



## Laboratory solutions

Sample preparation for the  
most stringent analytical requirements

**HERZOG**



HERZOG

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## Introduction

HERZOG is the world's leading supplier of manual and automatic laboratory systems for quality assurance. We see ourselves as a partner of the raw materials industry that supports its customers in all quality assurance and sample preparation matters. Our aim is to support our customers in designing, planning and optimising their processes, and to come up with solutions. Our close collaboration with numerous analysis instrument manufacturers allows the integration of various technologies for the purpose of getting an optimum overview of the relevant process steps.

Since this family company was founded in 1958, customer orientation, innovation and stringent quality requirements have been its basic principles. "Made by HERZOG" stands for intelligent solutions, high-quality German-made products and first class service competence. The company's 200 employees are proud that their machines and automation solutions are used by leading producers in the metals, cement, mining and recycling industries. Subsidiary companies in the USA, China and Japan and an extensive sales network ensure direct on-site contact with our customers. This enables our products and services to be available as quickly as possible and to be adapted to meet local requirements.

HERZOG has its own quality management system and is certified by the "TÜV Nord" technical inspectorate in accordance with ISO 9001:2008. Also, HERZOG has a certified occupational safety management system with the "Sicher mit System" ("systematic safety") quality seal of the "Berufsgenossenschaft Holz und Metall" (BGHM) professional association.

### Selection and testing of preparation parameters

Herzog offers its customers the possibility of testing samples and materials in our application laboratories alongside our application specialists. When producing an analysis sample, a large number of factors exist that can influence the quality of the measurement result. Grain size effects, matrix effects, preferred orientation of particles, the roughness of the sample surface and the shape of the dissolving tablets are just a few of the phenomena to which attention must be paid. Parameters such as grinding duration and grinding vessel, the addition of grinding aids and binding agents, contact pressure and the time for which it is applied, fusion time, movement of the crucible or the choice of fluxes and admixtures play an important role here. Herzog will assist you in selecting the right parameters for your application.

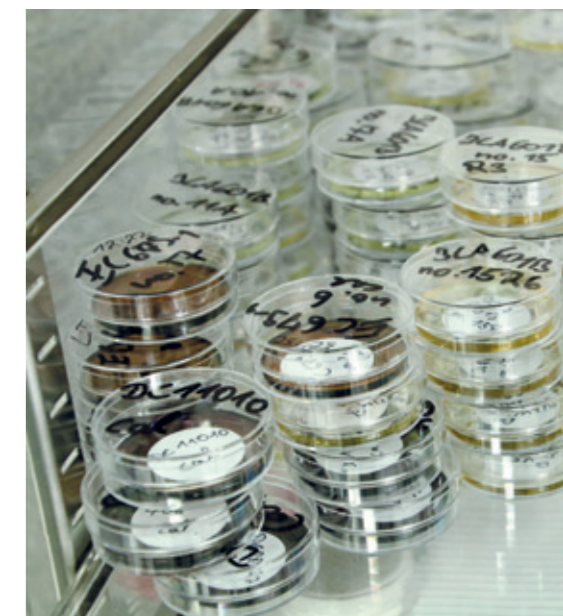
### Contamination tests and homogeneity tests

Processes such as fine grinding, dosing and pressing sample material often require efficient and automatic cleaning of the components used. Depending on what's needed, HERZOG provides an introduction to the manual cleaning processes that can be employed, or offers various technical solutions such as dry cleaning using compressed air, wet cleaning, sand cleaning and the use of blank samples. To minimise possible cross-contamination, material-specific test series can be measured in advance with the aid of XRF analysis. This allows precise adjustment of the cleaning parameters and design of the machine components tailored to the customer's needs. This in turn enables the possibility of contamination during routine operation to be almost completely eliminated.

Since only a certain part of the sample interacts with the X-ray beams during the analysis itself, it is essential for the XRF and XRD analysis that a representative and effective sample surface is present, the production of which can be reproduced. This can be investigated with the aid of replication series. Also, the pressing of sample material into metal rings can sometimes cause the unwanted separation or arrangement of particles that can corrupt the analysis result.



Fine grinding of sample material

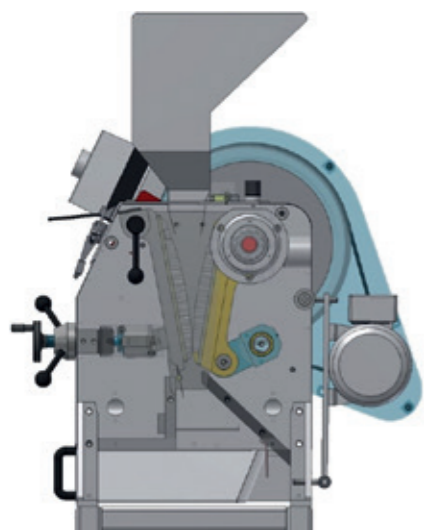


Glass beads, produced by thermal fusion

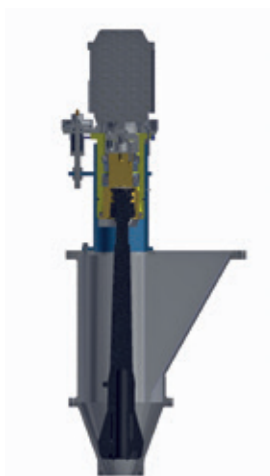


Sample preparation for precise element analyses

## Crushing



Basic configuration, jaw crushers equipped with one movable and one fixed breaking jaw



Basic configuration, cone crusher

Herzog crushers are designed for the coarse crushing and pre-crushing of sample material. The analytical fineness required for a subsequent spectroscopic examination is normally achieved with the aid of a disk vibration mill.

Herzog jaw crushers are designed as jaw crushers equipped with one movable and one fixed breaking jaw. This involves pressing the material to be crushed through the moving jaw and against the fixed jaw and crushing it through the application of pressure and impacts. The moving jaw is moved by an eccentric shaft and is thereby forced into an elliptical movement pattern that crushes the material and moves it downwards. If the grain size is smaller than the width of the bottom gap, the crushed material drops into the collecting container. Using no-rebound funnels prevents material from escaping out of the crushing chamber.

Depending on the material being crushed, the jaw crushers can be supplied with crushing jaws made of different materials. One characteristic of jaws made of manganese steel is that they harden further over time with increased use. Stainless steel is recommended when the formation of rust can be expected due to feed material. Tungsten carbide jaws are particularly hard resistant to wear. Their service life is long even when used on hard materials.

With the cone crusher, the crushing occurs in the gap between the crusher jacket and the crusher cone. This gap opens and closes circumferentially as a result of the eccentric tumbling motion of the crusher cone. The advantage of the cone crusher is that the material is crushed continuously by pressure and friction. There is no alternating working stroke and no-load stroke as occurs with the jaw crusher.

## Grinding

Grinding and pressing is a time-saving and cost-saving sample preparation procedure that is used in the analysis of many inorganic and organic materials. Using powdered samples not only allows the chemical composition to be determined, it also permits the use of X-ray diffraction methods (e.g. cement, salts) for some applications in order to determine the mineral content.

Prior to pressing, the material must be finely ground in order to guarantee sufficient homogeneity. HERZOG offers a wide variety of disk vibration mills in different sizes and configurations for the grinding of sample material. Very hard materials (e.g. silicon carbide) can also be ground down to a grain size that is sufficiently fine to guarantee a high-quality analysis. Along with the program parameters, the attainable fineness is also dependent on the following factors:

- Material
- Input quantity
- Grinding aids used
- Grain size when put in.

Generally, a grain size that permits an analysis is obtained after about 60 seconds in the case of most materials. If milling is performed for longer, agglomerations and material accumulations occur in the grinding box in the case of specific materials. Figure 01 shows a typical trend line. To perform the analysis by means of RFA, it is often necessary for the sample material to be ground to a grain size of  $< 75 \mu\text{m}$ . The grinding boxes must be made from wear-resistant materials in order to guarantee sufficient abrasion resistance. This applies particularly when the sample contains very hard mineral phases and has abrasive properties (e.g. clinker, silicon carbide, etc.).

This means that during grinding, there is inevitably abrasion of the used grinding stones and of the grinding box. Depending on the application, the grinding box should be suitably hard and should have a chemical composition that does not contain any elements that are of analytical interest. Different grinding boxes are available in order to prevent the entry of elements that are relevant to the analysis.

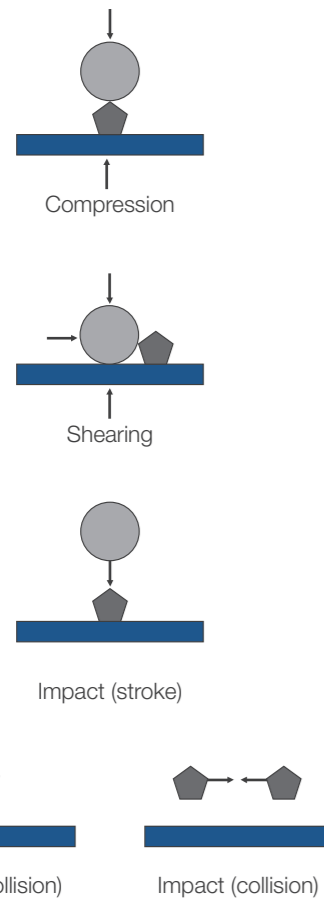


Grinding coarse-grained material into ...

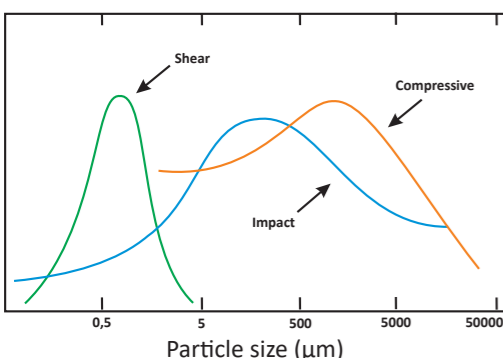


... fine powder, suitable for analyses by X-ray fluorescence, diffractometry and other methods

## Pressing



Different crushing mechanisms for grinding in oscillation mills



Factors that play a role with small grain sizes include shear forces, or compression sizes in the case of large grain sizes

### Configuration of the grinding boxes

Generally, there are four grinding box volumes available for grinding with manual mills (10, 50, 100 and 250 cm<sup>3</sup>). Only 100 cm<sup>3</sup> grinding boxes are used in the case of automatic mills. If smaller grinding boxes are used in larger holders, intermediate rings and spacers can be used as adapters. The required components are shown together in Figure 1 for the mill types HSM 250 H/HSM 250 P and HSM 100 H/HSM 100 P. The maximum speed of these mill types is 1470 rpm.

Various combinations of rings and stones are employed as grinding tools. In grinding boxes with a volume of between 10 and 50 cm<sup>3</sup>, only stones are used to grind the sample material. A combination of a ring and a stone is used in the 100 cm<sup>3</sup> grinding boxes. Two rings and a stone are used in order to guarantee sufficient pulverisation in the 250 cm<sup>3</sup> grinding box also. Agate grinding boxes are available with a volume of 100 cm<sup>3</sup>. However, due to their brittle character, agate grinding boxes can only be used with a maximum grinding speed of 750 rpm.

### Service life of grinding boxes

Grinding boxes and grinding stones are subject to natural wear. The service life of grinding boxes depends on:

- The properties of the sample material
- Number of samples
- Grinding speed.

The grinder wear should be checked at regular intervals. The following rules of thumb can be applied here:

- 1) The depth of the grinding box should not increase by more than 1 mm.
- 2) The ring's weight loss should not be more than 10 %.
- 3) The stone's weight loss should not be more than 8 %.
- 4) The agglomeration of the chrome steel stone should not be more than 4 mm.
- 5) The agglomeration of the tungsten carbide steel stone should not be more than 2 mm.
- 6) In the case of tungsten carbide, a visual inspection should be performed as to whether eruptions are visible.

Depending on the analytical requirements, it is possible to choose between four standard pressing methods:

- Material
- Free pressing
- Two-component pressing
- Pressing in an aluminium tray
- Pressing in steel rings.

In automatic presses, the sample material can only be pressed in steel rings because all other pressing methods are too complex and provide insufficient stability when handling samples. For free pressing, pressing of 2 components and pressing in aluminium trays, it is possible to freely select the diameter of the pressing tool with certain provisos.

