEC 60068-3-5 [K/min] are also important here. The more effective the technology installed is, the quicker it will be to set the required temperature and have it applied evenly throughout the test chamber.

Taking all of these factors into account, there is one main question to ask the manufacturer: How long are the heating up and cooling down times, and how are they regulated?



All BINDER environmental simulation chambers feature the proven APT.line™ preheating chamber technology, which ensures homogeneous temperature distribution and guarantees accurate measured values at every temperature setting. At the same time, the “Advanced Preheating Technology” provides exceedingly fast cooling down rates.

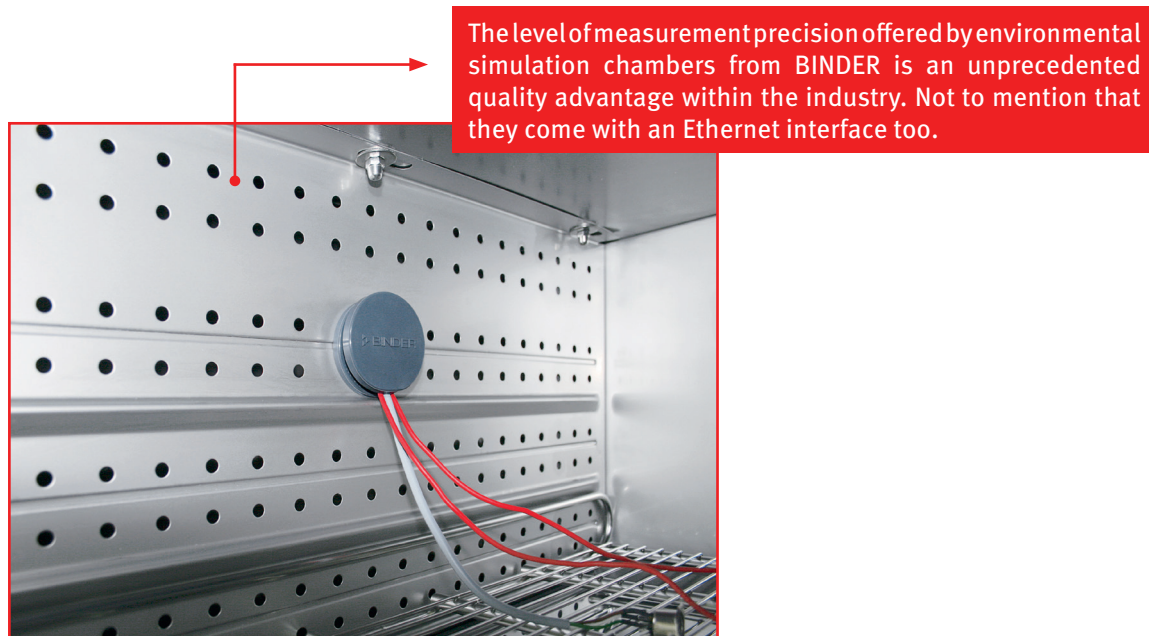
4. Measurement precision

The only way to guarantee maximum measurement precision is to have all of the components installed in a dynamic climate chamber working together. The main feature you want from the technology is for measurements to be reproducible. It's not just a case of recording all of the test parameters – they also need to be logged ready to be repeated.

Dynamic climate chambers will ideally come with an Ethernet interface to allow for all of the measured data to be accessed via your company's own testing software.

If you need to assess a dynamic climate chamber's measurement precision, you will need to pay attention first and foremost to the way in which all of the components installed work together. When considering measurement precision, you need to ask the following questions:

- Are temperature and humidity both regulated effectively?
- What are the potential risks associated with operation?
- Which safety devices are installed?
- Which interfaces are available for accessing data?



5. Operation and safety

Alongside the technical aspects, it's also important that your unit is practical and easy to use. The design and interface should be as functional as possible, especially given that incorrect test results can be delivered when measurement units aren't used properly.

Elements of a practical design include ease of access and cleaning of the interior. It should also be easy to move the unit so you have the option of placing it in a different position temporarily while long-term measurements are being performed, for example.

One feature that really sets BINDER dynamic climate chambers apart is the comparatively wide access point, making it much easier to test large objects. Units from BINDER also come with an access port as standard for special applications, such as those that require a separate power supply in the interior. Further access ports can be added to create compatibility with other applications, including testing tensile forces.

The built-in interface and software supplied should be as intuitive as possible to use. Units that don't have digital interfaces and dedicated software have not been able to keep up with the requirements for some time now. It is possible to move the unit and change where it is positioned without having to use a lifting carriage.



The stainless steel interior is no problem to clean and the test chamber can be loaded and unloaded with ease thanks to the prioritization of width over depth as far as the units are concerned. You can look through the heated window to check on samples and the interior is fitted with LED illumination.

The controller with time-segment programming means it is straightforward to set all of the necessary parameters and the programming options are extensive.

BINDER environmental simulation chambers come with four casters, two of which have brakes, for maximum flexibility.

Safety also needs to be given serious thought to protect people and preserve the machinery. The following questions should help you to assess the design and operation:

- Can the unit be moved and loaded with ease?
- Is it easy to clean?
- Which safety devices does the unit come with?
- What is the interface like? Is it easy to use?
- Are there digital interfaces?

CONCLUSION

Special requirements call for sophisticated technology. The specifications of environmental simulation chambers from BINDER are truly impressive – especially if you need to test materials under extreme or highly realistic environmental conditions in line with specific standards. The effective regulation of the temperature and humidity ensures that measurement results are highly accurate – no matter what the conditions are.

With dynamic climate chambers from BINDER, you have a tool for standardized testing of your materials and components that comes with plenty of standard equipment and ease of access. BINDER units have proven to be reliable in practical applications within a wide range of industries over the decades. As one of the leading suppliers of simulation chambers, you can rely on us to offer you comprehensive service and support, short delivery times, and the best possible price for our units.





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