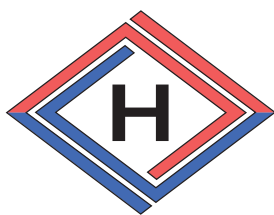


Plants and Systems for Resin Casting and Impregnation



HÜBERS
VERFAHRENSTECHNIK

The Know-How To Be Your Best

Customized machine concepts matched to
individual customer's specific requirements

1

Verfahrenstechnik HÜBERS: *Innovative technology* for higher quality and cost-effectiveness in the casting of

HÜBERS. The specialist in resin casting and impregnating technology.

Everywhere throughout the world where electrical parts have to be cast and impregnated with maximum precision and greatest economic efficiency HÜBERS is rated one of the leading names. The reason: HÜBERS continues to be one of the principal pioneers in resin casting technology and a world leader in this market.

HÜBERS. Facts and figures.

- Founded in 1937
- Headquarters: at Bocholt in Germany's state of North Rhine-Westphalia on the edge of the Ruhr industrial heartland and 70 km north of the international air port at Düsseldorf.
- 100 employees.
- More than 20 agencies and HÜBERS branches around the world
- More than 70 patents and utility models applied for since 1968.
- Since 1963 HÜBERS has built and installed over 1800 systems throughout the world.

What you can talk to HÜBERS about.

HÜBERS is the market-oriented, materials processing system supplier working concurrently with the electrical and electronics industries as system users, and with casting material suppliers in all questions of resin casting. **HÜBERS** is involved in all aspects from research and development needed to solve new problems to all matters arising in day-to-day production operations.

HÜBERS has the **know-how** to develop optimum customer-specific **solutions**.

The Know-How To Be Your Best

HÜBERS. Experts in all process technologies.

- Casting and impregnating,
- Atmospheric pressure, vacuum, vacuum-pressure and pressure-gelation,
- Single and multi-component systems.

HÜBERS. Supplier of individual components or complete systems.

- From storage and conveyor systems via mixing and metering units, degassing equipment, pressure and temperature generating units, casting chambers and moulds to dryers and curing systems.
- From laboratory-scale systems to fully automatic systems for high volume production with programmable logic controls and on-line quality assurance.

HÜBERS systems secure compe

Competition is placing ever more stringent requirements on electrical and electronic parts in terms of their precision, service life and cost-benefit ratio.

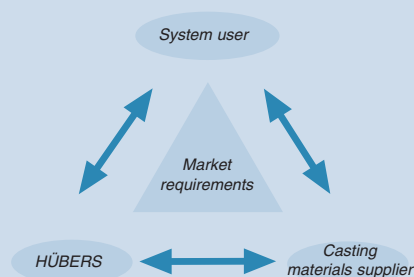
Advantages of parts produced on HÜBERS vacuum systems:

- Void-free structure, smooth surfaces
- Fulfilment of the highest electrical requirements
- Ready for installation - no rework necessary
- Constant, continuously reproducible quality

"Made in Germany" - "Made by HÜBERS"

HÜBERS is a world market leader in systems for ignition coils. In Europe nearly 100 % of all ignition coils produced in large series are cast on HÜBERS systems.

A defect in the ignition coil of a car can cause consequential damage, the cost of correcting which may be up to 30 times higher than that of the part itself. If a defect affects a complete series, the immense damage to the reputation of the car-maker has to be added to the above.



Switching pole housing

electrical and electronic parts.

titiveness.

The Know-How To Be Your Best. Some examples.

- HÜBERS static mixer: used as standard and suitable for all resin types; permits solventfree cleaning with the resin component.
- Ability to position the casting nozzles along 3 axes: the system gives high metering precision and long service lives and reduces maintenance costs.
- On-line monitoring with metering control device: 100 % check on the quality of the casting.
- Ceramic metering pumps: longer service life and precise metering even when using abrasive fillers.

Result: greater competitiveness.

HÜBERS. Innovative pacesetter for development.

Innovation, the basis of HÜBERS's success.

Working closely with system users and casting material suppliers, senior HÜBERS staff members are respected partners in the development of new processes and products. A convincing success story: 18 patents have been applied for in the last 15 years.



"HÜBERS innovations in process engineering help to secure tomorrow's markets for our customers", Josef Terhardt, Proprietor and Managing Director.



High-tech creativity in teamwork
Christof Pollmann, Mechanical Design manager, Ewald Bölting, Electrical Design manager, Bernfried Wiltig, Mechanical Assembly Manager

Insulator for high-voltage engineering

Examples of the many patents granted to HÜBERS.

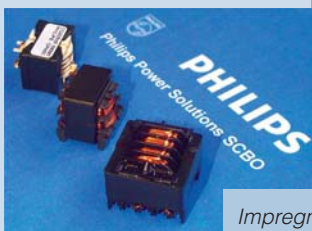
- 1992 Metering screw
- 1992 Multi-casting nozzle
- 1993 Electronic metering pump
- 1994 Electronic metering drive for multi-nozzles
- 1996 Ceramic metering pump
- 1997 Pressure-curing oven
- 2000 Continuous material preparation and compounding
- 2003 Vacuum filling and impregnating of high-performance capacitors

The HÜBERS development laboratory is available for companies interested in testing their own developments and new ideas. *The Know-How To Be Your Best.*

Cast-resin transformer for power distribution



Impregnated coil from the field of flat screen TVs



Challenge HÜBERS with your special applications.

Many other sectors of industry too are discovering new dimensions and opening up completely new markets for themselves with the aid of HÜBERS know-how in the area of multi-component resin casting and impregnating.



Verfahrenstechnik Hübers: *Design and manufacturing* of HÜBERS systems are optimized in terms of system avail

Technical advantages of HÜBERS systems.

HÜBERS systems are unparalleled in terms of their many patented details.

- Component preparation, mixing and metering technics
- Component degassing and preparation processes
- Devices for controlling and regulating the process
- Modular and low-maintenance structure.

The Know-How To Be Your Best. In-house innovations at HÜBERS.

- 1983 Process control department
- 1984 Development laboratory
- 1987 Introduction of CAE
- 1992 Introduction of PPC
- 1993 Introduction of CAD
- 1994 Modem-linked online service
- 1999 Setting up of a stand-alone service department
- 2001 Setting up of a training centre
- 2004 Construction of a new company head office building

The operators of HÜBERS systems reap the benefits therefrom.