### Free pressing

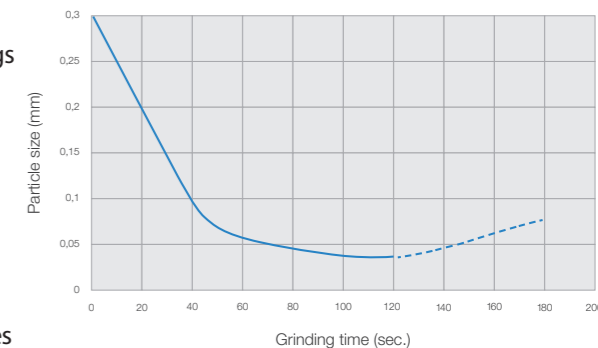
Free pressing is the lowest-cost pressing method because no consumables are required. Precise dosing of the sample material is also not required.

### 2-component pressing

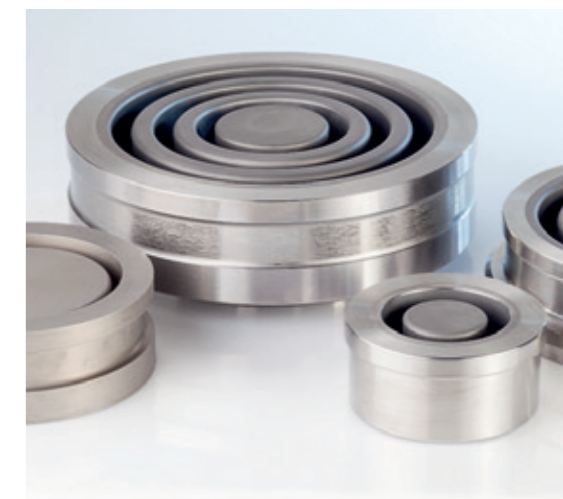
Pressing of 2 components requires an additional work step, but also offers the possibility of preparing small sample quantities for analysis. The refill magazine (e.g. boric acid, Boreox) is dosed and pre-pressed in an initial work step. A special pressing tool cover is used for this. The actual sample material is then pressed into the prepared matrix in a second pressing step.

### Pressing in aluminium trays

For pressing in aluminium trays, the plunger should have a suitable venting groove in order to prevent compression of gases in the plunger. Aluminium trays are available in various diameters. Aluminium trays have the advantage that no significant costs are incurred if the samples are to be archived. Nevertheless, aluminium trays offer no guarantee with regard to eruptions occurring on the edges.



Most of the grain size reduction normally occurs in the first 60 s



Different grinding boxes

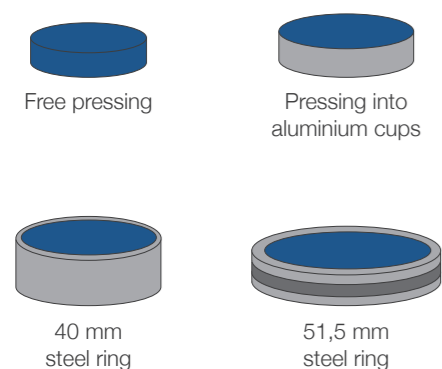
## Fusion

### Pressing in steel rings

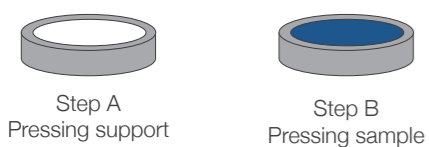
Using steel rings offers far-reaching advantages over the other pressing methods with regard to use in automated sample preparation systems. Using steel rings reduces the risk of contamination in the spectrometer by preventing eruptions on the sample edge. However, high costs are incurred if the re-useable rings must be archived. Two rings types are available for pressing in steel rings (Ø 40 mm & Ø 51 mm).

### Cleaning steel rings

A three-stage brush system can be used to clean used steel rings after the analysis. This can be used with both manual and automatic presses. On manual presses, it is placed manually into the ring and is then removed manually. In automated pressing, the cleaning runs entirely without the operator's intervention. The empty rings are then automatically stored in the internal magazine.



### Two-composed pressing



**Representation of the different methods for pressing sample material**

Fusion is an extremely efficient method of sample preparation for various analysis methods such as X-ray fluorescence, ICP and AA. The term fusion normally covers the mixing of a sample with a fusion agent, fusing the mixture and pouring in the form of a glass bead or dissolving in an acid solution.

Fusion is the best method when standards or sample material do not have a consistent matrix. This is normally the case with exploration, environmental and geological samples including mining material, minerals, clay, ores, dusts and waste materials. It is also often used with mixing materials such as cement, catalysts and electronic materials.

### Improving the analysis results

Preparation with the aid of the fusion process results in a significant improvement in analytical accuracy. There are various reasons for this. Firstly, samples that have an identical chemical composition can differ from each other in terms of mineralogy and particle size. This alone can result in different counting rates in the analysis instrument. The fusion process eliminates these factors and thereby increases measuring accuracy. Secondly, dilution occurs in fusion through the addition of a fusion agent. This leads to a reduction in the interaction between the elements being analysed and a reduction in the so-called matrix effect. Thirdly, fusion makes it significantly easier to perform a calibration. On the one hand it is possible to produce perfect matrix-matched standards for a large number of materials. On the other hand, synthetic standards can be used if no referenced standards are available. Accordingly, synthetic standards can be produced for almost any material without the complex regression analyses for creating calibration curves.



**Pressed tablet, made by pressing in an aluminium tray**



**Pressed tablet, made by free pressing**

### Avoiding errors

Fusion is an extremely important part of material analysis by way of X-ray fluorescence, ICP and AA. Fusion is an excellent method for avoiding errors that can have a negative influence on the accuracy of the corresponding measuring method. Fusion is also the simplest and most reliable method for preventing errors arising from inhomogeneous particle distribution, mineralogical effects and insufficient surface quality.

### Improving the sample solution

Fusion can easily dissolve oxidic samples that are difficult to prepare with the aid of acidulation. Conventional acidulation of resistant material such as silicates aluminium, zirconium etc. takes a long time and often only results in incomplete dissolving. However, complete sample dissolving is an extremely important factor for improving the accuracy and reliability of analysis results.

### Perfectly suited to fluorescence analysis

The fusion process produces a glass bead that is perfect for X-ray fluorescence instruments. The glass bead has the optimum dimensions, displays excellent homogeneity and has a flat surface.

### Time saving

A typical fusion process seldom takes longer than ten minutes. In contrast, acidulation takes hours before a satisfactory result can be obtained.

### Safety

Fusion is a reliable sample preparation process that requires no harmful acids and reagents. Special safety measures are therefore not necessary. The fusion process is especially safe when it is done with apparatus that has automatic sample handling, fusing and pouring of the melt.

### The fusion process

The most common method is borate fusion. This involves fusing a sample with an excess of lithium borate and in the form of a glass bead with a flat surface. During the fusion process, the sample's material phases are converted into glass-like borate, which results in a homogeneous fusion bead that is perfectly suited to X-ray fluorescence analysis. The finely ground sample material is first mixed in a crucible with a borate fusion agent (usually lithium), consisting of 95% platinum and 5% gold. The crucible is then heated to temperatures in excess of 1000°C until the sample is dissolved in the fusion agent. Movement of the melt during the fusion process improves the homogenisation of the material still further. A wetting agent (bromide, iodide, fluorine) can be added in order to support the separation of the melted material from the wall of the platinum material.

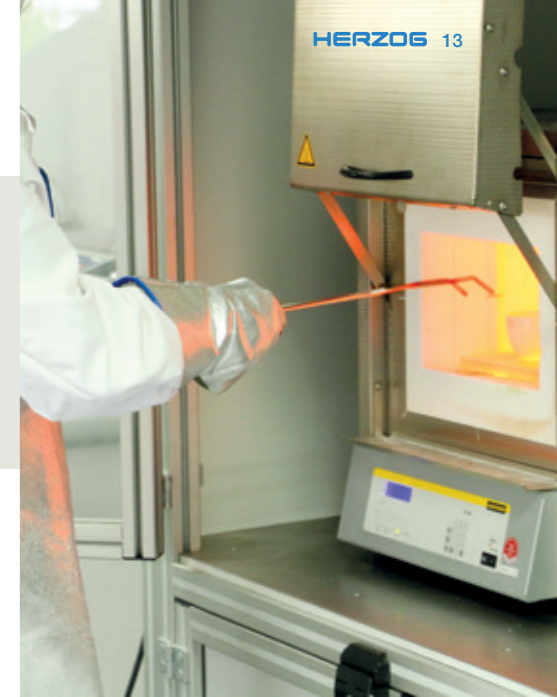
If the material is not present completely in oxidised form, it is essential to add an oxidising agent and to start the oxidation process at low temperatures. Non-oxidised material forms an eutectic alloy with the platinum wall, which can cause a lowering of the melting temperatures and destruction of the crucible by the fusion.



