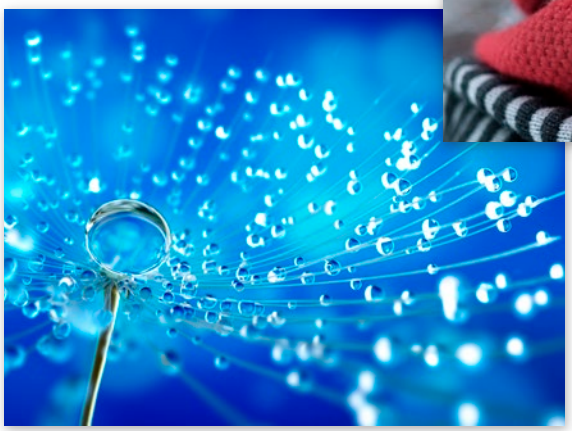
HGC product series

Humidity Generators and Controllers
for various laboratory applications



dataphysics

Humidity control in laboratory environment

Humidity is an important parameter for many different material analysis systems. Since the humidity generators and controllers of the HGC series can work stand-alone and are available as OEM products, they can be used for many laboratory applications and devices.

Fields of application include among others:

- atomic force microscopy (AFM)
- dynamic mechanical analysis (DMA)
- isothermal microcalorimetry (IMC)
- near infrared spectroscopy (NIR)
- Raman microscopy
- rheology
- thermogravimetric analysis (TGA)
- thermomechanical analysis (TMA)
- X-ray diffraction (XRD)
- various chambers and enclosures by DataPhysics Instruments

Humidity as an interfacial parameter

Moss or mould on a facade is an unsightly problem that occurs as a result of high and long-lasting surface humidity. In order to investigate which surface properties lead to or promote the fastest drying under high humidity, the conditions that prevail during the formation of morning dew can be simulated with a humidity generator of the HGC series.

Due to the wide relative humidity range the HGC series can reproduce humidity conditions from very humid like in the tropical rainforest to extremely arid like in the desert.

Bioinspired humidity and temperature controlled actuators

Pine cones only open when the weather is dry and warm; feather grass releases its seeds when the air humidity is high. Nature is full of environmentally adaptive materials and has since inspired many man-made materials. In the field of building engineering for example, temperature and humidity-dependent actuators are the key to intelligent facades and roofs that can respond to changing weather conditions.

Two key parameters – temperature and humidity – play a key role in modulating stimuli-responsive commodity materials. Until now, the simultaneous interaction of both temperature and humidity on adaptive structures has been less explored. Recently Verpaalen et al. have generated dual-responsive heat/humidity bilayer actuators and examined the dual-responsivity to changes in humidity and temperature.

In this work, the researchers fabricated the dual-responsive bilayer actuators by combining a humidity-sensitive polyamide 6 (PA6) layer and a temperature-sensitive liquid crystal network (LCN) coating. Self-alignment of the LCN was verified by polarised infrared spectroscopy. The pre-bent shape of the bilayer actuators was observed because the order of the LCN layer increased and expanded along the alignment direction due to the cooling process during fabrication.

The dual-responsivity towards humidity and/or temperature changes was demonstrated by submitting the material to a well-defined temperature and humidity. The bilayers showed different bending behaviour. At low relative humidity (5% RH), the bending angle was constantly around -50° even as temperature increased from 25 °C to 83 °C (red dots).

But at high relative humidity (80% RH), the bending angle dramatically decreased from +50° to -50° as temperature increased from 28 °C to 62 °C (red circles). At constant temperature (20 °C), the bending angle increased from -50° to +75° as the relative humidity increased from 7% to 80% (blue dots).

The authors have managed to design dual-responsive bilayer actuators sensitive towards humidity and temperature changes. They demonstrated different bending behaviours of PA6/LCN bilayers by controlling the temperature and humidity changes in the environment. PA6/LCN bilayers are expected to have a tremendous impact on current environmentally adaptive materials fabrication and hold potential promise for various applications.

A humidity generator and controller HGC 30 was used in this research. For more information please refer to the original publication.
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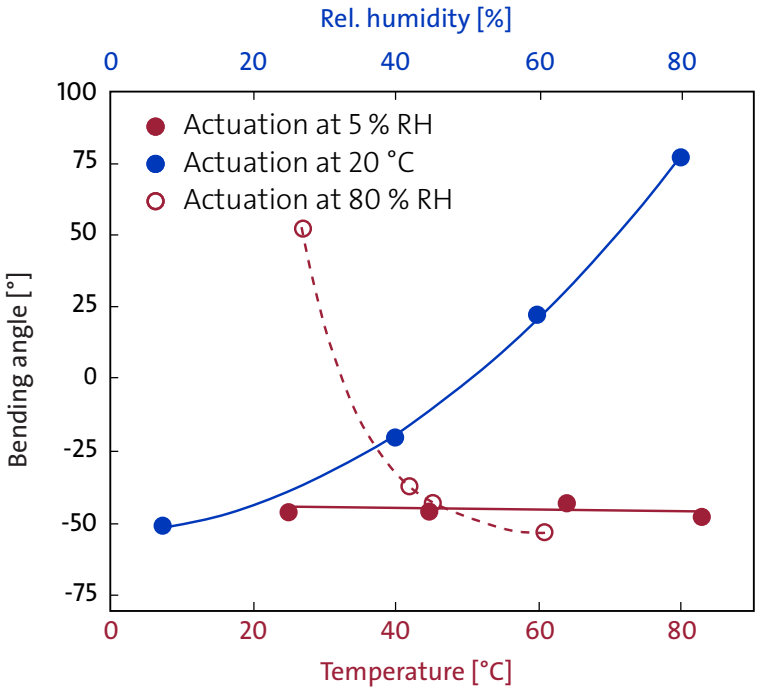


HGC models

The humidity generators and controllers of the **HGC series** allow for a reliable control of the relative humidity, in the **range of 5% to 90%**, inside small environmental measuring chambers from DataPhysics Instruments.

