

Preface

Dear customers, dear electric machine manufacturers and all those interested in electric machines and systems.

In more than 25 years a small craft business has developed into a medium-sized enterprise in central Germany, operating in the field of electrical engineering. During this period, with the help of regional and European funds a technology company with unequalled opportunities has been established.

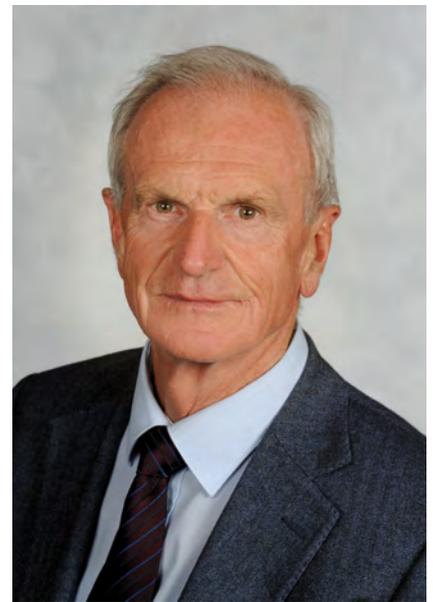
This catalogue offers a detailed insight into the technology of today's electrical engineering. It intends to be far more than a list of technical parameters: we would like to provide you with suggestions for possible alternatives that we can

offer in addition to your production options and processes.

Furthermore, this documentation can help interested apprentices, students, technologists and other experts in the field to further become acquainted with the technology of electrical engineering.

I would appreciate it, if this catalogue could establish new contacts and business relations and provide new impulses.

Thank you for your interest!



Yours faithfully
Dipl.-Ing. Ing. Thomas Partzsch

A handwritten signature in blue ink, appearing to be 'T. Partzsch', written in a cursive style.

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Introduction

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Presentation of the companies of the PARTZSCH Group

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PARTZSCH Elektromotoren e. K.

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PARTZSCH Spezialdrähte e. K.

4.2

PARTZSCH Elektromaschinenbau GmbH

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PAMO Reparaturwerk GmbH

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PARTZSCH Windgeneratoren Service GmbH

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GENET GmbH

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PARTZSCH Elektrowerke GmbH

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PARTZSCH Grundstücksverwaltung GmbH & Co. KG

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Landhotel Sonnenhof GmbH

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1 Introduction

This documentation describes the comprehensive range of services of the PARTZSCH Group and offers a detailed insight into the technological capabilities of our company.

Originating from the repair shop for electric machines founded in 1954 by Werner Partzsch, starting in 1989 under the direction of the owner Dipl.-Ing. Ing. Thomas Partzsch, the company developed into a high-performance medium-sized group of companies with currently over 700 employees.

The group of companies has become Europe's leading player within its industry sector.



2 Organisational chart and site plan

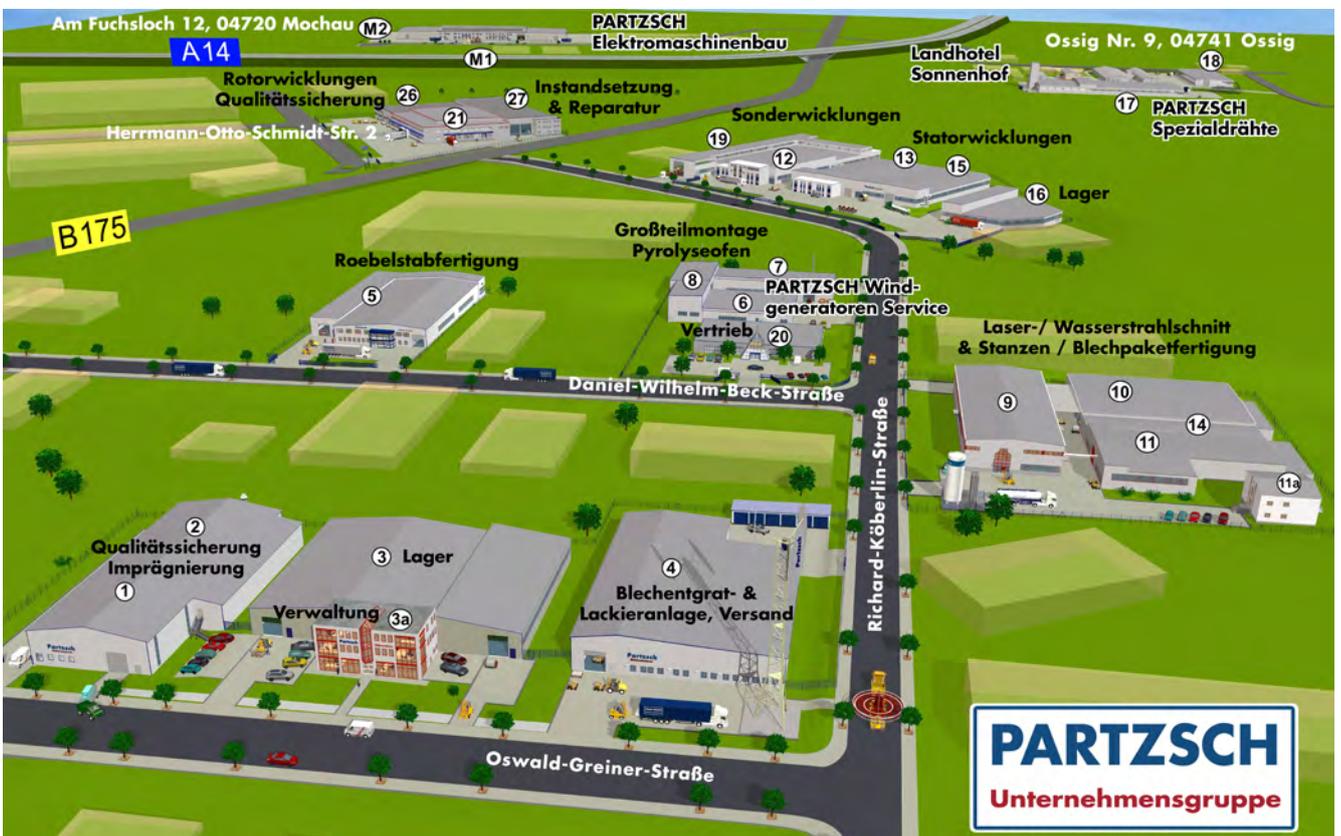


Figure: Business Park Döbeln Ost, Ossig (top right), Mochau (top)



Figure: Business Park Döbeln Ost and Ossig (top left)

Premises	Segment	
01	PARTZSCH Elektromotoren e. K.	Manufacturing F1
02	PARTZSCH Elektromotoren e. K.	Manufacturing F1
03a	Management Plant management PARTZSCH Elektromotoren e. K.	
03	PARTZSCH Elektrowerke	
04	PARTZSCH Elektromotoren e. K. Vehicle fleet and dispatch	Manufacturing FP
05	PARTZSCH Elektromotoren e. K.	Manufacturing F6
06	PARTZSCH Windgeneratoren Service GmbH	
07	PARTZSCH Elektromotoren e. K.	Manufacturing F1
08	PARTZSCH Elektromotoren e. K.	Manufacturing F1
09	PARTZSCH Elektromotoren e. K.	Manufacturing F7 / Production planning
10	PARTZSCH Elektromotoren e. K.	Manufacturing F7
11	PARTZSCH Elektromotoren e. K.	Manufacturing F7
12	PARTZSCH Elektromotoren e. K.	Manufacturing F3 and F4
13	PARTZSCH Elektromotoren e. K.	Manufacturing F2
14	PARTZSCH Elektromotoren e. K.	Manufacturing F7
15	PARTZSCH Elektromotoren e. K.	Manufacturing F1 and F2



Figure: Business Park Döbeln Ost, Ossig (top right), Mochau (top)

Premises	Segment	
16	PARTZSCH Elektromotoren e. K.	Material management
17	PARTZSCH Spezialdrähte e. K.	Manufacturing and storage
18	PARTZSCH Spezialdrähte e. K.	Manufacturing and storage
19	PARTZSCH Elektromotoren e. K.	Manufacturing F1 and F2
20	PARTZSCH Elektromotoren e. K.	Sales and reception
21	PARTZSCH Elektromotoren e. K.	Accounting and HR department
22-25	PARTZSCH Grundstücksverwaltung GmbH & Co. KG	
26	PARTZSCH Elektromotoren e. K.	Manufacturing F5
27	PARTZSCH Elektromotoren e. K.	Manufacturing F5
M1	PARTZSCH Elektromaschinenbau GmbH	
M2	PARTZSCH Elektromaschinenbau GmbH	
SH	Landhotel Sonnenhof GmbH	

3 Companies of the PARTZSCH Group

3.1 PARTZSCH Elektromotoren e. K.

Since 1993 the head office of the parent company of the PARTZSCH Group has been located in the Business Park Döbeln-Ost, Germany. The immediate proximity to the motorway A14 has provided perfect conditions for the company's steady growth in the past years. Oriented on the international market, the production of components for electrical engineering has become the main field of activity of the PARTZSCH Group. The components of the magnetic circuit, such as laminated cores and their windings, are of particular importance. With our service offered for electric

machines as an important business field, service companies and end users alike can enjoy the high quality standard the company has been famous for since its foundation in case of maintenance and repairs. With the current expansion process of the PARTZSCH Group, the owner-managed PARTZSCH Elektromotoren e. K. will meet future economic developments.

About 400 employees are currently working for PARTZSCH Elektromotoren e. K.



3.2 PARTZSCH Spezialdrahnte e. K.

In the 1990s delivery times for winding wires used in the servicing sector were extremely long. As a result of this bottleneck, a group of employees and a highly skilled engineer started to develop their own wire production. From this humble beginning a company was born, that currently employs 53 people, producing some 4,000 tons of winding wire each year.

The production range comprises the manufacturing of rolled and/or drawn profile and round wires. Today we can offer as many as 50 different types of wires, including enamelled, tape-covered and yarn-covered wires in a whole range of dimensions. 50 percent of the wires produced here are used within the PARTZSCH Group. The remaining 50 percent are produced for our customers throughout Europe.



Wire enamelling plant

3.3 PARTZSCH Elektromaschinenbau GmbH

PARTZSCH Elektromaschinenbau GmbH is another company within the PARTZSCH Group based in Dobeln/ Grosssteinbach. The company specialises in 3 fields: the production of the magnetic circuit of direct drive wind

turbine generators, the production of machine parts and components for textile machine engineering.



Hedelius T8



EMCO MaXXturn

3.4 PAMO Reparaturwerk GmbH

This company of the PARTZSCH Group located in Bitterfeld, Germany, is an economically independent enterprise, acting independently in the market.

The main fields of activity comprise the repair and production of components for DC machines, including on-site disassembly and assembly of motors and generators up to 250 MVA.

The company, originally a repair shop for railway traction motors, is optimally positioned with its experienced

technical staff and the latest manufacturing technology.

Large assembly shops facilitate the production and repair of tram motors not exceeding 500 kg and rolling-mill motors not exceeding 120 tons in any performance range.

The spectrum also includes rotors, main and commutating poles as well as compensating windings for DC machines of all kinds.

3.5 PARTZSCH Windgeneratoren Service GmbH

Reacting to the constant increase of new wind turbines installed in Germany, the 'PARTZSCH Windgeneratoren Service GmbH' was founded by Dipl.-Ing. Ing. Thomas Partzsch in collaboration with Holger Klotsche. The company maintains generators in wind turbines with gearbox. The business premises with customer contacts and service teams are located in the Business Park Döbeln-Ost, hall 6.

With our fleet of service vehicles we provide professional services for wind turbines all over Germany and abroad.



3.6 GENET GmbH

GENET is a new engineering and sales company based in Ingolstadt, Germany. The team consists of experts with longtime and international experience in the development and manufacturing of synchronous generators for power generation. With its comprehensive vertical integration and state-of-the-art machinery PARTZSCH offers ideal conditions and realises the entire manufacturing of the machines within this cooperation.

TOGETHER, we provide customised solutions in the field of special machine engineering for power ranges up to 20,000 kVA and voltages not exceeding 15,000 V. We specialise in the manufacturing, maintenance, repair and commissioning of generators for the following applications:

- ▶ Hydro power
- ▶ Steam turbines
- ▶ Frequency converters
- ▶ Marine and stationary applications



Special machines for marine and stationary applications

3.7 PARTZSCH Elektrowerke GmbH

The company is a commercial, service and sales company, offering the following products and services:

- ▶ Electric motors and converters from TECO
 - ▶ Sales
 - ▶ Rental
 - ▶ Advisory service on the energy efficiency of electric motors
 - ▶ Repair
- ▶ Geared motors
 - ▶ Sales
 - ▶ Advisory service
 - ▶ Repair
- ▶ Pumps
 - ▶ Advisory service
 - ▶ Sales
 - ▶ Maintenance
- ▶ Ventilators and blowers
 - ▶ Advisory service
 - ▶ Sales
 - ▶ Maintenance
- ▶ Emergency power generators
- ▶ Purchase of electric motors and generators



Production halls 13, 15 and 16

- ▶ Power tools
 - ▶ Advisory service and demonstration
 - ▶ Rental
 - ▶ Sales
 - ▶ Maintenance

3.8 PARTZSCH Grundstücksverwaltung GmbH & Co. KG

This company owns and manages the properties and buildings of the PARTZSCH Group. Buildings include the production halls and storage facilities, offices and

staff buildings that are rented to the manufacturing companies of the PARTZSCH Group.

3.9 Landhotel Sonnenhof GmbH

Landhotel Sonnenhof was built in 1820. It had undergone an extensive renovation in 2000 and been a sleeping beauty since 2003. The hotel was reopened in September 2016, now offering the core areas hotel, restaurant, catering and events in one location on this beautiful four-sided courtyard. The Landhotel forms part of the PARTZSCH Group and is located on the company premises. It therefore provides the ideal platform for mixing business with pleasure. In addition to seminar and conference rooms, restaurant and hotel rooms our guests can use the bowling alley, sauna, a gym and a 50-metre underground shooting range.



Courtyard of the Landhotel Sonnenhof



**Manufacturing field F1
Pyrolysis and impregnation**

4 Presentation of the individual companies

4.1 PARTZSCH Elektromotoren e. K.

4.1.1 General presentation

4.1.2 Manufacturing fields

4.1.2.1 Manufacturing field F1 - Pyrolysis and impregnation

4.1.2.1.1 Range of services pyrolysis

Pyrolysis is used to remove insulating material that binds and isolates the winding of electric machines. Windings are smouldered in a thermal process at approximately 360°C to 400°C in a low oxygen environment in a pyrolysis process with thermal afterburning. The thermally gentle treatment of the laminated core is of particular importance. Therefore, the temperature curve of the oven is gradually increased at set time intervals. Using this procedure, the stator or rotor is not

subjected to thermally induced material stress, thus ensuring the compliance with fit tolerances.

	Small oven	Large oven
Height	1.85 m	3.00 m
Length	1.90 m	3.85 m
Width	2.20 m	3.30 m
Capacity	10 t	50 t



Winding after pyrolysis



Walnut granules



Various machine parts

4.1.2.1.2 Machinery pyrolysis

In the large oven a rotor with a length of up to 5.50 m can be accommodated in the space diagonal. The temperature can be set up to 400°C.

Time intervals and the corresponding temperatures can be monitored automatically with an electric recorder. In addition, test reports can be prepared.

After the pyrolysis process and the removal of the winding all machine parts are blasted and cleaned with a special granule.

Location	Height	Width	Length	Blasting material
Hall 01	2.30 m	2.40 m	5.50 m	Walnut
Hall 07	2.40 m	2.60 m	5.50 m	Walnut
Hall 27	3.50 m	3.00 m	6.00 m	Corundum

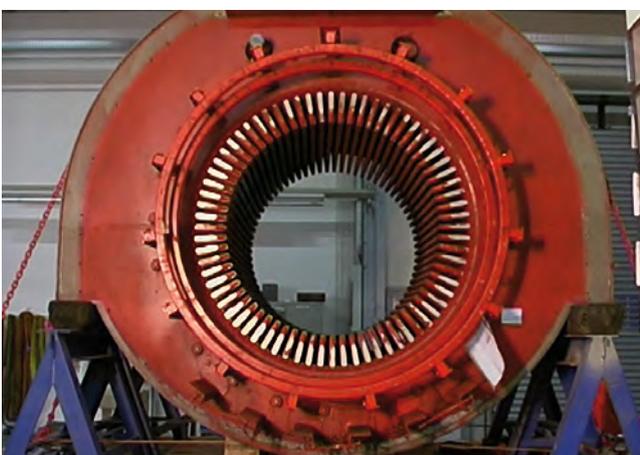
Afterwards, each laminated core is subjected to a magnetisation test and checked for hotspots using a thermographic camera. Where necessary, we will carry out repairs and provide the laminated core with a new primer to ensure our customer receives a product of high value.