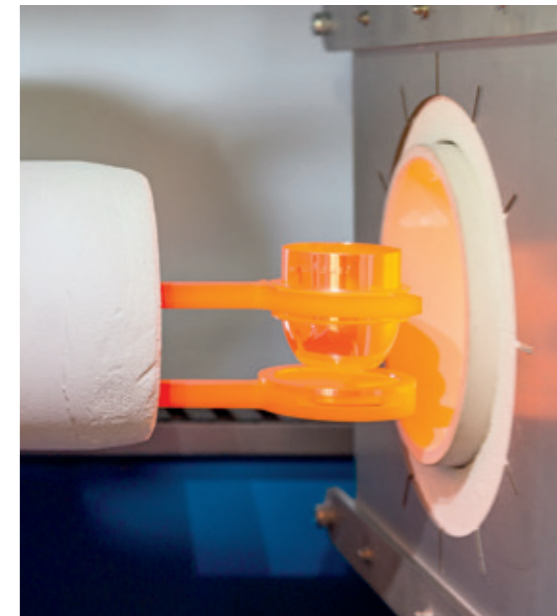
Dosed flux



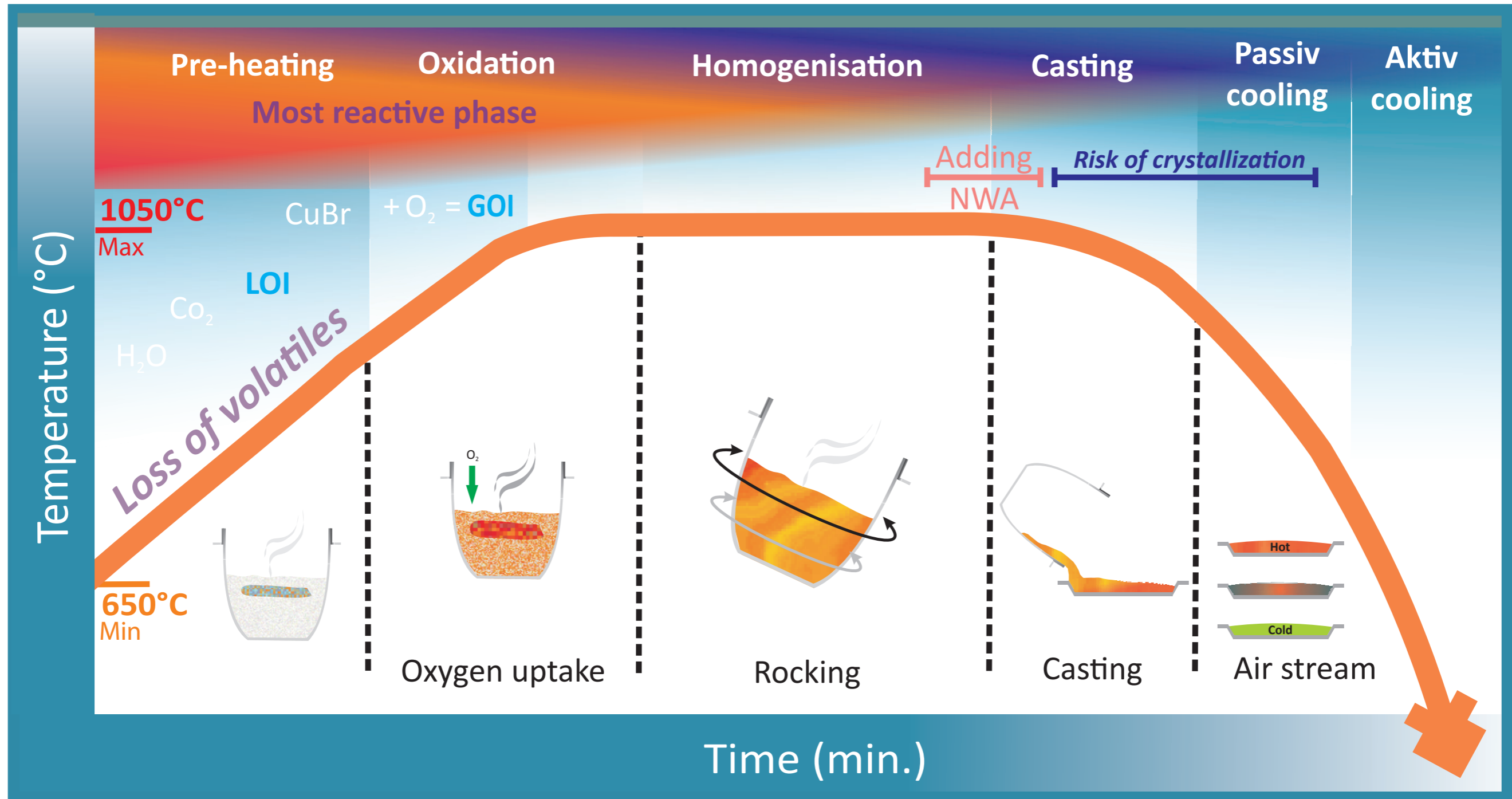
Handling the fusion crucible



Sample material oxidation



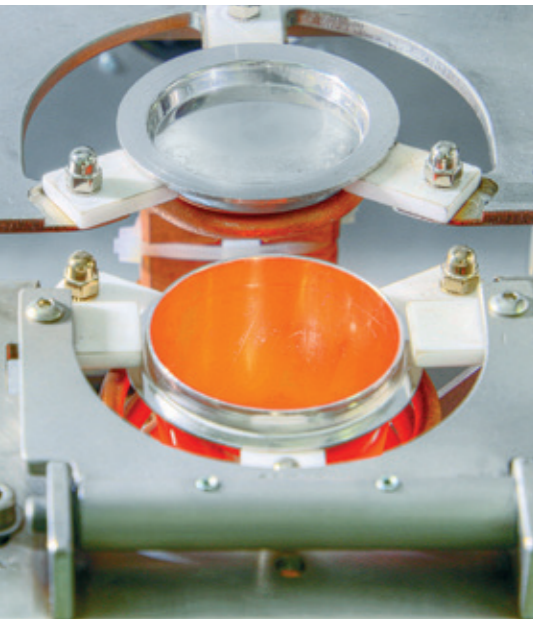
Red-hot crucible and pouring dish made of platinum/gold after fusion



Different phases of the fusion process in the production of a glass bead for X-ray fluorescence analysis



## Grinding / milling



Fusion with high-frequency induction

Typical material groups suitable for the opening process are:

- Aluminium silicates
- Aluminium ores, aluminium oxide
- Carbide
- Cement, raw meal, concrete
- Chrome ore
- Coal ash and furnace deposits
- Copper ores, copper slag and copper concentrates
- Iron ores, iron slags etc.
- Iron sinter, steel slags, iron alloys
- Lead ores and lead slags
- Manganese ores and manganese slags
- Metal alloys
- Minerals and ores
- Niobium ores and tantalum ores
- Ores of rare earths
- Silicates and aluminium silicates
- Phosphates and carbonates
- Dusts
- Tin ores and tin concentrates
- Titanium ores
- Tungsten ores
- Welding fillers
- Zirconium: Silicon carbide and boron carbide

### Spectroscopic process

Optical emissions spectroscopy (OES) in particular but also X-ray fluorescence analysis (XRF) are frequently-used methods for analysing metals and solid bodies. These analyses are applied both in the metals industry such as in steelworks and also in foundries and production. On the basis of its short analysis times and the highly-accurate measurement results, OES is the preferred method for monitoring the alloys used. It is used in the production, material testing and quality control of raw materials and both semi-finished and finished products. In XRF analysis, an X-ray beam stimulates the emission of a fluorescence that corresponds to the chemical composition. This can be analysed and compared with the results of standard samples.

### The importance of sample preparation

Thanks to software and hardware improvements, the processes named above are achieving increasingly detailed analysis results and are constantly lowering the evidence threshold for individual elements. As a result, sample preparation of the metals and materials being analysed is becoming increasingly important. Even minor contamination or slightly defective surfaces on the samples used can lead to incorrect analysis results and misinterpretations. For metal analysis in particular, the sample surface must be perfectly prepared because any spectroscopic analysis can only be as good as the quality of the samples.

### Inhomogeneity of the production sample

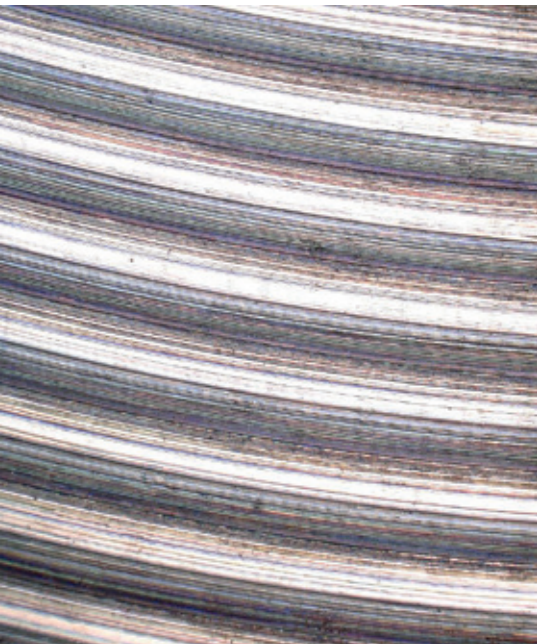
It is also of crucial importance for the the sample surface being analysed to be representative and homogeneous. This applies particularly to production control samples in steelworks, but also to other production locations. For various reasons, the top layer of a sample is not normally representative of the steel melts being examined. Firstly, due to the brief direct air contact with the warm sample surface, a layer of scale approximately 10µm thick forms following separation from the mould of the sampler. Secondly, the larger part of the non-representative sample layer consists of inhomogeneities known as segregations. These segregations arise as a result of separations of the solutes occurring on the solidification front as the liquid steel taken from the steel melt solidifies.



Sample grinding



Sample milling



The cause lies in the different solubility of the alloy elements in the solid and liquid phases. For the most part, these separations also remain following complete solidification and represent lasting inhomogeneities of the chemical composition. In addition, as a consequence of the melt solidifying from the outside inwards, the centre of the casting that solidifies last is in most cases oversaturated with typical by-elements such as carbon, phosphorus, sulphur, boron etc. This means that depending on the alloy composition, about 0.3 - 0.6 mm of the sample surface must be removed to allow the representative undisturbed sample layers to be analysed. Currently, this involves mainly using the milling and grinding machining processes. The sample preparation form selected depends on the material and analysis processes, but not least also on experience and tradition in the company and laboratory.

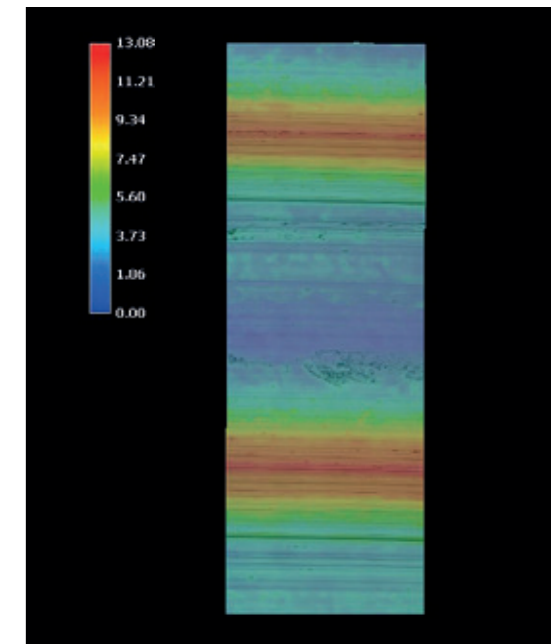
### Milling

For milling, HERZOG uses components that are perfectly matched to each other. Here the clamping unit, metal milling heads, spindle motor and traversing axes are designed so that sufficient torque is obtained for even hard samples to be processed without any problem. At the same time, the occurrence of vibrations and oscillations is prevented so that neither chatter marks nor dirty surfaces can interrupt the flatness of the analysis surface. Finally, the fine-tuning of these components ensures that the consumable materials, particularly the cutting plates, are not too heavily used and thus last for as long as possible. HERZOG would be happy to advise you on which milling machine, clamping fixture, milling head and cutting plates are best suited to your special application and sample shape. We will also support you in defining the optimum milling parameters for your application. The milling parameters that have the greatest influence here are feed rate, infeed and rotation. These should be selected in accordance with the sample geometry, material type and material hardness, as well as the milling tool used. A good compromise should be found here between maximum service life of the milling plates and the creation of a spectrometer-compliant analysis surface.

**The aim of sample preparation is to produce a clean and regular sample surface**

### Grinding

Normally, the first work step on the sample is surface grinding. This ensures that a flat surface is created on which all components of the surface are, if possible, on one level. For this step it is preferable to use fixed grinding particles with a large grain in order to achieve a high, consistent removal rate, short working times and maximum flatness. In some cases it may be necessary to follow the surface grinding with another work step to fine-grind the material. Grinding media made from other composites are used for this, which further minimise any remaining deformations on the sample surface. Herzog would be pleased to advise you in selecting the optimum grinding process and grinding material.



**Quantitative measurement of the milling profile**



Crusher

**HERZOG**

## Crusher

## HSC550

The HSC550 is a compact, robust and low-priced jaw crusher for pre-crushing various materials with a grain size of less than 50mm. The ergonomical handling of the machine, e.g. when replacing the crushing jaws, and the safety features make the HSC550 an ideal aid to laboratory work.

**At a glance:**

- Compact and robust jaw crusher
- easy crushing jaw changing and cleaning of the crushing chamber
- zero point alignment of the gap width scale

## Areas of use

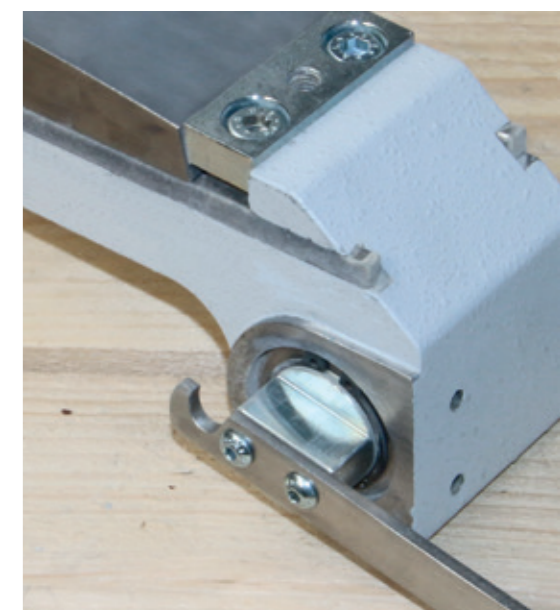
<b>Areas of use</b>	Building materials, chemistry, electronics, geology, glass, mechanical engineering, metallurgy, ceramics, plastics, recycling
<b>Materials</b>	Basalt, building materials, ores, feldspar, glass, granite, ceramic, clinker, coal, coke alloys, minerals, quartz, chamotte, slag, silicon, stone and much more.
<b>Hardness</b>	Medium hard, hard, brittle
<b>Max. feed size (mm)</b>	50
<b>Min. output size (mm)</b>	4
<b>Cleaning type</b>	Manual
<b>Functions</b>	Folding funnel (0.3l) with safety switch, collecting vessel (2l), adjustable gap width (0-20mm), zero point alignment of the gap width scale

## Technical Data

<b>Type</b>	Jaw crusher
<b>Size (W x H x D mm)</b>	409 x 752 x 774
<b>Weight</b>	130 kg
<b>Motor</b>	0.75 kWh three-phase brake motor
<b>Voltage/ mains connection</b>	Different voltages, 3-phase
<b>Connections</b>	Suction nozzles
<b>Protection type</b>	Motor: IP55, safety switch: IP67

## Consumable materials

Consumable materials	Order number
Pair of manganese steel jaw crushers	464864-8
pair of stainless steel jaw crushers	464865-5
pair of tungsten carbide jaw crushers	464866-3



## Crusher

# HSC590

The HSC590 is a robust jaw crusher for pre-crushing various materials with a grain size of less than 90mm. The HSC590 can be loaded in batches or can be operated continuously in the laboratory or in production. Properties such as central lubrication ensure a long operating life.

