PHOTO-OPTICAL PARTICLE ANALYSIS.
ACCURATE MEASUREMENT OF
MATERIAL QUALITY.
PHOTO-OPTICAL PARTICLE ANALYSIS – HAVER CPA.

In the field of conventional particle analysis, Haver & Boecker has been the market-leading manufacturer of test sieve shakers for many years. In the early 90s, this head start in terms of expertise provided the ideal conditions for taking new steps as a pioneer in particle analysis with the integration of powerful computer technology. Then as now, Haver & Boecker photo-optical analysis systems represent the latest state of technology.

Our wide product range consisting of future-oriented, expandable modular units and systems guarantees flexible solutions for all applications. Our photo-optical systems have proved their worth with hundreds of materials in various sectors, whether in the form of standardised laboratory/online units or customised industrial units, from pharmaceuticals, food and non-metallic minerals to the plastics and fertiliser industries.

We develop the future.

Our own design departments, an in-house tool making and mechanical engineering facility and our own electronics and control specialists ensure that every HAVER CPA system fully meets the requirements imposed upon it. Our engineering specialists will develop customised equipment, special design solutions and individual control systems especially for you. If required, we will take care of the connection to the PLC.

We work with partners from the Haver & Boecker Group in the development and improvement of our CPA technology. These include the Machinery Divisions in Münster and Oelde as well as Haver Engineering GmbH in Meißen, which is recognised as an affiliated institute of the Technical University Mining Academy of Freiberg.

Up to the present day, these collaborations have not only given rise to innovative products but also to numerous national and international patents. Time and again, methods that we have developed have become compulsory norms throughout the industry. Haver & Boecker is also represented on DIN and ISO national and international standardisation committees as a permanent member.

We will of course also assist in the commissioning of CPA systems and can provide you with a comprehensive after-sales service from professional maintenance to subsequent modifications and software updates – directly without the need to go through a distributor.

Haver & Boecker began producing wire cloth in Hohenlimburg, Germany, in 1887. Today, we are one of the world’s leading wire weaving companies with a global network of branches and manufacturing facilities.

Our work is based upon experience, continuous research and development of our products and manufacturing processes, along with the knowledge and ability of our staff. This combination of tradition and innovation allows us to meet and exceed the high expectations of our customers.

WE HAVE A SHARP EYE FOR QUALITY.
The patented HAVER CPA measuring process is used to analyse grain sizes and grain shapes of dry and non-agglomerating particles of bulk materials in the measuring range from 10 µm to 400 mm. When fitted with the appropriate HAVER peripherals, this process can be used as a laboratory, technical centre or online version in many different fields. The robust technology is virtually maintenance-free and is therefore absolutely fail-safe and works reliably even under extreme conditions. The CPA technology can be used to analyse coarse and fine materials such as gravel, sand, coke, coal, plastic granules, wood chipings, chemical and pharmaceutical products, fertilizers, foodstuffs and many more.

HAVER CPA systems are based upon an energy-saving and a low-maintenance technology that causes low operating costs. They are ready to connect to a PLC control system as standard and can also be integrated into online processes at a later date – without modification. The results produced by the HAVER CPA are comparable with a conventional sieve analysis but offer a range of decisive advantages. These include high reproducibility of the measuring results, enormous time saving, additional information relating to grain shapes and the number of particles.

The principle of CPA measurement: State-of-the-art innovation.

HAVER CPA measuring instruments are based on digital image processing. A high-resolution digital line scan camera scans the particles in free-falling bulk materials against the background of an LED lighting array with a recording frequency of up to 28,000 line scans per second. The scanned lines are combined by the CPA to form an endless data record and the shadow projections of the particles are evaluated in real time (HAVER REAL TIME) in parallel with the measuring process. Up to 10,000 particles can be detected and analysed every second. Due to a GigE camera interface the CPA devices can be operated using a notebook without additional hardware module (camera card). The GigE technology has a high transfer rate of up to 1,000 Mbit/s.

Tailor-made solution off the peg: CPA CONVEYOR.

The CPA CONVEYOR measuring process has been especially developed for analysing elongated materials, the measuring results of which tend to be falsified due to overlaying and rotation of particles while the image is being analysed. In this process, the material sample is fed via a metering channel from where it passes onto a faster running conveyor belt. The resulting difference in speed separates the particles and brings them into a stable orientation (maximum length to maximum width) before the digital image analysis takes place.

The HAVER CPA CONVEYOR measuring principle virtually rules out random rotation of the particles at the moment they are measured.
Unique features: HAVER REAL TIME. All HAVER CPA units feature the HAVER REAL TIME function and work with only one line scan camera. Every particle in the grain size measuring range can thus be measured and the result used in the size and shape analysis. Double detection due to individual images overlapping is ruled out, as are partial range detection and mis-measurement of truncated particles. In addition, the HAVER REAL TIME function also enables all CPA units to be used as particle counting devices.