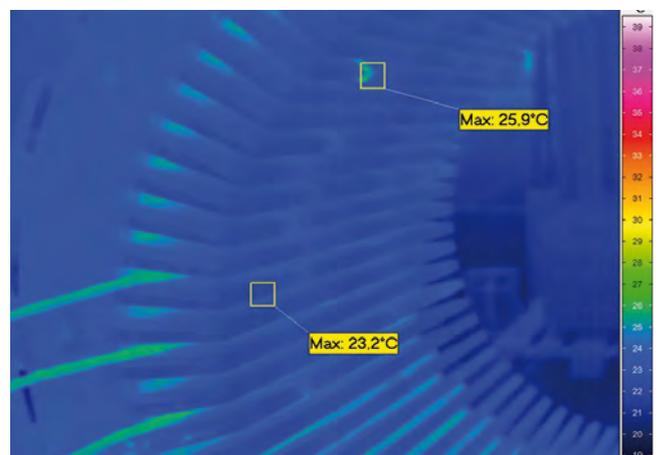
Flux test on a laminated core and application of the thermographic camera



Blasting chamber



Fully processed laminated core



Hotspots

4.1.2.1.3 Range of services impregnation

The impregnation of windings for electric machines is of particular importance for their electrical and mechanical strength.

There exists a variety of impregnation methods used. One of the primarily used processes is called vacuum pressure impregnation. This form of impregnation is very equipment intensive and thus the most cost-intensive process. However, due to the very high quality of the treated parts, customers often request or require the use of this technology.

Other impregnation methods include vacuum impregnation, current-UV process and dipping method. Other forms of impregnation have become less relevant these days. Impregnation systems in various sizes and designs allow for the implementation of all mentioned procedures within the PARTZSCH Group.

It is important to note that different types of resins are used for the individual impregnation processes. To ensure optimal production results, our experienced staff can help you choose the right process and resin.



Vacuum impregnation plant

VACUUM PROCESS

Using this process, the winding to be impregnated, along with the laminated core and sometimes even the housing, is introduced into the special container of the system.

A vacuum of approx. 5 to 10 mbar is generated by a vacuum pump in order to remove air pockets within the winding. During the vacuum impregnation process these small cavities are filled with the inflowing resin. After flooding the winding in the container and a dwell time for the resin to set, normal pressure is restored. At the end of the procedure the flooding process is reversed and the winding allowed to drain. In a drying oven equipped with a rolling device the resin is cured in the winding. By rotating the laminated core, with or without the housing, an optimum distribution of the impregnating agent within and around the winding is ensured.



Winding in impregnation container

i VACUUM PRESSURE IMPREGNATION

In the vacuum pressure impregnation a special impregnation container with a pressure-proof lid closing mechanism with bayonet lock is used.

The entire process consists of two cycles. Similar to the vacuum process, in the vacuum phase the winding is first dried and then flooded with the impregnating agent.

During the subsequent pressure phase the impregnating agent is forced into the smallest cavities of the winding through a cushion of compressed air.

Using capacitance measurement the resin absorption of the insulation can be monitored. The process is completed as soon as the capacitance change has reached a minimum. The pressure in the container is then used to push the impregnating agent back into the storage containers.

After draining, the winding is transferred to the drying oven, where the rolling curing process is performed.

i IMPREGNATING AGENT BASE EPOXY RESIN

The epoxy resin anhydride system corresponds to thermal class F.

Since the epoxy resin does not have a reactive thinner, processing can be performed in a very low vacuum. The air content is thus reduced to a minimum, which is reflected in particular in the loss factor ($\tan\delta$).

This is of particular significance for insulation systems used with high rated voltages (exceeding 10 kV). Due to the viscosity of the epoxy resin, impregnation is performed at a resin and object temperature of 60 to 70 °C. Given the necessity of cooled storage at 10 °C and additional heating costs during impregnation, high energy and equipment costs are incurred when using this impregnating agent.

Although epoxy resin offers various qualitative benefits when used as impregnating agent, operating costs should also be considered carefully.



Impregnation container with pressure-proof lid locking mechanism



Control panel of the vacuum pressure impregnation system



Vacuum pressure impregnation system

4.1.2.1.4 Machinery impregnation

i IMPREGNATING AGENT BASIS POLYESTER RESIN (UP RESIN)

- ▶ Low-voltage windings
with Voltatex® 4030

Due to its good flow behaviour, this impregnating resin forms the ideal basis for an optimum resin absorption in round-wire windings. Above this, the resin manifests a good penetrating power with low drip loss. With a very short and effective VPI process the complete impregnation is ensured.

- ▶ Traction windings
with Voltatex® 4202

This low-emission impregnating resin is environmentally friendly and pioneering in terms of elasticity and resistance. Due to its higher viscosity, the impregnating resin must be preheated to a temperature of 40 °C. This slightly greater input during vacuum pressure impregnation, however, is reasonable especially for traction motors that are exposed to all kinds of environmental influences, for instance if used as underfloor engines.



Wind turbine generator with Damisol® 3340

- ▶ Windings of wind turbine generators
with Damisol® 3340

Large wind turbine generators with a bore diameter of up to 5 metres are impregnated with this polyesterimide resin. With its medium viscosity the impregnating resin is easy to handle and offers a good ratio of resin application and impregnation.

- ▶ High-voltage windings
with Damisol® 3309

This polyesterimide resin is part of the insulation system Samicabond® by Von Roll and meets the requirements of thermal class 180 (H). Both storage and impregnation can be performed at room temperature. To further improve the flow properties of the impregnating agent, the windings are preheated. Thus, even thicker insulation sleeves will be thoroughly impregnated. Due to its comparatively simple handling, this impregnating resin is in great demand. Despite the slightly poorer electrical properties as compared to the epoxy resin system, all electrical characteristics of the applicable standards are met. With this impregnating resin rated voltages up to 13.8 kV can be reliably handled.

Technical parameters for the use of impregnating agents

Impregnating agent / VPI system	Container dimensions (base)	Filling level impregnating agent
Voltatex® 4030	0.8 m × 1.4 m	0.7 m
Voltatex® 4202	1.0 m × 1.1 m	0.9 m
Damisol® 3340	Ø 5.0 m	approx. 1.5 m
Damisol® 3309	Ø 4.3 m (rings 3.9 m)	approx. 2.5 m (max. 3.3 m)
Epoxy resin EPR 162	approx. 2.7 m × 4.2 m	approx. 2.4 m



Impregnated winding

i CURRENT-UV IMPREGNATION

Current-UV impregnation is an innovative dipping process for low-voltage round-wire windings. In this process a low DC voltage is applied to the winding. The current flow effectively generates the required process heat. Upon submerging the preheated winding, the viscosity of the impregnating agent decreases. The agent can now penetrate into the smallest cavities. With continuous heating the impregnating resin forms a gel at the hot conductors of the winding. After the submersion the resin can drain off at the cooler laminated core.

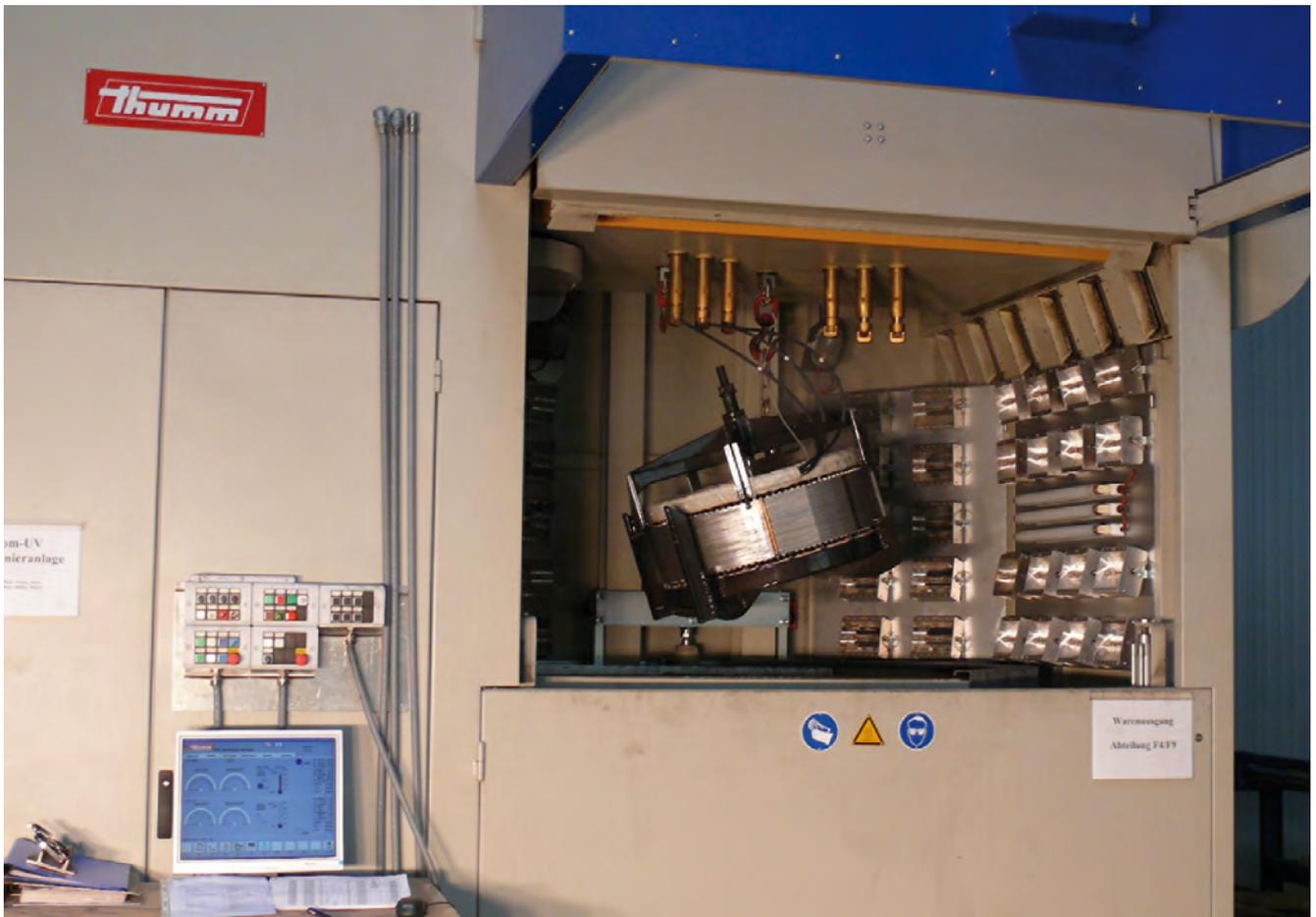
Compared to vacuum impregnation, a higher filling level is achieved in this process. Especially when processing larger quantities, current-UV impregnation can replace the entire vacuum process, including oven drying. The current-UV process is automatically controlled until the curing of the impregnating agent is completed.

The winding is heated and dried using electric current. UV-lamps cure the light-sensitive resin on the laminated core.

Without the need for conventional oven drying, energy and time savings are achieved. In combination with the use of a low-emission impregnating agent the environmental impact is reduced.

Technical parameters for the use of impregnating agents

Diameter of the objects to be impregnated	max. 900 mm
Submersion depth (height of impregnating agent)	max. 1,000 mm
Capacity of the loading station	1 × 500 kg plus 2 × 100 kg
System power (per station)	100 kW (max. 100 V / 1,000 A)



Current-UV impregnation system



Manufacturing field F2
Preformed and
field coil windings

4.1.2.2 Manufacturing field F2 - Preformed and field coil windings

4.1.2.2.1 Range of services preformed coils

One of the most important areas of our company is the fabrication of preformed windings with profile wire.

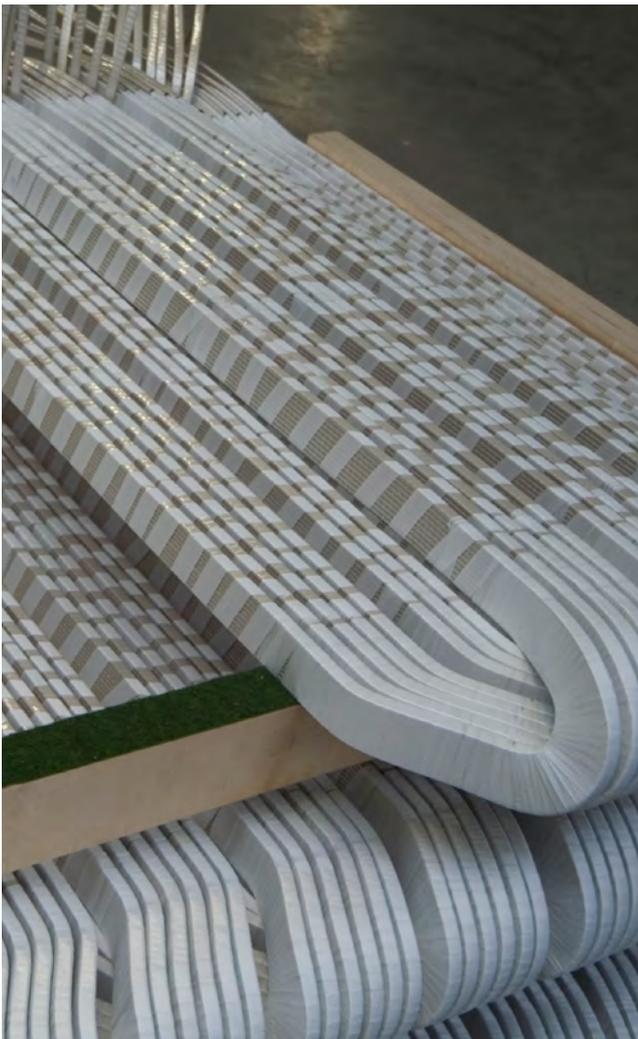
The smaller dimensions of preformed coils are primarily manufactured for traction machines. Maximum dimensions up to a fish length of 5.5 m can be produced.

The individual coils can weigh up to 60 kg and are produced on special coil spreading machines. Pole numbers from 2 to 24 can be realised. There also exist various rated voltages up to 15 kV that, depending on the machine's field of application, may require the realisation of the corresponding insulation thicknesses.

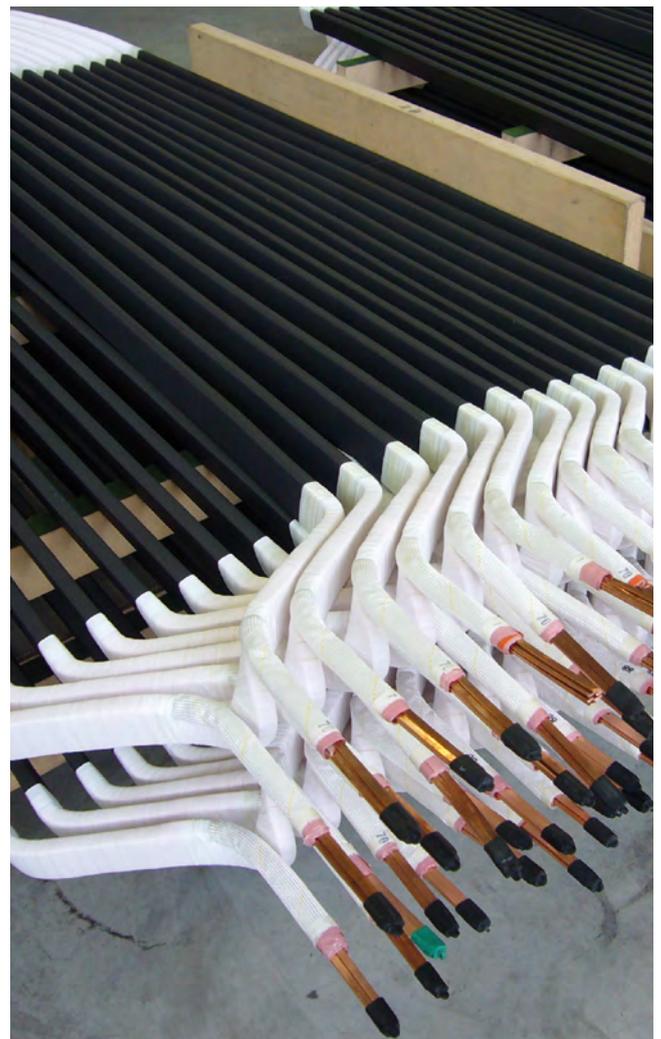
We offer two basic types of insulation:

i RESIN-RICH SYSTEM

During the so-called resin-rich process the coil legs are wound with mica tapes rich in resin and cured in the hot coil press. There are eight presses available for this procedure that allow pressing sleeves up to a length of 2 metres. After this step, the coils are ready for installation. They can be ordered as coil sets and be installed on site or in our manufacturing plants by our technicians.