### At a glance:

- Compact and robust jaw crusher
- easy crushing jaw changing and cleaning of the crushing chamber
- zero point alignment of the gap width scale

### Areas of use

<b>Areas of use</b>	Building materials, chemistry, electronics, geology, glass, mechanical engineering, metallurgy, ceramics, plastics, recycling
<b>Materials</b>	Basalt, building materials, ores, feldspar, glass, granite, ceramic, clinker, coal, coke alloys, minerals, quartz, chamotte, slag, silicon, stone and much more.
<b>Hardness</b>	Medium hard, hard, brittle
<b>Max. feed size (mm)</b>	90
<b>Min. output size (mm)</b>	2
<b>Cleaning type</b>	Manual
<b>Functions</b>	Folding funnel with safety switch, collecting vessel (5l), adjustable gap width (0-30mm), zero point alignment of the gap width scale, central lubrication

### Technical Data

<b>Type</b>	Jaw crusher
<b>Size (W x H x D mm)</b>	450 x 1160 x 900
<b>Weight</b>	300 kg
<b>Motor</b>	1.5 kWh three-phase brake motor
<b>Voltage/ mains connection</b>	Different voltages, 3-phase
<b>Connections</b>	Suction nozzles
<b>Protection type</b>	IP54

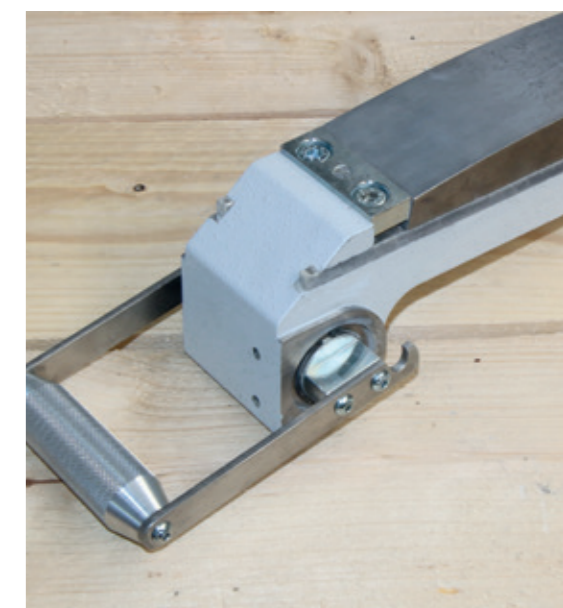
### Consumable materials

#### Consumable materials

Pair of manganese steel jaw crushers

pair of stainless steel jaw crushers

pair of tungsten carbide jaw crushers



## Crusher

## HP-C/M AUT

The HP-C/M AUT is a mortar crusher for pre-crushing and crushing various materials. It is often used in the sample preparation of catalysts, but can also be used for other materials. Close attention was paid to achieving the most complete material recovery possible and to efficient cleaning mechanisms.

## At a glance:

- Mortar crusher for crushing different materials
- crushing process runs automatically after the material is put in
- very good cleaning possibility to minimise material carryover
- low material loss (material-dependent)

## Areas of use

Areas of use	Crushing catalysts
Materials	Ceramic monoliths
Hardness	Soft, medium hard
Max. feed size (mm)	200x200
Min. output size (mm)	1-5 adjustable to 10 mm
Cleaning type	Pneumatic
Functions	Input flap with locking devices, collecting vessel (5l), adjustable gap width, effective cleaning by compressed air, up to 18 crushing programmes can be set

## Technical Data

Type	Mortar crusher
Size (W x H x D mm)	850 x 850 x 2085
Weight	890 kg
Motor	4 kVA
Voltage/ mains connection	400 V, 50 Hz, 3-phase
Connections	Suction nozzles, compressed air
Protection type	IP54





## Pulverizer

# HSM 50 H

The HSM 50 H is the compact and efficient benchtop unit for grinding up to 50 ccm sample material. Easy operation, silencers and safety features make the HSM 50 H an essential part of your everyday laboratory work.

## At a glance:

- Compact benchtop disk vibration mill
- easy operation and handling of the grinding vessel
- different grinding vessel sizes and grinding sets

## Areas of use

<b>Areas of use</b>	Building materials, chemistry, electronics, geology, glass, mechanical engineering, metallurgy, ceramics, plastics, recycling
<b>Materials</b>	Basalt, building materials, ores, feldspar, glass, granite, ceramic, clinker, coal, coke alloys, minerals, quartz, chamotte, slag, silicon, stone and much more.
<b>Hardness</b>	Medium hard, hard, brittle Max. 9 Mohs
<b>Max. feed size (mm)</b>	4
<b>Min. output size (mm)</b>	20-150
<b>Feed quantity (ml)</b>	10-50 ml (depending on the grinding set)
<b>Functions</b>	Flap with safety lock, adjustable grinding cycle duration

## Technical Data

<b>Type</b>	Disk vibration mill
<b>Size (W x H x D mm)</b>	570 x 570 x 610
<b>Weight</b>	112 kg
<b>Drive power</b>	0,75
<b>Voltage/ mains connection</b>	Different voltages, 3-phase
<b>Protection type</b>	IP54

## Accessories

Accessories	Order number
Chromium steel grinding vessel 50 ccm	104072-4
chromium steel grinding vessel 10 ccm	104061-7
tungsten carbide grinding vessel 50 ccm	104038-5
tungsten carbide grinding vessel 10 ccm	104051-8





## Pulverizer

## HSM 100 H/P

The HSM 100 H (manual clamping fixture) and HSM 100 P (pneumatic clamping fixture) are the efficient and robust laboratory solutions for fine grinding of various materials. The great variety of grinding sets makes the HSM 100 the optimum machine for a wide range of different applications.

## At a glance:

- Compact disk vibration mill
- easy operation and handling of the grinding vessel
- different grinding vessel sizes and grinding sets
- operation and adjustment of the grinding parameters via HMI panel
- manual or pneumatic clamping fixture for grinding vessels

## Areas of use

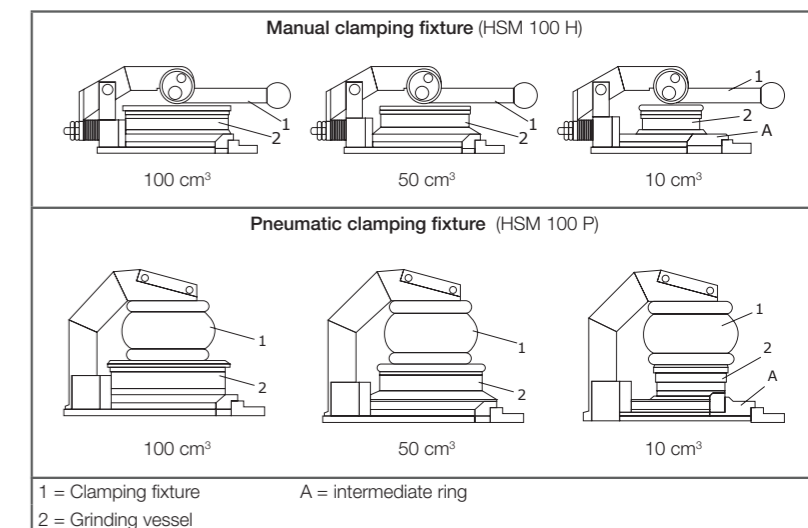
<b>Areas of use</b>	Building materials, chemistry, electronics, geology, glass, mechanical engineering, metallurgy, ceramics, plastics, recycling
<b>Materials</b>	Basalt, building materials, ores, feldspar, glass, granite, ceramic, clinker, coal, coke alloys, minerals, quartz, chamotte, slag, silicon, stone and much more.
<b>Hardness</b>	Medium hard, hard, brittle Max. 9 Mohs
<b>Max. feed size (mm)</b>	5
<b>Min. output size (mm)</b>	30-150
<b>Feed quantity (ml)</b>	10-100 ml (depending on the grinding set)
<b>Functions</b>	Operation via HMI panel, flap with safety lock, adjustable grinding cycle duration, pneumatic clamping fixture (option: HSM 100P)

## Technical Data

<b>Type</b>	Disk vibration mill
<b>Size (W x H x D mm)</b>	550 x 750 x 1000
<b>Weight</b>	250 kg
<b>Drive power</b>	2 kVA
<b>Voltage/ mains connection</b>	Various voltages, 3-phase
<b>Supply media</b>	Compressed air (only with a pneumatic clamping fixture)
<b>Protection type</b>	IP54

## Accessories

Accessories	Order number
Chromium steel grinding vessel 100 ccm	104090-6
Chromium steel grinding vessel 50 ccm	104168-0
Chromium steel grinding vessel 10 ccm	104061-7
intermediate ring for grinding vessel 10 ccm	096004-7
tungsten carbide grinding vessel 100 ccm	102987-5
tungsten carbide grinding vessel 50 ccm	104124-3
tungsten carbide grinding vessel 10 ccm	104051-8
intermediate ring for grinding vessel 10 ccm	096004-7
Colmonoy grinding vessel 100 ccm	104190-4
titanium carbide grinding vessel 100 ccm	104149-0



## Pulverizer

## HSM 100 A

The HSM 100 A delivers reliable performance in the HSM series. It is also equipped as standard with a pneumatic clamping fixture and stepless speed adjustment. The latter simplifies optimisation of the grinding parameters and allows the use of agate grinding vessels for special applications.

## At a glance:

- Compact disk vibration mill
- easy operation and handling of the grinding vessel
- different grinding vessel sizes and grinding sets
- operation and adjustment of the grinding parameters via HMI panel with steplessly selectable speed
- pneumatic clamping fixture for grinding vessel
- agate grinding vessel can be used

## Areas of use

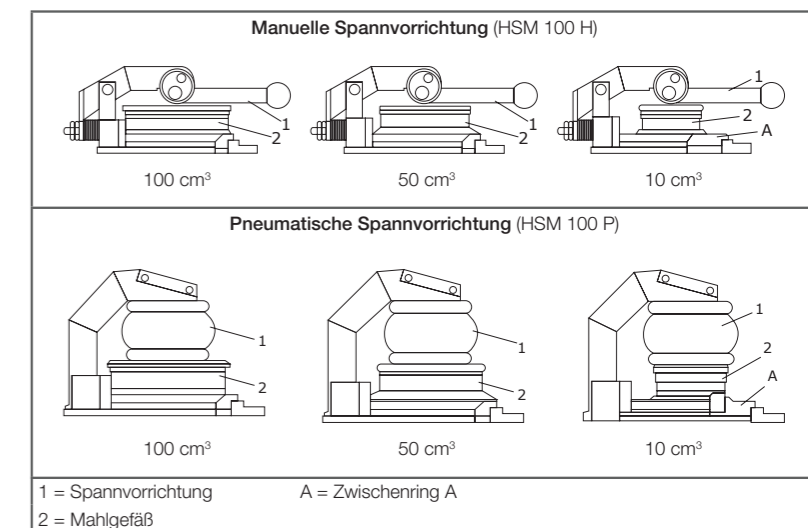
<b>Areas of use</b>	Building materials, chemistry, electronics, geology, glass, mechanical engineering, metallurgy, ceramics, plastics, recycling
<b>Materials</b>	Basalt, building materials, ores, feldspar, glass, granite, ceramic, clinker, coal, coke alloys, minerals, quartz, chamotte, slag., silicon, stone and much more.
<b>Hardness</b>	Medium hard, hard, brittle Max. 9 Mohs
<b>Max. feed size (mm)</b>	5
<b>Min. output size (mm)</b>	30-150
<b>Feed quantity (ml)</b>	10-250 ml (depending on the grinding set)
<b>Functions</b>	Operation via HMI panel, flap with safety lock, adjustable grinding cycle duration, speed steplessly adjustable from 750-1500 rpm, pneumatic clamping fixture, use of agate grinding vessel possible

## Technical Data

<b>Type</b>	Disk vibration mill
<b>Size (W x H x D mm)</b>	550 x 750 x 1000
<b>Weight</b>	250 kg
<b>Drive power</b>	2 kVA
<b>Voltage/ mains connection</b>	Various voltages, 3-phase
<b>Supply media</b>	Compressed air
<b>Protection type</b>	IP54

## Accessories

Accessories	Order number
Chromium steel grinding vessel 250 ccm	104118-5
Chromium steel grinding vessel 100 ccm	104090-6
Chromium steel grinding vessel 50 ccm	104168-0
Chromium steel grinding vessel 10 ccm	104061-7
tungsten carbide grinding vessel 250 ccm	104099-7
tungsten carbide grinding vessel 250 ccm	102987-5
tungsten carbide grinding vessel 50 ccm	104124-3
tungsten carbide grinding vessel 10 ccm	104051-8
grinding vessel 250 ccm	104144-1
grinding vessel 100 ccm	104190-4
agate grinding vessel 250 ccm	101060-2
intermediate ring for grinding vessel 10 ccm	096005-4
adapter for grinding vessel 50/ 100 ccm	105970-8
titanium carbide grinding vessel 100 ccm	104149-0



## Pulverizer

## HSM 250 H/P

The HSM 250 H (manual clamping fixture) and HSM 250 P (pneumatic clamping fixture) allows efficient fine grinding of sample quantities up to 250 ccm. However, grinding sets with smaller volumes can also be used with this machine without any problem.

