

HAVER & BOECKER



DIE DRAHTWEBER



**PHOTO-OPTICAL PARTICLE ANALYSIS.
ACCURATE MEASUREMENT OF
MATERIAL QUALITY.**

HAVER & BOECKER

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 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 also program software enhancements for you and 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 und ISO national and international standardisation committees as a permanent member.

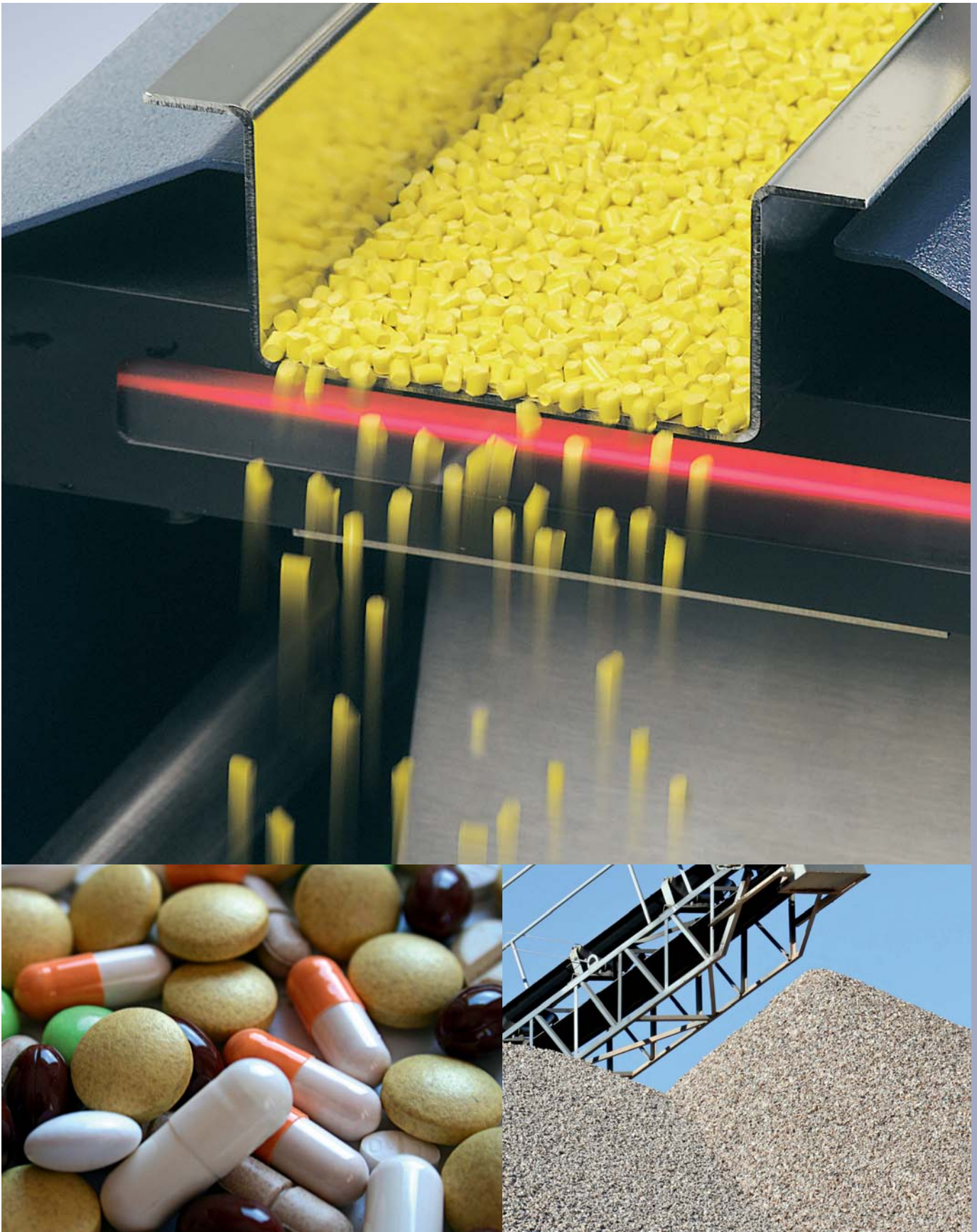
We will of course also assist in the commissioning of CPA systems and can provide you with a comprehensive after-sales service from professional maintenance to subsequent modifications and software updates – directly without the need to go through a distributor.