Preformed coils



Finished coil set

VPI-SYSTEM

In addition, we offer the so-called VP-system. In this procedure the insulation is applied as dry mica tapes using robots or semiautomatic machines. If necessary, this task can also be performed by hand. These 'soft' coils are mounted into slots; the winding is impregnated in the vacuum pressure process after connecting and cured while rolling in drying ovens.

The VPI procedure is up to 20 percent less expensive than the resin-rich process. This cost advantage derives from taping machines used for realising the required insulation thicknesses.

A disadvantage of the VPI process is the fact that an individual defective coil can hardly be removed from the overall installation. In contrast, when applying the resin-rich technique, individual coils can be easily exchanged.

Special fields of application of resin-rich coils are extremely large stator diameters or locations that only allow installations on site. In terms of quality the electrical parameters up to a rated voltage of 13.8 kV do not significantly vary between the resin-rich and the VPI process. However, for voltages of 15 kV and above, the VPI process is usually preferred for epoxy resin impregnations. This is because when using epoxy resin a vacuum of 0.1 mbar can be achieved without the evaporation of solvents. Consequently, significant $\tan\delta$ values can be reached. The $\tan\delta$ also serves for the quantitative evaluation of the air content in the insulation system.



Installation of coils in slots



Hot coil press



End winding section of a preformed winding

4.1.2.2.2 Machinery preformed coils

- ▶ Fish winding machine with drum stands and wire guide
- ▶ Taping machine for the protective tape on fish
- ▶ Coil spreading machine
- ▶ Hydraulic hot coil press for preforming
- ▶ Semiautomatic taping machine for main insulation
- ▶ Winding robot for main insulation and end winding side (non-connection-end)
- ▶ Turning equipment up to 50 t
- ▶ Insertion device for coils exceeding 25 kg
- ▶ Soldering device for cross sections up to 300 mm
- ▶ VPI impregnation system
- ▶ Drying oven
- ▶ Application of the main insulation using coiled tubing (wide strip) or winding robot (tapes) during the resin-rich process
- ▶ Hydraulic hot coil press for main pressing
- ▶ Completion of up to 20 parallel wires
- ▶ Fish length: 300 to 5,500 mm

Feasible dimensions of preformed coils in general

- ▶ Stator inner diameter from 300 mm
- ▶ Spread angle: 0 to 140° up to 1,100 mm chord (under 200 mm hand tape)
- ▶ Length of straight core part: 280 to 3,500 mm
- ▶ Cross section straight core part: 5 x 15 mm to 25 x 70 mm (to a maximum of 1,400 mm²)
- ▶ Feasibility of other dimensions will be checked upon request

Feasible dimensions of preformed coils for traction machines

- ▶ Stator inner diameter from 280 mm
- ▶ Spread angle: 0 to 160°
- ▶ up to 340 mm chord (under 200 mm hand tape)
- ▶ Length of straight core part: 200 to 600 mm
- ▶ Cross section straight core part up to 10 x 20 mm
- ▶ Feasibility of other dimensions will be checked upon request



Fish winding machine



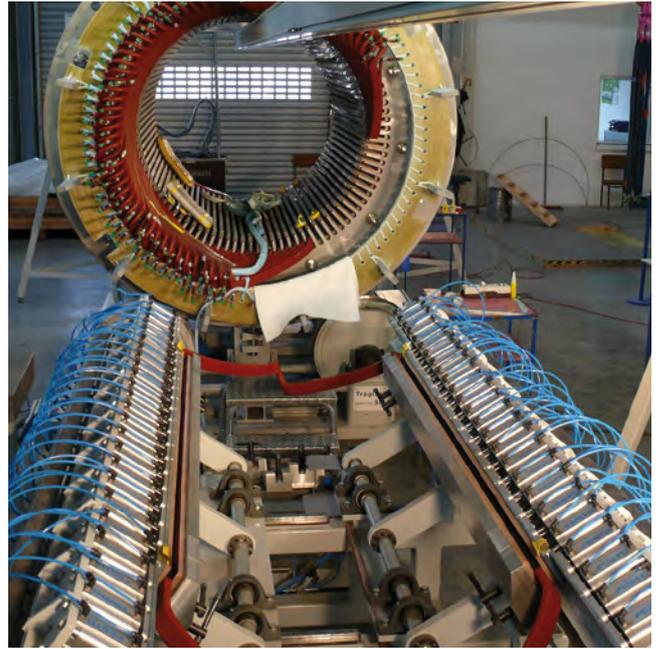
Taping robot



Coil spreading machine



4-pole generator winding in VPI design



Preformed coil cold press with insertion device



Manufacturing area insertion and connecting



Stator of a wind turbine



Manufacturing area coil insulation

4.1.2.2.3 Range of services field coils

The field coil winding is, among others, a component of synchronous machines and is typically found on the rotor. The coils are directly wound or plugged onto the pole.

They are available in various designs (made of insulated flat or round wire, edgewise wound from bare copper or soldered from individual copper parts). The individual coils are connected to allow the magnetisation direction change from pole to pole.

TECHNICAL PARAMETERS

Structure of pole wheels made of separately wound field coils:

- ▶ Total weight up to 32 t
- ▶ Feasibility of other dimensions will be checked upon request

Round-wire field coils:

- ▶ Up to 50 kg net weight
- ▶ Up to 1 m in length
- ▶ Feasibility of other dimensions will be checked upon request

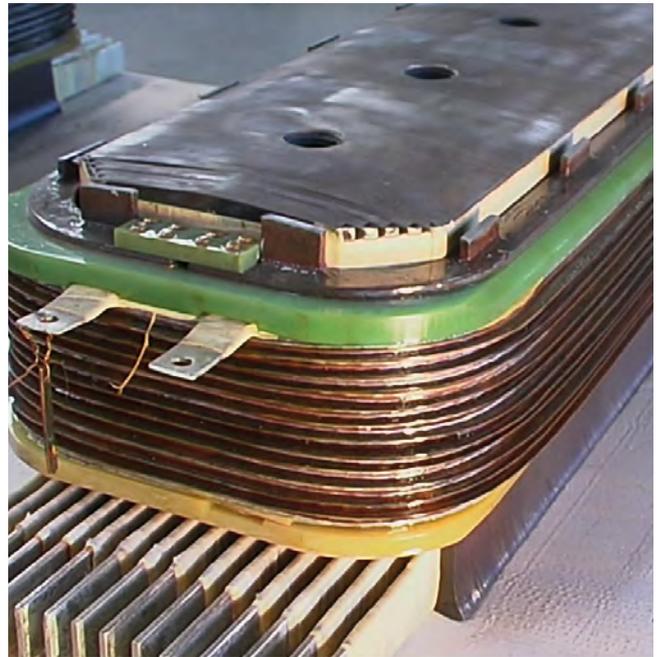
Field coils made of insulated flat wire:

- ▶ Material strand insulation (enamel, enamelled wire insulated with glass yarn, Daglas)
- ▶ Maximum weight: 5 t
- ▶ Maximum length: 4 m
- ▶ Maximum width: 1 m
- ▶ Wire bent over the high edge starting at wire thicknesses of 2 mm with a width of 10 mm
- ▶ Feasibility of other dimensions will be checked upon request

Field coils made of water-jet cut copper parts:

- ▶ Copper parts can be cut using our water-jet cutting system

For synchronous generators in four- and multi-pole design with rated voltages exceeding 15 MVA, poles are manufactured from profiled copper stripes. Each winding consists of four individual copper metal strips soldered or welded together to form a continuous, flat coil winding. Here, the processing and treatment of joints is of particular importance, as these must not exhibit thickening.



Regenerated field coil



Field coil made of insulated flat wire



Round-wire field coil

PARTZSCH Elektromotoren e. K.

Using great pressure and current-generated heat, the coils are then cured to size. A subsequent mechanical processing is performed in the next step in order to place the cutouts for the clamping elements, fastenings and stabilisers of the field coils.

The pole cover plates are screwed onto the rotor shaft. This is performed using a hydraulic wrench with a maximum tightening torque of 44,000 Nm.



Welded field coil made of water-jet cut copper

4.1.2.2.4 Machinery field coil windings

Pole welding machine

- ▶ Minimum coil internal dimension, width: 140 mm
- ▶ Minimum coil internal dimension, length: 1,100 mm
- ▶ Maximum coil external dimension, width: 1,000 mm
- ▶ Maximum coil external dimension, length: 3,000 mm
- ▶ Maximum total height of coil: 320 mm
- ▶ Maximum weight of coil: 1,200 kg
- ▶ Maximum conductor width: 105 mm
- ▶ Conductor height 2 to 7 mm
(larger conductor heights must be checked for feasibility using soldering sample)
- ▶ Feasibility of other dimensions will be checked upon request



Field coil welding system

Hot moulding press



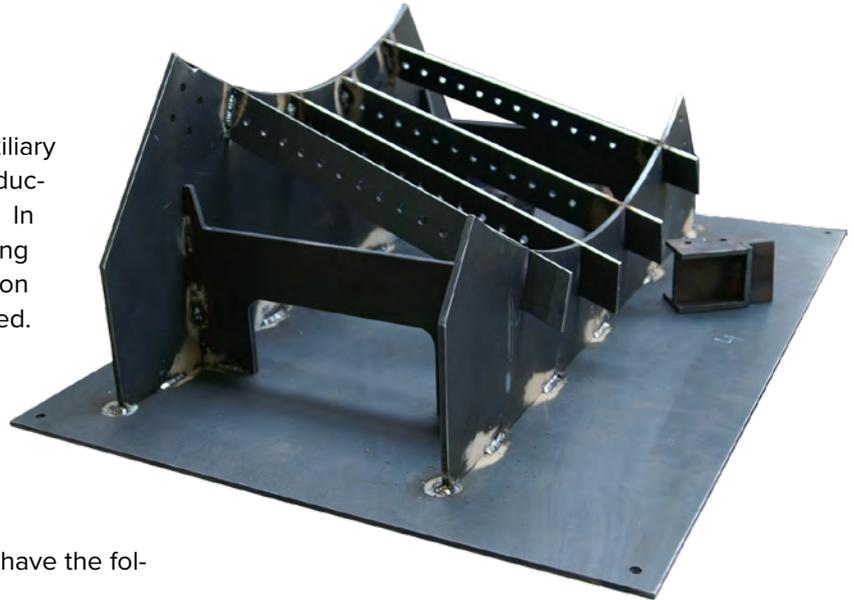


Manufacturing field F3
Tool making

4.1.2.3 Manufacturing field F3 - Tool making

4.1.2.3.1 Range of services

In our tool-making department all auxiliary tools and devices needed for the production of our products are manufactured. In close cooperation with our engineering department a prompt dossier preparation and material procurement is guaranteed. This department manufactures components for all companies of the PARTZSCH Group.



4.1.2.3.2 Machinery

In our manufacturing field tool making we have the following machinery at our disposal:

Process	Travel		Height
	X	Y	Z
Wire EDM	400 mm	250 mm	200 mm
Die-sinking EDM	350 mm	250 mm	200 mm
Start hole EDM	350 mm	250 mm	200 mm
Drilling	550 mm	450 mm	1,100 mm
Boring mill	406 mm	253 mm	400 mm
Milling	1,000 mm	600 mm	400 mm
Turning	Ø 340 mm	1,600 mm	
Grinding	1,500 mm	400 mm	approx. 500 mm
Sandblasting	700 mm	700 mm	approx. 700 mm
Bench saw	1,200 mm	2,000 mm	30 mm
Band saw	270 mm	160 mm	300 mm
Screw press, small	400 mm	400 mm	300 mm
Screw press, large	540 mm	500 mm	500 mm
3D measurement	600 mm	600 mm	400 mm





Manufacturing field F4
**Round-wire and
special windings**

4.1.2.4 Manufacturing field F4 - Round-wire and special windings

4.1.2.4.1 Range of services

This segment specialises in the production of round-wire windings in conventional single-layer and two-layer or special designs, such as pole-changing windings. We use state-of-the-art manufacturing technologies: winding machines, pull-in technique, slot folding machines and welding equipment.

If necessary, our technical experts can produce hand windings in the required quality with no limit to the number of poles.

Technical parameters

Standard round-wire windings can be produced with the following parameters:

- ▶ Average winding length up to 3.5 m
- ▶ Up to size 800 maximum weight of 8 t
- ▶ Hand windings for sizes 150-800
- ▶ Pulling in of windings for sizes 132-450 (for series)
- ▶ High-temperature windings for short-time excess temperatures (400 °C/ 2 h; 600 °C/ 1 h)
- ▶ For higher ambient temperatures in continuous operation up to 100 °C
- ▶ Round-wire slip-ring rotors up to 6 t
- ▶ Round-wire pole-wheel windings
- ▶ High-voltage round-wire windings up to 6.6 kV
- ▶ Converter-compatible windings
- ▶ Strand winding
- ▶ Additional winding types, larger dimensions and weights available upon request



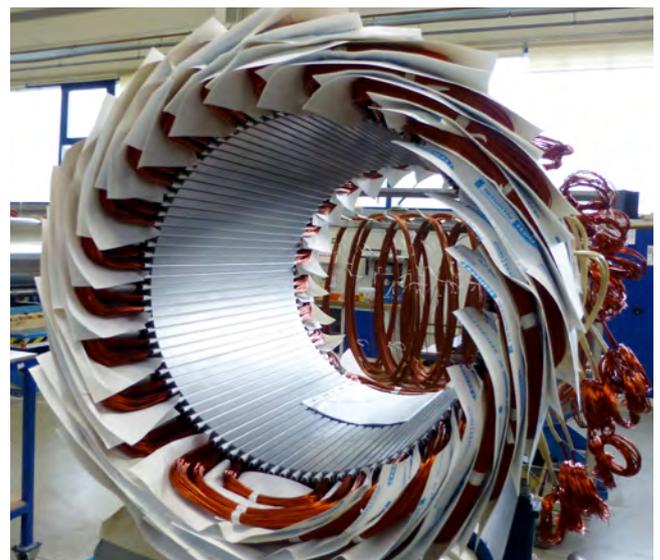
High-voltage winding in round-wire design

SPECIAL WINDINGS

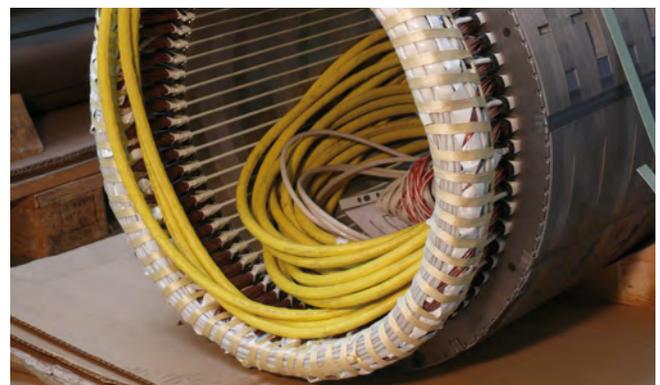
The requirements for the insulation capacity of electric machines are becoming increasingly complex, as the fields of application are becoming more and more versatile and comprehensive.

The company 'PARTZSCH Spezialdrähte e. K.' specialises in the production of wires and insulations for common applications in the field of electrical engineering, but also offers individual wire insulations for special applications.