## At a glance:

- Compact disk vibration mill
- easy operation and handling of the grinding vessel
- operation and adjustment of the grinding parameters via HMI panel with steplessly selectable speed
- manual or pneumatic clamping fixture for grinding vessel

## Areas of use

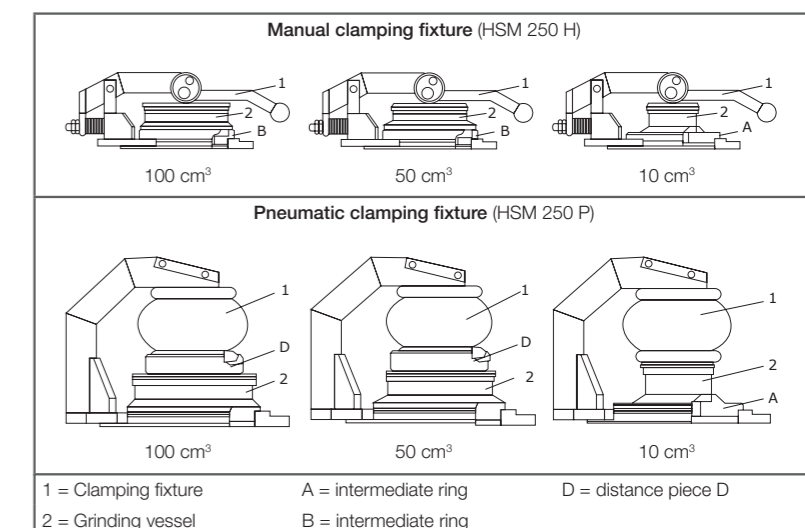
<b>Areas of use</b>	Building materials, chemistry, electronics, geology, glass, mechanical engineering, metallurgy, ceramics, plastics, recycling
<b>Materials</b>	Basalt, building materials, ores, feldspar, glass, granite, ceramic, clinker, coal, coke alloys, minerals, quartz, chamotte, slag., silicon, stone and much more.
<b>Hardness</b>	Medium hard, hard, brittle Max. 9 Mohs 5
<b>Max. feed size (mm)</b>	5
<b>Min. output size (mm)</b>	30-150
<b>Feed quantity (ml)</b>	10-250 ml (depending on the grinding set)
<b>Functions</b>	Operation via HMI panel, flap with safety lock, adjustable grinding cycle, pneumatic clamping fixture (HSM 250 P)

## Technical Data

<b>Type</b>	Disk vibration mill
<b>Size (W x H x D mm)</b>	550 x 750 x 1000
<b>Weight</b>	250 kg
<b>Drive power</b>	2 kVA
<b>Voltage/ mains connection</b>	Various voltages, 3-phase
<b>Supply media</b>	Compressed air
<b>Protection type</b>	IP54

## Accessories

Accessories	Order number
Chromium steel grinding vessel 250 ccm	104118-5
Chromium steel grinding vessel 100 ccm	104090-6
Chromium steel grinding vessel 50 ccm	104168-0
Chromium steel grinding vessel 10 ccm	104061-7
tungsten carbide grinding vessel 250 ccm	104099-7
tungsten carbide grinding vessel 100 ccm	102987-5
tungsten carbide grinding vessel 50 ccm	104124-3
tungsten carbide grinding vessel 10 ccm	104051-8
Colmonoy grinding vessel 250 ccm	104144-1
Colmonoy grinding vessel 100 ccm	104190-4
intermediate ring for grinding vessel 10 ccm	096005-4
adapter for grinding vessel 50/ 100 ccm	096006-2
titanium carbide grinding vessel 100 ccm	104149-0



## Pulverizer

## HP-M 100P

The HP-M 100 P is a semi-automatic laboratory mill that eliminates the need for the operator to empty and clean the grinding vessel. This significantly reduces the physical demands on laboratory staff. It also improves the reproducibility of results, thanks to the automation. In addition, features such as stepless speed control also make it easier to optimise grinding parameters.

## At a glance:

- Compact disk vibration mill with automatic output and cleaning
- automatic cleaning of the grinding vessel with compressed air
- automatic output of the ground material in cups at a separate output position for quick further processing of the material while the grinding vessel is being cleaned
- operation and adjustment of the grinding and cleaning parameters via HMI panel
- steplessly adjustable speed

## Areas of use

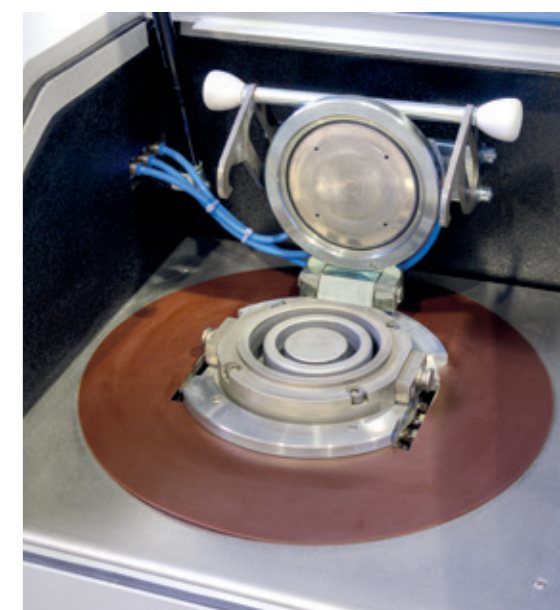
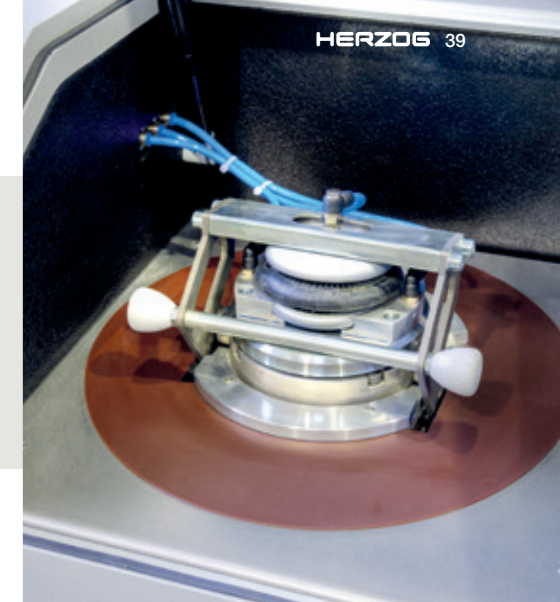
<b>Areas of use</b>	Building materials, chemistry, electronics, geology, glass, mechanical engineering, metallurgy, ceramics, plastics, recycling
<b>Materials</b>	Basalt, building materials, ores, feldspar, glass, granite, ceramic, clinker, coal, coke alloys, minerals, quartz, chamotte, slag., silicon, stone and much more.
<b>Hardness</b>	Medium hard, hard, brittle Max. 9 Mohs
<b>Max. feed size (mm)</b>	10
<b>Min. output size (mm)</b>	30-150
<b>Feed quantity (ml)</b>	100
<b>Functions</b>	Operation via HMI panel, flap and cup output with safety lock, pneumatic clamping fixture, grinding cycle duration adjustment, output time, cleaning time, speed steplessly adjustable from 750-1500 rpm, automatic output of the ground material into cups, automatic grinding vessel cleaning

## Technical Data

<b>Type</b>	Disk vibration mill
<b>Size (W x H x D mm)</b>	570 x 950 x 1170
<b>Weight</b>	355 kg
<b>Drive power</b>	2 kVA
<b>Voltage/ mains connection</b>	Various voltages, 3-phase
<b>Supply media</b>	Compressed air
<b>Protection type</b>	IP54

## Accessories

Accessories	Order number
Chromium steel grinding vessel 100 ccm	414070-3
tungsten carbide grinding vessel 100 ccm	400995-7



# Grinding aid tablets

Grinding aids have many different functions in the crushing of sample material. Grinding aids are used particularly with samples that have components with different milling properties. The amount of grinding aid used depends on the application and is usually between 2 % and 10 % of the sample quantity.

Too much grinding aid results in weakening of the intensities and increases the detection limits of the analysis. Since just-pressed samples are used for the analysis of trace elements, dilution effects play a decisive role in the sample preparation. During pressing, the grinding aid tablets can be used in order to obtain a stable pellet. The use of grinding aid tablets containing wax offers the additional advantage that moisture absorption is reduced.

## PE 190

<b>Composition</b>	Wax (polyethylene)
<b>Use</b>	Materials that are generally difficult to bind
<b>Characteristics</b>	PE 190 is a macromolecular linear PE wax with a high density. Correct storage of the grinding aid tablets is important. It must be ensured that the pills are kept in a cool and dry place. Direct sunlight must also be avoided. For this reason, the pills are also supplied in a black zip-lock bag. If not properly stored, the pills will discolour yellow and become brittle. It is especially important to re-seal opened bags tightly.
<b>Order number</b>	335766-2

## HMPA Grinding aids description

HMPA is a series of grinding aids with microcellulose and Licowax C in different mixing ratios. The microcellulose has a grain size of around 100 µm and a density of between 0.28-0.33 g/cm<sup>3</sup>.

## HMPA 20

<b>Composition</b>	Cellulose + binder (205 ±2mg)
<b>Characteristics</b>	HMPA20 is best suited to samples that must be pressed once. The weight of the pills is given as 205 ± 2 mg. HMPA 20 is 100% microcrystalline cellulose.
<b>Purity</b>	Al, Ba, Ca, Co, Cr, Cu, Fe, K, Mn, Mo, Ni, C, Ti, Sr, Si, Pb < 1 ppm
<b>Order number</b>	222222-2

## HMPA 40

<b>Composition</b>	Zellulose + Wachs
<b>Characteristics</b>	HMPA 40 has a wax – cellulose ratio of 1:9. The weight of the pills is 205 (±2) mg.
<b>Purity</b>	Al, Ba, Ca, Co, Cr, Cu, Fe, K, Mn, Mo, Ni, V, Ti, Sr, Si, Pb < 1 ppm
<b>Order number</b>	335757-1

## HMPA 50

<b>Composition</b>	Cellulose + wax
<b>Characteristics</b>	HMPA 50 is only conditionally suitable for samples containing sulphur and phosphate. The weight of the pills is given as 206 (±5) mg. HMPA 50 has a wax – cellulose ratio of 1:1.
<b>Reinheit</b>	As, Sb, Cd, Tl, Zn, Se, Te, Sn, Cr, Co, Cu, Mn, Ni < 1ppm Al, Si, Fe, Ca, W, Pb, Ti < 10 ppm S, P < 100 ppm
<b>Bestellnummer</b>	349534-8





## Presses

## Presses

## TP 20 TP40 TP60

The manual hydraulic tablet press produces highly stable pellets for X-ray fluorescence analysis. Different versions are available for pressures of 20, 40 or 60 tonnes, depending on the material and analysis requirement.

## At a glance:

- Benchtop laboratory press, simple operation
- robust design
- great flexibility thanks to a variety of pressing tools
- versions available with maximum pressures of 20, 40 and 60 t
- top cross member for simple tool changing (model 2d)

## Areas of use

<b>Areas of use</b>	Building materials, chemistry, electronics, geology, glass, mechanical engineering, metallurgy, ceramics, plastics, recycling
<b>Materials</b>	Basalt, building materials, ores, feldspar, glass, granite, ceramic, clinker, coal, coke alloys, minerals, quartz, chamotte, slag, silicon, stone and much more.
<b>Pressing force</b>	20, 40, 60 t depending on model
<b>Pressing tools</b>	Free pressing (OD= 40mm), pressing in aluminium cans (OD=40mm), pressing in steel rings (OD= 40mm or 51.5 mm)
<b>Functions</b>	Min. output size (mm) Feed quantity (ml) 20-150 10-50 (depending on grinding set)

## Technical Data

<b>Type</b>	Tablet press
<b>Size (W x H x D mm)</b>	525 x 340 x 610
<b>Weight</b>	150 (TP 20) kg, 170 (TP 40) kg, 230 (TP 60) kg
<b>Maximum pressing capacity</b>	200 kN (TP 20), 400 kN (TP 40), 600 kN (TP 60)
<b>Maximum piston stroke</b>	40 mm

## Accessories

TP 20/ TP 40/ TP 60 accessories:	Order number
free pressing (OD=40mm)	5-3502-106247-0
pressing in aluminium cans (OD=40mm)	5-3501-106057-3
pressing in steel rings, only TP20/40 (OD=40 mm, ID=35 mm, h=14 mm)	5-3511-100556-0
pressing in steel rings, only TP20/40 (OD=51.5 mm, ID=35 mm, h=14 mm)	5-3511-124453-2
pressing in steel rings, only TP60 (OD=40 mm, ID=35 mm, h=14 mm)	5-3511-428415-4
pressing in steel rings, only TP60 (OD=51.5 mm, ID=35 mm, h=14 mm)	5-3511-418017-0

## TP 40/2d and TP 60/2d accessories:

Free pressing (OD=40mm) TP402d	5-3502-106248-8
free pressing (OD=40mm)	5-3502-106253-8
TP602d, pressing in aluminium cans (OD=40mm)	5-3502-106262-9
TP402d, pressing in aluminium cans (OD=40mm)	5-3502-106254-6
TP602d, pressing in steel rings, only TP402d (OD=40 mm, ID=35 mm, h=14 mm)	5-3511-153094-8
pressing in steel rings, only TP402d (OD=51.5 mm, ID=35 mm, h=14 mm)	5-3511-201564-2
pressing in steel rings, only TP602d (OD=40 mm, ID=35 mm, h=14 mm)	5-3511-106255-3
pressing in steel rings, only TP60 2d (OD=51.5 mm, ID=35 mm, h=14 mm)	5-3511-124861-6



## Presses

## TP 20 E

The hydraulic benchtop press automatically builds up a pressure of up to 20 tonnes. This eliminates the need to build up the pressure with a hand pump, thereby significantly reducing physical stress on the operator. Their compact size allows the TP 20 E to be set up anywhere. The different pressing tools transform the TP 20 E into a universal laboratory press.