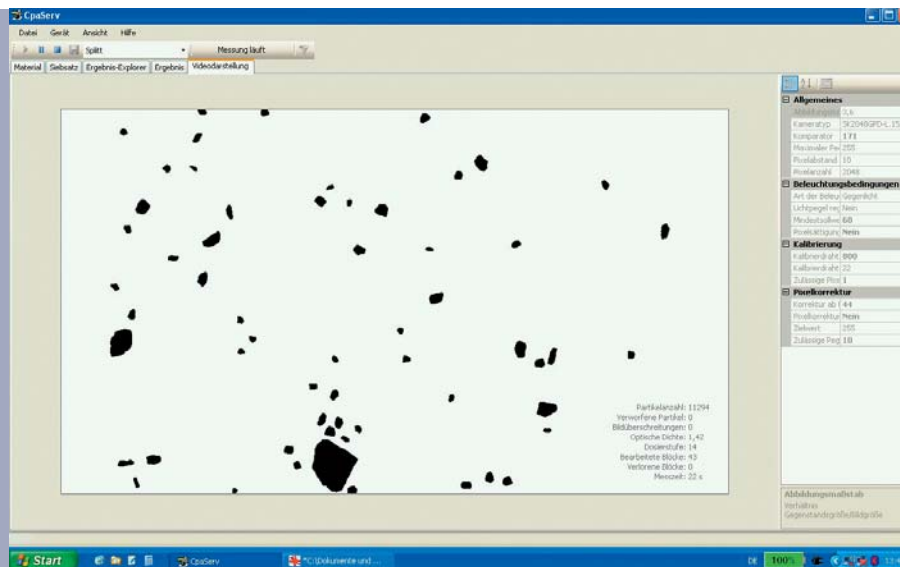
Haver & Boecker began producing wire cloth in Hohenlimburg, Germany, in 1887. Today, we are one of the world's leading wire weaving companies with a global network of branches and manufacturing facilities.

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.



FOCUS ON MAXIMUM PRECISION.



The patented HAVER CPA measuring process is used to analyse grain sizes and grain shapes of dry and non-agglomerating particles in bulk materials in the measuring range from 10 µm to 400 µm. 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 CPA technology can be used to analyse coarse and fine materials such as gravel, sand, coke, coal, plastic granules, wood chippings, chemical and pharmaceutical products, fertilisers, foodstuffs and many more.

The results produced by the HAVER CPA are absolutely 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 and low operating costs thanks to low-maintenance technology.

Another advantage is the diversity of the particle data analysis. HAVER individual particle memory enables different grain shape values to be evaluated for every particle measured and statistical means to be determined in freely selectable grain size classes. All particles of a sample which lie within the measuring range are analysed and can also be counted if required.

Under control, reliably and automatically.

The HAVER CPA software deployed in HAVER CPA systems is easy to use and runs under all popular Windows operating systems. It offers a wide range of analysis functions as well as evaluating the measuring results and displaying them graphically.

HAVER CPA systems are ready to connect to a PLC control system as standard. They can also be integrated into online processes at a later date - without modification. The robust technology is virtually maintenance-free and is therefore absolutely fail-safe and works reliably even under extreme conditions.



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

HAYER 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 (HAYER REAL TIME) in parallel with the measuring process. Up to 10,000 particles can be detected and analysed every second.