As a result, we have a wide range of special wires and windings available for you.



Stator with round-wire winding



Frequency converter-proof winding

i FREQUENCY CONVERTER-PROOF WINDINGS

A topic of great current interest is the operation of motors with frequency converters. The insulation system of a converter-fed motor is subjected to particular stress as compared to the supply with sinusoidal voltages. In particular, the winding of machines with a rated voltage exceeding 400 V and supply via fast-switching voltage source converters can be subjected to extreme stress. For this type of application we have developed a special insulation technology which ensures safe insulation up to rated voltages of 690 V without limiting the slew rate through filter circuits.

Drives of machines equipped with this insulation technology offer higher efficiency, as losses in filters and chokes do not apply. As energy efficiency is a major concern these days, the PARTZSCH Group makes a significant contribution with this technology.

Technical parameters

Standard frequency converter-proof windings can be produced with the following parameters:

- ▶ average winding length up to 3.5 m
- ▶ up to size 800 maximum weight of 8 t
- ▶ additional winding types, larger dimensions and weights available upon request

i HIGH-TEMPERATURE WINDINGS

By removing smoke, smoke exhaust systems contribute to ensuring a safe escape and rescue of people in case of fire. Motors used in these applications are equipped with an insulation system that allows the operation of these installations at ambient temperatures up to 600 °C for the relevant period of time.

We have developed a suitable product series of 4-pole to 12-pole motors with sizes from 180 to 315.

Technical parameters

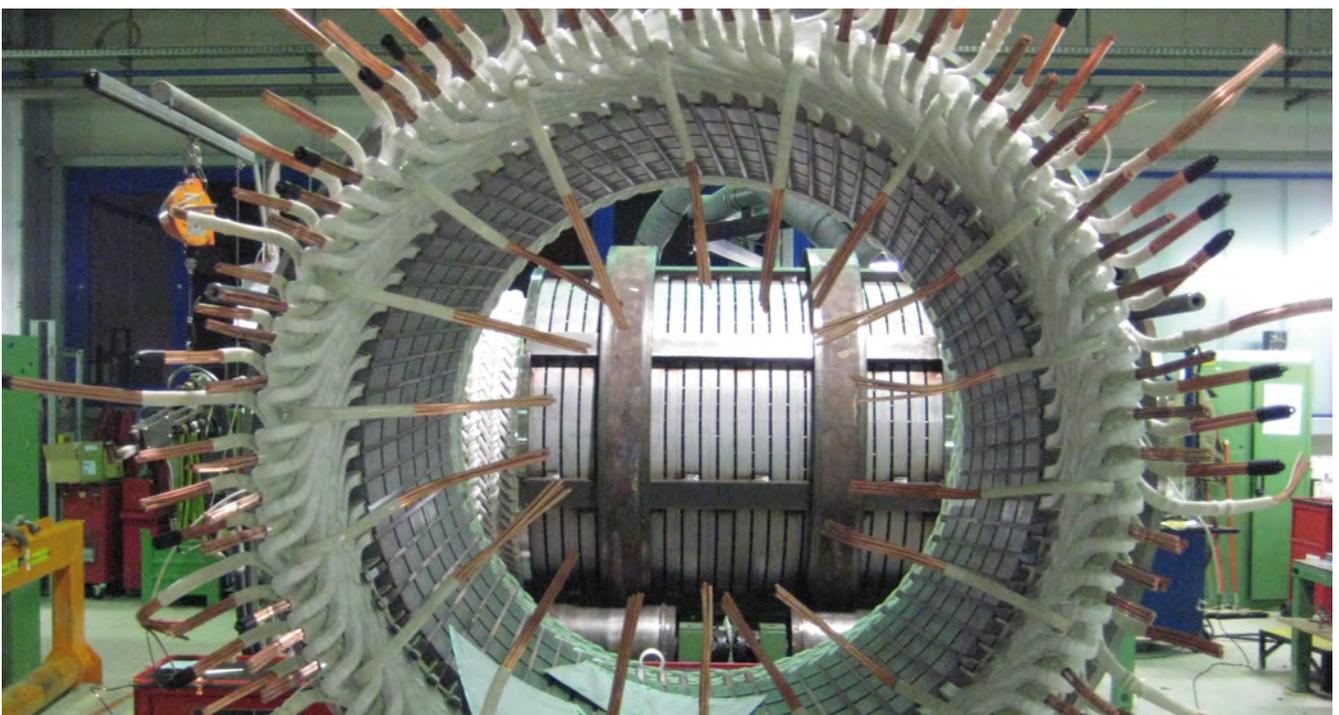
Motor series class F400 (400 °C, 2 hours)

- ▶ 4-pole motors from 15 kW to 110 kW
- ▶ 6-pole motors from 11 kW to 110 kW
- ▶ 8-pole motors from 7.5 kW to 90 kW

Motor series class F600 (600 °C, 1 hour)

- ▶ 4-pole motors from 15 kW to 110 kW
- ▶ 6-pole motors from 11 kW to 110 kW
- ▶ 8-pole motors from 7.5 kW to 90 kW

Installed winding before connecting



i CLOSED-SLOT COILS

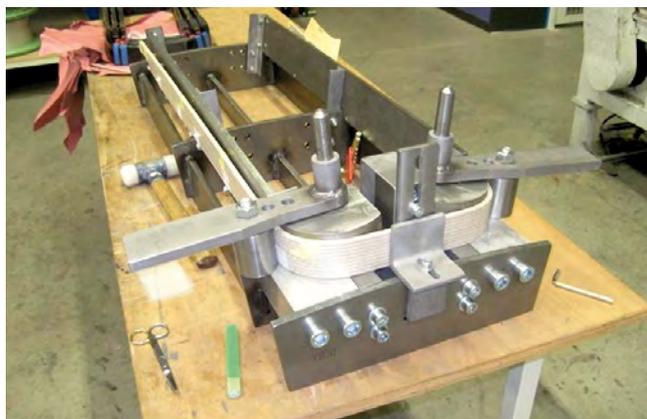
The product range of the PARTZSCH Group further includes coils in special designs, such as plug-in coils, still found in older machines.

Regardless of their size, plug-in coils can be manufactured on the basis of drawings or the original winding using specially designed equipment.

In addition, we produce windings with cranked end windings, available in angles of 90°, 45° and 0°.

With these coils, single-layer windings can be produced in two- or three-range design.

Also, we can manufacture and deliver so-called pull-through windings upon request. Please do not hesitate to contact us for any queries regarding the feasibility of additional special windings.



Special equipment



Special component

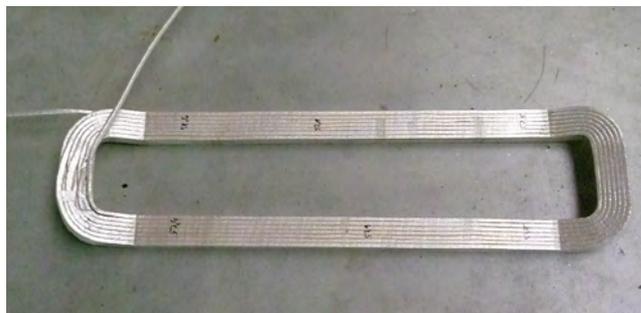
i STRAND WINDINGS

Technical parameters

- ▶ Up to size 1,500
- ▶ Up to a weight of 14 tons
- ▶ Up to a nominal voltage of 690 V

Machinery

- ▶ 3 specially designed rolling devices
- ▶ Own pressing machine for clamping



Uninsulated special winding



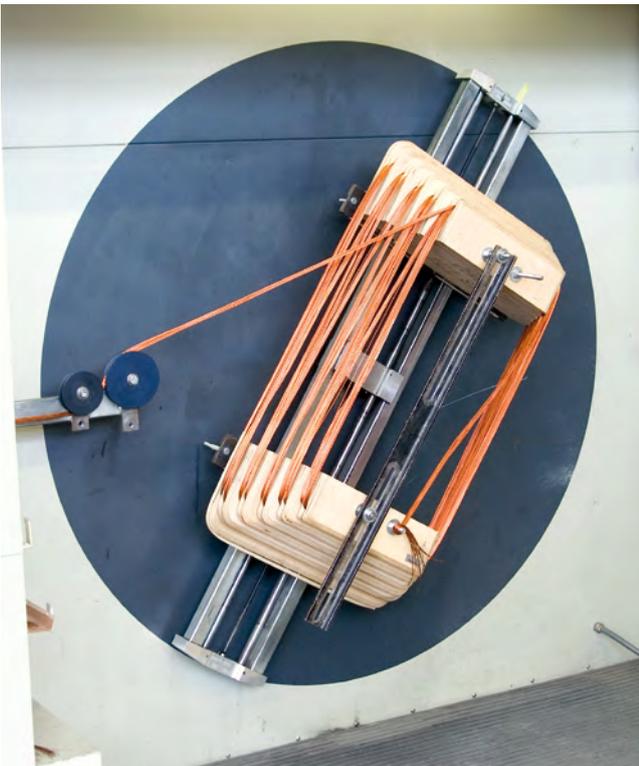
Insulated special winding



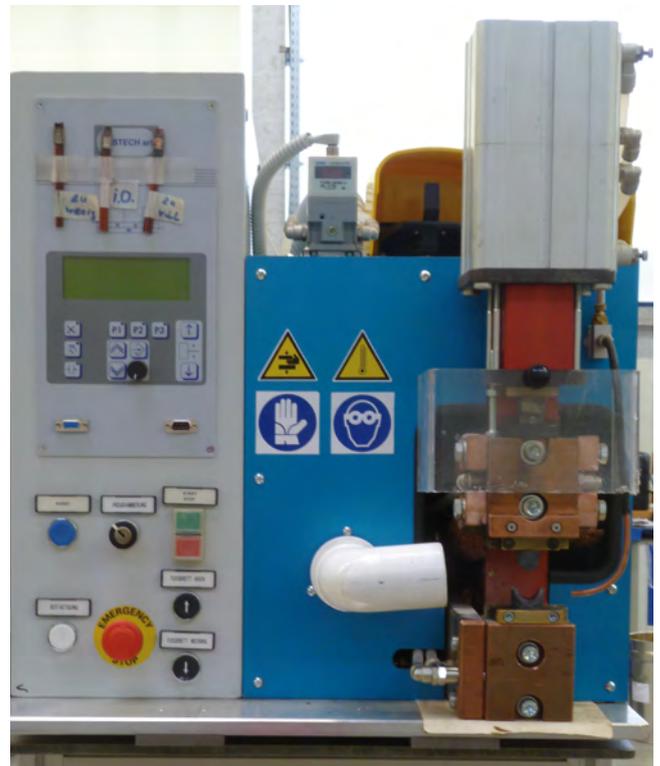
Special winding design

4.1.2.4.2 Machinery three-phase round-wire windings

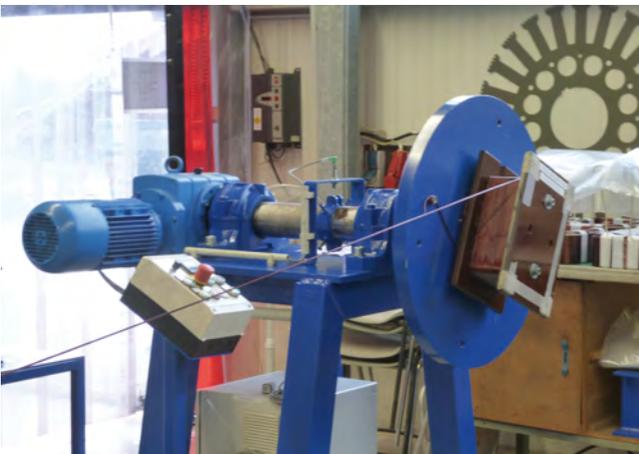
- ▶ Insulation cutting and stamping machines
 - ▶ Coil winding machine (coil length up to 1,300 mm)
 - ▶ Field coil winding machine (coil length up to 1 m, net weight not exceeding 50 kg)
 - ▶ Welding machine (for welded joints from 10 mm² to 150 mm²)
 - ▶ Electronically programmable testing device
- ▶ Current-UV impregnation system for stators up to size 350 (up to 4 stators simultaneously, impregnation cycle 1.5 to 2.5 h)
 - ▶ Pull-in machine up to size 450, four- and multi-pole machines up to 1.5 t
 - ▶ Press for compressing end windings up to size 160



Programmable winding machine



Welding machine



Hand winding machine



Current-UV impregnation system



Manufacturing field F5

**Repairs and
rotor windings**

4.1.2.5 Manufacturing field F5 - Repair of motors, generators, pumps and production of rotor windings

4.1.2.5.1 Range of services repairs

Our repair services include the disassembly, cleaning, drying and reimpregnation of stator and rotor windings as well as the mechanical overhaul of roller and plain bearings. In our mechanical department we perform the reconditioning of assemblies, such as fans, the processing of bearing seats, the fixing of laminated cores, the exchange of rotor bars in squirrel-cage rotors and many other repair works to be realised on electric machines.

Apart from that we can also offer a rotor balancing service to our customers.

We can balance all rotors from approximately 10 kg to 32 t at their rated speed (2 to 12 poles). The reconditioning can be performed for machines weighing up to 120 t. In these processes, the maximum permissible rated voltage is 18 kV.

Processing of two half-shells, including windings



4.1.2.5.2 Technical options and machinery for repair services

Machine weight or individual unit weight

- ▶ max. 120 t

Balancing and overspeed testing

- ▶ Roller bearings: max. 32 t; 3.1 m shaft length, 2,100 rpm
- ▶ Plain bearings: see chapter 4.1.2.10.2

System capacities (W x D x H in metres)

- ▶ Washing room: 5.3 x 5.0 x 3.4
- ▶ Oven: 5.0 x 5.8 x 4.0
- ▶ Blasting cabinet (corundum): 3.0 x 6.0 x 3.5

- ▶ Blasting cabinet (walnut): 2.6 x 5.5 x 2.4

- ▶ Enamel application and drying room: 5.0 x 5.4 x 3.4

Lathe

- ▶ Distance between centres: 10,000 mm
- ▶ Centre height: 1,000 mm
- ▶ Weight: 40 t between centres or with 2 steady rests
- ▶ Free turning diameter: 1,680 mm
- ▶ Clamping diameter: max. 1,400 mm; 230 mm

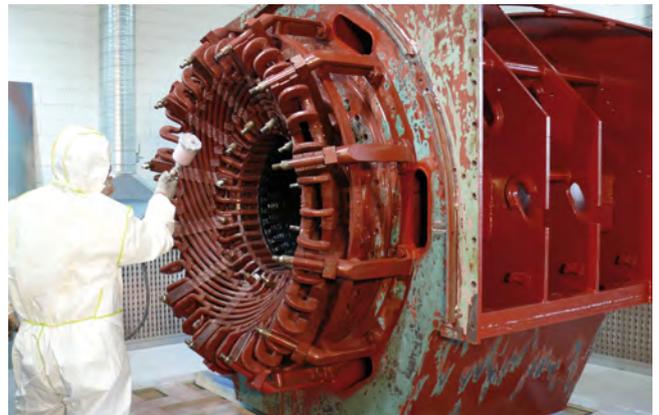
4.1.2.5.3 Range of services rotor windings

We primarily differentiate between DC and three-phase rotor windings. This differentiation is of high importance when it comes to the technical and technological design of these two types of windings. Although rated voltages or rated powers are not even considered here in particular.

The production or manufacturing of these windings comprises numerous special aspects that can be fully implemented with all parameters by the PARTZSCH Group.



Washing, drying and blasting system



Colouring



Balancing and centrifugal casting plant



Bearing reconditioning



Turning



Test runs *No-load test with oil supply for plain bearing systems*

i SLIP-RING ROTOR WINDINGS

Machines for small rated power levels are designed as round-wire windings, whereas for medium and large rated power levels bar windings are applied.

Depending on the weight and size of the rotor, in addition to lifting equipment certain winding, cutting, straightening and taping machines may be applied. Apart from that, the availability of special welding procedures for the various material qualities is an essential criterion for the technological feasibility.

The mechanical processing of rotor parts, such as the manufacturing of shafts, laminated cores and slip-ring assemblies also forms part of our range of services.

The application of appropriate tapes for absorbing the centrifugal forces on the winding is of utmost importance and requires special machinery.