Each particle at a glance. The HAVER CpaServ software deployed in HAVER CPA systems is easy to use and runs under the most Windows operating systems. Thanks to this software a wide range of particle specifications can be analysed. HAVER individual particle memory enables different grain shape values to be evaluated for every particle measured and for statistical means to be determined in freely selectable grain size classes. Each particle is fully-scaled presented in the particle list. The details about the particular grain sizes and grain shapes are stored and can also be used for further analyses. Input data errors can be minimised thanks to “copy and paste” into documents or tables (e.g. in Excel). Multifarious options for filtration furthermore enable a customised presentation of results.
## PHOTO-OPTICAL PARTICLE MEASURING INSTRUMENTS

<table>
<thead>
<tr>
<th>DESIGNATION</th>
<th>HAVER CPA 2-1 HR</th>
<th>HAVER CPA 2-1</th>
<th>HAVER CPA 2 CONVEYOR</th>
<th>HAVER CPA 2-1 ONLINE</th>
<th>HAVER CPA 2-1 ONLINE</th>
<th>HAVER CPA 4-1</th>
<th>HAVER CPA 4-2</th>
<th>HAVER CPA 4 CONVEYOR</th>
<th>HAVER CPA 5 CONVEYOR</th>
<th>HAVER CPA 4 GRAVIOPT</th>
<th>HAVER CPA 5 GRAVIOPT</th>
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<td>0.034 - 25</td>
<td>0.036 - 45</td>
<td>0.034 - 25</td>
<td>0.063 - 50</td>
<td>0.035 - 15</td>
<td>0.091 - 90</td>
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<td>65</td>
<td>70</td>
<td>100</td>
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<td>Conveyor width [mm]</td>
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<td>1.5</td>
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<td>3.6</td>
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<td>LED</td>
<td>LED</td>
<td>LED</td>
<td>LED</td>
<td>LED</td>
<td>LED</td>
<td>Fluscent tube / LED</td>
<td>LED</td>
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<td>730 x 260 x 410</td>
<td>940 x 260 x 580</td>
<td>850 x 330 x 500 (CPA)</td>
<td>1500 x 790 x 940</td>
<td>1770 x 810 x 1050</td>
<td>2230 x 830 x 1390</td>
<td>2221 x 1700 x 3300</td>
<td>3000 x 790 x 2010</td>
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<td>205</td>
<td>167</td>
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<td>Operating voltage [V]</td>
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<td>230 or 115</td>
<td>230 or 115</td>
<td>230 or 115</td>
<td>230 or 115</td>
<td>230 or 115</td>
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<td>IP 54</td>
<td>IP 54</td>
<td>IP 65</td>
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<td>IP 54</td>
<td>IP 54</td>
<td>IP 54</td>
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## PERIPHERALS FOR HAVER CPA UNITS

<table>
<thead>
<tr>
<th>DESIGNATION</th>
<th>HAVER HS D</th>
<th>HAVER HS D-S</th>
<th>HAVER DMS</th>
<th>HAVER EM Z</th>
<th>HAVER DISPERSION SYSTEM</th>
<th>HAVER AS 6</th>
<th>HAVER AS 12</th>
<th>HAVER AS 24</th>
<th>HAVER CPA CONTAINER</th>
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<tbody>
<tr>
<td>Grain size range [mm]</td>
<td>2 - 45</td>
<td>0 - 15</td>
<td>0 - 45</td>
<td>0 - 45</td>
<td>-</td>
<td>0 - 30</td>
<td>0 - 30</td>
<td>0 - 30</td>
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<tr>
<td>Hopper volume (approx.) [l]</td>
<td>23</td>
<td>0.1 (max. 100 g)</td>
<td>0.15</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Application [-]</td>
<td>for fast drying of moist bulk materials (Online / Laboratory)</td>
<td>for fast drying of moist fine bulk materials (Online / Laboratory)</td>
<td>for screening out the fine contents of bulk material (Online / Laboratory)</td>
<td>for conveying and dosing bulk materials (Online / Laboratory)</td>
<td>for destruction of agglomerates using ultrasound before CPA analysis (Online / Laboratory)</td>
<td>for the automatic feeding of CPA units (Online / Laboratory)</td>
<td>for the automatic feeding of CPA units (Online / Laboratory)</td>
<td>for the automatic feeding of CPA units (Online / Laboratory)</td>
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<td>Dimensions (appr.) (LxWxH) [mm]</td>
<td>1500 x 700 x 1500</td>
<td>395</td>
<td>1000 x 600 x 1300</td>
<td>860 x 700 x 1700</td>
<td>380 x 245 x 420</td>
<td>1100 x 400 x 1380</td>
<td>1760 x 400 x 1380</td>
<td>1760 x 550 x 1380</td>
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<td>Weight (approx.) [kg]</td>
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<td>127</td>
<td>81</td>
<td>14</td>
<td>70</td>
<td>76</td>
<td>90</td>
<td>1250 (incl. fittings)</td>
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<td>Operating voltage [V]</td>
<td>230</td>
<td>115</td>
<td>115</td>
<td>115</td>
<td>115</td>
<td>115</td>
<td>115</td>
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<td>230 or 115</td>
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<td>IP 55</td>
<td>IP 55</td>
<td>IP 54</td>
<td>IP 54</td>
<td>IP 54</td>
<td>IP 54</td>
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<td>Power [kW]</td>
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<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>Air conditioner: 2.14 Rapid heater: 1.00</td>
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<td>max. air quantity [l/min]</td>
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<td>-</td>
<td>-</td>
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<td>-</td>
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<td>-</td>
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</tr>
<tr>
<td>Number of containers [gce]</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>6</td>
<td>12</td>
<td>24</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>-</td>
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</tbody>
</table>
HAVER & BOECKER