- ✓ High and **constant product quality**, maintenance of tight manufacturing tolerances.
- ✓ **Assurance of outstanding properties** and long-lasting operational reliability of parts manufactured
- ✓ **Process parameters** such as mix ratio, casting volume, pressure, temperature and time are kept reliably constant and **are reproducible** but can be easily changed when required.
- ✓ **On-line quality assurance** of production processes.

✓ Easily realized, integrable **system options permit the use of all resin systems** in a wide spectrum of viscosities, levels of filler and formulations. Systems allow use of the products of all well known manufacturers and the majority of local manufacturers.

✓ **Low cost for service and maintenance.**

✓ Low sensitivity to operational disruptions and **high system availability.**

✓ **Assurance of future flexibility:** Each system can be converted for other processes, used for other products, rapidly retooled and - if required - enhanced or expanded.

✓ **Cost reductions** in raw materials, power, labour and retooling. Time savings in operating, cleaning, maintenance and service.



100 % quality products and manufacturing cost reductions are design objectives when the parts and details of HÜBERS systems are being engineered.

Electrical design and assembly work is carried out exclusively by HÜBERS's own, process-engineering personnel. The same holds for the electronic system control and the programming of the systems. This ensures

- proper matching of all electrical functions to the process-based components and the processes,
- disruption-free operations, and
- low cost for maintenance.

ability and productivity.

HÜBERS. Quality-conscious system engineering that accepts no compromises.

Quality starts in the mind.

Of decisive importance is the quality-consciousness of all HÜBERS employees. They know that the quality built into each system determines the quality of the parts that will be manufactured on it. HÜBERS employees are motivated by awareness of their own contribution to the success of their company. They feel responsible for their own work and are highly qualified.

Plus-points built into all HÜBERS systems.

- ✦ Strict quality checks accompany the manufacturing of each system; these start with checks on incoming goods and end with testing of the final system prior to shipment.
- ✦ High percentage of in-house manufacturing for all system components specific for the particular process.

- ✦ Selection of suppliers of high repute and with world-wide service networks for bought-in parts

- ✦ Working out of customer-specific solutions

- ✦ In-house planning and operator-specific programming of all systems by HÜBERS's own process engineers

- ✦ Customer-specific execution of the software and man-machine interface

- ✦ Prior to shipment: Assembly and functional testing of the complete system under the customer's production conditions with his production materials and producing his products.

- ✦ Flexibility in terms of HÜBERS production planning permitting excellent reliability in terms of commissioning dates as promised



The quality team.
Production manager Georg Heßling and his team

Quality assurance prior to shipment.
Assembly and testing of the complete system under customer's production conditions in the HÜBERS assembly shop.



Verfahrenstechnik Hübers: *Sales engineering and service* of high competence and reliability. From the planning stage

Hübers sales engineering sets new standards.

One notices the difference immediately. The people you interface with at HÜBERS - all graduate engineers from the best technical universities in Europe - know what they are talking about.

The Know-How To Be Your Best.

× HÜBERS sales engineering is always oriented on the requirements and wishes of the customer.

× Planning meetings frequently indicate new production and sales opportunities for HÜBERS customers.

× Comprehensive technical discussions with interested parties can naturally also cover opportunities for modernizing or extending systems by incorporating new, more efficient system components.

× Each enquiry from an interested party is converted into a concept customized to his present and future requirements.

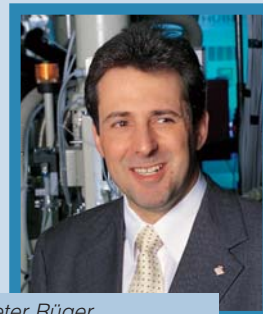
× The numerous special technical features incorporated in HÜBERS systems frequently enable quantum leaps to be made in a customer's production quality and productivity and give him marketing advantages.

× More than 20 agencies and branches around the world and the wealth of experience gained by HÜBERS from the installation of resin casting and impregnation systems in 45 countries provide the certainty that particular national requirements will be taken into account in the system concept proposed. Thus consideration will be given to the local raw materials situation, to the wishes of the customer that system components from suppliers in his domestic market be used, to the language and level of training of the operating personnel etc.