We can offer these windings with two types of insulation. They can be produced using the resin-rich process with cured slot insulation or the VPI technology with complete submersion in thermal class 155 (F) or 180 (H).

Technical parameters

- ▶ weight: max. 32 t

Copper

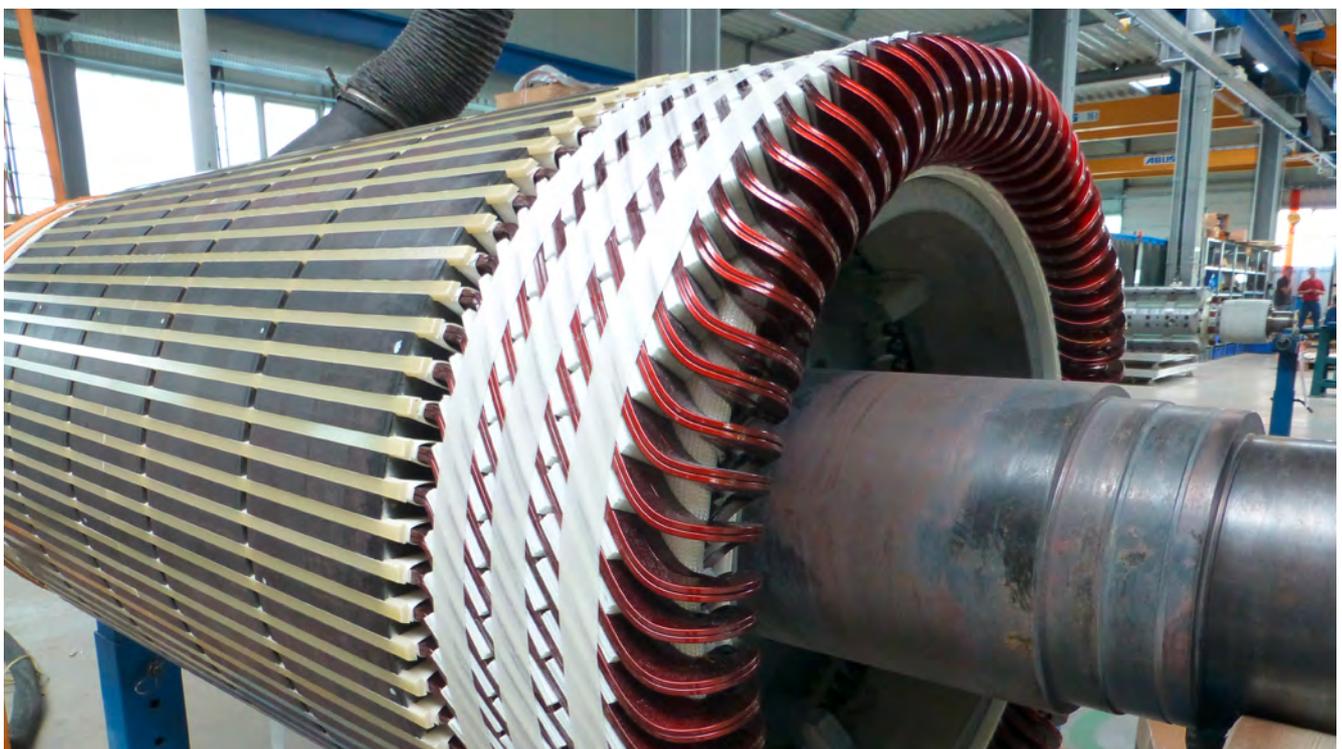
- ▶ insulated bars and/or enamelled wire
- ▶ VPI or resin-rich processes
- ▶ minimum cross section: 4 x 1 mm
- ▶ max. cross section of 25 x 5 mm up to a length of max. 2 m
- ▶ special sizes available upon request

End winding tape

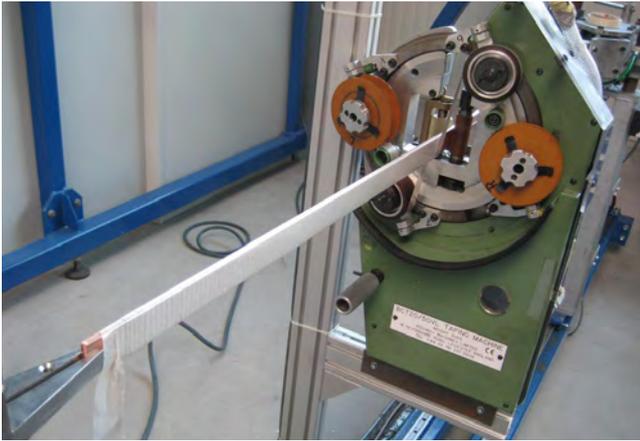
- ▶ up to 1,500 mm laminated core diameter
- ▶ up to 5,000 mm shaft length
- ▶ max. weight: 10 t
- ▶ larger rotors are currently taped in Bitterfeld

Special features

- ▶ Production of 2-pole turbo rotors, including balancing and overspeed.



Slip-ring rotor



Insulation of copper bars



End-winding taping system

i SQUIRREL-CAGE ROTOR WINDINGS

Squirrel-cage rotor windings are manufactured using copper, aluminum or special alloy bars.

The generation of the welded joints of the bars with the short-circuit rings on both sides requires high technical expertise, as these parts are exposed to extreme temperature fluctuations and thus extreme variations in length and expansion may occur.

Just considering the bar profiles with their varying profiles, from round-bar rotors or deep-bar rotors to double-bar rotors, suggests the high number of machine tools needed for the production of these profiles and the application of the corresponding welding processes.

Our customers can benefit from our longtime experience in this field.

Technical parameters

- ▶ weight: up to 32 t

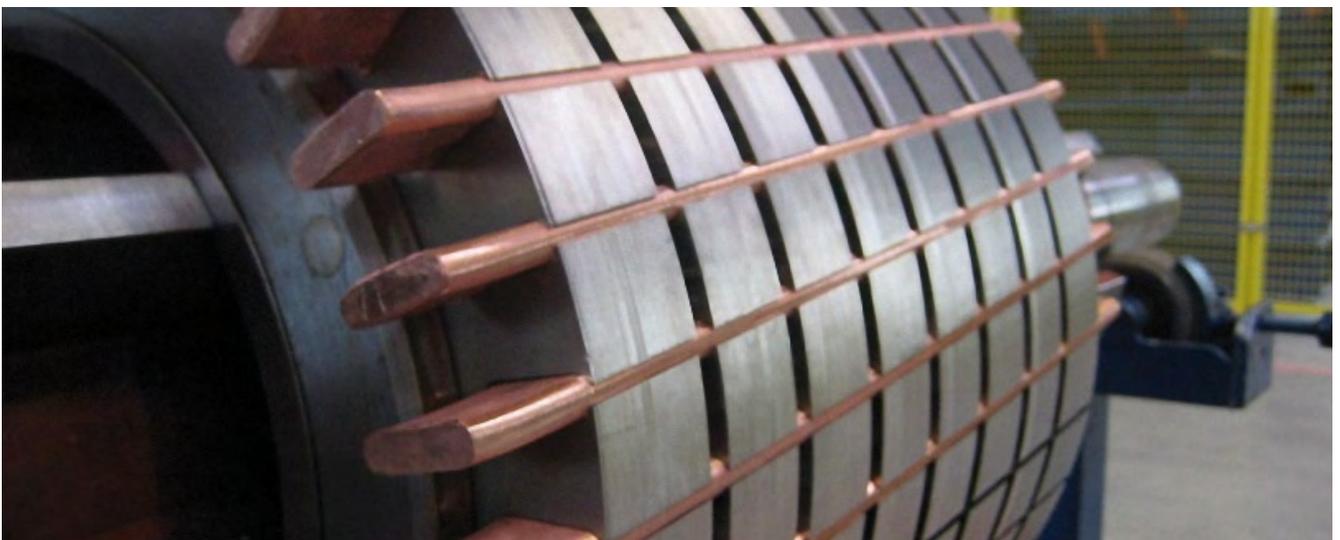
Joining processes

- ▶ welding, hard and soft soldering
- ▶ flame or - induction brazing

Other

- ▶ aluminum or copper bar design
- ▶ any desired bar geometry
- ▶ material analyses

Three-phase squirrel-cage rotor



i POLE-WHEEL WINDINGS

For synchronous machines, special pole-wheel windings are needed. These windings are available in a variety of designs and for various rated power levels. The rated voltage is relatively low.

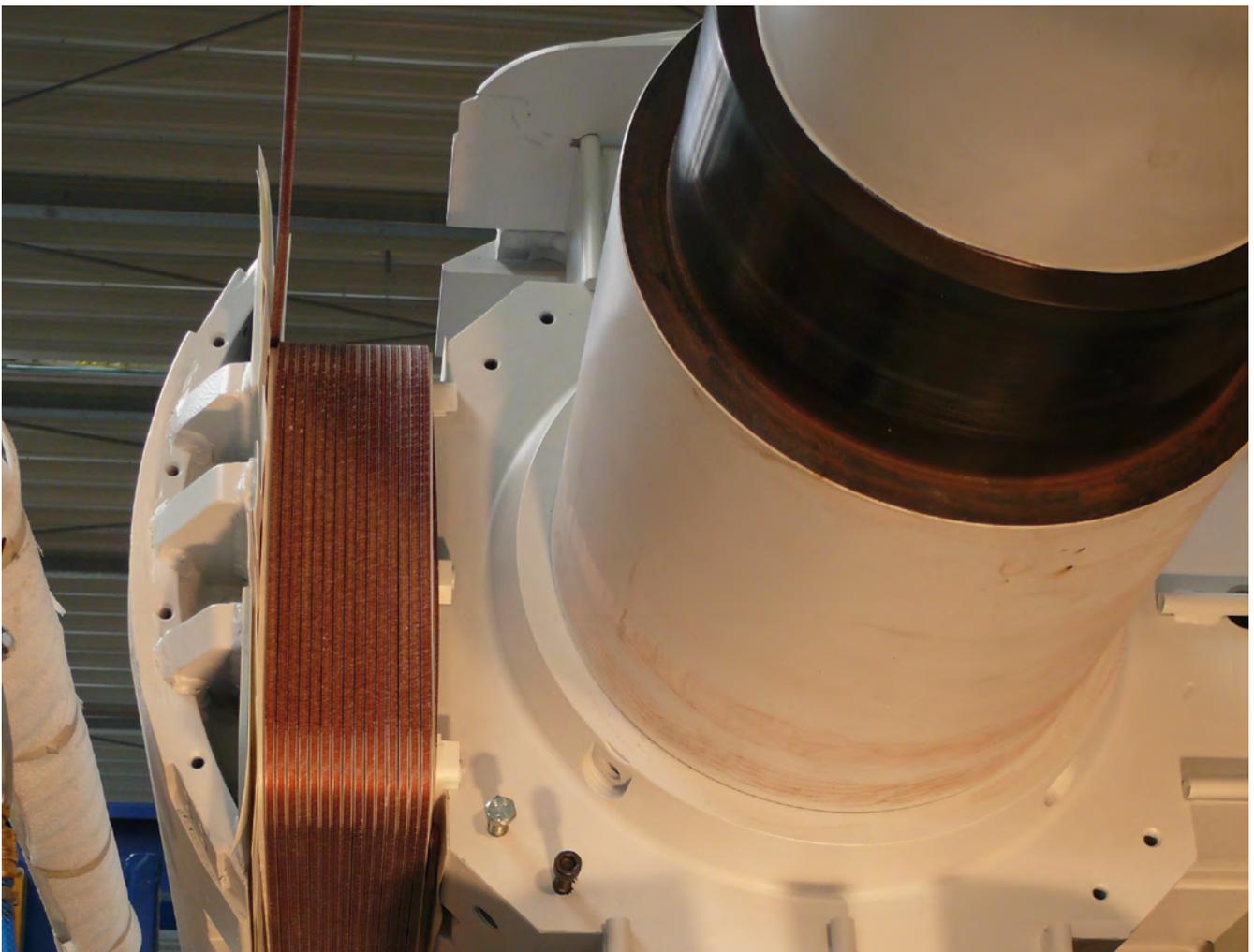
There are significant differences in the manufacturing of the so-called field coils. One procedure involves winding the poles onto a field coil box with enamelled profile wire, then mounting them onto the pole core and finally screwing them onto the pole wheel.

Another method is the direct winding of the pole core. In this procedure the rotor is placed in a special facing lathe that allows the direct winding of the pole core.

Technical parameters

- ▶ Unit weight up to 22 t
- ▶ Laminated core diameter max. 1,500 mm
- ▶ Shaft length max. 5,000 mm
- ▶ Shaft diameter at the mounting point max. 350 mm
- ▶ Wire height: 1.5 to 8.0 mm
- ▶ Wire width: 1.0 to 12.0 mm
- ▶ Wire insulation: Enamel or enamelled wire insulated with mixed yarn sintered (Daglas)
- ▶ Realisation of specific customer requirements upon request

Pole-wheel winding





**Manufacturing field F6
Roebel bar production**

4.1.2.6 Manufacturing field F6 - Roebel bar windings

4.1.2.6.1 Range of services

For generators from about 30 MVA onwards and for special motors, so-called Roebel bar windings are used. These bars, consisting of a large number of individual braided strands, create an improved current distribution within the slot as compared to the skin effect.

The manufacturing of these special winding bars requires specific machines, such as:

- ▶ Insulation cutting and stripping machines, combined with cranking tools for bars up to a length of 10 m;
- ▶ Hot coil presses for pre-curing and pressing the bars in resin-rich design.

The finished, pre-cured bars are bent into the required involute shape using a bending robot. Following this procedure, the bars receive soldering lugs for the installation on site.

Our production line is supplemented by a taping robot for the application of the main insulation.

The PARTZSCH Group is able to produce straight bars up to a total length of 10 m and a rated voltage not exceeding 21 kV. In case of the VPI design, the maximum laminated core length is 8.0 m.

Apart from the manufacturing of individual bars, our production range also includes complete Roebel-bar windings.