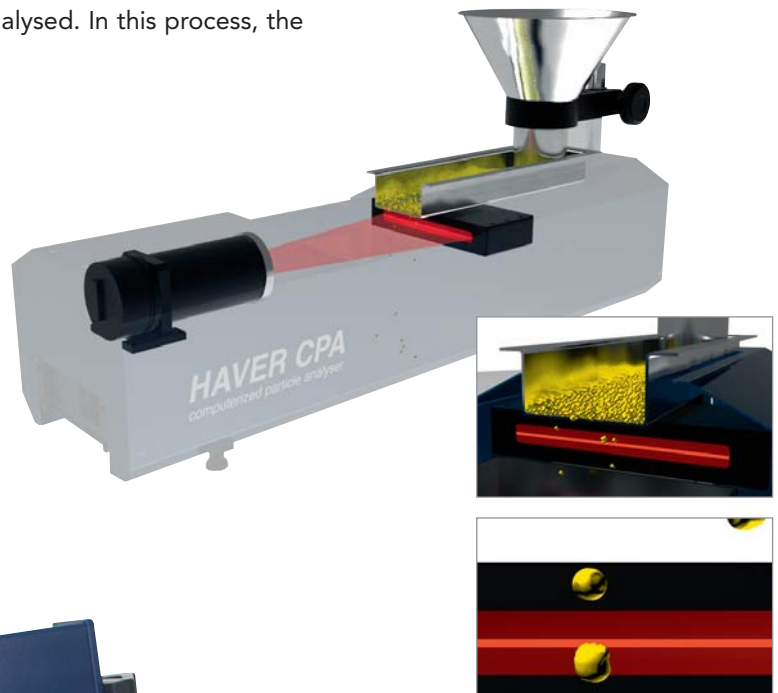
All HAYER CPA units feature the HAYER REAL TIME function and work with only one line scan camera. Every particle in the grain size measuring range can thus be measured and the result used in the size and shape analysis. Double detection due to individual images overlapping is ruled out,

as are partial range detection and mis-measurement of truncated particles. In addition, the HAYER REAL TIME function also enables all CPA units to be used as particle counting devices.

**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 HAYER CPA CONVEYOR measuring principle virtually rules out random rotation of the particles at the instant they are measured.



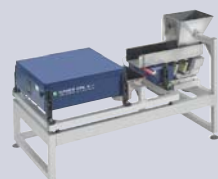
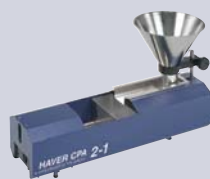


ALL CPA-SYSTEMS AT A GLANCE.

HAVER CPA LABORATORY UNITS

HAVER CPA

PHOTO-OPTICAL PARTICLE MEASURING INSTRUMENTS



DESIGNATION		HAVER CPA 2-1	HAVER CPA 3-2		HAVER CPA 2 CONVEYOR	HAVER CPA 4-1
Number of measuring ranges	[-]	1	2		1	1
Measuring range	[mm]	0.034 - 25	0.022 - 6	0.050 - 30	0.037 - 20	0.063 - 50
Chute width / Sampling width	[mm]	65	38	100	65	200
Belt width	[mm]	-	-		70	-
Hopper volume (approx.)	[l]	1.5	3.6		4	14
Application	[-]	Laboratory	Online / Laboratory		Online / Laboratory	Online / Laboratory
Lighting module	[-]	LED	Halogen		LED	LED
Dimensions (approx.) (L x W x H)	[mm]	730 x 260 x 410	800 x 260 x 560		940 x 260 x 580	1500 x 790 x 940
Weight (approx.)	[kg]	16	30		27	120
Supply voltage	[V]	230 or 115	230 or 115		230 or 115	230 or 115
Protection class (standard)	[-]	IP 54	IP 54		IP 54	IP 54
Interfaces	[-]	BUS-Ext., GigE, USB	digital IO-Ports, RS 646, RS 232		digital IO-Ports, RS 646, USB	digital IO-Ports, RS 646, RS 232
Line resolution	[Pixel]	2048	4096		2048	4096
Pixel frequency	[MHz]	40	60		60	60