## At a glance:

- Benchtop laboratory press, simple operation
- automatic pressure build-up with hydraulic unit
- by reducing the physical stress on the operator
- different pressing tools can be used
- safety door for maximum operator safety

## Areas of use

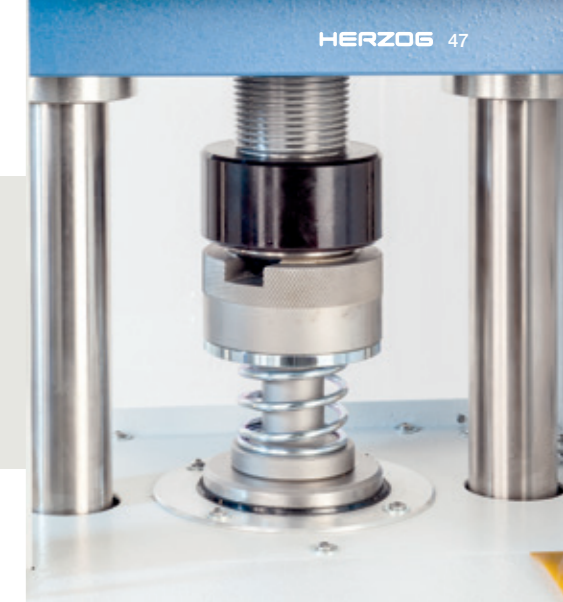
<b>Areas of use</b>	Building materials, chemistry, electronics, geology, glass, mechanical engineering, metallurgy, ceramics, plastics, recycling
<b>Materials</b>	Basalt, building materials, ores, feldspar, glass, granite, ceramic, clinker, coal, coke alloys, minerals, quartz, chamotte, slag, silicon, stone and much more.
<b>Pressing force</b>	20 t
<b>Pressing tools</b>	Free pressing (OD= 40mm), pressing in aluminium cans (OD=40mm), pressing in steel rings (OD= 40mm or 51.5 mm)
<b>Functions</b>	Door with safety switch

## Technical Data

<b>Type</b>	Tablet press
<b>Size (W x H x D mm)</b>	581 x 320 x 537
<b>Weight</b>	130 kg
<b>Maximum pressing capacity</b>	200 kN
<b>Maximum piston stroke</b>	32 mm
<b>Power consumption</b>	0.5 kVA
<b>Voltage/ mains connection</b>	400V, 50 Hz, 3-phase
<b>Protection type</b>	IP 54

## Accessories

Accessories	Order number
Free pressing (OD=40mm)	5-3502-106247-0
pressing in aluminium cans (OD=40mm)	5-3501-106057-3
pressing in steel rings, only TP20/40 (OD=40 mm, ID=35 mm, h=14 mm)	5-3511-100556-0
pressing in steel rings, only TP20/40 (OD=51.5 mm, ID=35 mm, h=14 mm)	5-3511-124453-2





## Presses

## HTP 40 HTP 60

The semi-automatic hydraulic tablet press produces highly stable pellets for X-ray fluorescence analysis. Maximum pressures of 40 or 60 tonnes can be achieved, depending on the model. The programmable logic controller allows precise and individual adjustment of the pressure force regulation, thereby allowing many different and challenging materials to be pressed.

## At a glance:

- Laboratory press with HMI panel for simple parameter selection
- compiling individual storable programmes for setting the pressing force parameters
- problem-free pressing even of challenging materials
- improved quality and reproducibility thanks to automatic pressing
- great flexibility thanks to various pressing tools
- versions with max. pressure of 40 and 60 t are available

## Areas of use

<b>Areas of use</b>	Building materials, chemistry, electronics, geology, glass, mechanical engineering, metallurgy, ceramics, plastics, recycling
<b>Materials</b>	Basalt, building materials, ores, feldspar, glass, granite, ceramic, clinker, coal, coke alloys, minerals, quartz, chamotte, slag, silicon, stone and much more.
<b>Pressing force</b>	40 or 60 t depending on model
<b>Pressing tools</b>	Free pressing (OD= 40mm), pressing in aluminium cans (OD=40mm), pressing in steel rings (OD= 40mm or 51.5 mm)
<b>Functions</b>	Operation via HMI touch panel, full control of the pressing operation by adjusting the pressure, force build-up / reduction and application time parameters, simple filling and cleaning of the pressing tool via swivelling cross member, manual or pneumatic ring cleaning module available

## Technical Data

<b>Type</b>	Tablet press
<b>Size (W x H x D mm)</b>	550 x 620 x 1250
<b>Weight</b>	340 kg
<b>Maximum pressing capacity</b>	400 kN (HTP 40), 600 kN (HTP 60)
<b>Power consumption</b>	400V, 50 Hz, 3-phase
<b>Voltage/ mains connection</b>	400V, 50 Hz, 3-phase
<b>Protection type</b>	IP 54

## Accessories

Accessories	Order number
<b>Pressing tools, free pressing (OD=40mm, chromium steel matrix):</b>	
Chromium steel stamp and cover	5-3502-105344-6
chromium steel stamp, tungsten carbide cover	5-3502-105916-1
titanium carbide stamp and cover	5-3502-106116-7
titanium carbide stamp, tungsten carbide cover	5-3502-106117-5
pre-pressing stamp for 2-component pellets	7-4226-103997-3
<b>pressing tools, aluminium cans (OD=40 mm, chromium steel matrix):</b>	
Chromium steel stamp and cover	5-3502-105631-6
chromium steel stamp, tungsten carbide cover	5-3502-106118-4
titanium carbide stamp and cover	5-3502-106119-2
titanium carbide stamp, tungsten carbide cover	5-3502-106120-9
<b>pressing tool, steel rings HTP40 only (OD=40 mm, ID=35 mm, h=14 mm) chromium steel matrix:</b>	
Chromium steel stamp and cover	5-3510-105695-1
incl. titanium carbide counterpressure plate	5-3510-106121-7
incl. tungsten carbide counterpressure plate	5-3510-200727-6
<b>pressing tool, steel rings HTP40 only (OD=51.5 mm, ID=35 mm, h=8.6 mm) chromium steel matrix:</b>	
Chromium steel stamp and cover	5-3510-107838-5
incl. tungsten carbide counterpressure plate	5-3510-158914-2
<b>additional equipment:</b>	
Manual ring cleaning unit OD=40mm/51,5mm	5-2222-412508-4
pneumatic ring cleaning unit OD=40 mm	450595-4
pneumatic ring cleaning unit OD=51.5 mm	290187-4





## Fusion machines

# Bead One R

The Bead One R is a benchtop fusion unit (resistance furnace) for producing glass beads for chemical analyses with maximum repeat accuracy and precision. The Bead One R boasts high-precision temperature control, simple adjustment of the fusion parameters via the HMI touch panel and a high level of safety. Optionally it is possible to connect a 9-position magazine for automatic batch operation and a magnetic stirring unit for pouring in an acid solution.

## At a glance:

- Fusion unit with high-quality resistance furnace for temperatures up to 1300°C
- pouring the melt in a dish for producing glass beads and in an acid solution
- numerous safety features incl. cold- to-cold technology and safety switch
- HMI touch panel with clear depiction of all important parameters and of the process progress
- easy configuration of the fusion programmes with definition of the parameters such as temperature
- fusion time and cooling time, swivel time and angle etc.
- excellent servicing capability with remote access
- easy replacement of furnace pipe and plug

## Areas of use

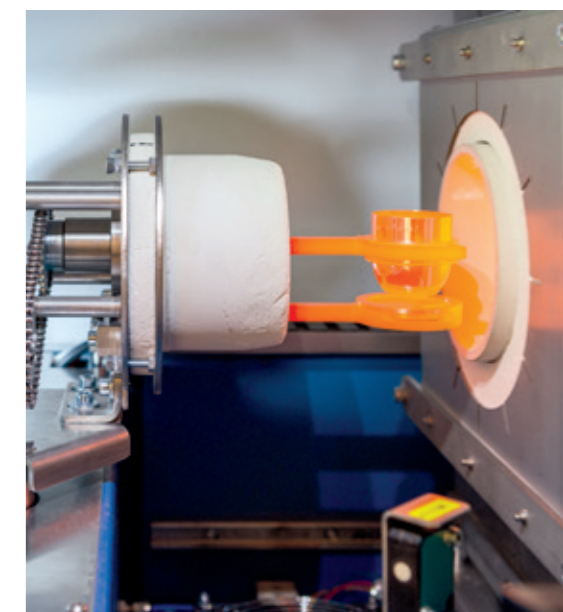
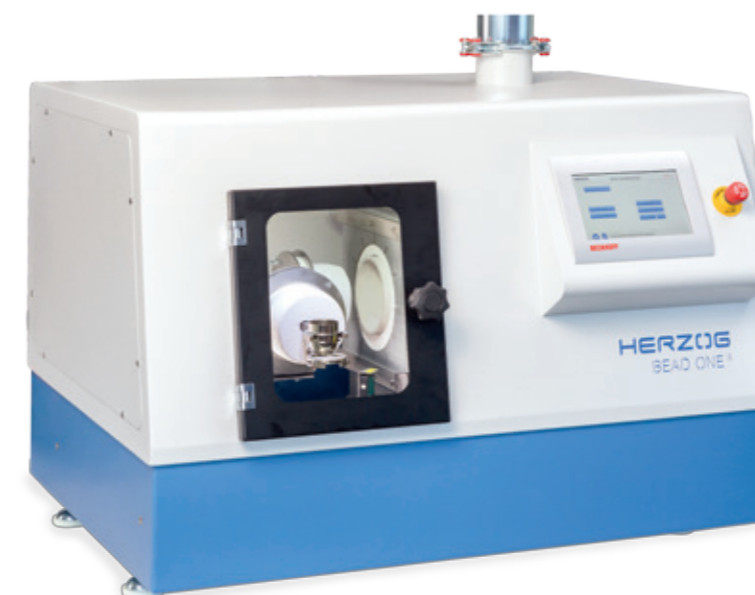
<b>Areas of use</b>	Building materials, chemistry, electronics, geology, glass, mechanical engineering, metallurgy, ceramics, plastics, recycling
<b>Materials</b>	Basalt, building materials, ores, feldspar, glass, granite, ceramic, clinker, coal, coke alloys, minerals, quartz, chamotte, slag, silicon, stone and much more.
<b>Pouring options</b>	in dish (diameter 40mm) for production of a glass bead, pouring in acid cup for analytical liquid
<b>Max. furnace temperature</b>	1300°C
<b>Function</b>	Fusion with high-quality SiC resistance furnace, automatic sample handling with automatic retraction into furnace, swivelling of the melts and cooling of the glass beads, door with safety switch, optional magazine (9 pos. each for the dish and crucible) incl. cooling position for automatic processing of pre-dosed sample material

## Technical Data

<b>Type</b>	Fusion unit (resistance furnace)
<b>Size (W x H x D mm)</b>	874 x 670 x 770
<b>Weight</b>	125 kg
<b>Voltage/ mains connection</b>	230 V, 50 Hz 1/N/PE
<b>Power consumption</b>	2 kVA
<b>Furnace type</b>	Furnace with SiC heating elements, 3x PtRH-Pt thermocouple for temperature control

## Accessories

Accessories	Order number
9 position-magazine	452333-8
integrated magnetic stirring unit for pouring in liquid	462646-1
platinum/gold crucible	449143-7
platinum/gold pouring dish (diameter 29 mm)	183734-3
platinum/gold pouring dish (diameter 29 mm)	188788-4
platinum/gold pouring dish (diameter 34 mm)	294497-3
platinum/gold pouring dish (diameter 39 mm)	272118-1
furnace plug	446956-5
ultrasound cleaning bath	400629-2
bead suction picker	422351-7
crucible tongs	350521-1



## Fusion machines

# Bead One HF

The Bead One HF is a benchtop fusion unit (induction) for producing glass beads for chemical analyses with maximum repeat accuracy and precision. The high-frequency technology allows for extremely precise and delay-free temperature control and temperature ramp function. This makes the Bead One HF suitable for demanding analytical tasks and a high sample throughput rate. An independent high-frequency generator for the dish allows fully controlled cooling of the melts.