Your contacts at HÜBERS



*Rainer Bardenschlager,
graduate engineer*

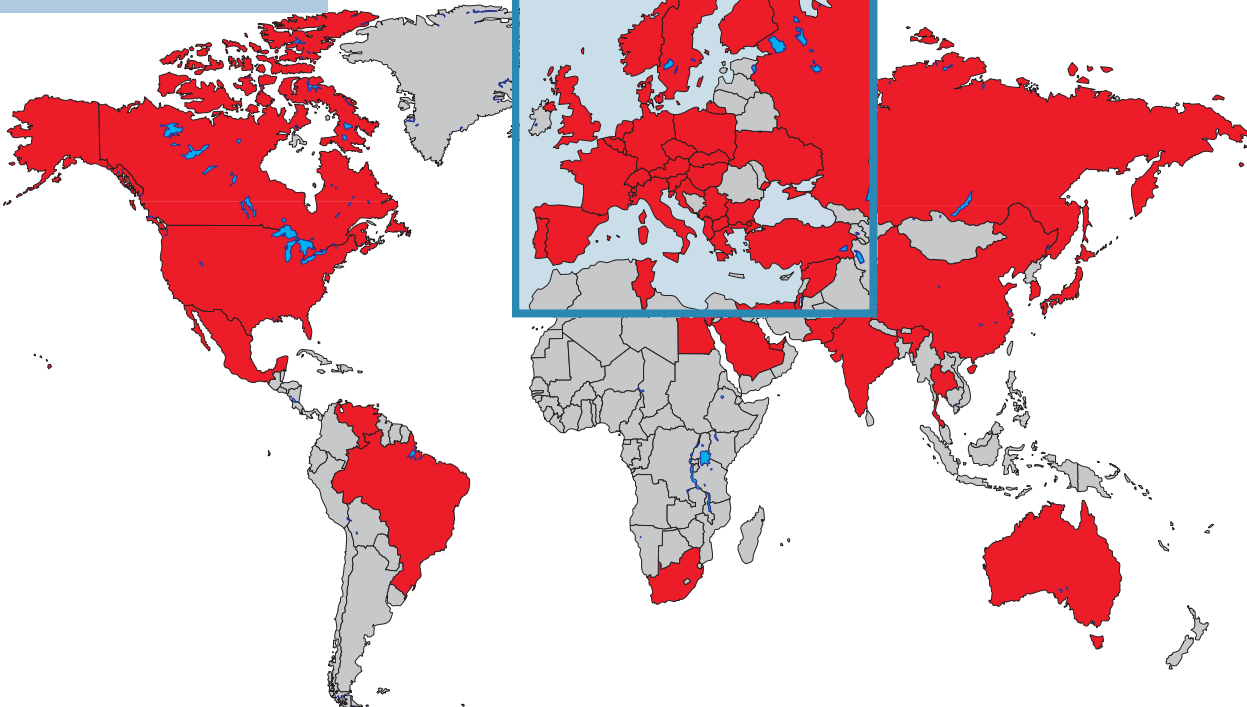


*Peter Rüger,
graduate engineer*



*Hanno Steinzen,
graduate engineer*

The international scale for quality and productivity:
HÜBERS has installed more than 1800 systems in 45 countries around the world.



to support on everyday operational matters.

The service concept maximizes the productivity of HÜBERS systems.

HÜBERS feels responsible for the availability and productivity of its systems throughout their complete service life. This brings results.

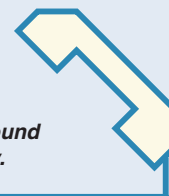
The HÜBERS service philosophy accepts no compromises.

→ Prior to shipment: Assembly and functional testing of the complete system; test runs with the customer's production materials and in his presence.



→ Training of the personnel who will operate HÜBERS systems is carried out at acceptance testing and at the customer's facility.

→ The comprehensive technical documentation and complete operating instructions represent important items in the package of quality and productivity advantages inherent in HÜBERS systems.



HÜBERS is available around the clock 24 hours a day.

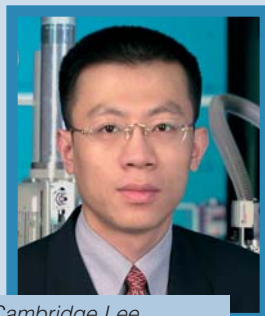
for productive solutions.

Someone is always responsible. Responsibility is not divided.

→ The same HÜBERS team that has built a system also installs it at the customer's.
→ All HÜBERS systems are designed for easy maintenance and troubleshooting. The fact that all controls were conceived and programmed by HÜBERS means that operational disruptions can be localized immediately.
→ The depth of vertical integration gives HÜBERS flexibility and speed in the supplying of replacement parts.



Markus Schlütter,
graduate engineer



Cambridge Lee,
graduate engineer,
HÜBERS China



Shigeru Kurata,
graduate engineer,
HÜBERS Japan

HÜBERS
Head office and production
facility in Bocholt, built 2004



Verfahrenstechnik Hübers - *the name for high performance.* Vacuum mixing and metering systems *for the electrical*

A high performance vacuum-epoxy-system for cast-resin transformers.



They must be dischargefree, resistant to surge voltages and compact. Coils are produced by an environmentally friendly process. The casting of cast-resin-transformers requires the highest uniformity of mixing and absolute precision at metering.

In spite of the use of abrasive fillers, this system operates with a high level of availability and requires virtually no maintenance.

- The cast-resin transformers are cast fully automatically first under vacuum and then under pressure, the complete process being microprocessor-controlled.
- The system uses a preformulated multi-component resin with quartz powder as filler.
- Ceramic metering pumps able to stand up to the abrasive filler are driven synchronously by brushless servomotors.
- Electronic on-line control of the metering as well as of the overall process ensure uniform quality of casting.
- Vacuum metering-mixers with high performance degassing units provide optimum degassing with materials of all viscosities for both continuous and discontinuous processes.



Vacuum mixing and metering for the production of superconducting magnets in magnetic-resonance tomographs.

Requirements to be met by the part to be cast: high mechanical strength and fracture toughness at - 269 °C. The photo shows the three chambers for casting under vacuum followed by application of pressure. Each mould group, which is loaded into the casting chamber, can be identified by barcode.

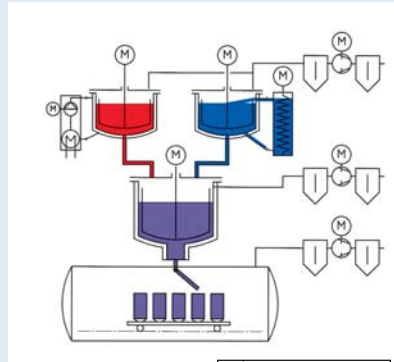
industry.



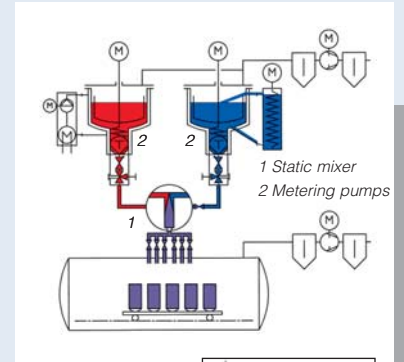
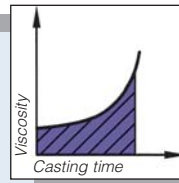
The HÜBERS system - the decisive factor in the fight on prices and quality and for customers.

Resin casting and impregnation systems from HÜBERS permit the production of electrical parts fulfilling extraordinarily high quality demands and reduce manufacturing costs. Modern, efficient HÜBERS systems are an important instrument in the permanent struggle to stay competitive.

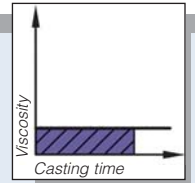
The Know-How To Be Your Best. The advantages of HÜBERS's multi-component metering technology.



Batch mixing



Hübbers technology



Process sequence

With batch mixing under vacuum, the resin and hardener components are measured into the mixing chamber manually and mixed discontinuously. Casting is carried out under manual control and gravity.

Precisely functioning metering pumps press the premixed non-reactive components synchronously into the HÜBERS static mixer. Here the components are brought together for the first time and are mixed to give the reactive mix. Only that quantity of reactive mix that is required is produced.

Viscosity, reactive mix

The viscosity increases continuously during the mixing process. Relatively large quantities of reactive mix are prepared.

The viscosity remains constant during the casting phase. The static mixer contains only the very smallest quantities of the fresh, reactive mix.

