High-quality sample preparation
for the steel industry

HERZOG

Content

HERZOG

Your partner for automatic sample preparation

"Made by HERZOG": Since HERZOG's founding, our customers all over the world have been placing their confidence the intelligence and quality of our solutions and first-class products. As a leading supplier of laboratory systems, we develop innovative, future-oriented machines for the world market.

We see ourselves as a partner of the international primary industry, offering our customers consulting and engineering from a single source, with everything from the supply of high quality machines to full laboratory automation. Satisfied customers and outstanding products are the result of our motivated and highly qualified employees. As a family business steeped in tradition, we have a strong commitment to our employees and customers alike. Social responsibility and sustainability are by no means mere theoretical terms for HERZOG – they are part of the dynamic entrepreneurship that we practice every day.

HERZOGSteel

HERZOG is the world's leading supplier of sample preparation systems in the iron and steel industry. HERZOG systems are used by the world's leading steel manufacturers for quality assurance and process control throughout the production process.

Our integrated solutions provide the optimal preparation for steel, iron and slag samples for OES and XRF as well as CNS analysis.

Innovative HERZOGSteel solutions are designed according to customer requirements and are based on an close, dynamic collaboration with the world's leading steel producers.

Components of HERZOGSteel

The individual components of HERZOGSteel have been developed for the rigorous requirements of the steel industry and adapted to suit each customer in the best possible way.

Automation

HERZOG offers automation optimally tailored to customer requirements. We find the best automation solution, including robots, linear transport systems or other handling devices. Robotic systems guarantee a particularly flexible handling of samples controlled by our Prepmaster system. With the use of robotics, it is easy to extend or modify a system configuration, or to exchange components.

Line system

A linear configuration of HERZOG components has unsurpassed reliability if flexible sample handling is not a top priority. Input and output magazines as well as freely configurable connections to the analysis systems guarantee user-friendly and fast sample processing.

Stand-alone solutions

All HERZOG components are designed for automatic and manual operation. Most HERZOG equipment can be easily integrated into automation if the customer's sample volume increases. HERZOG offers full flexibility.
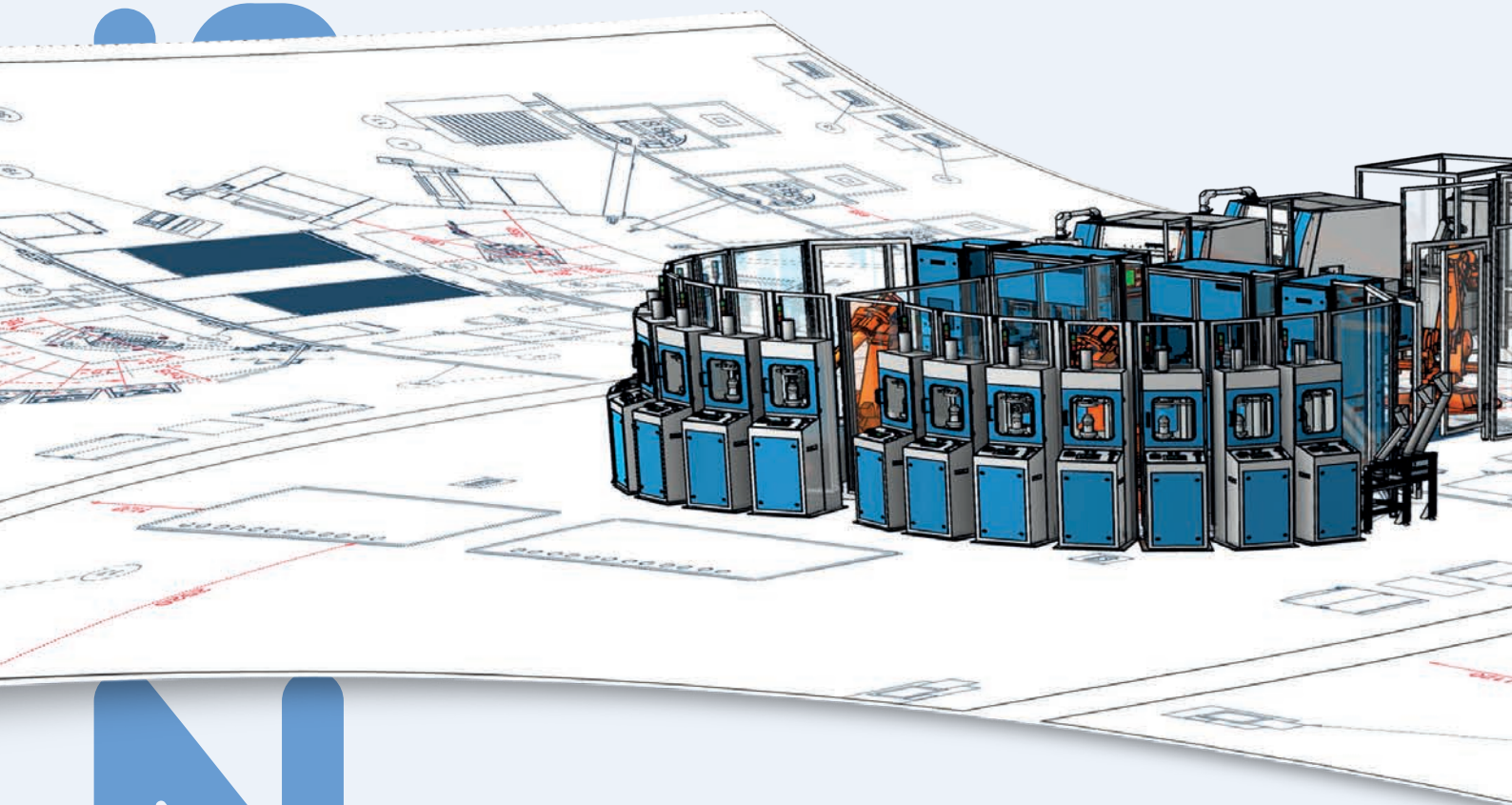
From the idea to the perfect solution – HERZOG is

Individuality

HERZOGSteel solutions can be individually configured to meet the requirements of any customer.