The humidity generators and controllers of the HGC series work as **stand-alone devices** and are also combinable with **various laboratory devices and chambers of other manufacturers**. In addition, the HGC series is available as an OEM product.

HGC 20
The HGC 20 is the **base system** of the HGC series. With its **integrated pump and desiccant reservoir** it can independently generate a dry airflow using ambient air. Together with the **heated water reservoir** the necessary humidity can be generated within the HGC.

Using the gas connection tube this air flow of well-defined humidity can be fed into **various environmental chambers or laboratory devices**. The gas tube is heated in order to prevent any condensation during transfer. With the additional **humidity and temperature sensor** the HGC 20 can measure directly at the target location and **calculate the dew point** inside of an environmental chamber.

Due to the **integrated touch screen** the system can be operated without additional software and is directly ready for use.

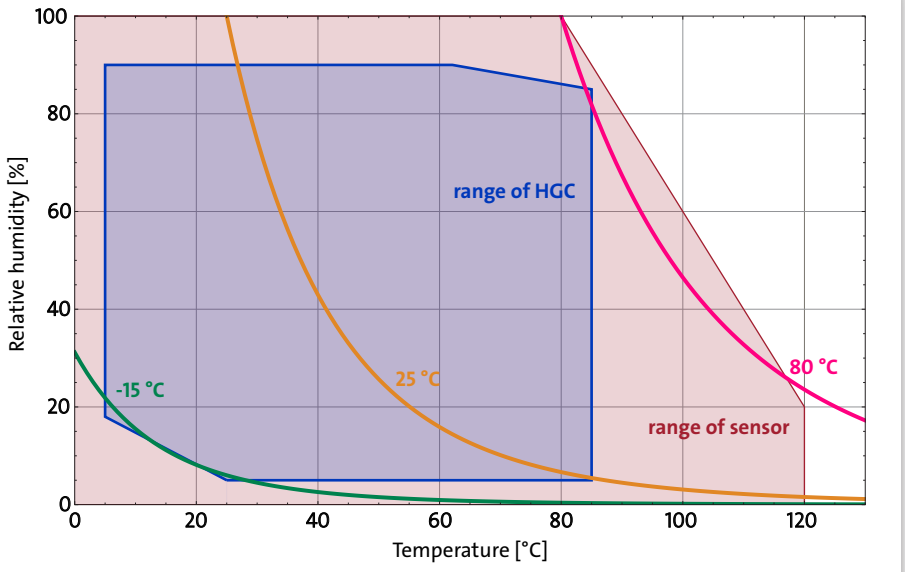
Humidity Generator and Controller HGC 30

HGC 30
The HGC 30 is the **advanced system** of the HGC series. With its additional inlet for an **external gas supply** it can be used with clean oil-free **pressurised air, argon or nitrogen**.

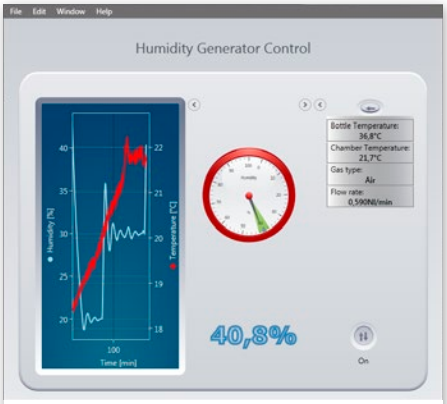
With the integrated **pressure and flow rate regulator** the HGC 30 can adjust the flow rate when using the external gas supply and achieves a **higher throughput** than the HGC 20.

Software for an efficient workflow
The SCH 20 software for Microsoft Windows® assists you in the intuitive use of the humidity generator HGC. Of course, the software of the DataPhysics Instruments measuring instruments includes, integrated, HGC humidity control. It has the following main features:

- control of the relative humidity directly in the sample chamber / enclosure
- define, execute, save, and load humidity profiles
- collection, evaluation and export of humidity and temperature data



Dew points and working range of HGC and its sensor



Humidity control using SCH 20

Technical data

	HGC 20	HGC 30
Relative humidity		
control range	5% ... 90% @ 25 °C; 10% ... 85% @ 85 °C	
accuracy	± 1.8%	± 1.0%
Temperature range	5 ... 85 °C (requires appropriate temperature-controlled chamber)	
Dew point range	min. -15 °C, max. 85 °C	
Gas supply	ambient air	ambient or pressurised air Nitrogen, Argon
inlet for external gas supply (only for clean, oil-free gases)	—	via 6 mm push-in fitting
inlet pressure	—	max. 14 bar
flow rate	600 ml/min	70 ... 600 ml/min (ambient air) 70 ... 3500 ml/min (external gas)
Heated water reservoir	80 ml	
Desiccant reservoirs	two desiccant reservoirs (total stored desiccant amount about 1.0 kg), with automated drying and regeneration of desiccant by a built-in heating system	
Heated connection gas tube length	120 cm	
Device control	via integrated touch screen or software	
Connection to controlling device	RS-485 (for DataPhysics measuring system) or USB to PC (for third-party systems)	
Dimensions (L [mm] x W [mm] x H [mm])	330 x 280 x 350	
Weight	19.5 kg	20.5 kg
Power supply	80 ... 275 VAC; 50 ... 60 Hz; max. 250 W	

For more information please contact us.
We will find a tailor-made solution to your surface chemistry requirements and will be pleased to provide a quotation, obligation-free, for your instrument system.

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