Precision of mixing

Depends on the operator.

Does not depend on the operator.

During production stops

The reactive material that has been mixed must be used or is wasted. Cleaning has to be carried out with environmentally unfriendly solvents.

The casting process can be interrupted by chilling the static mixer. Only small quantities of material are lost at cleaning. Solventfree cleaning is carried out using the resin component.

The HÜBERS technology ... and its advantages

HÜBERS metering pumps

Piston-type metering pumps with constant delivery pressure, driven from above via the stirrer axis.

6-fold vacuum sealing that does not come into contact with the casting resin. Quickly changed insert modules to permit different quantities of casting resin. Option: fully ceramic version.

- Metering out from an evacuated container
- All materials can be metered precisely regardless of the proportion of filler they contain.
- Maintenance-free and wear-resistant; no loss of pressure even with relatively long pipe systems as may be given with multiple casting valves.
- The pumps function independently of gravity.
- Long service life even with highly abrasive materials.

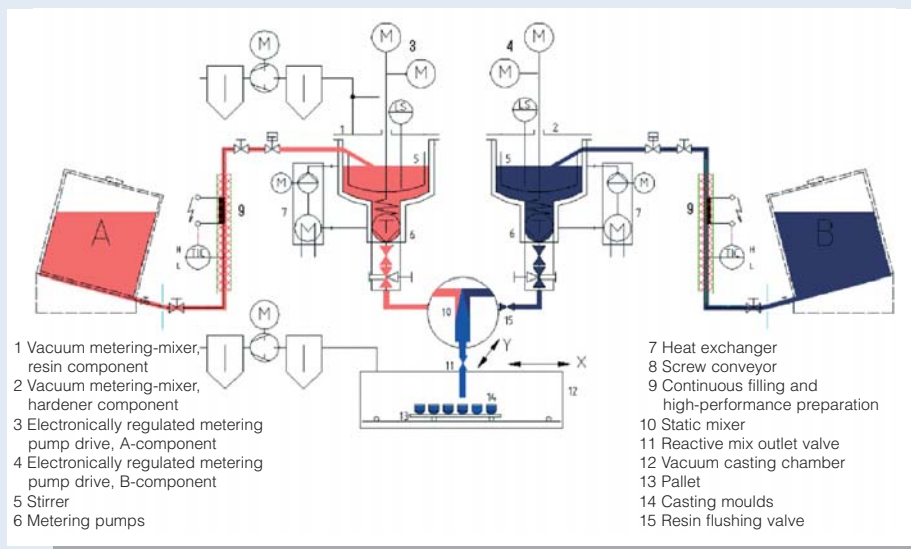
HÜBERS metering pump drive

The metering pumps can be driven alternatively either with (1) central drive with adjustable lever arm system or via (2) electronically controlled servomotor drives.

- The two metering pumps run synchronously guaranteeing exact maintenance of the mix ratio.
- (1) Simple and cost-effective
- (2) More flexibility in selection of the casting parameters.

Continued on page 10

The Know-How To Be Your Best. Further advantages of HÜBERS's multi-component metering technology



The HÜBERS-technology... .. and its advantages

HÜBERS vacuum metering-mixer

Mixer vessel with large diameter and low height. Special shape of the stirrer, optimally matched to the vessel geometry; < 1 mm bottom clearance; slow-running. Regulation of vessel temperature via double jacket.

- Large surface to give optimum preparation of the material.
- Thorough, gentle mixing to give high level of homogenization.
- Optimum degassing even without high performance degassing unit.
- Casting resin material that is uniformly degassed and prepared regardless of its viscosity.

HÜBERS continuous material preparation and degassing system

This is used in order to enable systems to be made capable of three-shift working when pre-mixer groups are dispensed with. It can also be retrofitted to increase the capacity of existing systems in a cost-favourable manner whereby the proven conventional material preparation equipment is retained.

- Good preparation and homogenization of the components.
- Minimum dwell time of the materials in the material preparation containers.
- Minimization of the work necessary when changing the delivery container.

HÜBERS static mixer

No moving parts, vacuumtight, low volume, no dead space, easy to assemble. Optionally able to be chilled and/or heated.

- Able to be used with a very wide range of mix ratios and viscosities.
- Can be flushed out with the resin component.
- Easy to maintain, long service life.

HÜBERS casting systems

Single casting valve or patented multiple nozzle metering system. HÜBERS static mixer and casting resin valves can be moved in a vacuumtight manner along the Y axis over the pallet. The latter can be moved along the X axis.

Optional: triple-chamber automatic casting unit with one loading chamber, one casting chamber and one unloading chamber to shorten process cycle times and increase capacity. Patented metering-monitoring system for process control.

- Material passes directly from the HÜBERS static mixer and casting valve into the mould.
- Voidfree and dripless casting.
- No contamination of the parts or casting chamber from dripping.
- Smaller quantity of reactive mix, uniform temperatures, higher quality and precision of casting - even with multiple nozzle systems and very small casting quantities.
- Quality-assuring automatic process control giving high production capacity.
- Each unit can be used both under vacuum and at atmospheric pressure.

Hübers - the name for Vacuum mixing and

Vacuum and atmospheric casting

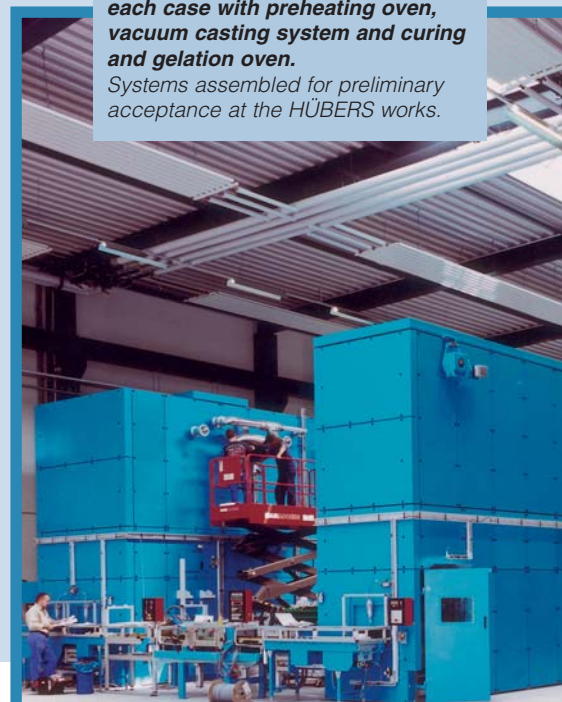
Precision continuous flow system for the production of over 3 million ignition coils per year in 3-shift operation.