Taping robot



Cutting and cranking system



Hot coil press

4.1.2.6.2 Technical parameters

The following technical parameters can be realised

- ▶ Minimum cross section of insulated strand: 4 x 1 mm
- ▶ Maximum cross section of insulated strand: 16 x 4.5 mm
- ▶ Number of strands per half bar: 80
- ▶ Maximum conductor length after cutting: 10,000 mm ± 2 mm
- ▶ Maximum twisting: 180°; 360°; 540°
Special Roebel designs available upon request



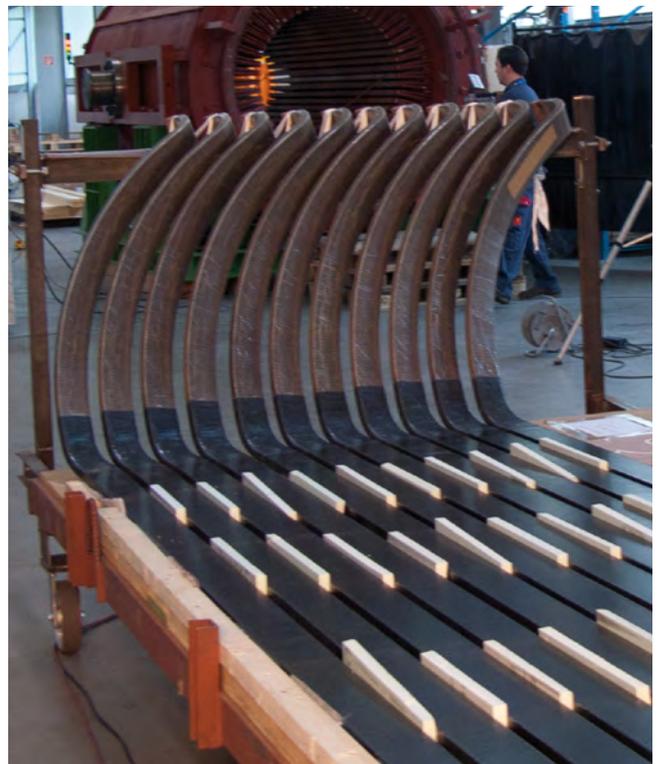
Taping robot

i PRODUCTION RANGE
ROEBEL BARS

Insulation system	Product	Nominal voltage	Thermal class	Comments
Resin-Rich	complete windings	≤ 13.8 / ≤ 16 kV	155 (F)	resin rich insulation tapes, hot pressed insulation sleeve
	Roebel bars	≤ 13.8 / ≤ 16 / 21 kV	155 (F)	
VPI polyester resin	complete windings	≤ 13.8 / ≤ 16 kV	180 (H)	polyesterimide resin (UP), vacuum-pressure method
VPI epoxy resin	complete windings	≤ 13.8 / ≤ 16 kV	155 (F)	epoxy resin (anhydride), vacuum-pressure method
	Roebel bars	≤ 13.8 / ≤ 16 / 21 kV	155 (F)	



Roebel bars after hot pressing



Finished Roebel bars manufactured in resin-rich technology



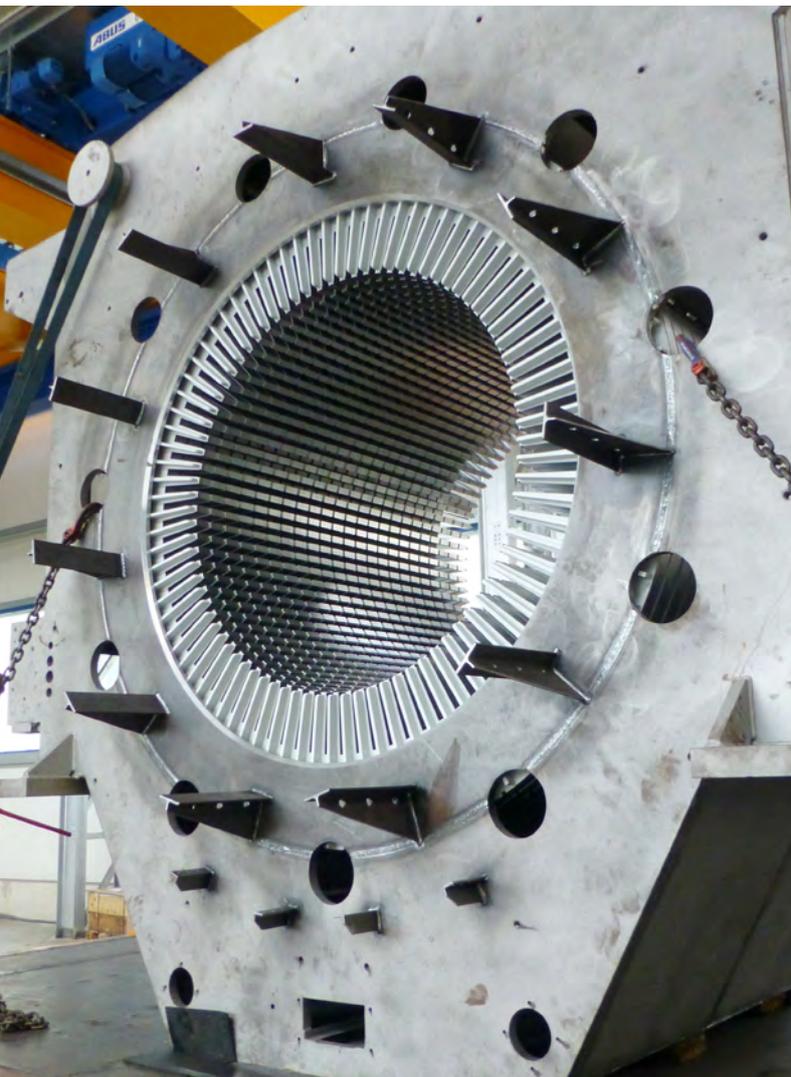
**Manufacturing field F7
Laminated core production**

4.1.2.7 Manufacturing field F7 - Laminated core production

4.1.2.7.1 Range of services

The magnetic circuit of electric machines includes the stator and the rotor laminated core. These consist of laminated electrical sheets. Depending on the size and diameter of the laminated cores, there exist a number of options for manufacturing the corresponding sheets.

Sheets up to a laminated core outside diameter of 1,250 mm are usually cut out as a complete contour, thus creating a ring. With laminated core outside diameters exceeding 1,250 mm, the sheets are manufactured as segments and combined into the complete core. Our company has a variety of processes available for producing the individual contours.



Laminated core in housing

i PRODUCTION OF INDIVIDUAL SHEETS

Laser cutting

The programmable machine control of the laser cutting units allows the production of any desired contour for the electric machine.

With a very low cutting tolerance and a high repeat accuracy, this procedure is the optimum solution for the production of high-quality contours.

It is used for the manufacturing of prototypes, repair and small series of electric machines, but also for realising deliveries of electrical sheet contours within a short time frame.

Water-jet cutting

For contours that cannot be cut using the laser cutting method, we apply our water-jet cutting system.

With a pressure of up to approx. 4,000 bar and the addition of an abrasive agent, non-ferrous metals up to 100 mm, aluminum up to 250 mm and steel up to 100 mm material thickness can be processed.

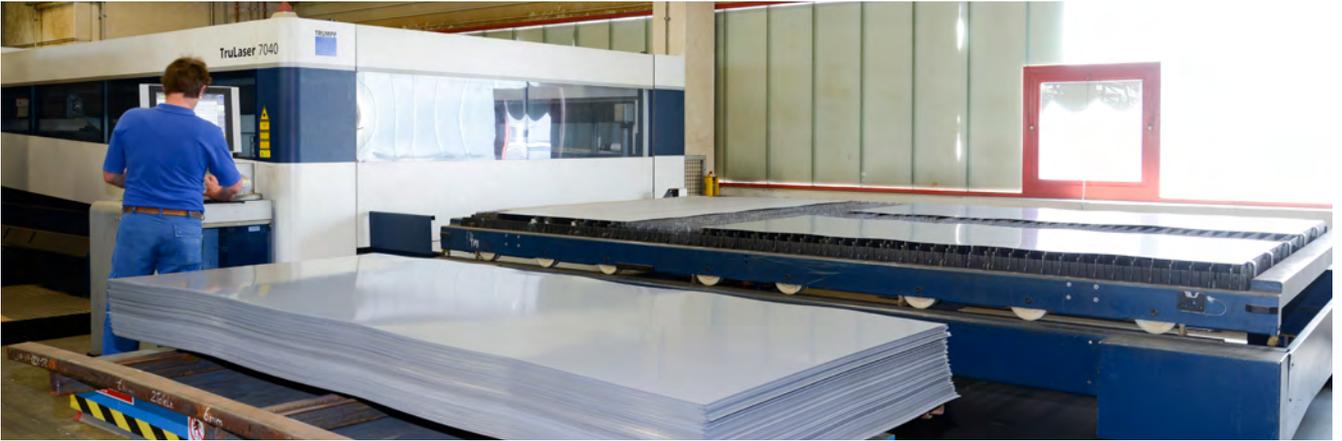
As this procedure allows the processing of a large variety of materials, many parts of the electric machine, such as pressure plates, press rings or copper parts can be manufactured.

Post-treatment of sheets

During the manufacture of electrical sheet contours, a cutting burr is created, which can cause an electrically conductive contact between the sheets when pressing the laminated core. This facilitates the generation of eddy currents over various sheets, thus increasing the hysteresis losses of the laminated core.

This effect can be eliminated by post-treatment of the electrical sheets.

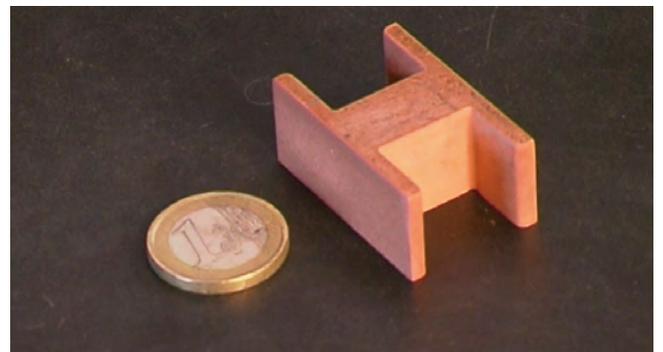
During post-treatment the cutting burr is removed and the sheet is recoated on both sides.



Laser cutting unit



Water-jet cutting system



Water-jet cut contour



Deburring and coating system

i ASSEMBLY OF LAMINATED CORES FOR STATORS AND ROTORS

In our company we offer a number of assembly methods. Please feel free to contact us – we are always happy to help you select the appropriate method for your application and advise you on the corresponding advantages and disadvantages. We can layer the sheets in a so-called layer cage or directly into the housing. The layer cage is used as an auxiliary means and is adapted to the outer contour of the sheet. The laminated core is pressed to shape under a press or using a pressing machine and fastened accordingly (e.g. by welding or clamping).

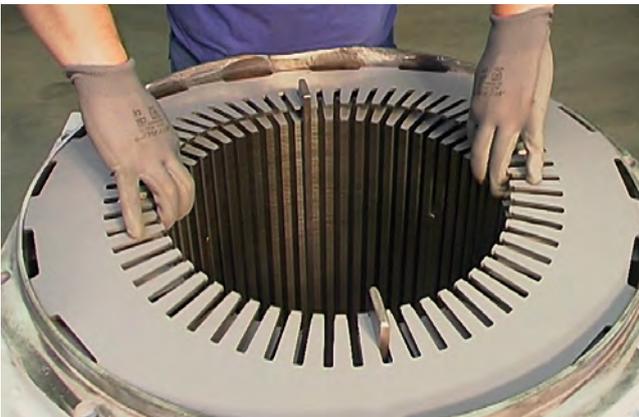
Another option is the assembly using a stacking mandrel. The mandrel is adapted according to the inner diameter of the rotor or stator core and will be removed after the completion of the layering. In case of machines with a laminated core outside diameter exceeding 1,250 mm, segments are used. These segments can also be layered directly into a cage or the housing. The core layered into the cage is then pulled into the housing completely.

Apart from the solutions given above, laminated cores can also be produced using free layering.

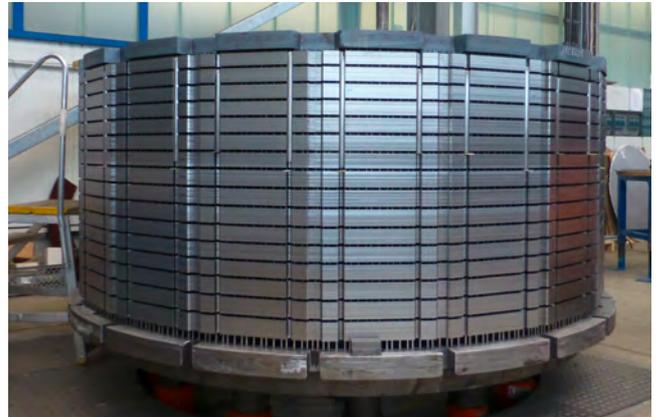
Here, the core is layered using auxiliary means and then fastened without applying a housing, mandrel or cage. Auxiliary means used for layering cores may include, for example, stacking strips or needles. These are ground in order to obtain dimensional accuracy.

Depending on the laminated core length, intermediate pressings are performed, thus ensuring dimensional accuracy.

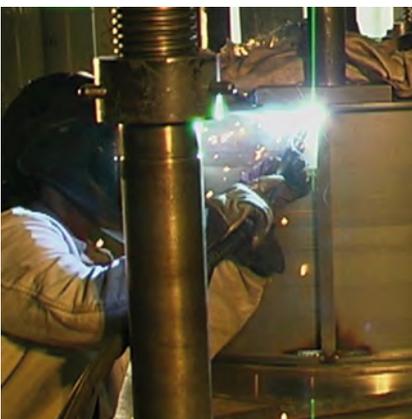
In shrinking processes used for the assembly of laminated cores in housings or on shafts, the components to be joined are measured at room temperature and aligned vertically. After the uniform heating or cooling (shafts) of the corresponding components, these are subjected to the joining process and accurately aligned with one another.



Assembling the laminated core



Laminated core



Fastening the pressed core



Stacking into the housing



Free layering of a laminated core

i CORE CONSTRUCTION

Production of:

- ▶ Rotor cores as individual core or on a shaft
- ▶ Main and commutating poles
- ▶ Stator insertion cores
- ▶ Bonded cores

The cores can be layered freely or integrated into the housing. The fastening of the cores is realised by clamps, welding or shrinking processes, among others.

Laminated cores made of whole sheets or segments with or without pressure plates

We develop individual solutions for the repair of laminated cores and provide assistance in the manufacture of prototypes. With the support of our welding engineering staff and the 3D measurement of large cores by our quality assurance team we can handle major complex projects.

Technical parameters

- ▶ Max. core size: L x Ø: 2,500 mm x 2,500 mm
- ▶ Max. weight: 40 t
- ▶ Max. pressing force: 6,000 kN
- ▶ Max. housing size: Ø 5,500 mm x 2,000 mm

Larger dimensions and weights may be feasible following technical evaluation.



Hydraulic pressing

i WELDING PROCEDURES

The following welding procedures are used in laminated core production, in manufacturing and repair of components for rail vehicles:

- ▶ Metal active gas welding (MAG; 135)
- ▶ Tungsten inert gas welding (TIG; 141)
- ▶ Manual arc welding (E; 111)
- ▶ Resistance spot welding (21)

In these procedures materials of the material groups 1.1, 1.2 and 8 are processed.

Permits and test certificates

The PARTZSCH Group is certified according to DIN 18800-7:2008-11, Class D for the welding of steel structures with predominantly static load and is permitted to perform welding work within the specified scope for certification level CL1 according to EN 15085-2.

The final weld inspections are performed by our certified staff using the following procedures:

- ▶ Magnetic particle inspection
- ▶ Dye-penetration method
- ▶ Visual weld inspection



Welding certificate



Certificate according to EN 1090-2

4.1.2.7.2 Technical parameters and machinery

i TECHNICAL PARAMETERS PRODUCTION OF INDIVIDUAL SHEETS

Decoiling of sheets from coil

- ▶ Max. coil weight: 10 t
- ▶ Max. coil width: 1,260 mm
- ▶ Max. sheet thickness: 1.0 mm
- ▶ Min. sheet thickness: 0.35 mm

Laser cutting

Material thicknesses:

- ▶ Thin sheet metal and electrical sheet from 0.2 mm to 3 mm
- ▶ Steel panels (mild steel) from 3 mm to 20 mm
- ▶ Max. working area: 2,050 mm x 4,000 mm

For thin sheet metal and electrical sheets up to a thickness of 1 mm we guarantee a cutting accuracy of +/- 0.05 mm.

Water-jet cutting

Water-jet cutting with and without abrasive agent at pressures of up to 4,000 bar for a variety of 2D contours.

Typical materials:

- ▶ Stainless steel up to 100 mm
- ▶ Mild steel up to 100 mm
- ▶ Aluminum up to 250 mm
- ▶ Non-ferrous metals up to 100 mm

Max. working area:

- ▶ 3,000 mm x 3,000 mm

Additional materials and material thicknesses may be feasible following technical evaluation.



Double-head laser cutting machine

Spot welding of sheets

- ▶ Spot or projection welding of sheets for the production of ventilation and cover plates.

Deburring and coating of electrical sheets

- ▶ Removal of cutting burr on cut and punched contours
- ▶ Subsequent application of insulating varnish on both sides of the sheets
- ▶ Workpiece length: 350 mm to 1,250 mm
- ▶ Workpiece width: 350 mm to 1,250 mm
- ▶ Workpiece thickness: 0.35 mm to 1.0 mm

Coating specifications

- ▶ Viscosity: 60 to 150 DIN 4s
- ▶ Minimum application thickness: 2 to 3 µm on each side, dry



Individual sheets



Water-jet contour cutting

i TECHNICAL PARAMETERS
WELDING

For the performance of welding work we apply state-of-the-art welding equipment, thus providing optimum results.