HERZOG machines are designed for a wide range of applications – from stand-alone solutions to integral parts of a fully-automated robotic system. Moreover, our modular construction method allows our components to seamlessly adapt to our customers' specific requirements. Together with our team, we will find the optimal solution for you.
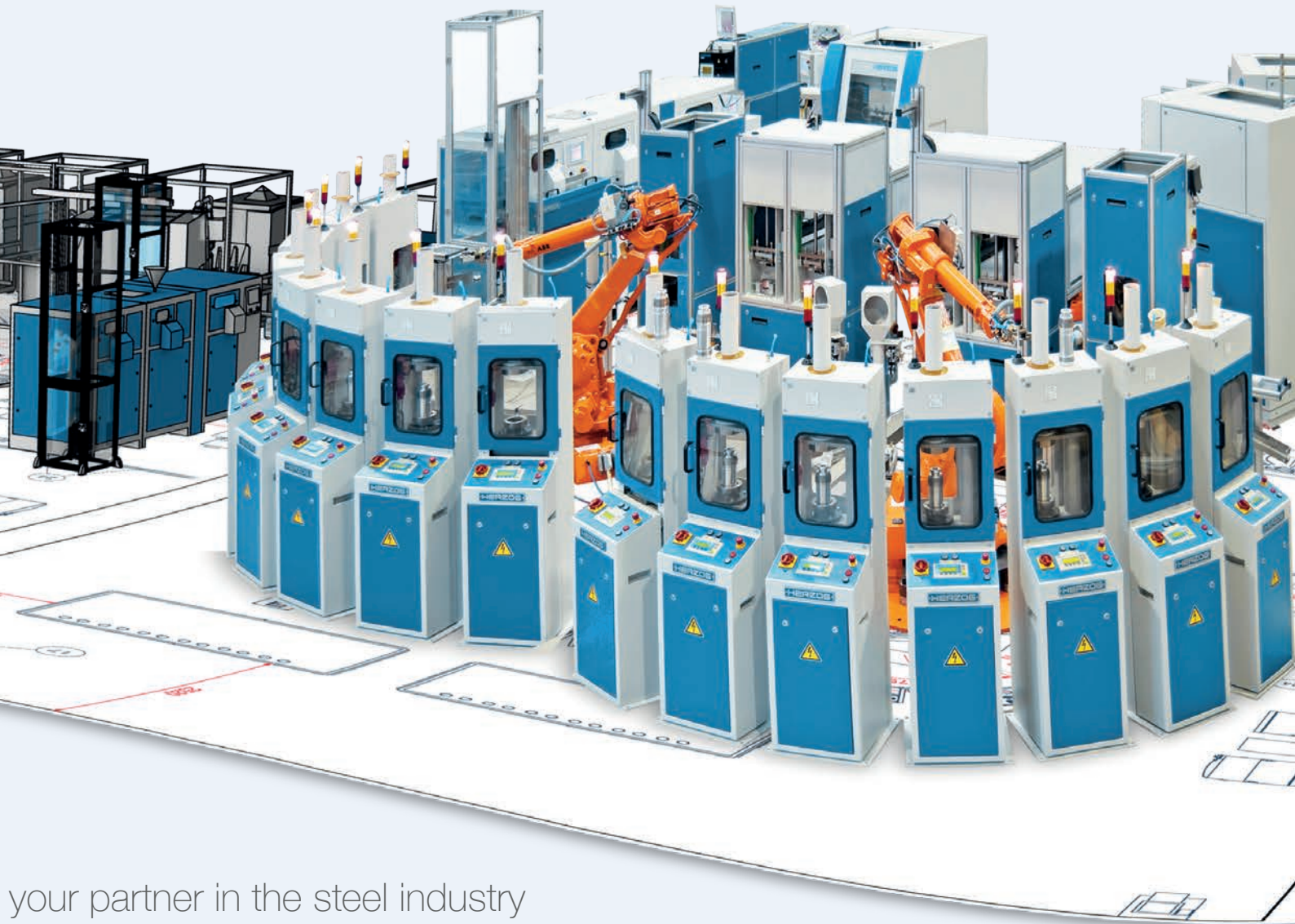
your partner in the steel industry

Flexibility

HERZOGSteel solutions are flexible and can adapt to the individual conditions of each production process.

HERZOGSteel offers:

- **Processing of different steel and iron qualities:**
  HERZOG systems enable the optimum preparation of any sample surface, from raw iron samples to high-alloyed speciality steels.

- **Processing of different sample forms:**
  HERZOG systems can be adapted to any individual sample form and consequently guarantee optimum analysis results.

- **Management of various sample volumes:**
  HERZOG systems can be configured according to the desired sample capacity, and include manual solutions for just a few samples as well as complete automation arrangements for thousands of samples per day.
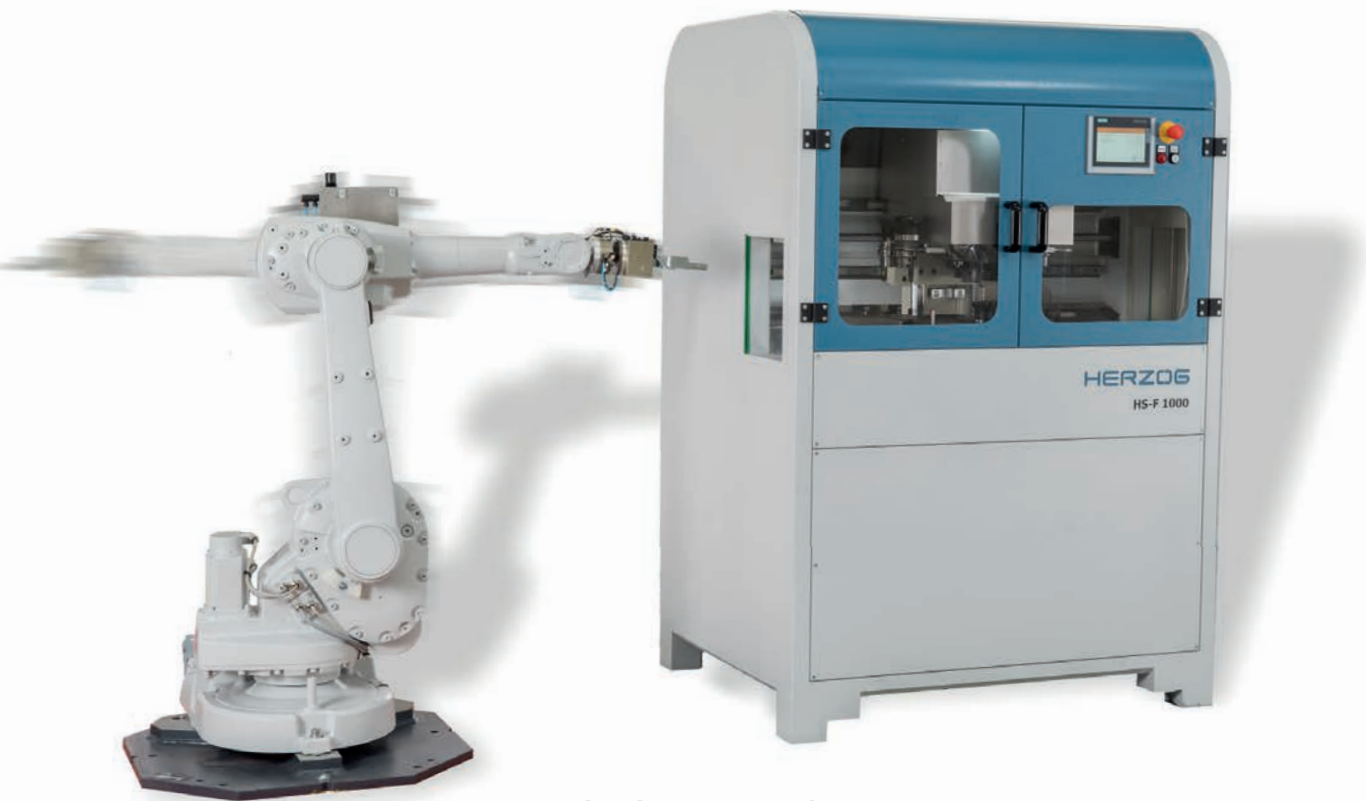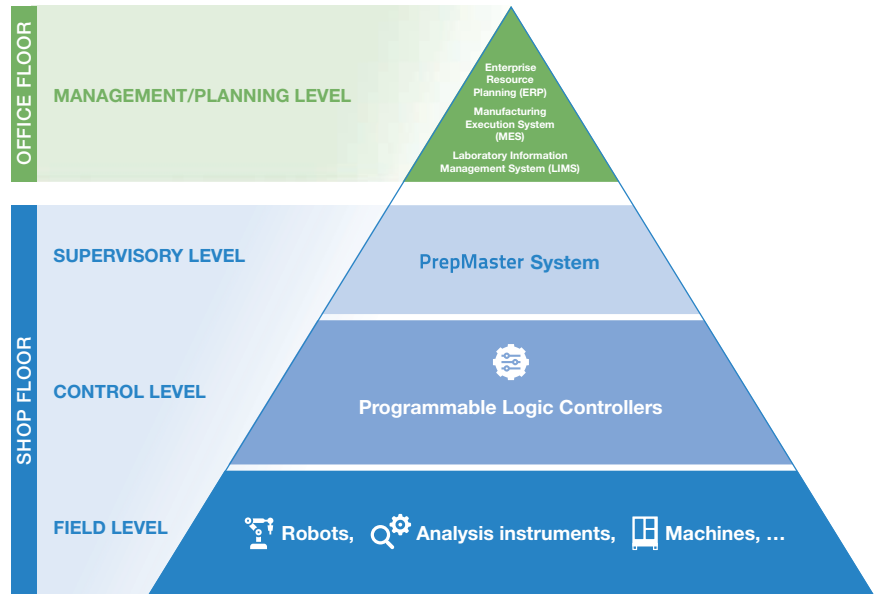
Velocity