- 8 casting valves able to meter out even very small quantities with maximum precision for void-free and dripless casting.
- Casting is carried out first under vacuum; it is then completed under atmospheric pressure to give a top layer, both stages being in the same cycle.
- The system uses filled, cold-curing epoxy resin of high reactivity.
- Full curing in the inline-conveyer or oven.
- Quality and process control with patented metering-monitoring system and monitoring of the active, electromagnetically operated non-return valves.



Complete production lines for ignition coils and pencil coils, in each case with preheating oven, vacuum casting system and curing and gelation oven.

Systems assembled for preliminary acceptance at the HÜBERS works.



precision. metering systems *for the electronics industry.*

for the large-scale production of ignition coils.



**"Made in Germany" -
"Made by HÜBERS"**

It is no accident that HÜBERS is a world market leader in systems for ignition coils. Thus in Europe nearly 100 % of all ignition coils produced in large series are cast on HÜBERS systems. A defect in the ignition coil of a car can cause consequential damage, the cost of correcting which may be up to 30 times higher than that of the part itself. If a defect affects a complete series, the immense damage to the image of the make of car has to be added to the above.



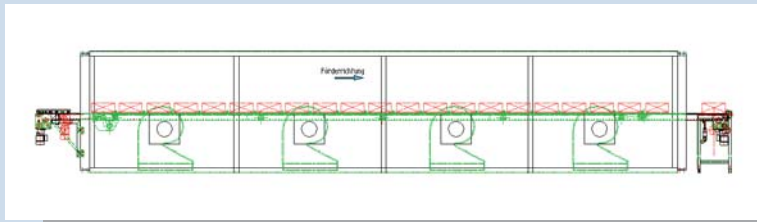
Vacuum casting chamber with 8-fold nozzle able to be moved in a vacuum-tight manner in the casting chamber longitudinal direction, executed as triple chamber automatic unit with downstream atmospheric casting system with 4-fold nozzle able to be moved at right angles to the direction of conveying. System capacity: 8 million ignition coils per annum.

Oven systems from HÜBERS round off the whole.

Guaranteed reproducible processes for each component.

• VTH offers everything from under one roof - whether it be a unit for integrating into a complete system or individual components, whether it be a standard solution or an oven for a particular individual application.

HÜBERS high-performance inline-conveyor oven

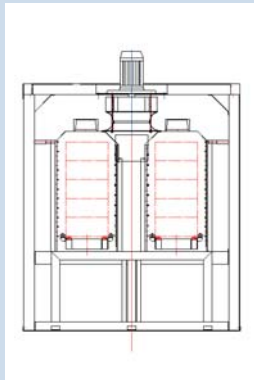


Principle: Pallets pass through the oven one after the other.

Benefit: Cost-favourable solution when the space requirement is not a problem; low overall height; multi-stage temperature profiles with defined ramps can be set.



HÜBERS automatic batch oven

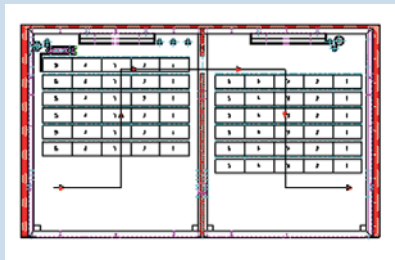


Principle: The oven is charged with pallets whereby it is kept at a temperature below the gelation temperature. After the last pallet has been loaded, the temperature cycle is started for all the pallets. The oven is emptied in a rapid process after the complete temperature profile has been run through.

Benefit: Very compact form of construction; multi-stage temperature profiles with defined ramps can be set.



HÜBERS stack oven

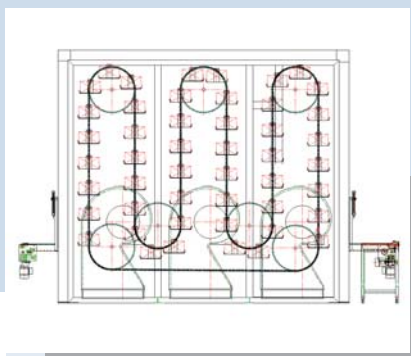


Principle: Pallets are loaded into the oven. When each row has been filled, all the rows of pallets are lifted up by one level. When one row of pallets has reached the uppermost position of a temperature range, it is pushed into the next temperature zone and from here is lowered down in fixed time cycles and unloaded.

Benefit: Compact form of construction; each pallet passes through exactly the same temperature profile.



HÜBERS serpentine conveyor oven



Principle: Pallets are loaded into the oven in fixed time cycles and pass through the individual temperature zones.

Benefit: Relatively compact form of construction; each pallet passes through exactly the same temperature profile. Result: precisely reproducible process conditions.



COMPACT from HÜBERS - the way to start on state-of-the-art casting. The *cost-effective, expandable compact solution* for absolutely void-free parts.

With COMPACT HÜBERS makes its know-how on large systems available for small and medium-sized production runs.

COMPACT: a unique combination of advantages and performance characteristics.

● **Atmospheric/vacuum:** Metering from vessels optionally either at atmospheric pressure or under vacuum (vacuum down to 1 mbar without any problem) with casting.

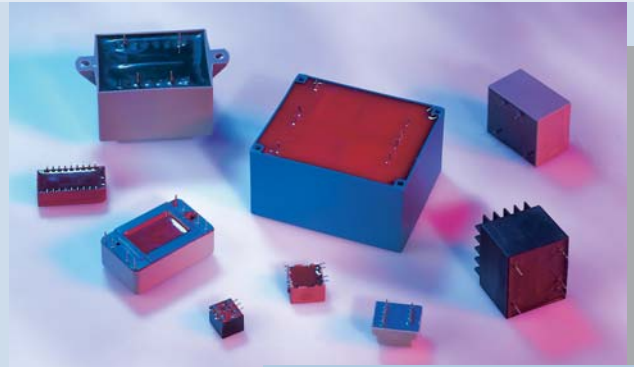
- at atmospheric pressure via a flexible casting gun.
- on a table permitting 2-axial positioning (atmospheric or under vacuum) or
- in a vacuum casting chamber.