with HAVER peripherals, the modular design enables individual online solutions.

The HAVER CPA 2-1 ONLINE for the analysis of bulk material in the measuring range from 34 µm up to 25 mm has been designed for the continuous quality control during production.

In a permanent measuring standby modus the HAVER CPA 2-1 ONLINE analyses regularly fed samples without production interruption. Due to the robust construction it is resistant against surrounding conditions like heat, dust or humidity.

The HAVER CPA 4-1 analyses grain sizes and shapes in the measuring range from 63 µm to 50 mm. Its robust design makes it particularly suitable for large sample quantities.

The HAVER CPA 4-2 with two measuring ranges measures grain sizes and shapes of fine and coarse fractions separately in one unit. Examples include sand and grit in the measuring range from 35 µm to 15 mm or gravel and crushed stone in the measuring range from 91 µm to 90 mm.

The HAVER CPA 4 CONVEYOR works using the CONVEYOR measuring process and has been designed for coarser elongated material up to 220 mm. It has proved valuable particularly in the analysis of the lengths and widths of wood chips.
Modular peripherals, containers

The range of HAVER CPA units is complemented in practice by various peripheral devices. Moist materials, for example, must be dried first in order to be able to measure them photo-optically. For this purpose, we have developed the HAVER HSD High Speed Dryer, which dries mineral bulk material within a minimum amount of time. Conveyor speed and heating temperatures can be adjusted to suit the material. The high heating capacity and air quantity guarantee high flow rates. The HAVER HSD is frequently used for pre-drying wet gravel before analysing with the HAVER CPA 4.1. It can be used with all HAVER CPA units as well as separately for the fast drying of bulk material.

The HAVER DMS is a double deck screening machine for pre-screening with two separating cuts. In doing so, the feed material can be divided into three fractions. The two screens can be individually designed and tensioned by the Haver screening service. Rubber balls or special ultrasonic modules can be used to implement even super fine separating cuts and to enable automatic cleaning of the screens to be achieved. The pre-screening function of the HAVER DMS is used in combination with a HAVER CPA particle measuring unit to screen out the fine content of a material sample. This reduces measuring times significantly. To achieve optimum utilisation of the classification area, we recommend additional pre-dosing with the magnetically driven HAVER EMZ feed trough. Its large material hopper makes it the ideal buffer storage for downstream processes. In step mode, it conveys all kinds of bulk material.

We have developed the HAVER AS auto sampler for automatically feeding HAVER CPA devices with material samples. Six, twelve or twenty-four samples (AS 6, AS 12, AS 24) can be automatically measured around the clock without tying up capacity. The HAVER AS is controlled by the HAVER CpaServ software via an interface. It can be used as a laboratory or technical centre unit and also for collecting retain samples.
The CPA product range covers an exceptionally wide performance spectrum thanks to the consistent modular design. We develop tailor-made systems for our customers for special applications. This includes gaining an accurate picture of the specific requirements and the installation conditions on site.

Following an intensive planning and consulting, the next step is to produce detailed design drawings as a basis for the calculation and production. The system is put through its paces in several test runs prior to delivery.

Of course, we also support you during the subsequent installation and commissioning of your CPA systems, and are available on site to instruct and train your staff. Competent after-sales service assists you with maintenance, subsequent modifications and software updates for your CPA system.

One of many advantages for our customers is the direct contact to our CPA team at every stage. This saves valuable time and cuts costs considerably, and ensures maximum reliability as a result of the typical Haver & Boecker high product and service quality.

Haver & Boecker has actively influenced the technology of wire weaving since its beginning. As a result of our successful company history, today we are able to offer our customers the benefit of our unrivalled experience, technology and know-how about wire cloth.

Whether science and research, industry or architecture – wherever Haver & Boecker products are used, our customers benefit from a broad but still unique individual service.

With our worldwide weaving network we offer the comforting certainty to be your competent and reliable partner at any time and any place. So as to continue WEAVING IDEAS in time to come.

In 2014, Haver & Boecker operates production sites in Germany, Great Britain, Belgium, the USA, Canada, Brazil, India and Belarus. More than 2,870 people work for the Group worldwide.
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