PERIPHERALS FOR HAVER CPA UNITS

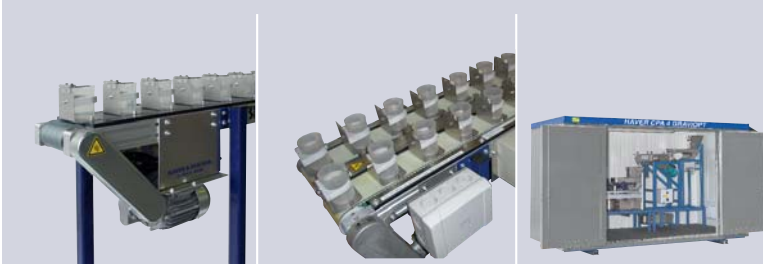


DESIGNATION		HAVER HSD	HAVER DMS	HAVER EMZ	HAVER AS 6
Grain size range	[mm]	2 - 45	0 - 45	0 - 45	0 - 30
Hopper volume (approx.)	[l]	23	-	15	-
Application	[-]	for fast drying of moist bulk materials (Online / Laboratory)	for screening out the fine content of bulk materials (Online / Laboratory)	for conveying and dosing bulk materials (Online / Laboratory)	for the automatic feeding of CPA units (Online / Laboratory)
Dimensions (approx.) (L x W x H)	[mm]	1500 x 700 x 1500	1000 x 600 x 1300	860 x 700 x 1700	1100 x 400 x 880
Weight (approx.)	[kg]	220	127	81	70
Supply voltage	[V]	400	230 or 115	230 or 115	230 or 115
Protection class (standard)	[-]	IP 54	IP 55	IP 55	IP 54
Power	[kW]	18,54	-	-	-
max. heating temperature	[°C]	600	-	-	-
max. air quantity	[l/min]	3900	-	-	-
Number of containers	[Stk.]	-	-	-	6
Container capacity (standard)	[ml]	-	-	-	500

INDUSTRIAL UNITS



HAVER CPA 4-2		HAVER CPA 4 CONVEYOR	HAVER CPA 5 CONVEYOR	HAVER CPA 4 GRAVIOPT	HAVER CPA 5 GRAVIOPT
2		1	1	1	1
0.035 - 15	0.091 - 90	0.106 - 200	0.4 - 400	0 - 50	0 - 200
100	300	310	815	200	450
-	-	400	750	-	-
3.6	18	14	-	-	-
Online / Laboratory		Online / Laboratory	Inline	Online / Laboratory	Online
LED		Fluorescent tube	Fluorescent tube	LED	Halogen
1900 x 800 x 1050		2000 x 800 x 1300	2221 x 1700 x 300	3000 x 790 x 2010	5400 x 720 x 1720
178		175	167	450	530
230 or 115		230 or 115	230 or 115	230 or 115	230 or 115
IP 54		IP 54	IP 64	IP 54	IP 54
digital IO-Ports, RS 646, RS 232		digital IO-Ports, RS 646, RS 232	digital IO-Ports, RS 646, RS 232	digital IO-Ports, RS 646, RS 232	digital IO-Ports, RS 646, RS 232
4096		4096	2048	4096	4096
60		40	40	60	60



HAVER AS 12	HAVER AS 24	HAVER CPA CONTAINER
0 - 30	0 - 30	0 - 50 together with HAVER CPA 4 GRAVIOPT
-	-	-
for the automatic feeding of CPA units (Online / Laboratory)	for the automatic feeding of CPA units (Online / Laboratory)	"Plug and Play"-Online- solution for integration into existing or newly planned systems (Online)
1760 x 400 x 1300	1760 x 550 x 1300	4050 x 2170 x 2470
76	90	1250 (incl. fittings)
230 or 115	230 or 115	230 or 115
IP 54	IP 54	-
-	-	Air conditioner: 2.14 Rapid heater: 1.00
-	-	-
-	-	-
12	24	-
500	500	-



PRECISION IN EVERY FORMAT.