● **Productivity:** a dual-plunger pump in each vessel saves time, permits continuous casting without waiting times and gives higher productivity.

● **Casting quality:** COMPACT makes HÜBERS's vacuum mixing and metering know-how - as practice-proven on large systems - available for optimization of quality with small and medium-sized production runs. The well known advantages of HÜBERS's metering vessels, metering pump drives and static mixers are also realized here.

● **Flexibility:** The compact system mounted on its trolley can be moved from manufacturing island to manufacturing island - to give production flexibility.

● **Security for the future:** Modular, easy-to-maintain construction; able to be converted to meet new requirements; if necessary able to be enhanced for filled and abrasive casting resins.



With COMPACT you can open up attractive niches in the market - primarily in the areas of epoxy, polyester, polyurethane and silicone castings, e.g. of inductive components.

The Know-How To Be Your Best.

Basic version

- System able to be moved, with 2 x 25 l HÜBERS preparation vessels (suitable for polyurethane, epoxy polyester or silicone)
- HÜBERS metering pump technology, dual-plunger pumps for high precision even with small casting quantities
- Electronically regulated metering pump drives with mix ratio freely adjustable
- Microprocessor control / PLC; system parameters freely programmed via the CRT
- Resin flushing valve, static mixer, vacuum-tight construction
- Equipped for casting at atmospheric pressure with nondrip, single casting nozzle with potlife control (also able to be used under vacuum)



Compact system: Vacuum casting for silicone applications with downstream curing oven and casting of the cap with filled epoxy resin at atmospheric pressure for high-performance semiconductors; automatic transportation of the pallets between the individual processes.

Quality and cost advantages: Vacuum mixing and metering systems for *Automatic Pressure Gelation (APG)* from HÜBERS.

If APG, then by direct injection with HÜBERS technology.



20 kV lead-through insulated support produced by the APG process.

The innovative APG technology from HÜBERS.

In contrast to the APG pressure vessel casting process which is still widely used, HÜBERS uses two-component metering with direct injection. In combination with the HÜBERS static mixer and the HÜBERS metering pump technology, the direct injection process opens up new dimensions in terms of quality and economic efficiency.

Faster and more productive: centralized supply for a number of clamping machines.

Automatic pressure gelation (APG):

Short cycle times thanks to rapid gelation and demoulding with automatic opening and closing of the mould. During the gelling process, **fresh material is supplied continuously to the mould under pressure** in order to prevent cracks and voids and to compensate for the shrinkage of the material. The mould is held together by the clamping machine.

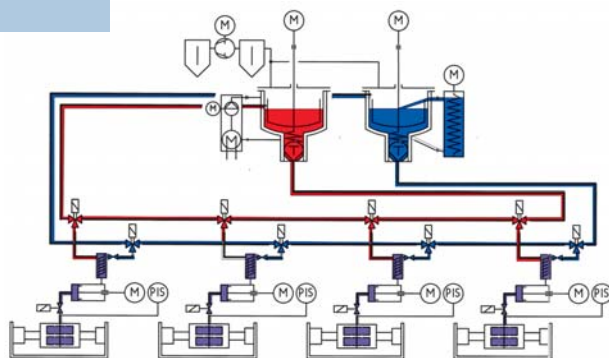
APG production system

Continuous mould-filling process via static mixer with shrinkage compensation unit; clamping machine with upper and lower core pullers; compact arrangement for direct injection.



The Know-How To Be Your Best. Die HÜBERS direct injection.

The degassed **material is injected into the APG mould directly from the static mixer**. Shrinkage compensation is carried out by the HÜBERS metering pumps. **One central mixing and metering system can serve a number of clamping machines**. In this case each clamping machine has its own static mixer positioned directly in front of the mould and also has its own shrinkage compensation unit to maintain the pressure. The system is supplied via a ring line which requires no maintenance and is free of sedimentation. In principle the length of this line is immaterial.



Advantages of HÜBERS direct injection.

- + **Uniform material and product quality** thanks to constant reactivity, constant temperature and constant viscosity of the material. No sedimentation of fillers anywhere in the system.
- + **Shorter production cycles** with shorter clamping times. The system can be run with significantly higher mixing temperatures.
- + **Can also be used for highly reactive epoxy resins or polyurethane.**
- + **Exactly maintained and reproducible process parameters, which can be checked online,** ensure uniform quality.
- + **Lower expenditure for cleaning, elimination of solvents, considerable reduction of the resin wastes** through compact form of construction.
- + **Optimization of the process sequence** because even complicated moulds can be filled with the aid of electronically variable casting speeds and freely programmable tilting angles of the clamping machines.

APG technology complete from HÜBERS. Including *operator-friendly clamping machines.*

Typically HÜBERS: accessible, tiltable and automatic.

HÜBERS clamping machines permit the productivity advantages of APG systems to be fully realized ...

- ✓ They are **freely accessible from all sides**. The mould too is easily accessed.
- ✓ They are able to be **tilted and rotated around a number of axes**. This enables the moulds to be inserted by automatic lifting devices.
- ✓ The **static mixer** can be **directly docked** on to / decoupled from the **filling nozzle**. The short path with just a small quantity of reactive mass ensures the uniform, homogeneous quality of the cast component and minimizes wastage of material.
- ✓ **Core pullers** can be fitted **everywhere they are needed**.
- ✓ **Construction withstands rigorous continuous operation** and high static loading but at the same time slim, cost-saving design.
- ✓ The HÜBERS clamping machines can be **rapidly retooled** for other APG moulds.

... but they offer even more: Universal clamping machines

- ✓ Modular system for customer-specific, cost-favourable design
- ✓ Starting from the basic model, HÜBERS universal clamping machines can be enhanced and/or expanded - in accordance with the particular market and order situation - to ever more efficient and capable systems.
- ✓ **Right for the future** because each work step can be carried out in a **microprocessor-controlled manner** or enhancement carried out in steps to the same end.

Productive and automatic

From the closing of the mould via the securing of the core pullers, the connecting of the casting valve to the demoulding process. HÜBERS clamping machine for APG moulds, clamping area 1000 x 800 mm.