Modern production processes require fast and thorough monitoring of the manufacturing process. HERZOGSteel systems have been designed as high-speed solutions to guarantee optimum process performance:

HERZOG's high-precision components allow the control of the production process within a narrow time frame:

- Fastest possible transport via the HERZOG Airtube
- Rapid unpacking and transfer of samples
- High sample-handling speed by means of optimised handling systems
- High milling and grinding speeds
- Intelligent sample management supported by the PrepMaster Core SCADA software with a full capacity workload of all components and high-priority processing of special samples

PREPMASTER
STRUCTURE

OFFICE FLOOR

MANAGEMENT/PLANNING LEVEL

Enterprise
Resource
Planning (ERP)

Manufacturing
Execution System
(MES)

Laboratory Information
Management System (LIMS)

SHOP FLOOR

SUPERVISORY LEVEL — PrepMaster System

CONTROL LEVEL — Programmable Logic Controllers

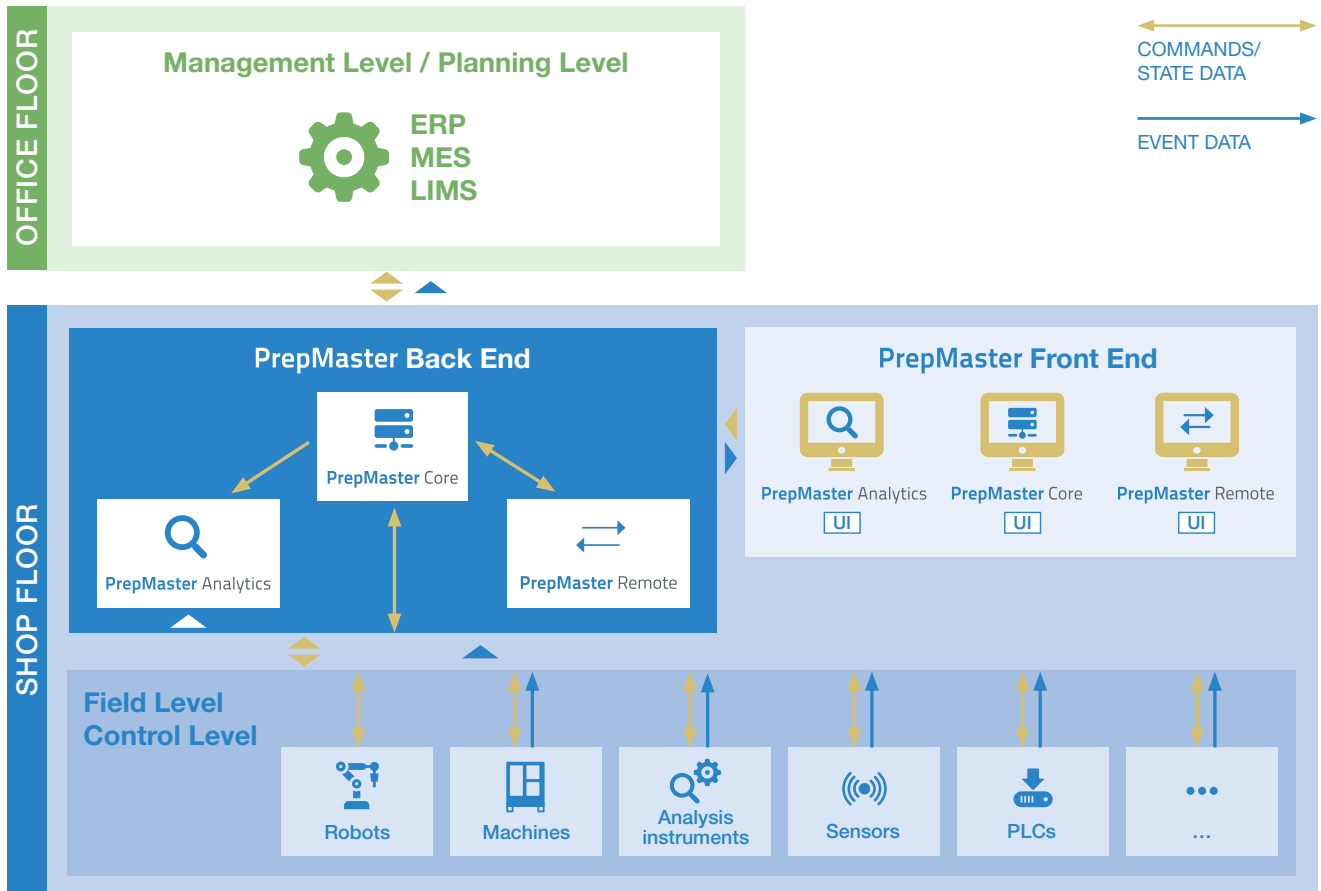FIELD LEVEL — Robots, Analysis instruments, Machines, …

Herzog's software solutions ensure optimal integration of all levels of the Shop Floor and build flexible and robust connections to the customer's Office Floor applications.

PrepMaster Suite

The PrepMaster Suite is a fully integrated SCADA system used for the automation, control, monitoring and evaluation of all processes in the laboratory and plant. The PrepMaster Suite is fully scalable, modular and readily expandable. The software enables the integration of a wide range of application-specific machines and instruments from various original equipment manufacturers. The PrepMaster Suite can be easily integrated into the customer's IT infrastructure and offers powerful interfaces for inter-process communication. Accordingly, PrepMaster can simply connect to other instances in the Shop and Office Floor, such as manufacturing execution systems (MES), ERP systems or LIMS applications.

PrepMaster Core and PrepMaster Analytics are autonomous modules that can be used independently of each other. However, the full PrepMaster functionality is only available when both modules are installed and can communicate with each other. PrepMaster Remote is a supplement to PrepMaster Core, which allows PrepMaster to be extended to a multi-user system.

OFFICE FLOOR

Management Level / Planning Level

ERP
MES
LIMS

COMMANDS/
STATE DATA

EVENT DATA

SHOP FLOOR

PrepMaster Back End

PrepMaster Core

PrepMaster Analytics

PrepMaster Remote

PrepMaster Front End

PrepMaster Analytics
UI

PrepMaster Core
UI

PrepMaster Remote
UI

Field Level
Control Level

| Robots | Machines | Analysis instruments | Sensors | PLCs | … |

Schematic diagram of the structure
of HERZOG's software with inte-
gration of the PrepMaster modules
at the supervisory level.