Laboratory units: CPA 2-1, CPA 3-2, CPA 2 CONVEYOR

All HAVER CPA laboratory units are equipped with HAVER CPA software that runs under common versions of Windows operating systems. It impresses with its convenient installation, user-friendly menu-driven application and clear presentation of results. Thanks to the HAVER REAL TIME function, HAVER CPA laboratory units can also be used as particle counting devices. The consistent modular design enables them to be combined with all HAVER peripherals to suit the application.

The HAVER CPA 2-1 is suitable for analysing the grain sizes and shapes of fine sample materials from 34 μm up to 25 mm. By using a GigE came-

ra, the HAVER CPA 2-1 can also be operated with a notebook, which provides a high degree of mobility and flexibility. Using the technologies described above, the HAVER CPA 2-1 forms an economic base model for the laboratory environment. Easy to use, it represents an alternative to laborious particle size analysis by means of a test sieve tower.

The HAVER CPA 3-2 is suitable for analysing the grain sizes and shapes of super-fine and fine sample materials and is fitted with two measuring ranges. There is a choice of measuring range from 22 μm to 6 mm or 50 μm to 30 mm depending on the material and application. It is possible to switch between measuring

ranges quickly and without major effort.

As well as numerous applications in the laboratory, the HAVER CPA 3-2 has also proved valuable in online mode for monitoring production processes such as those for sugar, cat litter and fertiliser.

We have developed the HAVER CPA 2 CONVEYOR so that it is also able to measure materials that represent a particular challenge due to their elongated shape. Sample material from 37 μm to 20 mm is separated and measured. The unit is also suitable for wood fibres, catalysts and extruded synthetic granulates.

The units and the software are prepared for online connection to a PLC system. Standard interfaces enable them to be incorporated into the running production process. Customer-specific software requirements can be programmed individually on request.



**Industrial units: CPA 4-1, CPA 4-2,
CPA 4 CONVEYOR**

HAVER CPA industrial units for production facilities, laboratories and technical centres also work with the proven HAVER CPA software and can also be used as particle counting devices with the HAVER REAL TIME function. In combination with HAVER peripherals, the modular design enables standardised online systems to be made to measure.

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 CONVEYOR works using the CONVEYOR measuring process. While the smaller version, the HAVER CPA 2 CONVEYOR, measures fine, elongated materials, the HAVER CPA 4 CONVEYOR has been designed for coarser, elongated material up to 200 mm. It has proved valuable particularly in the analysis of the lengths and widths of wood chips.



PERFECTION RIGHT DOWN TO THE PERIPHERALS.