Inert gas MAG/MIG

- ▶ Max. output: 400 A
- ▶ Max. wire diameter: 1.6 mm

Inert gas TIG

- ▶ Output: 160 to 400 A

Resistance spot welding

- ▶ Nominal power: 40 kVA
- ▶ Max. welding power: 118 kVA
- ▶ Max. short-circuit current: 26.2 kA



Welding system Mega Puls 400 from REHM

Pulse welding with MegaPuls 400 from Rehm



i MACHINERY
LAMINATED CORE PRODUCTION

For the production of laminated cores the following machines are at our disposal:

- ▶ 9 double-head laser cutting machines
- ▶ 1 water-jet cutting system
- ▶ 1 continuous deburring and coating system
- ▶ 1 decoiler
- ▶ 1 light measuring table



Decoiler



Large-format scanner for testing laser cutting



Laminated core in stacking tower with pressing machine



Double-head laser cutting machine



**Special construction and
reproduction of
electric machines**

4.1.2.8 Special construction and reproduction of electric machines

As an alternative to the reconstruction and renewal of machinery we can offer the reproduction of your motor or generator.

The special feature of this technology is the exact reproduction of all dimensions, but also the new configuration of the machine's magnetic circuit with the aim of improving its efficiency. Energy efficiency is one of our top priorities.

You can rely on our complete range of services for designing and manufacturing.

REPRODUCTIONS

Depending on the repair expenses or the availability of spare parts in some cases machines are no longer worth repairing. And for customised electric motors there is usually no alternative in place.

With PARTZSCH you can benefit from an identical reproduction of your electric machine, regardless of age and type. You can thus receive a completely identical new machine in exchange for your existing machine. The reproduction is realised on the basis of existing drawings / documentation or the temporary provision of a sample machine.



Light measuring table

MANUFACTURING OF PROTOTYPES

- ▶ Stator production
- ▶ Rotor production
- ▶ Special machine engineering
- ▶ Development until start of production
- ▶ Application also in potentially explosive atmospheres and in deep water

CONSTRUCTION

Our engineers and technologists specialise in the on-going development and optimisation of existing technologies. Our experience gained in many years has an important impact on this field of expertise. True to the motto 'Everything you can imagine you can create' we can help you realise your individual requirements, from the idea to the finished product.

REVERSE ENGINEERING

Contour detection with a large-format scanner for the repair and reproduction of machines, to receive one individual sheet. We can detect and digitise the contour with the help of our large-format scanner. Following the reconstruction on a CAD computer, all data are transmitted to the laser cutting unit. Here, the reconstructed sheet is cut to size.

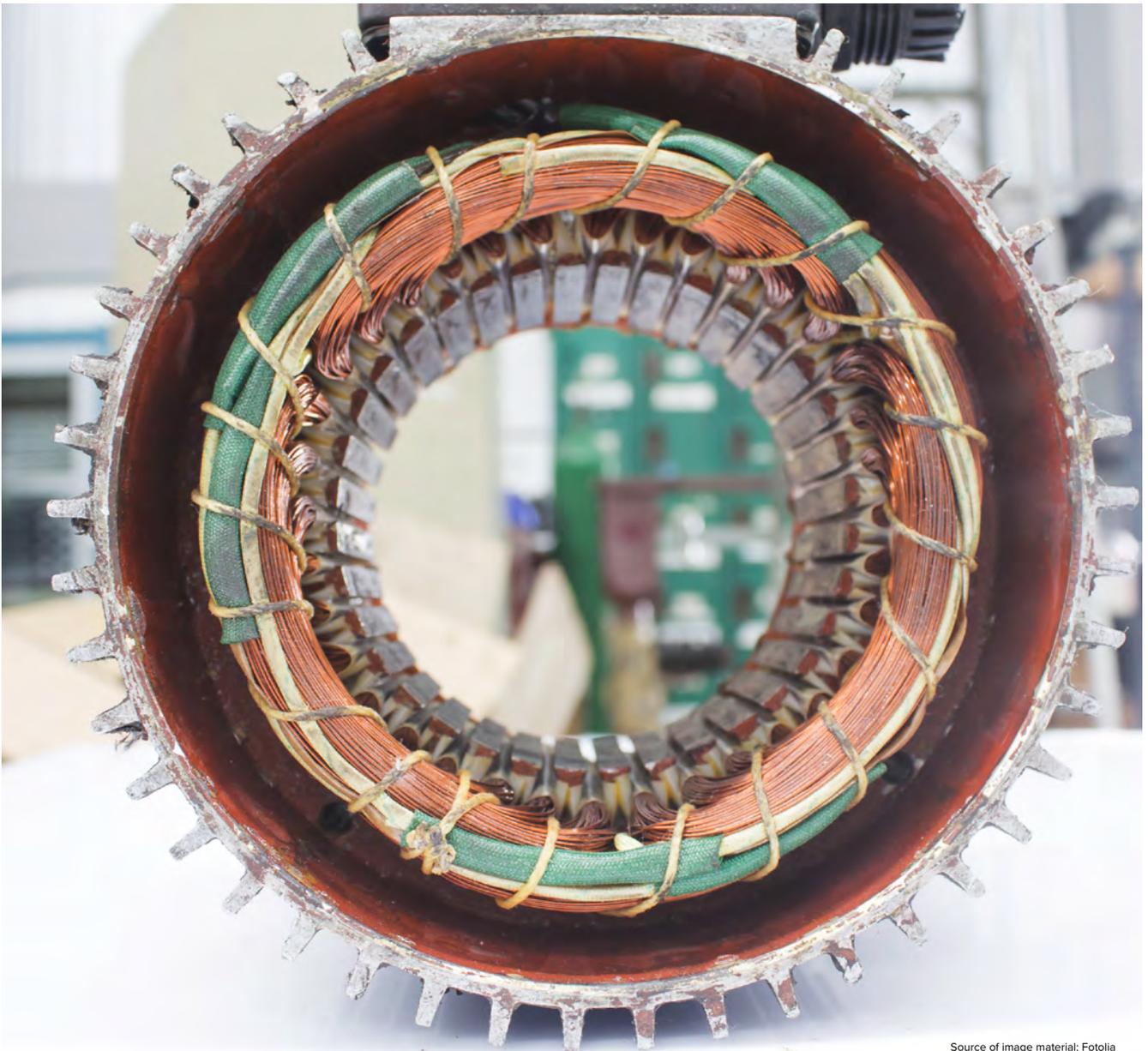
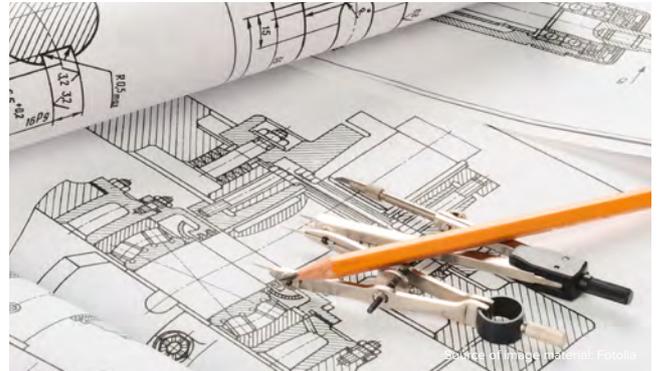
In case of the new construction of your machine you can simply send a PDF file containing the corresponding dimensions. Also, DXF or DWG files can be used instead. It should be mentioned here that we always have about 500 to 600 t of sheet coils available in various electrical sheet qualities.

RANGE OF SERVICES

- ▶ Complete reproduction (even without the original documents)
- ▶ Prototype production / development until start of production
- ▶ Complex and new electric machines included
- ▶ Regardless of machine age and type
- ▶ Reverse engineering / reconstruction

i YOUR ADVANTAGES

- ▶ No adaptation of the installation site necessary
- ▶ No adaptation of electrical installations necessary
- ▶ No new permits or tests necessary
- ▶ Machines interchangeable without restrictions



Source of image material: Fotolia



Quality-related services

4.1.2.9 Quality-related services

4.1.2.9.1 Diagnoses

In order to ensure fair general conditions for the repair of the machines supplied by our customers, all machines are inspected in our test facilities for defects that are not initially visible.

These inspections agreed with the customer include the disassembly and cleaning of the machines with subsequent electrical testing and mechanical measuring and, where applicable, thermal measuring.

After the preparation of a detailed inspection report, which is sent to the customer for consultation, the offer is compared with the actual scope of services to be performed. If necessary, the customer receives a supplementary offer. The customer then decides on the scope of work to be performed, or rather, the repair procedure used for his machines in our company.



Thermographic inspection of the laminated core after pyrolysis



Test facility

4.1.2.9.2 Technical parameters

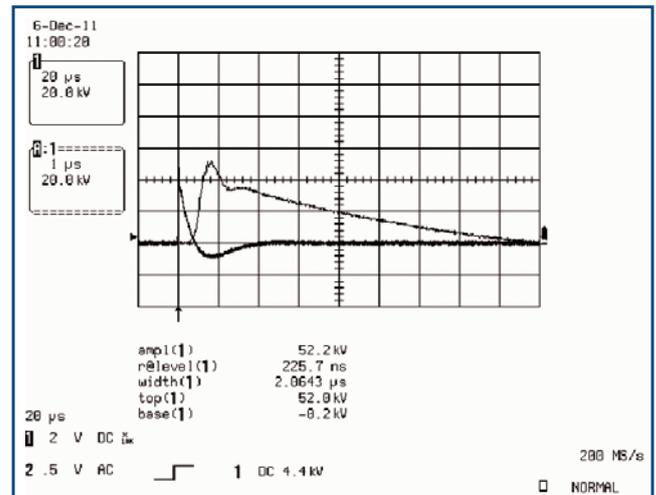
- ▶ Visual inspection of machine components
- ▶ Runout inspection
- ▶ Electrical receiving inspections
 - ▶ *Insulation resistance measurement*
 - ▶ *High-voltage testing up to 35 kV AC*
 - ▶ *Surge voltage testing up to 40 kV*
 - ▶ *Resistance measurement*
- ▶ Mechanical receiving inspections
 - ▶ *Measurement of bearing seats*
 - ▶ *3D measurement of the entire machine*
- ▶ Thermographic inspection of the laminated core

4.1.2.9.3 Services in test facilities

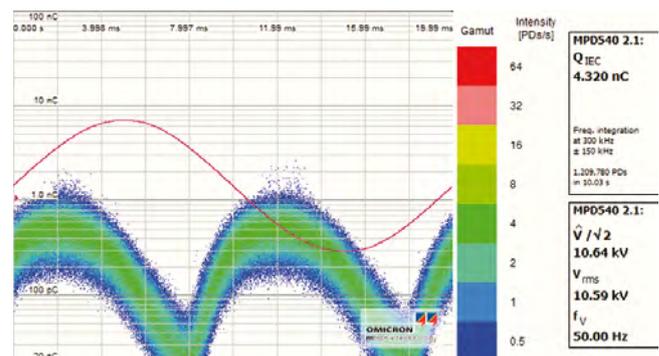
During the ongoing manufacturing of the various products, a variety of electrical and visualising tests is performed subsequent to all relevant production stages of the product. From the individual winding to the entire machine these inspections ensure the high quality standard of the PARTZSCH Group.

ELECTRICAL TESTS

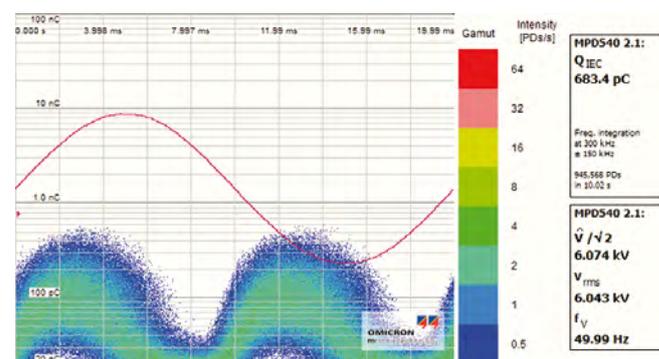
- ▶ Resistance measurement (measuring current up to 10 A)
- ▶ Measurement of the insulation resistance up to 5 kV
- ▶ Mobile surge voltage testing up to 40 kV
- ▶ Permanent surge voltage testing according to EN 60034-15 up to 100 kV
- ▶ AC high-voltage testing systems, permanent
 - ▶ 60 kV / 8 A
 - ▶ 30 kV / 15 A
 - ▶ 100 kV / 200 mA
- ▶ AC high-voltage testing systems, mobile
 - ▶ 35 kV / 4 A
 - ▶ *Loss factor measurement*
 - ▶ *Partial discharge measurement system*
 - ▶ *Frequency generators 500 Hz and 2,000 Hz*
 - ▶ *DC supply up to 1,500 A*



Analysis of the surge voltage testing for winding insulation



Nominal voltage 10.5 kV



Phase-to-earth voltage 6.0 kV

i MECHANICAL TESTS

- ▶ Length measuring devices up to 1,800 mm
- ▶ 3D measurement with laser tracking system
- ▶ Laser-optical alignment control
- ▶ Coordinate measuring machine 400 x 400 mm
- ▶ Surface roughness measurement device
- ▶ Runout measuring device
- ▶ Penetration and magnetic particle testing
- ▶ Inspections and approvals by our welding engineers
- ▶ Ultrasonic and X-ray inspections by external partners

i MACHINE TESTINGS

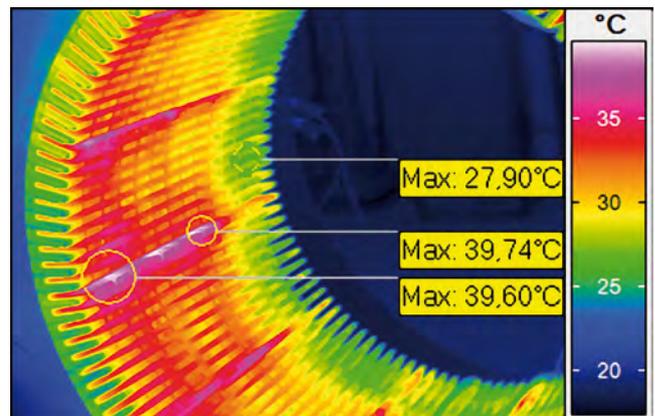
- ▶ No-load test on motors and generators up to 1,200 kW
- ▶ Vibration measurement and vibration analysis
- ▶ Oil supply for plain bearing systems
- ▶ Voltage supply up to 11,000 V (3 ~) and 850 V (DC)
- ▶ Torque measurement up to 10,000 Nm
- ▶ Crane capacity up to 120 t
- ▶ Cooling water supply for air/water heat exchangers
- ▶ Temperature monitoring
- ▶ Recording of measurement values with MCPS system
- ▶ Field balancing up to 4,500 min⁻¹