Screenshots of PrepMaster Core

PrepMaster Core

PrepMaster Core – the key application of the PrepMaster Suite – is used to monitor and control HERZOG automatic systems. The entire software architecture is based on a machine-oriented code and geared towards high reliability to guarantee 100% automation availability. In addition, great importance was given to the usability of the software, which allows the user to operate the system as simply and effectively as possible.

The main functions of PrepMaster Core:

- **Easy monitoring and control of the system:** PrepMaster Core offers a user-friendly GUI. All relevant information on the status of the system, components and samples is clearly displayed. Sample worksheets can be easily configured and modified. The PrepMaster Remote module provides web-based access to all important operating and monitoring functions for additional operators without additional client-side installations.

- **Adaptive and priority-controlled sample management:** The PrepMaster Core routing module enables the fast and efficient preparation of samples in the steel laboratory. The intelligent sample administration easily manages even high sample volumes and peak workloads. Priority samples are routed before other samples to make critical analysis results available as quickly as possible.

- **Reference sample management and control:** PrepMaster Core provides multiple tools to enable trouble-free and efficient processing and meas-urement of reference materials. These include creating lab-specific routines for monitoring and recalibration samples, configuring reference sample parameters, setting up schedules, etc.

- **Automatic vision system for spark point optimisation:** The integrated SparkPoint module determines the optimal spark positions for optical emission spectrometry (OES) based on the camera images and customer-defined parameters.

- **Optimum serviceability:** Several integrated service tools enable the fast diagnosis of the system's functional status, facilitate the analysis of errors that have occurred, and help to optimise the system. The corresponding diagnostic information can be evaluated by the user or sent as diagnostic files to the HERZOG specialists. HERZOG employees can access the system via secure remote access.

PrepMaster Analytics

PrepMaster Analytics is a modern Industry 4.0 application for recording, logging and monitoring all relevant data and processes of an automated system. PrepMaster Analytics provides a holistic overview of all important key performance indicators and significantly improves the process efficiency and reproducibility of sample preparation and analysis.

PrepMaster Analytics features include:

- Acquisition, presentation and processing of analytical results: For data acquisition, PrepMaster Analytics includes preconfigured interfaces for a wide range of analysis instruments. Data can be displayed in a variety of ways in tabular and graphical form on various dashboards. Data can also be edited manually or automatically, with all changes logged automatically. Users can track and monitor data in a number of ways. The application also accounts for measurement uncertainty while monitoring the analytical results.

- Monitoring the calibration status of analysis instruments and validation of analytical results: PrepMaster Analytics allows the automatic display and continuous monitoring of reference analyses using statistical process control (SPC) tools. It links the relevant analyses of a production sample with the relevant reference analyses. This ensures that each analysis in the laboratory is performed under referenced conditions and is validated. These procedures are logged automatically and are available in the event of an audit, e.g. in the context of ISO 17025.

- Monitoring of automation performance: PrepMaster Analytics provides all the necessary tools for visualising and monitoring the performance of the automatic system. Important key performance indicators can be tracked and evaluated in real time. Typical KPIs relevant for evaluating the performance include sample throughput, cycle time, and processing times. Simultaneously, the data provides information about further optimisation options within the system.

Screenshots of PrepMaster Analytics

- **Overview and summary of all important sample data:** The Sample Vita module of PrepMaster Analytics combines all relevant data on the preparation and analysis of a specific sample in a central data dashboard. It clearly presents all the relevant routing data, machines and instruments used, sample preparation times and steps, as well as analysis results for a sample. This means that all data is available at any time for the complete documentation of sample preparation and analysis, e.g. as part of an ISO 17025 audit.

- **Documentation, planning and monitoring of service and maintenance activities:** PrepMaster Analytics contains various tools that make maintenance, service and issue resolution much easier. The maintenance module enables the simple setup and definition of automation components and related maintenance tasks. Furthermore, maintenance progress and efficiency can be evaluated statistically. The systematic recording of availability as well as warning and error messages not only facilitates fault analysis, but also provides laboratory management with a quick overview of the system's performance.

- **Condition monitoring and predictive maintenance tool:** PrepMaster Analytics offers optional modules for monitoring different machine tools using sensor data. This enables the monitoring of appropriate sample preparation, the control of the tool condition (TCM), and the performance of predictive maintenance.
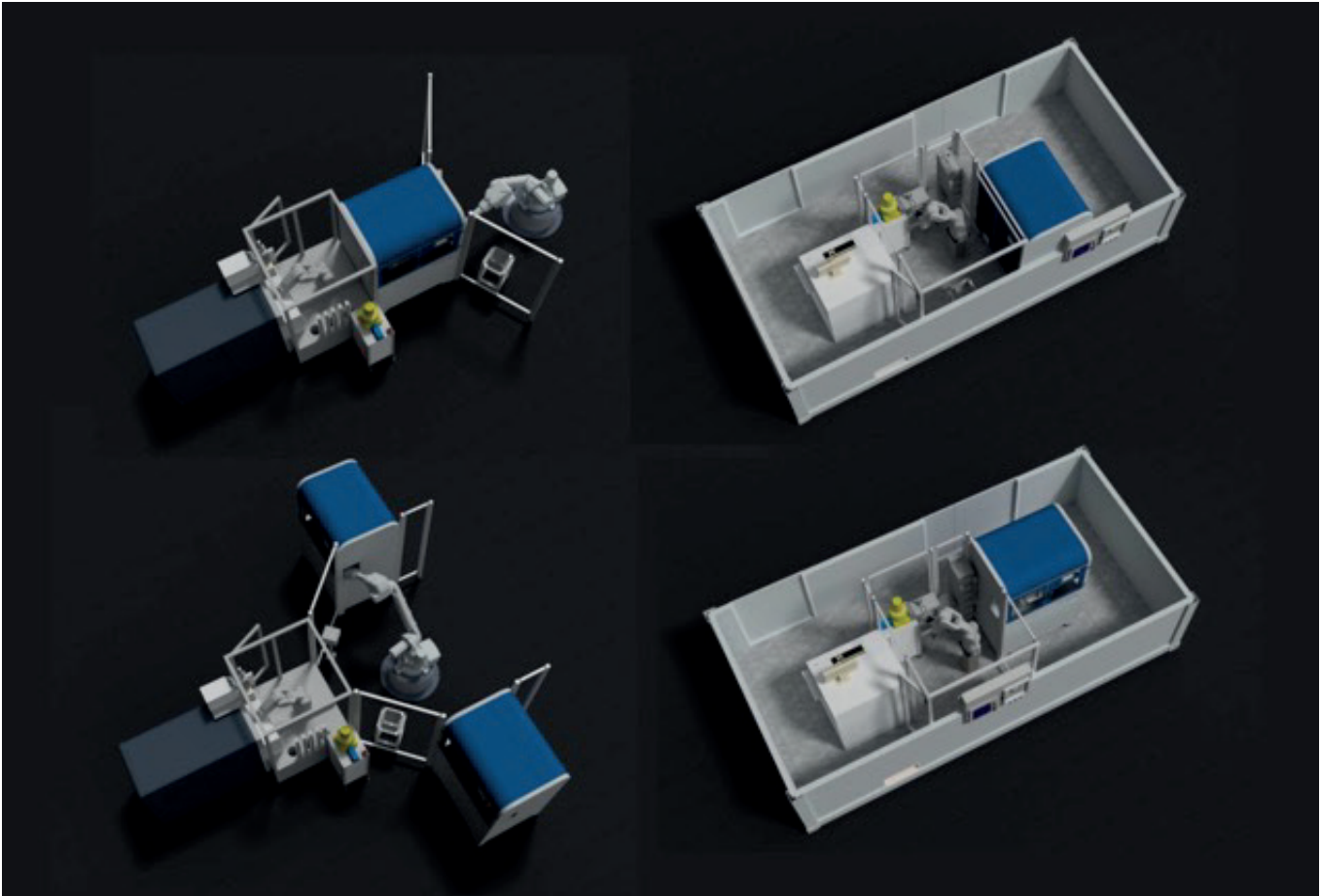
HERZOG Standard Automation