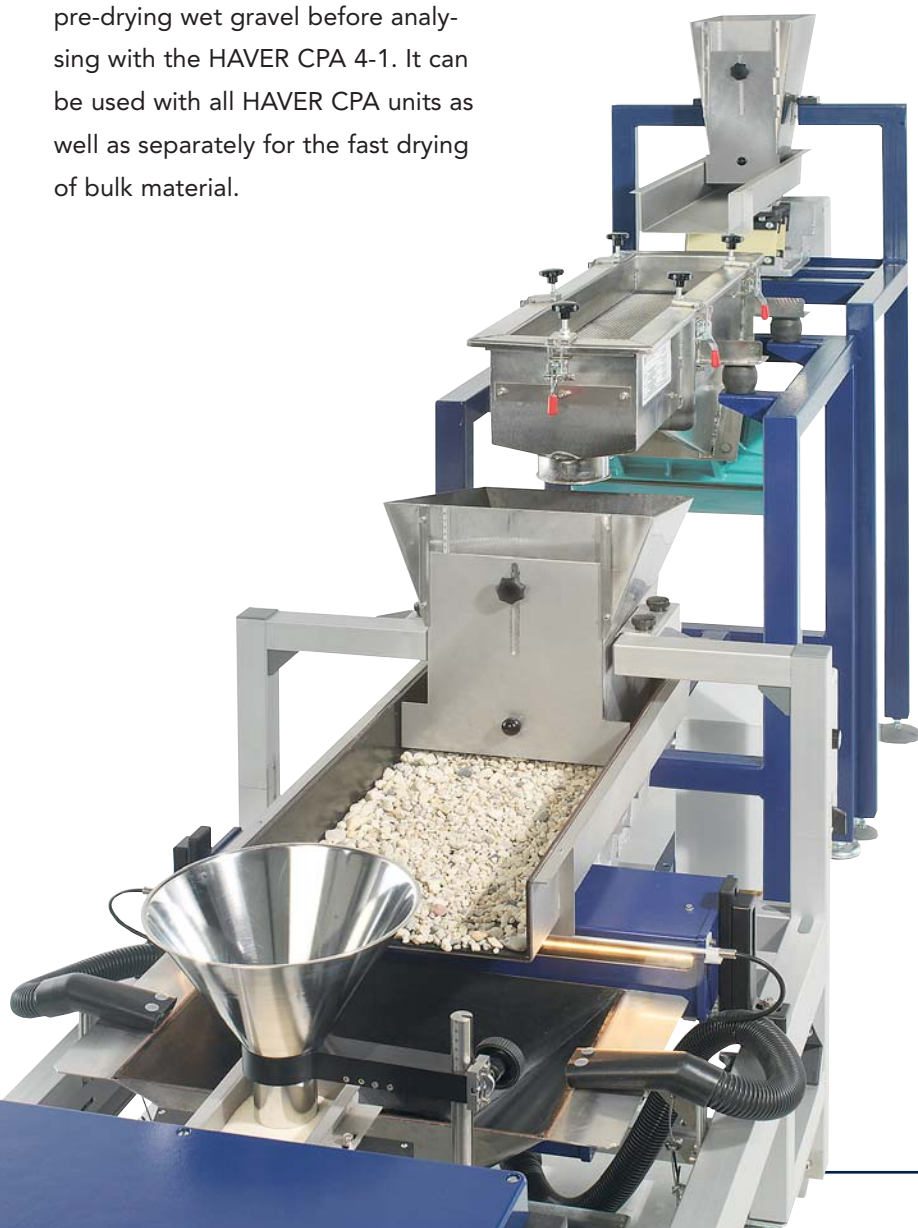
Modular peripherals, containers

The range of HAVER CPA units is complemented in practice by various peripheral devices. Moist materials, for example, must be first dried 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 speeds 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 many times over. 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 CPA software via an interface. It can be used as a laboratory or technical centre unit and also for collecting retain samples.

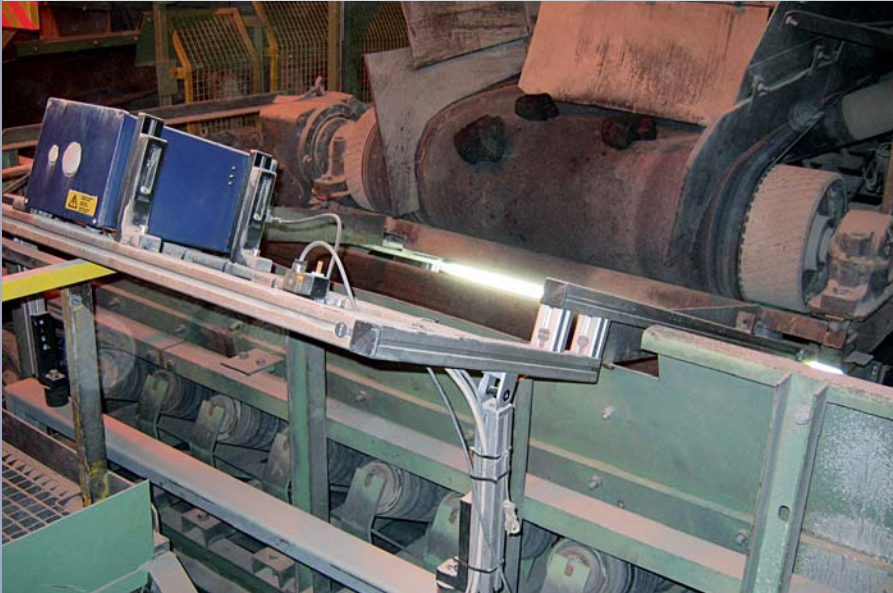




SPECIAL SOLUTIONS FOR SPECIAL TASKS.