### At a glance:

- Fusion unit with high-frequency induction technology for temperatures up to 1350°C
- precise temperature control for crucible and dish thanks to two independently working high-frequency generators and pyrometers
- precise and instantaneous temperature ramp function for different oxidation and fusion steps
- HMI touch panel with clear depiction of all important parameters and of the process progress
- easy configuration of the fusion programmes with definition of the parameters such as temperature
- fusion time and cooling time, swivel time and angle etc.

### Areas of use

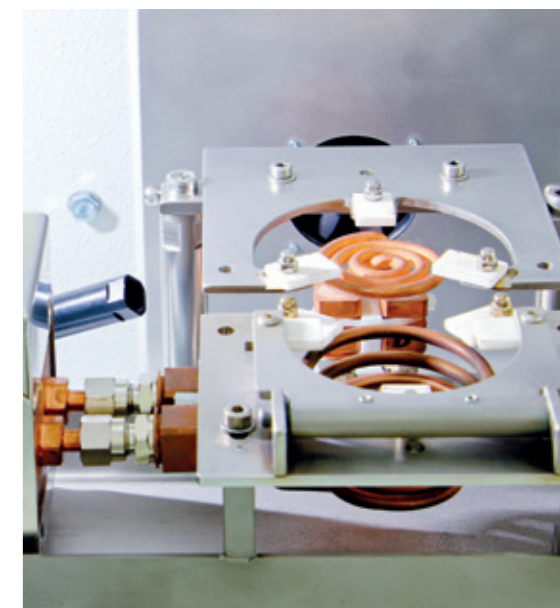
<b>Areas of use</b>	Building materials, chemistry, electronics, geology, glass, mechanical engineering, metallurgy, ceramics, plastics, recycling
<b>Materials</b>	Basalt, building materials, ores, feldspar, glass, granite, ceramic, clinker, coal, coke alloys, minerals, quartz, chamotte, slag, silicon, stone and much more.
<b>Pouring options</b>	In different dish diameters for production of a glass bead with diameters of 29, 32, 34, 36 and 39 mm
<b>Temperature range</b>	Crucible: 385-1350°C, dish: 200-1200°C, simultaneous heating-up of the crucible and dish by independent high-frequency generators
<b>Function</b>	Fusion with the induction process, simultaneous heating-up of crucible and dish by independent high-frequency generators, extremely precise temperature ramp function for technically sophisticated fusions, constant temperature control of crucible and dish by two pyrometers, high safety standard thanks to safety door and cold-to-cold process

### Technical Data

<b>Type</b>	Fusion unit (induction / high-frequency technology)
<b>Size (W x H x D mm)</b>	800 x 670 x 790
<b>Weight</b>	140 kg
<b>Voltage/ mains connection</b>	230 V, 50 Hz 1/N/PE; CEE 32A
<b>Power consumption</b>	6.5 kVA

### Accessories

Accessories	Order number
Cooling water recooling system	447333-6
platinum/gold crucible (matt)	463400-2
platinum/gold crucible (glossy)	186307-5
platinum/gold pouring dish (bead diameter 29 mm)	183734-3
platinum/gold pouring dish (bead diameter 32 mm)	188788-4
platinum/gold pouring dish (bead diameter 34 mm)	294497-3
platinum/gold pouring dish (bead diameter 36 mm)	294414-8
platinum/gold pouring dish (bead diameter 39 mm)	272118-1
ultrasound cleaning bath	400629-2
crucible tongs	350521-1



## Fusion machines

# HP-DT2

The HP-DT 2 is used for high-precision weighing of flux in plastic cups. Up to 30 cups are simultaneously fed into the HP-DT 2 via a tray and are filled fully automatically. There is space on the feed transport for a total of three trays, enabling sixty cups to be filled without the operator having to intervene. The HP-DT 2 is the optimum machine for relieving laboratory staff of routine work, for improving the accuracy of weighing and for achieving a high sample throughput rate.

### At a glance:

- Weighing equipment for flux for use in thermal fusions
- high-precision weighing equipment with an accuracy of +/- 3mg
- precise dosing possible in a range up to 15g
- automatic dosing of up to 30 cups per tray
- easy configuration of the dosing parameters via HMI panel

### Areas of use

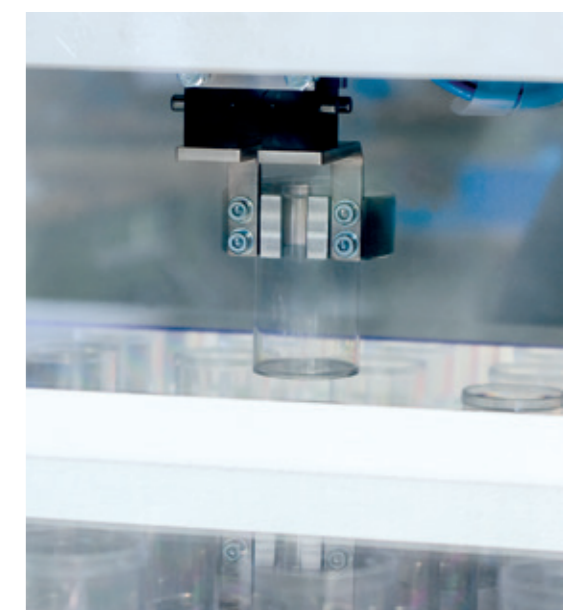
<b>Areas of use</b>	Building materials, chemistry, electronics, geology, glass, mechanical engineering, metallurgy, ceramics, plastics, recycling
<b>Materials</b>	Flux
<b>Dosing accuracy</b>	Up to 3 mg, depending on the material and dosing speed
<b>Dosing speed</b>	Up to 30 cups / 20 minutes, depending on the desired accuracy, material and quantity
<b>Function</b>	High-precision dosing of flux in plastic cups, 30 cups fed in per tray, space for 3 trays on the feed transport, automatic tray transport sequence, cup transfer from the tray to the weighing unit, tare function, cup transferred back to the tray, dosing parameters selected via HMI terminal. If desired, final weights output for each individual cup

### Technical Data

<b>Type</b>	Automatic weighing unit for flux
<b>Size (W x H x D mm)</b>	870 x 1050 x 1600
<b>Weight</b>	190 kg
<b>Voltage/ mains connection</b>	230 V, 50 Hz, 1N/P/E

### Accessories

Accessories	Order number
Plastic cup	N.N.





## Grinding machines

## Grinding machines

# HS 200

The HS 200 is a compact benchtop pendulum grinding machine for preparing iron and steel samples that are used for spectroscopic quality assurance in places such as steelworks, foundries and metal plants. The machine boasts an extremely robust design and easy handling of the grinding arm. This means that the machine still delivers reproducible surface grinding after many years of operation – even with difficult samples. Numerous different clamping fixtures allow extremely flexible use of the HS 200.

### At a glance:

- Manual benchtop pendulum grinding machine for the surface grinding of iron and steel samples
- extremely robust and compact design
- smooth-motion swivel arm with tapered roller bearings for particularly easy and sensitive grinding
- easy cup wheel replacement
- low maintenance with great durability and a long service life
- maximum flexibility thanks to numerous different clamping fixtures

### Areas of use

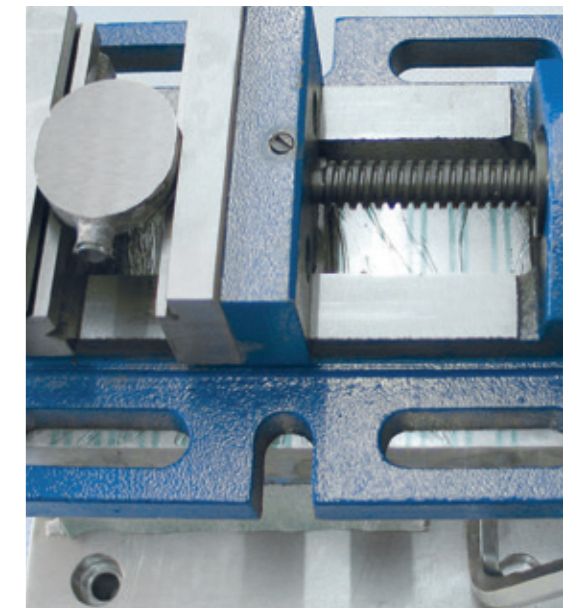
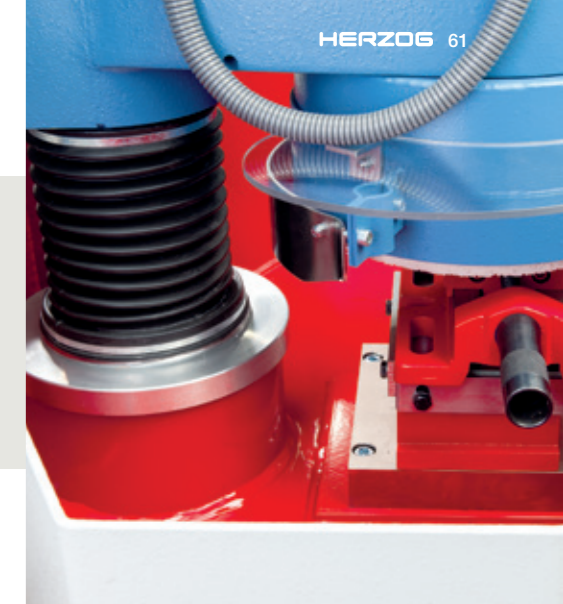
<b>Areas of use</b>	Electronics, mechanical engineering, metallurgy, recycling
<b>Materials</b>	Metal samples from steelworks, foundries, metal production facilities
<b>Sample dimensions and height</b>	N.N.
<b>Sample shape</b>	round, oval, square, xxx
<b>Functions</b>	Simple and sensitive grinding thanks to smooth-motion swivel arm, simple cup wheel replacement, suitable for wet and dry grinding, numerous clamping fixtures including parallel vice, pneumatic, permanent magnet, electric magnet, combination of vice and permanent magnet, swivel-action cover hood with safety switch

### Technical Data

<b>Type</b>	Jaw crusher Manual pendulum grinding machine
<b>Size (W x H x D mm)</b>	700 x 615 x 650
<b>Weight</b>	200
<b>Voltage/ mains connection</b>	400V, 50 Hz, 3-phase
<b>Power consumption</b>	1.5 kVA
<b>Speed</b>	2800/min
<b>Dimensions consumables</b>	200 x 100 x 51 mm

### Accessories

Accessories	Order number
Parallel vice	105813-0
pneumatic clamping fixture	105800-7
permanent magnet clamping plate	272797-2
electric magnet clamping plate	186096-7
vice and permanent magnet combination	135883-7
connector for dust extractor	128505-5
liquid cooling unit	186097-2
demagnetising unit, 230 V, 50 Hz	326001-5
1 phase, under bench	771024-7



## Grinding machines

## HT 350

The HT 350 is a dual-disk grinding machine for the surface grinding of samples for the purpose of quality assurance in steelworks, foundries and other metalworking facilities. Two grinding disks working independently of each other allow two different work steps such as pre-grinding and fine grinding to be performed in one machine, without the need to change grinding media. With features such as a safety switch and a working height of approx. 1 m, the machine allows very safe and ergonomical working. Numerous different sample holders for great flexibility.