HERZOG: EXPERTISE IN AUTOMATION
HERZOG has set the standards in a wide range of applications for auto-mated sample preparation and quality control. The HERZOG Standard Lab reflects our many years of experience and expertise in industrial automation. By launching the HERZOG Standard Lab, we can offer customers outstanding performance with excellent cost effectiveness.

The design of the HERZOG Standard Lab is based on well-established quality control procedures that are standard in a wide range of industries. All hardware components, software modules and processes have been optimised to fulfil laboratory requirements in the best possible way.

Different configurations of the HERZOG SteelLab

HERZOG SteelLab

HERZOG SteelLab in a standard container

The HERZOG SteelLab is the state-of-the-art solution for the automatic optical emission spectroscopic analysis of steel samples. What is special about the SteelLab is its small footprint, high configurability and flexibility. The SteelLab is available in either a stand-alone configuration or as an integral component of larger-scale steel automation systems.

In a stand-alone configuration, the SteelLab includes a milling or grinding machine for sample preparation before analysis. The SteelLab fits into a standard size container and can be stored next to the production site to allow immediate analysis. The SteelLab is standard available without a container housing for installation in any location that is appropriate for analytical purposes.

In larger-scale steel automation systems, the SteelLab is usually connected to the sample preparation circuit. The SteelLab receives the prepared production sample and performs a fully-automatic OES analysis.

The functions of the SteelLab have been streamlined to guarantee the highest possible analytical performance and the fastest possible sample preparation and analysis time. Furthermore, the mechanical systems and automation software have been optimised to reduce operator intervention to a minimum.
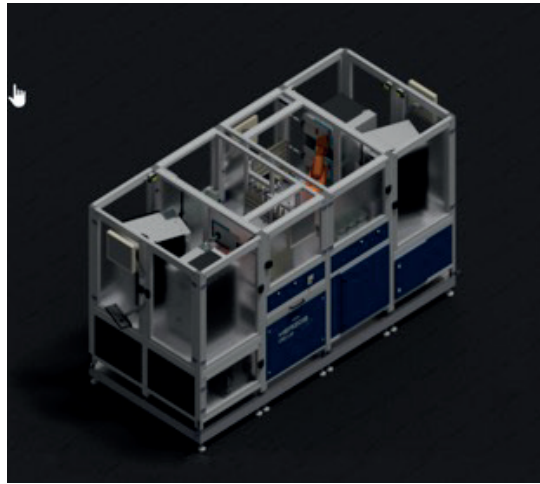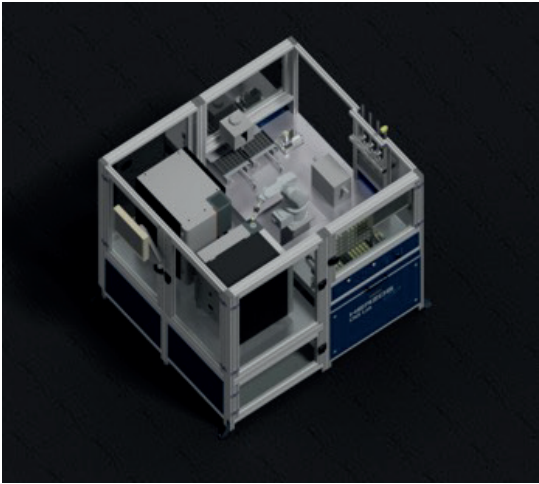
Example configurations of
the HERZOG CNSLab

HERZOG CNSLab

The HERZOG CNSLab is the our automatic solution for elemental
analysis of solid materials by furnace combustion. The CNSLab has
been especially developed for the analysis of iron and steel samples
using punched pieces or milling chips, but can also be used for other
types of inorganic materials. The CNSLab can be fully integrated into
steel automation systems, so that chip samples from the HS-F1000 and
punched pieces from the HUST or HCP can be directly transferred to
the CNSLab.

The CNSLab covers the complete process of sample preparation, from the
automatic receipt of the sample to the transfer of the preheated crucible
containing the weighed sample and additives to the analyser. Furthermore,
the CNSLab supports all steps required for instrument calibration, including
the management of reference samples and the definition of the calibration
procedure.

Depending on the sample volume, the CNSLab may have one robot with
up to two analysers or two robots with up to four analysers. It leads to a
significant reduction of routine tasks for laboratory personnel, increased
sample throughput, and improved quality of sample preparation and analysis.

Automation of all process
steps necessary for thermal
evolution analysis

Milling

Our milling machines are specially designed for the requirements of sample preparation. Due to their analysis-perfect processing of all metal grades, they achieve optimal OES analysis results in the shortest possible preparation time. Our machines offer exceptional durability for the highest possible reproducibility and maximum lifetime.

The operating concept of HERZOG milling machines can be very easily and optimally adjusted to the requirements of the user. Alignment and clamping of the samples as well as selection of the milling cutter run automatically. Feed speed, milling depth and cutting speed can be set as program parameters at the control panel or via PrepMaster Core/ Entry. The TCM module implemented in PrepMaster Analytics allows the automatic sensor-based monitoring of the milling tools and cutting tips. This ensures that each individual sample is prepared and analysed under optimal conditions.

Various machines and options are available for any need.

HS-F 1000

The HS-F 1000 milling machine combines innovative technology and full flexibility with a compact and robust design. The HS-F 1000 has a specially developed mineral cast frame with excellent dampening properties. On the one hand, this guarantees perfect milling results even with extremely hard samples and, on the other hand, long tool life of the cutting inserts. Machining times are short because the design principle eliminates the need for time-consuming measurement of the sample height. Flexible integration into automatic systems is possible as the machine offers robot or belt connection from both sides as well as from the rear.

Tool changer in the HS-F 1000

The HS-F 1000 provides a wide range of options such as tool changers, deburring tools and a module for the generation of granular chips for combustion analysis, which can also be linked to the fully automated CNSLab. The HS-F 1000 is ready for integration into Industry 4.0 applications such as tool condition monitoring, predictive maintenance and video monitoring.

Easy integration into robot automations

HS-FF 2000

The HS-FF 2000 is the universally usable, flexible and fast solution for the processing of steel samples. Due to its special design and extremely sturdy spindle bearing, the HS-FF 2000 allows even the hardest iron and steel samples to be prepared with ease. The machine can be easily integrated into robot-based automation systems, or operated manually. The machine is accessible from two sides and can therefore be included into two-robot circles.

The sturdy spindle allows even the hardest steel grades to be prepared

Two independently operated precision milling spindles can be fitted with milling cutters for various material grades. There is no need to change cutters when changing from steel to iron, and vice versa. Separate programs for automatic deburring of round calibration samples are available in conjunction with a special milling head.