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.



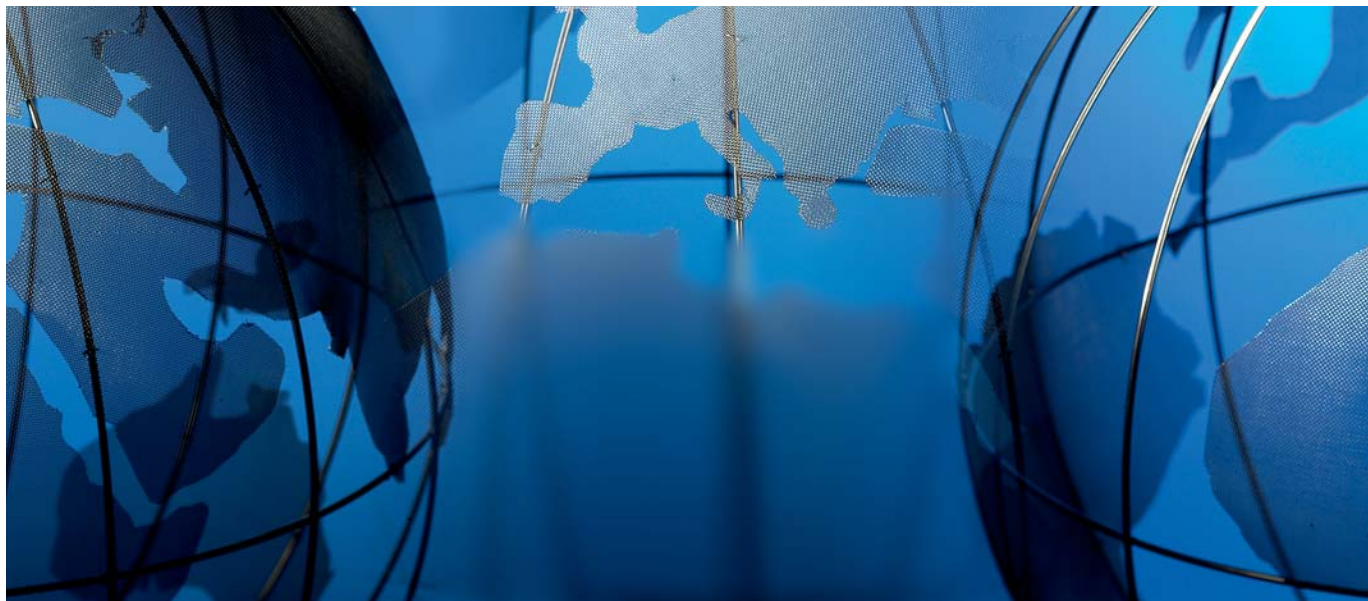
Following an intensive planning and consulting, the next step is to produce detailed design drawings as a basis for the calculation and production. The system is put through its paces in several test runs prior to delivery.

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.

NO SITE IS OUT OF SIGHT.



Against the background of a successful company history, Haver & Boecker today offers its customers more experience, technology and expertise in all aspects of wire cloth, mechanical engineering and particle analysis than almost any other company.

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 network, we provide the comforting certainty to be your competent and reliable partner at any time and any place.

In 2010, Haver & Boecker operates several plants in Germany as well as manufacturing facilities in Great Britain, Belgium, the USA, Canada, India and Brazil. More than 2,000 people work for the Group worldwide.

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