## At a glance:

- Manual dual-disk grinding machine for the surface grinding of iron and steel samples
- two grinding disks working independently of each other for two different work steps in one machine
- use of quickly-changeable and low-cost abrasive paper due to vacuum suction on the turntable
- ergonomical working height, safety features thanks to safety switches and motor braking
- different sample holders for maximum operator flexibility

## Areas of use

<b>Areas of use</b>	Electronics, mechanical engineering, metallurgy, recycling
<b>Materials</b>	Metal samples from steelworks, foundries
<b>Sample dimensions and height</b>	N.N.
<b>Sample shape</b>	N.N.
<b>Functions</b>	Sample processing by two two grinding disks working independently of each other, thereby allowing pre-grinding and fine grinding, vacuum suction allows use of quickly-changeable and low-cost abrasive paper, integrated highly-efficient dust extraction with spark separation and easily accessible and changeable pocket filters, high safety standard thanks to flap with safety switch and immediate stopping of the grinding disks, different magnetic and mechanical sample holders

## Technical Data

<b>Type</b>	Manual turntable grinding machine for iron and steel samples
<b>Size (W x H x D mm)</b>	820 x 870 x 1050
<b>Weight</b>	315
<b>Voltage/ mains connection</b>	450V, 50 Hz, 3-phase
<b>Power consumption</b>	Overall: 5.5 kVA motor power Grinding disks: each 1.5 kVA Dust extraction: 0.48 kVA
<b>Speed</b>	2800/min
<b>Dimensions consumables</b>	Diameter 350mm

## Accessories

Accessories	Order number
40 mm diameter, magnetic	104833-9
45 mm diameter	106068-0
magnetic, 50 mm diameter	106079-7
magnetic, 35...45 mm diameter, mechanical	106083-9





## Grinding machines

# HTS 2000

The HTS 2000 is a semi-automatic cup wheel grinding machine for processing iron and steel samples that are used for quality assurance in steelworks, foundries and metalwork shops. Numerous different sample shapes can be clamped by using different pneumatic and electro-magnetic or permanent magnet clamping fixtures. The grinding process itself runs fully automatically with programme control, resulting in high sample surface reproducibility. Wear of the cup wheel is automatically monitored and compensated for by a measuring device.

### At a glance:

- Semi-automatic plate grinding machine for the surface grinding of iron and steel samples
- automatic programme-controlled grinding sequence for high reproducibility
- grinding parameters adjusted via HMI panel
- automatic cup wheel wear compensation
- different pneumatic and magnetic clamping fixtures for a large number of different sample shapes
- cooling with water or compressed air during grinding

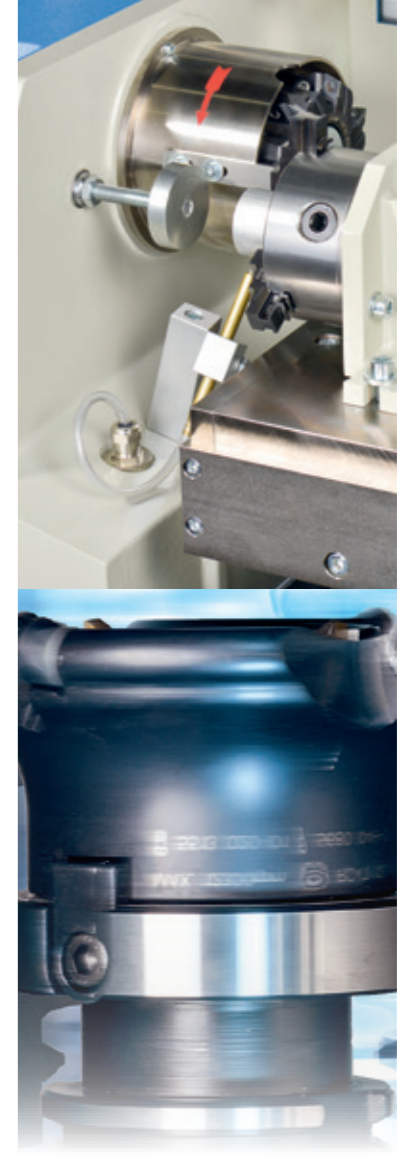
### Areas of use

<b>Areas of use</b>	Electronics, mechanical engineering, metallurgy, recycling
<b>Materials</b>	Metal samples from steelworks, foundries
<b>Sample dimensions and height</b>	Depending on the clamping fixture: Hydropneumatic clamping fixture: Cylindrical samples: Diameter 32–55 mm Thickness 8–60 mm, production samples: Length up to 70 mm, width 32– 55 mm, height 8–60 mm, electromagnetic clamping plate: Magnetic, thin samples with flat surface: Diameter 30-50 mm Thickness 4–60 mm
<b>Sample shape</b>	N.N.
<b>Functions</b>	Grinding process runs fully automatically after the sample is put in manually, grinding parameters configurable via HMI panel, measuring device for monitoring cup wheel wear, numerous clamping fixtures (pneumatic, magnetic) for different sample shapes, cooling unit with compressed air or water, connection for dust extraction

### Technical Data

<b>Type</b>	Semi-automatic cup wheel grinding machine or iron and steel samples
<b>Size (W x H x D mm)</b>	950 x 700 x 1700
<b>Weight</b>	750
<b>Voltage/ mains connection</b>	400V, 50 Hz, 3-phase
<b>Power consumption</b>	3.7 kVA
<b>Speed</b>	2870/min
<b>Dimensions consumables</b>	200 x 100 x 51 mm





## Milling machines

## Milling machines

# HPF

The steel mill HPF is the optimum machine for semi-automatic surface working for almost all sample shapes that are used for quality control in steelworks, foundries and metalwork shops. Thanks to the programme-controlled exact and automatic repetition of all milling conditions, the HPF guarantees excellent reproducibility of the sample surface for spectroscopic examination. The robust design, the high drive power and the freely configurable milling parameters allow short preparation times. The samples can be clamped either by a hydromechanical vice or an automatic adjustable clamping fixture.

### At a glance:

- Semi-automatic milling machine for surface working of iron and steel samples
- robust design and high drive power for quick sample processing
- sample clamped by hydromechanical vice or automatic special adjustable clamping fixture
- steplessly selectable spindle speed, feed speed and milling depth for optimally adapted processing conditions
- HMI panel for adjusting the milling parameters, high safety and service standard e.g. thanks to hood with safety switch and easy access for cleaning and maintenance

### Areas of use

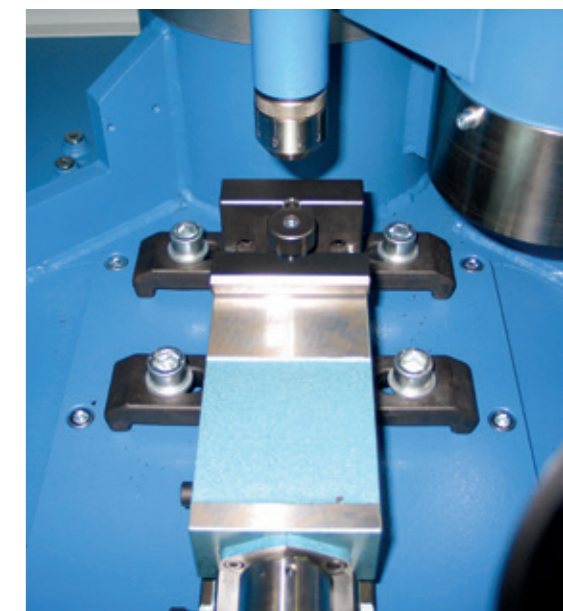
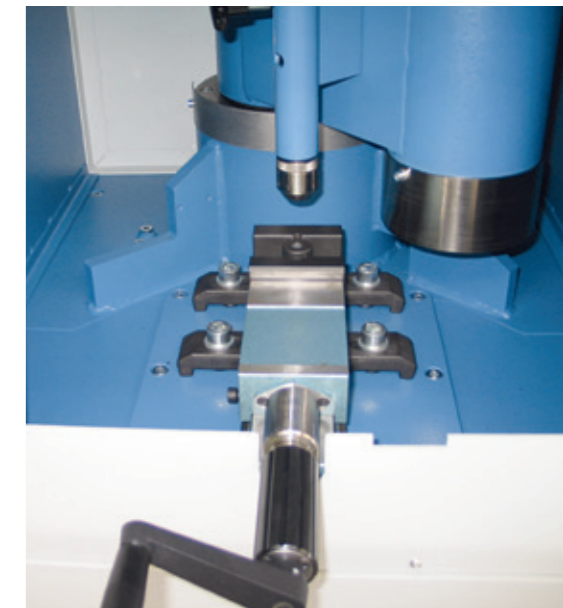
<b>Areas of use</b>	Electronics, mechanical engineering, metallurgy, recycling
<b>Materials</b>	Metal samples from steelworks, foundries
<b>Sample dimensions and height</b>	N.N.
<b>Sample shape</b>	round, oval, square, xxx
<b>Functions</b>	Steplessly adjustable milling spindle speed (280-1400/min), three speeds quickly selectable thanks to rotary switch, steplessly selectable feed speed and milling depth, milling process runs fully automatically after the sample is put in, different clamping fixtures with hydromechanical vice or automatic special adjustable clamping fixture, swivel-action cover hood with safety switch

### Technical Data

<b>Type</b>	Semi-automatic milling machine for steel samples
<b>Size (W x H x D mm)</b>	1400 x 1200 x 1850 (machine), 1050 x 1000 x 750 (switch cabinet)
<b>Weight</b>	750 kg
<b>Voltage/ mains connection</b>	450V, 50 Hz, 3-phase
<b>Power consumption</b>	2.2 kVA
<b>Supply media</b>	Compressed air
<b>Speed</b>	280-1400/min

### Accessories

Accessories	Order number
Automatic, hydraulic clamping fixture with cutting depth adjustment for round samples up to 42 mm in diameter	104744-8
manual parallel clamping device	261747-0
cutter head for steel samples	230532-4
turning plate for steel samples	343939-5
milling tool	418629-2
tungsten carbide turning plate	343189-7



## Milling machines

# HAF/2

The nonferrous mill HAF/2 was specially developed for the preparation of nonferrous metal samples for spectroscopic analysis. The HAF/2 allows perfectly coordinated surface working of many different sample shapes and sample materials. The optimised clamping fixture and the completely automatic milling sequence make work much easier for the operator and improve surface reproducibility.

### At a glance:

- Semi-automatic milling machine for surface working of nonferrous metal samples
- robust and compact design and simple handling
- sample clamped by 3-jaw chuck with stop
- steplessly adjustable milling depth via accuracy spindle with hand wheel
- automatic milling process with sample alignment via stop
- sample moved via flat support on precision bearings
- milling with steplessly adjustable feed speed
- high safety standard thanks to hood with safety switch

### Areas of use

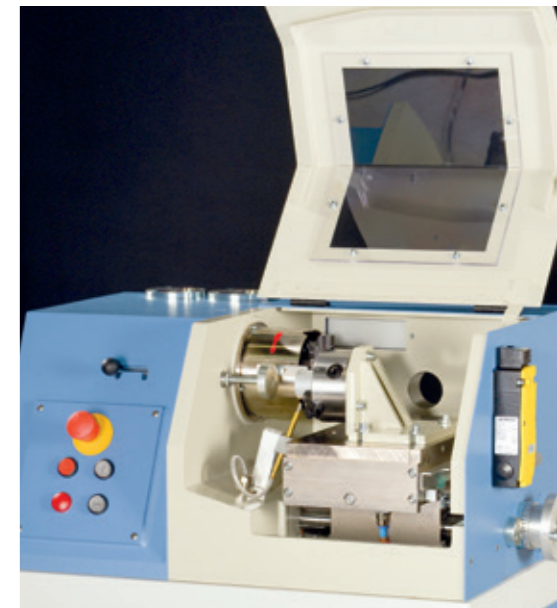
<b>Areas of use</b>	Electronics, mechanical engineering, metallurgy, recycling
<b>Materials</b>	Samples made of nonferrous metals such as aluminium, copper, lead, zinc, tin and their alloys etc.
<b>Sample dimensions and height</b>	N.N.
<b>Sample shape</b>	mushroom-shaped, cylindrical, rectangular etc.
<b>Functions</b>	Manual alignment and sample clamping in central 3-jaw chuck, milling depth adjustment via hand wheel with accuracy spindle, automatic milling process: Sample alignment with stop, sample moved to the milling spindle by facing on precision bearings, milling with steplessly adjustable feed speed, spraying unit with controllable spray nozzle for sample cooling, optional extractor for coolant vapours, cover hood with safety switch

### Technical Data

<b>Type</b>	Semi-automatic milling machine for nonferrous samples
<b>Size (W x H x D mm)</b>	720 x700 x 1190
<b>Weight</b>	365 kg
<b>Voltage/ mains connection</b>	400V, 50 Hz, 3-phase
<b>Power consumption</b>	2 KW
<b>Supply media</b>	Compressed air
<b>Speed</b>	2700/min

### Accessories

Accessories	Order number
Cutter head with 7 turning plates	465900-9
turning plate	364304-6
milling diamond	364444-0
with special special cut, extractor	294846-1



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