Two independently operated precision milling spindles can be fitted with milling cutters for various material grades.
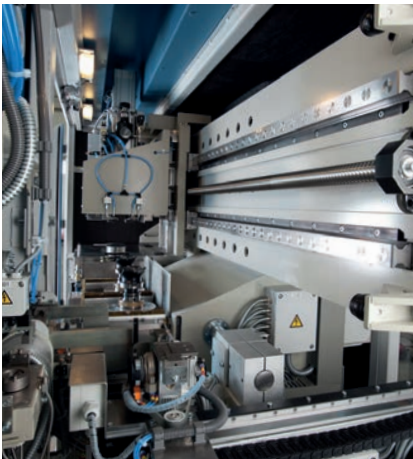
HS-FF

The HS-FF is the optimal milling device for the preparation of steel samples. Due to its universal design, it can be easily integrated into container laboratories, linear systems or robot automation systems. Of course, the sample can also be introduced manually via an infeed device.

The HS-FF is available with numerous options, including different types of input and output magazines for samples.

Milling of samples takes place from below for extremely fast sample handling

HS-CF

The HS-CF is the ideal machine for the fully automatic processing of conical steel and iron ore samples. The machine has been designed for use in the laboratory and in the production of sample material for OES and CNS analysis. The extremely robust design ensures the safe, sustained processing of even the hardest material grades.

The HS-CF combines the cutting and milling stages within one unit.

Samples can either be inserted manually by the operator or automatically by a robot or via conveyor belts. Alternatively, a variety of input magazines are also available. The HS-CF can cut off samples and extract slices of varying thickness for CNS analysis. The sample is forwarded to the milling unit with two independently operated precision milling spindles for various metal grades. Thus there is no need to exchange tools when changing from steel to iron, and vice versa. The machines include a cooling unit for hot samples.

HAF/2

The HAF/2 fine surface milling machine is optimal for the sample preparation of non – ferrous samples for spectral or X-ray fluorescence analysis. The semi-automatic machine is characterised by its compact and robust design and easy handling.

Grinding

HERZOG can provide an appropriate grinding solution for any customer needs – from full automation to manual stand-alone machines. There are various options available, including belt or cup wheel grinding, coarse and fine grinding, or sample water cooling, as well as an optional milling cutter e.g. for calibration samples.

The core characteristics of our grinding machines are compact construction, easy operation and highest safety standards – all with the objective of optimum surface preparation.

Optimised machine utilisation by integration of the cup wheel and abrasive belt – in combination or separately.

HB 3000

The fully automatic HB 3000 cup wheel and abrasive belt grinding machine permits automated sample preparation for spectroscopic analysis with all its advantages, including improved reproducibility. The HB 3000 can be easily integrated into any kind of automation.

The HB 3000 is characterised by its rapid and precise grinding of iron, steel and particularly high-alloy steel samples in a wide range of geometries, the temperature of which may reach 800° C. The HB 3000 is equipped with program-controlled intermediate cooling during the grinding processes to ensure optimum grinding results. This cooling system also enables the processing of incandescent samples.

In conjunction with the abrasive, grain and hardness, the integration of cup wheel and abrasive belt into a single machine ensures that preparation of the sample perfectly meets the requirements of analysis. The abrasive belt, for example, is suitable for absolutely exact fine grinding of high-cost calibration samples. Conversely, optimum service life is achieved with coarse grinding by means of the cup wheel.

HTS 3000

The HTS 3000 takes advantage of HERZOG's cup wheel technology and can be used, for example, in steel mill and foundry laboratories. After inserting a new cup wheel, the machine automatically adjusts the cup wheel to the correct height position. During each grinding cycle, the cup position is automatically adjusted to ensure precise material removal, resulting in perfect sample surfaces for spectroscopic analysis. The grinding process has been optimised to guarantee short processing times. The current degree of wear of the cup wheel is automatically monitored to allow timely replacement of the cup wheel. The HTS 3000 can be used as a fully automatic machine; manual sample insertion is additionally possible at any time.
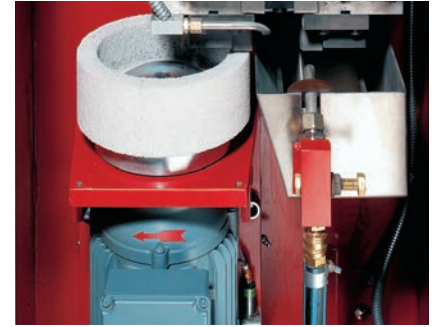
Optimised cup wheels guarantee perfect sample preparation.

HT 3000

The fully automatic HT 3000 cup wheel grinding machine permits automated preparation of samples with different geometries. The pneumatic clamping unit enables symmetrical samples to be gripped reliably and in a predefined manner for high grinding capacities and short sample preparation times.

HB 4000

Universal sample preparation for spectroscopic analysis: The program-controlled grinding process offers significant improvements in the reproducibility of the sample preparation and thus accurate analysis results in less time and at lower cost.

HT 350

Optimum sample preparation of iron and steel samples: The HERZOG Dual Disk Surface Grinder makes it possible to achieve a precision flat surface with reduced material cost.

HTS 2000

This grinding machine allows the grinding of steel and iron samples of different dimensions for the purpose of spectroscopic analysis.

HS 200

This manually operated swing grinding machine allows the grinding of pig iron and steel samples with a reproducible ground surface.

Cutting and punching

Our machines for cutting and punching enable the processing of samples and pins for further analysis. We provide solution for all types of application in the steel industry.

The fully automatic HUST

HUST

The HUST produces punched pieces for combustion analysis. The fully automatic HUST can process, e.g. separated sample slices, which are transported directly from the HS-CF into the machine. At the same time, it can also punch double-thickness samples, which are inserted by the robot. If necessary, the scale layer can either be milled off in the HS-F 1000 or removed by sandblasting in the HUST before punching. In addition, inductive heating of the sample tongue can be carried out in the HUST before the punching process. The punched pieces are then discharged separately into a magazine or the CNSLab for fully automatic combustion analysis.

HMI panel of the manual HUST

HCP

The HCP is a machine for cutting and punching cylindrical and conical steel samples. A specially developed clamping chuck enables the sample to be rotated during the cutting process. This results in an undisturbed cutting pattern without burr formation, lower heat generation in the sample and longer service life of the cutting wheels. With the aid of the integrated die cutter, punches can be produced from the separated slice. These are then discharged into a magazine for subsequent combustion analysis. The sample remaining after the cutting process can be milled in the HS-F 1000 and analysed by OES.

HS-CF

The HS-CF is the ideal machine not
only for milling, but also for fully automatic cutting of cylindrical and conical steel and iron samples. One option is to cut off a sample for OES. Another option involves the extraction of a slice of varying thickness between 4 and 6 mm.

The intelligent servomotor torque control guarantees particularly effective material cutting. The sturdy cutting disc drive in conjunction with the HERZOG high-capacity cutting disc guarantees top speed with maximum surface quality.


The HS-CF can cut even the hardest steel grades.