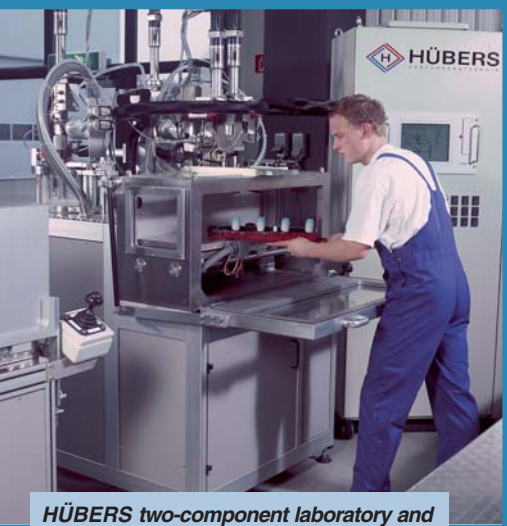


Vacuum APG: A fixed central part and two mould clamping platens able to be moved with linear guides form the vacuum chamber: this has four clamping cylinders on each side to give a total closing force of 90 tons.

The clamping machine shown in the photo is used for the production of medium-voltage switchgear parts of epoxy resin. The system is characterized by its excellent accessibility permitting easy mould changes, the high clamping forces and its ability to take heavy moulds (1.5 tons), the opening width of approx. 1.4 m on each side, the accessibility from all 4 sides and the operating via a touch-screen with WIN 2000 operating system.



With the Know-How from HÜBERS: *Laboratory and special systems.*



HÜBERS two-component laboratory and short-run casting system of type Micro with A and B preparation containers, static mixer and vacuum casting chamber.

Vacuum mixing and metering system for the determination of special mixes.

Integrated mixing device which can be lowered in. The use of one-way vessels means that mixing vessels are not contaminated and do not have to be cleaned.



HÜBERS's know-how and technology are available for the testing and developing of new ideas.

Leading manufacturers of casting resins and impregnating systems make use of our laboratory systems for the developing and testing of new products and processes. The following are available:

- Batch-mixer with casting chamber as the simplest, most cost-favourable version for vacuum casting.
- 2-component vacuum casting systems for laboratory work and short runs.
- Vacuum / overpressure impregnating systems.
- HÜBERS can offer laboratory and special systems suitable for every development project.
- **Ask HÜBERS!**
HÜBERS can work out special developments for the mastering of new challenges.
- **HÜBERS offers:**
Use of the HÜBERS laboratory for joint development projects.

The small ones possess the same advantages as the big ones.

- ✚ Use of the same control and metering techniques
- ✚ Transferability of the results obtained on the laboratory systems to production systems.
- ✚ These systems too can be expanded and enhanced retrospectively.
- ✚ **The Know-How To Be Your Best.**

Vacuum / overpressure laboratory impregnating system

for new technologies in the transmission systems for the car industry.



Quality optimization from the very start:

Storage and conveyor systems, vacuum compounding and material preparation systems from HÜBERS.

Everything for the complete solution.

HÜBERS offers all the system components required for quality-optimized material flow from the point of the receipt.

Storage and conveyor systems

to permit the raw material to be purchased more cost-favourably and processed more reliably:

× Storage and metering tanks for fillers and pigments in powder form:

silo systems, bag emptying cabinets and container systems.

× Storage tanks for components in liquid form

such as resins, hardeners, accelerators and flexibilizers.

× Conveying and metering systems

for the controlled delivery of the components in powder, granulated and liquid form as well as in highly viscous paste form to the material preparation systems: delivery pumps with dry-running safeguards, electronic metering scales

for the continuous controlling and recording of the quantity being delivered.

Compounding and material preparation systems to permit cost-favourable in-house formulating and preparation in place of the purchasing of preformulated material:

× Vacuum dryers for the preparation of fillers under vacuum and at controlled temperatures with measuring and conveyor systems for the exact delivery of the filler to the vacuum metering-mixer.

× Continuous and discontinuous material preparation and metering for optimum casting quality.

× Melting containers for material delivered in highly viscous or solid form. The transport containers are emptied without any residue or sediment being left in them; melting and material preparation in one operation means the melting oven can be dispensed with.

The merits of modularity: the profitable path into the future.

All HÜBERS system components have been designed to be fundamentally modular and can be put to use in a flexible manner. The advantages:

- + Existing system parts can continue to be used **following capacity increases.**
- + Systems **can also be used for other products.**
- + Systems **can be changed over to other processes**, e.g. from vacuum casting to casting at atmospheric pressure or to pressure gelation or vice-versa.
- + Systems **can be expanded** for pressure gelation in parallel and/or for casting under vacuum or at atmospheric pressure in parallel, the units being supplied in each case from central mixing and metering systems.
- + **Ability to enhance** manual systems to fully automatic casting lines.

Result: Minimizing of production costs, ability to adjust to the particular market and production situation.

The Know-How To Be Your Best.



Vacuum compounding system:

Transfer of the filler from the bag emptying cabinet via the screw conveyor into the vacuum dryer. This stands on an electronic weighing machine to permit the amount added to be checked. The container on the left in the foreground serves for the melting of the solid resin which is then added to the premixer via the delivery pump and flowmeter. Filler from the dryer is added and the material homogenized.



Unloading station permitting big bags of filler to be emptied in an operator-friendly and dustfree manner.

HÜBERS impregnation systems for every task.

HÜBERS. The specialist for impregnation system technology.

→ Compact impregnation systems with vessels in all required sizes.

→ Vacuum and vacuum-pressure impregnation (VPI) systems of every type and for all impregnating media.

→ Vacuum impregnation systems for electrical components, cast metal parts, refractory products etc.

→ Vacuum drying and impregnation systems.

→ Atmospheric impregnation systems.

→ Oil impregnation systems.

HÜBERS. Metal impregnation systems.



Engine blocks of a special aluminium alloy as examples of components, with which the pores that have arisen at casting are sealed with a vacuum metal impregnation system. This ensures the quality of cast metal parts which have already been machined but are not tight.



Fully automatic vacuum metal impregnation system with vacuum impregnation vessel, integrated stock vessel and dripping station with centrifuge, washing vessel, flushing vessel and curing vessel with dripping station. The components, which are in frames, are conveyed to the individual process stations fully automatically with a lifting harness. The washing and flushing water is recovered in a recycling system. Impregnation agent, washing water and flushing water are recycled and then led back to the processes again. The components are locked in / locked out fully automatically in the upstream loading station and the downstream unloading station.

HÜBERS. Impregnation systems for electrical engineering.