HSA

HERZOG's pneumatic pin cutter is optimised for straightforward removal of the sprue from steel samples produced by sampling probes. It can be used for all standard sample geometries, such as round and oval samples or double medallions.
The cutting action is performed with constant precision and is so accurate that no reworking is required. Thanks to its extremely robust construction, the pneumatic pin cutter is not only the right choice for laboratory use, but can also be used on site under tough conditions.
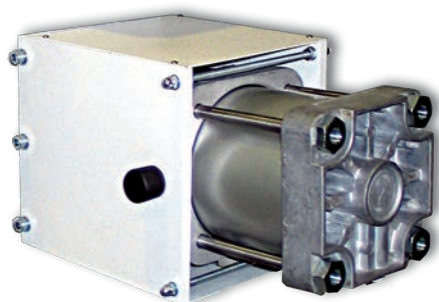
The pneumatic action cuts off the sprue quickly and precisely.
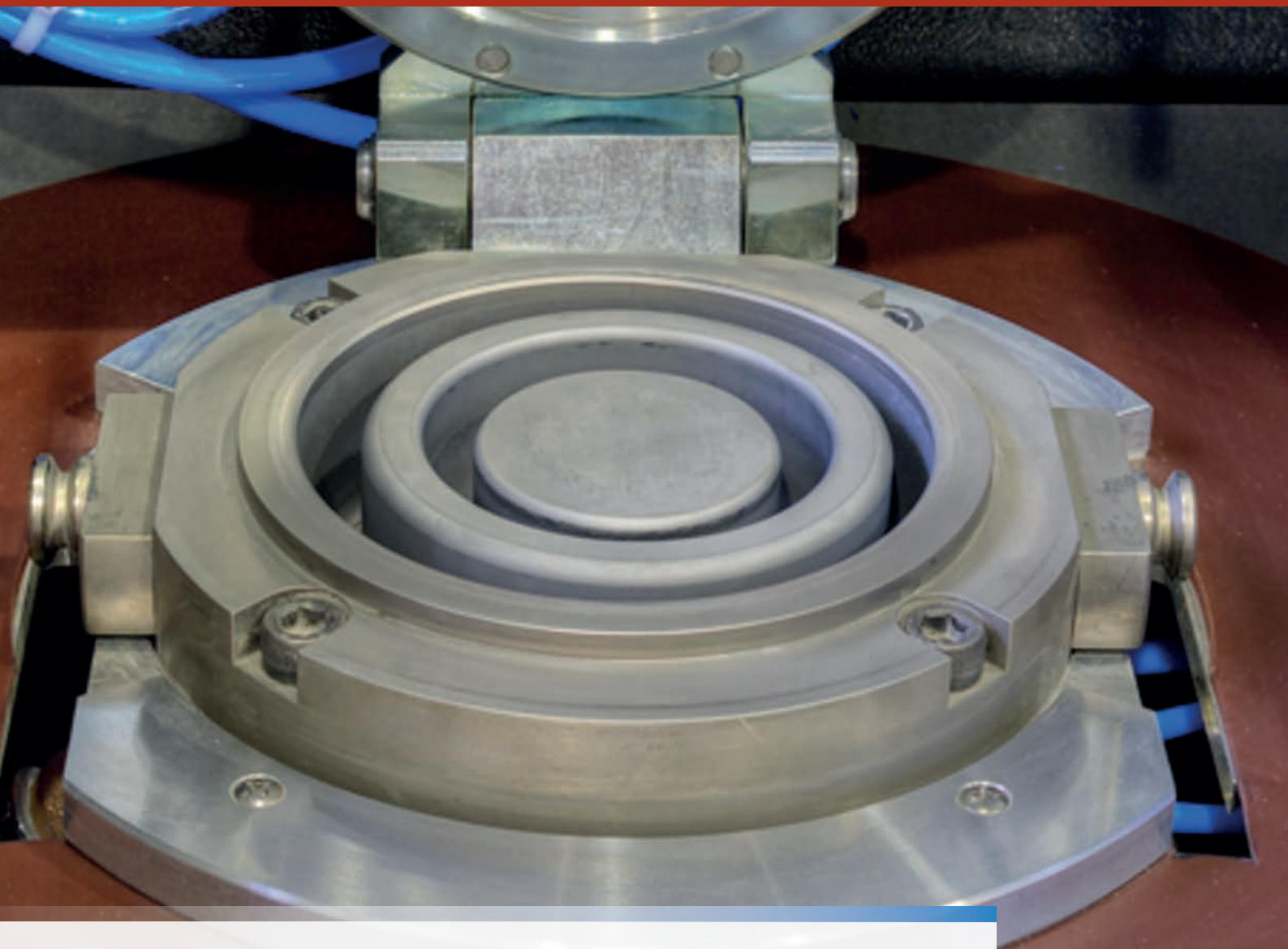
Slag sample preparation

Slag preparation involves special requirements. Our crushers, pulverising mills and pellet presses are designed to address these requirements. We offer magnetic separation for our crushers and mills accordingly. Accordingly, we offer magnetic separation for our crusher and mills. Furthermore, the pulverising process can be optionally combined with wet cleaning and blank sample dosing to avoid contamination. Our pellet presses can be equipped with several press tools.

HERZOG offers an entire range of slag preparation options, from full automation to manual material processing. A linear combination of crusher, mill and press is also available, which can easily be integrated into all types of automation.

With their modular design, the HP-CA crusher, the HP-MA pulverising mill and the HP-PA pellet press are especial-
ly suitable for linear automated systems. The fine tuning and the intelligent control of the machines lead to perfect
analysis results and short sample preparation times. There are multiple options available, including wet cleaning,
sample dosing with pre-sample disposition, and magnetic separation. The HP-CA/MA/PA is available with a variety
of input and output magazines and can be integrated into robotic automation systems.

HP-CA

The HERZOG HP-CA automatic
jaw breaker's comprehensive and
complete automation ensures pre-
cise, reproducible analytical results.
Careful cleaning by compressed air
after each crushing cycle prevents
contamination of subsequent sam-
ples. The fully enclosed and noise-
insulated HP-CA requires a mini-
mum of manual intervention and
maintenance. Emergency shutoff
switches ensure maximum safety.

HP-PA

All important parameters for the
pressing process can be adjusted
using the HP-PA interface.
Pressing pressure and sequence,
compression speed and pressure
holding time can be individually de-
fined in order to achieve the correct
properties for the analysis of every
individual pressed sample.

HP-MA

Various options make the HP-MA
the optimal machine for slag prepa-
ration, such as grinding vessel
wet-cleaning, sample dosing with
pre-sample disposition, and magnetic
separation. The high RPM of the
drive motor guarantees short grinding
processes, and the robust construc-
tion ensures a long service life.

HP-M100P	This fine grinding mill is suitable for the pulverisation of various types of sample material, including silicate, cement, ceramic material, ores, sinter and slags, as well as ferroalloys and various other minerals.
HSM 100	The HSM 100 offers the full benefits of HERZOG vibration mills – controlled grinding processes for the preparation of samples for XRF analysis. Control by a programmable controller results in a substantial improvement in the reproducibility of sample preparation and consequently optimum analysis results.
HTP 40/60	These presses offer the full benefits of program-controlled pressing processes. Control by programmable controller results in a substantial improvement in the reproducibility of sample preparation, and consequently optimum analysis results.
TP 20/40/60	This manually operated hydraulic press allows all common compacting operations to be carried out in the laboratory.
TP 40/2d / TP 60/2d	This manually operated pelletising press can be used to easily produce tablets with a variety of diameters (depending on the specifications of the spectrometer).
HSC 550/590	The HSC 550 and HSC 590 jaw crushers comminute medium-hard, hard, brittle and hard-tough materials such as slag, ores, oxide materials and ferroalloys. Depending on the model, the input grain size is max. 50 or 90 mm.
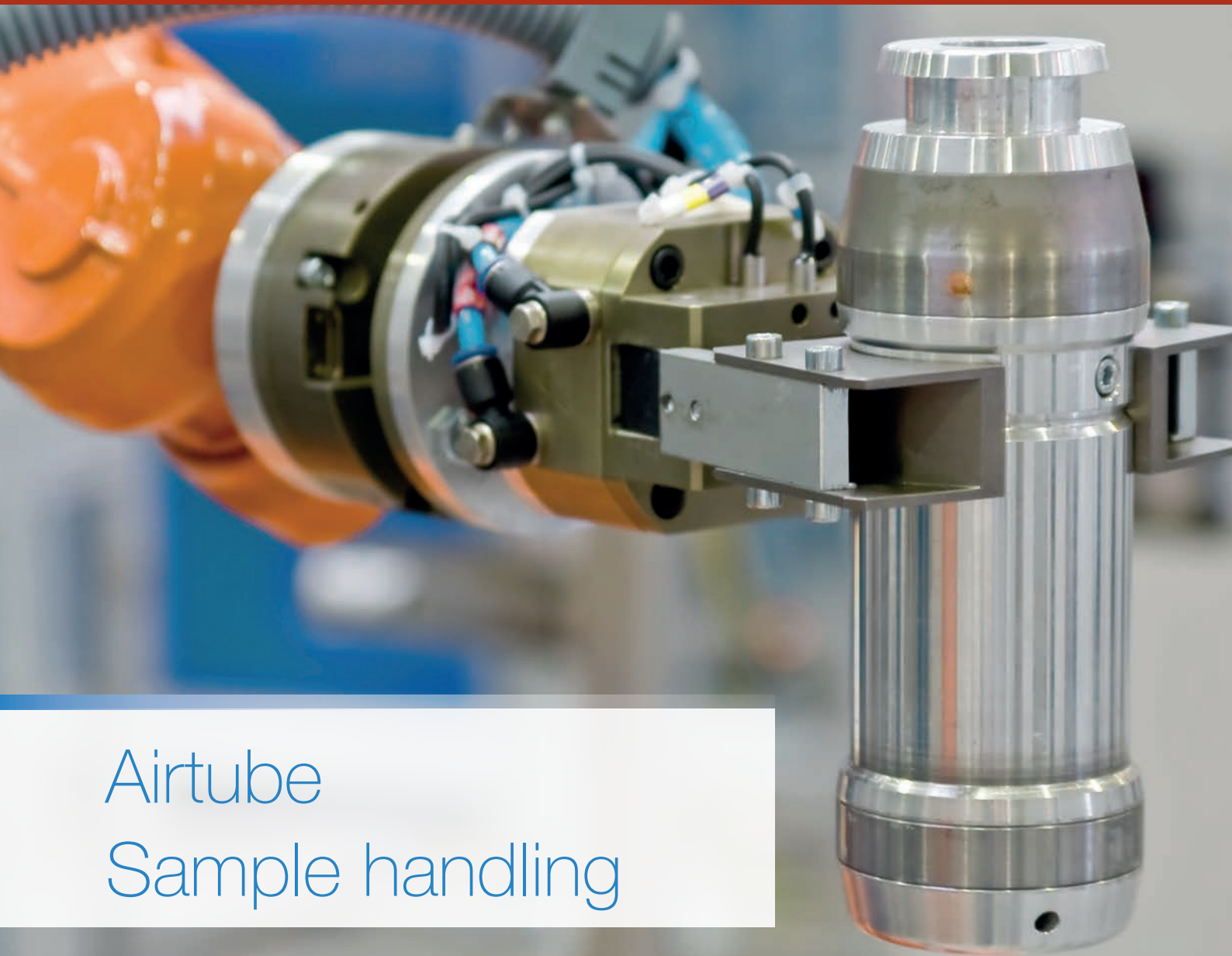
Airtube
Sample handling

HERZOG pneumatic airtube systems transport the samples reliably and quickly from the steelworks to the laboratory. Our decades of experience in this field enable installation even under difficult spatial conditions and over long distances. With the help of our sending and receiving stations, the sample information from the customer's manufacturing execution systems (MES) can be automatically integrated into the PrepMaster software. When the pneumatic tube arrives at the laboratory, the sample is automatically unpacked and aligned for subsequent sample preparation and analysis. Powdered samples, such as slag, are emptied into cups for further processing. This is done either in the receiving station itself or in special unpacking and transfer stations. In any case, all processes are optimised to achieve short throughput times and maximum plant availability.

HR-HSK/B

The HR-HSK/B is our plant station for sending and receiving airtube carriers from the steelworks to the laboratory. The steel, iron or slag sample is filled into the specific carrier, capped with the help of the integrated tool, and placed in the input position. After the sample ident has been selected by means of a pushbutton on the panel, the carrier is transported to the laboratory and can be unpacked there.

HR-HSK/L

The HR-HSK/L is the pneumatic airtube station for laboratory use. It is designed for receiving and sending airtube carriers in robot laboratories. The HR-HSK/L stations are set up in a circle according to the robot radius. The narrow design allows the integration of a large number of stations into one robot circle. After transport of the pneumatic tube from the HR-HSK/L by the robot to the unpacking station, the samples are removed and made available for further sample preparation and analysis. The operator can also take out the carrier manually via the front door. Numerous precautionary measures ensure the safety of operating personnel.
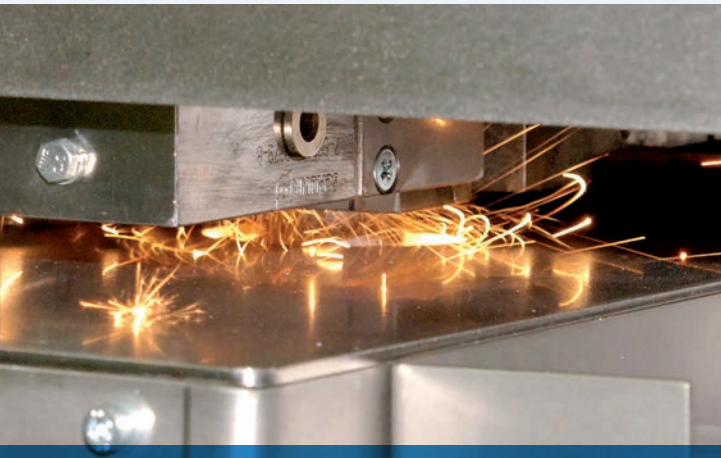
HR-LSM

The fully automatic HR-LSM sending and receiving station is suitable for receiving airtube carriers, opening them and automatically discharging the sample. The sample can be further transported by conveyor belts or a robot. The HR-LSM is capable of processing metallic samples as well as powder samples such as slag. The HR-LSM can handle different sample shapes such as lollipop, double thickness, or cylindrical samples with or without pins. All processes are optimised to achieve very short processing times.

HR-ES/L and HR-ES

The HR-ES/L is an automatic unit for handling steel and iron samples. After input by the robot, the carrier is emptied. The sample is transferred to the next robot circuit for milling or grinding, for example. Depending on customer specifications, the sample previously goes through water-cooling and drying by compressed air. The HR-ES/L can manage different sample shapes, including round, conical or lollypop samples.
The HR-ES is used to empty slag samples from the carrier into a sample cup. This can be transported to the slag line for further processing.

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HERZOG