Impregnated coils from the field of flat screen TVs.

Systems, that can be retrofitted in modular manner, for the manual, semi-automatic or fully automatic series production.

- The components hanging down in the pallet are positioned in the reception device on the left and are then moved under the open lid of the impregnation chamber.
- The lid is lowered pneumatically and the chamber is closed.
- After the chamber has been evacuated, the impregnating agent is sucked into the chamber. An overflow weir in the chamber ensures that the impregnating agent is always at a constant level and prevents the connection contacts being wetted.
- Finally the atmospheric pressure is restored in the chamber, the impregnating agent is drained off and the lid is raised. The pallet is moved out to the right to the dripping-off position.
- To reduce emissions, this system can also be supplied in an encapsulated version.

Micro-casting system from HÜBERS for the precise casting of the very smallest quantities.

HÜBERS. Just 5 mg of highly abrasive material can be cast under vacuum.

✦ Casting of the very smallest quantities of highly filled abrasive casting resin under vacuum or at atmospheric pressure.

✦ Shot sizes of down to 5 mg are possible.

✦ One or two components can be metered in under vacuum from cartridges.

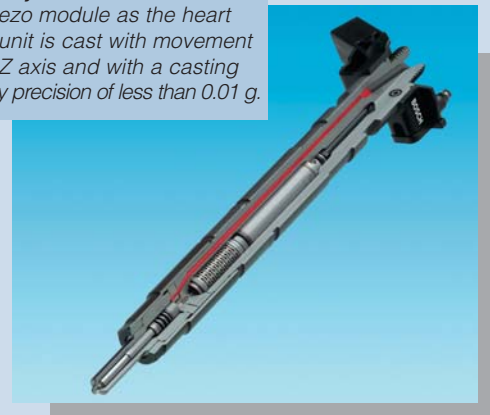
✦ Able to be integrated optimally in cell form of construction into flexible manufacturing lines.



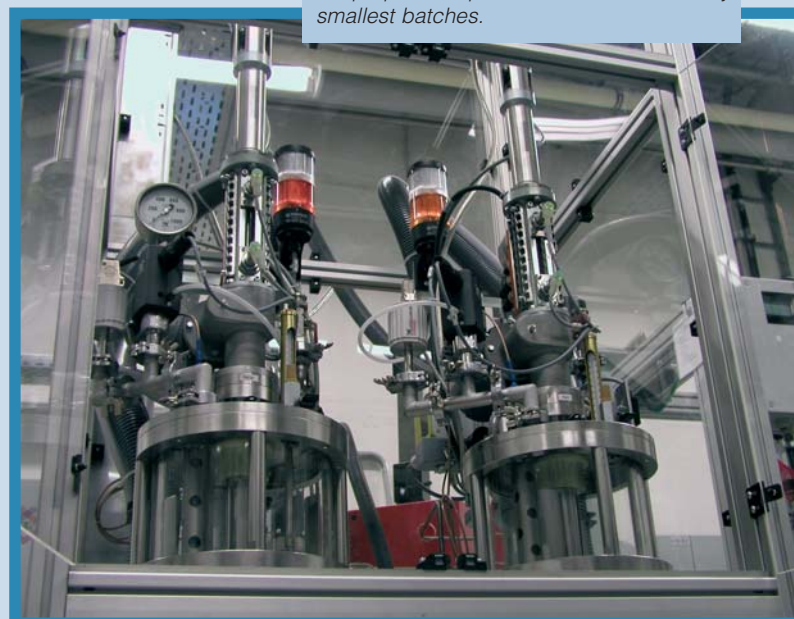
Atmospheric casting
of highly abrasive silicone mass that has been prepared under vacuum. Here individual casting stations are integrated as cells into a manufacturing line.

Diesel injector.

The piezo module as the heart of the unit is cast with movement of the Z axis and with a casting quantity precision of less than 0.01 g.



Vacuum casting
of piezo actuators with silicone mass, integrated in the injection valves of internal combustion engines. 4 components are cast simultaneously with a quantity precision of less than 0.01 g.



Micro metering-mixer group in glass cylinder design for optimum observation of the preparation process, even with the very smallest batches.

The Know-How To Be Your Best

We shall be pleased to send you further additional information on:

Electrical industry
Electronics industry

Resin casting and impregnation engineering

The Know-How To Be Your Best

- in resin casting and impregnation engineering for higher quality and cost efficiency in the production of electrical components.

1

Electrical industry

Vacuum mixing and metering systems

- Multi-component vacuum/ atmospheric casting systems
- Systems with single casting head
- Systems with multiple casting heads
- High-performance compounding and material preparation systems

2

Electronics industry
Electrical industry
Automobile industry

Impregnating systems

- Batch mixer systems
- Two-component systems
- Atmospheric / vacuum casting systems
- Vacuum / pressure impregnation systems
- APG systems
- Special systems for each development task

3

Electronics, electrical, chemical, and plastics industry, special applications

Laboratory and special systems

- Batch mixer systems for vacuum casting
- Two-component systems
- Atmospheric casting systems
- Laboratory and special systems for every development problem

4

Electronics industry

Vacuum mixing and metering systems

- Multi-component atmospheric casting systems
- Multi-component vacuum casting systems
- Systems with single casting head
- Systems with multiple casting heads
- High-performance degassing

5

Electrical industry

Systems for automatic pressure gelation

- Vacuum-mixing and metering systems with direct injection
- Single casting heads
- Ring-line systems

6

Electrical industry

APG clamping machines and moulds

- Universal clamping machine
- Special solutions
- Moulds

7

Electrical industry

Vacuum compounding and material preparation systems

- Storage systems for solids and components in liquid form
- Conveying systems for solids and fluids
- Filler dryers
- Mixers
- High-performance mixing and degassing systems

8

Electronics industry
Electrical industry

Drying and curing systems

- Batch ovens
- High-performance inline-conveyor ovens
- Stack ovens
- Serpentine conveyor ovens
- Pressure curing ovens
- Special ovens
- Transport and conveying engineering

9

Electronics industry

Compact

- Multi-component atmospheric casting system
- Multi-component vacuum casting system
- Systems with single casting head

10

Electronics industry

Micro

- Smallest-quantity metering systems
- Single component atmospheric / vacuum casting systems
- Multi-component atmospheric / vacuum casting systems
- Systems with single and multiple casting heads

11



HÜBERS
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