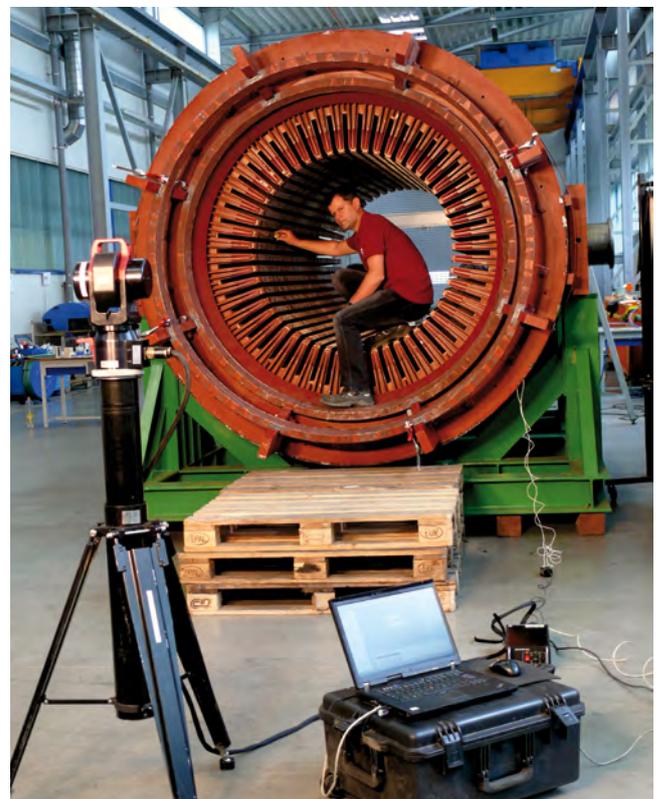
Mobile test facility

i LAMINATED CORE TESTS

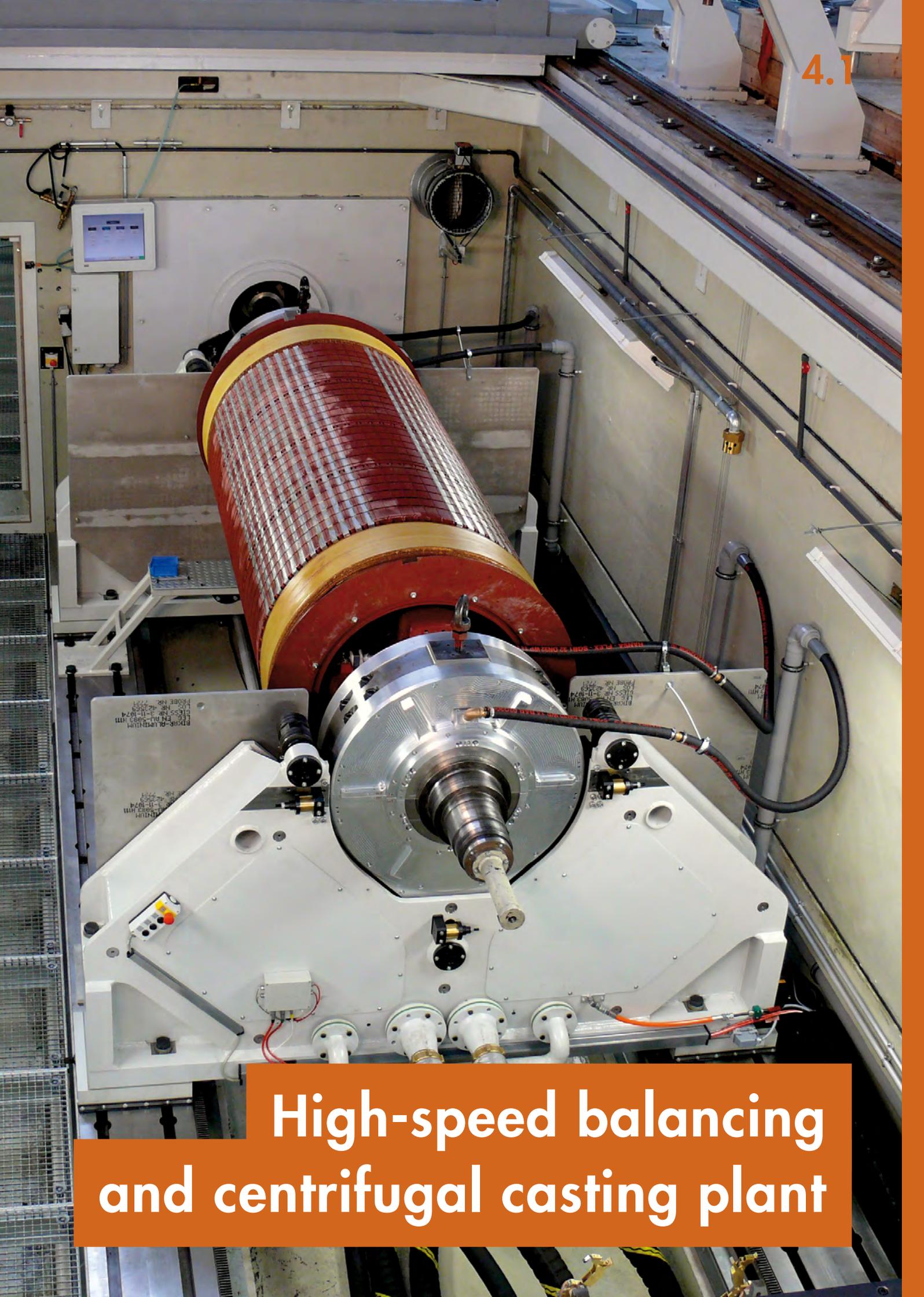
- ▶ Adjustable voltage supply for ring magnetisation 0 to 400 V / 400 A
- ▶ Thermography with thermographic camera from Infratec
- ▶ Versatile use of thermographic camera possible, e.g. for the analysis of solder joints and press fittings
- ▶ Voltage supply for tests 25 V / 1,000 A AC and 25 V / 1,000 A DC



Thermographic measurement with defective area



Laser tracker



High-speed balancing and centrifugal casting plant

4.1.2.10 High-speed balancing and centrifugal casting plant

4.1.2.10.1 General description

The manufacture and repair of rotors is completed with a mass distribution test of the rotor, ensuring the compliance with balancing tolerances.

If necessary, adjustments can be made through the installation of balancing masses.

For that purpose, the system detects mechanical vibrations of rotors at low and high speed ranges.

The achieved balancing quality of the test object is documented in a protocol.

4.1.2.10.2 Technical parameters

The system was supplied by Hofmann Mess- und Auswuchttechnik GmbH & Co. KG with the following parameters:

- ▶ max. rotor mass: 32,000 kg
- ▶ max. mass per bearing pedestal: 16,000 kg
- ▶ min. rotor mass: approx. 1,000 kg
- ▶ length machine bed: approx. 8,000 mm
- ▶ max. rotor diameter above machine bed: approx. 2,500 mm
- ▶ max. bore diameter of bearing head for accepting plain bearing shells: \varnothing 600 mm
- ▶ max. bearing spacing: approx. 7,100 mm
- ▶ min. bearing spacing: approx. 500 mm
- ▶ balancing speed range: 180 to 4,500 min⁻¹

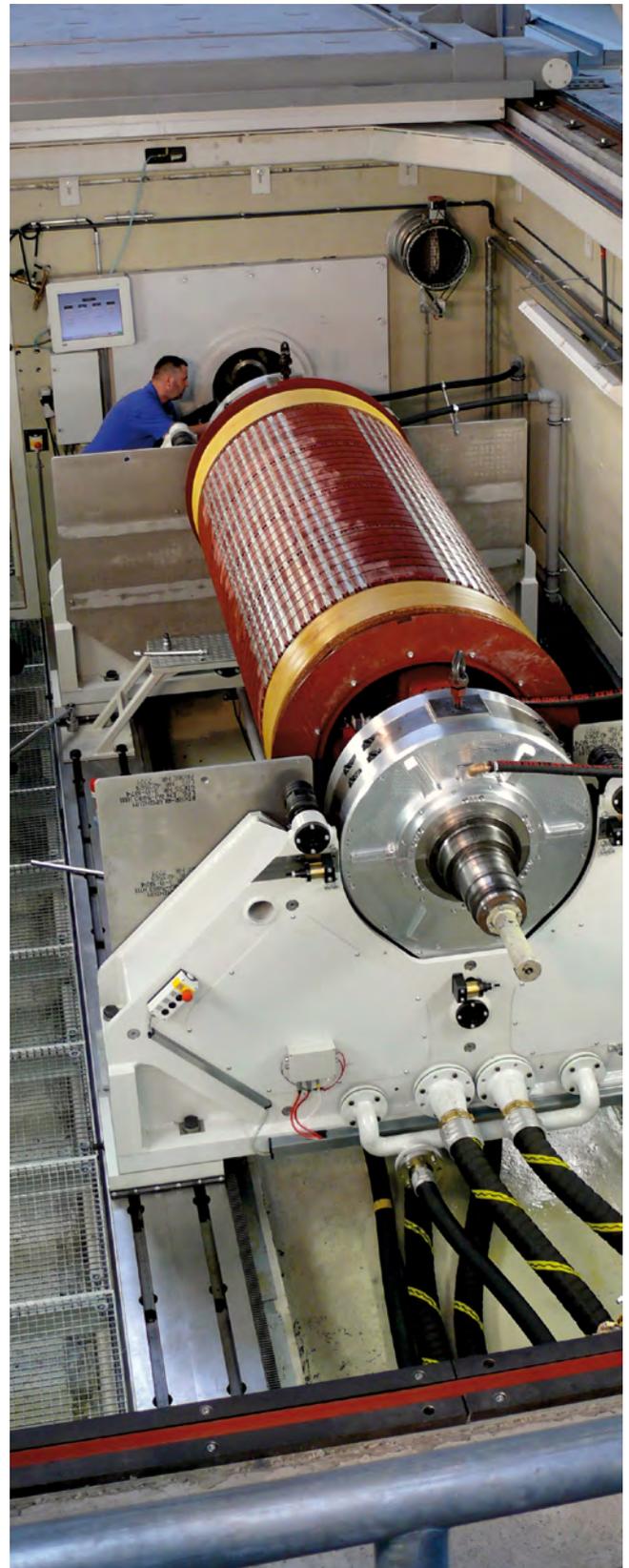
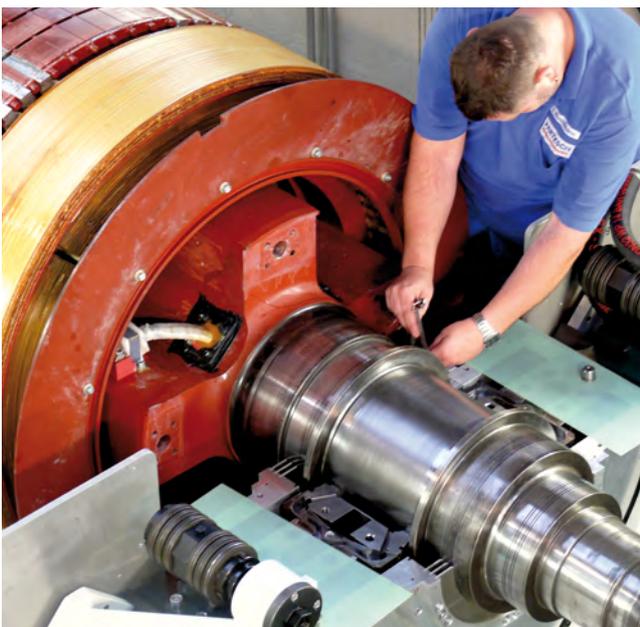
A separate inspection of the rotor to be tested must be performed for use in this system!



High-speed balancing and centrifugal casting plant of the PARTZSCH Group

4.1.2.10.3 Balancing process

- ▶ Process planning / clarification of all components needed
- ▶ Installing the test object in the balancing and overspeed testing system
- ▶ Testing of all plant components and safety installations
- ▶ Balancing start – ‘pre-balancing’ in low-speed range
- ▶ High-speed acceleration to first critical speed or rated speed
 - ▶ *Determination of influence coefficients*
 - ▶ *Balancing*
- ▶ High-speed acceleration to second critical speed or rated speed
 - ▶ *Determination of influence coefficients*
 - ▶ *Balancing*
- ▶ High-speed acceleration to third critical speed or rated speed
 - ▶ *Determination of influence coefficients*
 - ▶ *Balancing*
- ▶ Heating of winding, including laminated core, if necessary
- ▶ Overspeed test or safety run
- ▶ Balancing for delivery status
- ▶ Electrical testings during operation of test object, such as:
 - ▶ *Impedance testing, Measurement of ISO value*
 - ▶ *High-voltage testing at rated speed*
- ▶ Removal of test object from the balancing and overspeed testing system
- ▶ Preparation of inspection protocol



Preparation and installing the test object in the high-speed balancing and centrifugal casting plant

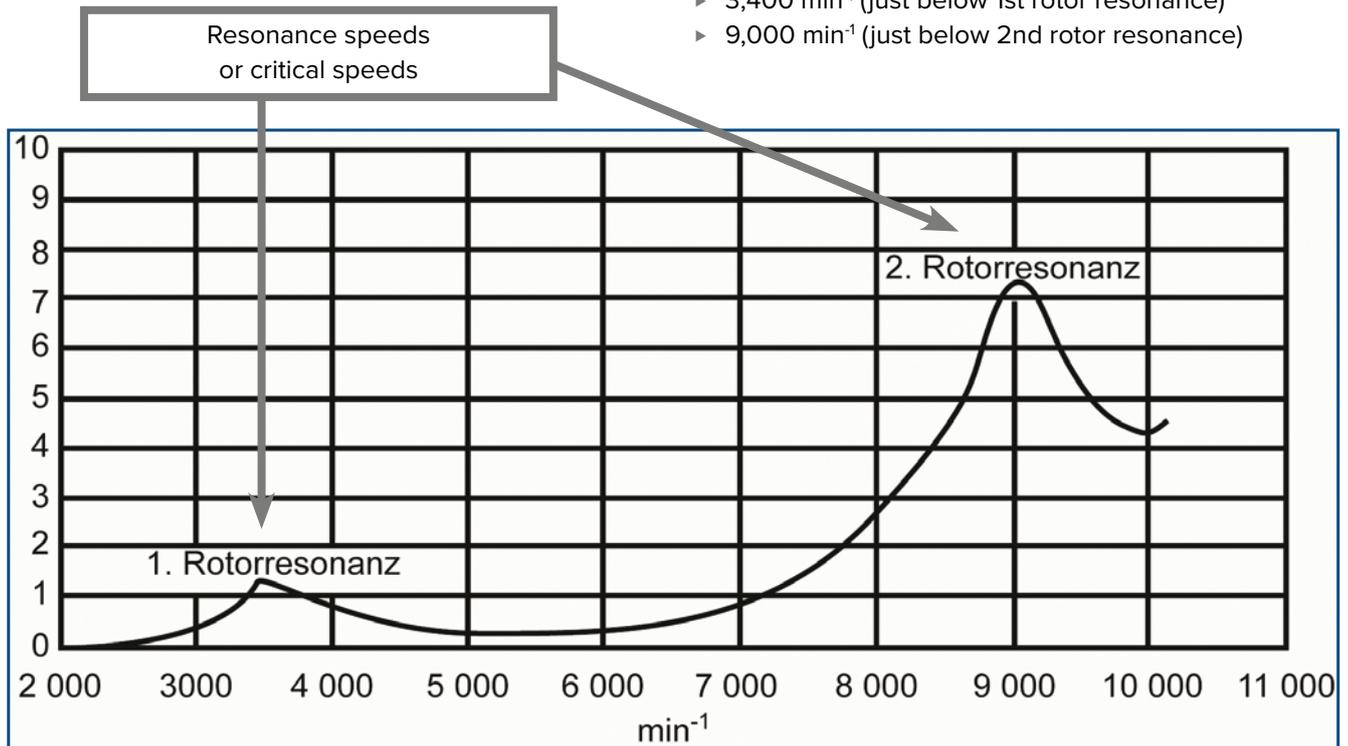
4.1.2.10.4 Example of a run-up curve before balancing (in terms of DIN ISO 11342)

The objective of the balancing process is the checking and adjusting of the test object, if necessary, in order to ensure compliance with defined balancing tolerances at operating speed, taking into account the behaviour at the object's resonance speeds below its operating speed. Balancing quality G2.5 (or as agreed).

i INFLUENCE COEFFICIENTS

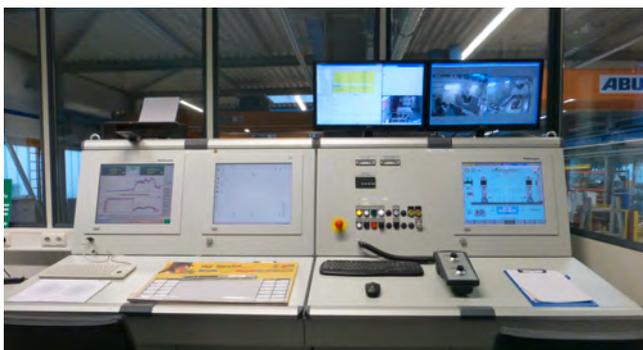
These are the balancing speeds for the test object:

- ▶ 1,000 min⁻¹ (low speed)
- ▶ 3,400 min⁻¹ (just below 1st rotor resonance)
- ▶ 9,000 min⁻¹ (just below 2nd rotor resonance)



4.1.2.10.5 Receiving inspection of rotor

- ▶ Runout measurement in lathe (test points as agreed)
- ▶ Insulation resistance measurement (measuring voltage 1,000 V or as agreed)
- ▶ Measurement of ohmic resistance



4.1.2.10.6 Tests performed in the high-speed balancing and centrifugal casting plant

- ▶ Overspeed test or safety run (values as agreed)
- ▶ Realisation of overspeed test or safety run with heated test object (as agreed and after technical clarification)
Additional costs will be incurred
- ▶ Vibration measurement as a function of the speed after balancing quality has been achieved
- ▶ Analysis of vibration velocity at rated speed
- ▶ Determination of residual unbalance (according to DIN ISO 11342)
- ▶ Specification of balancing masses and their position
- ▶ Securing the balancing masses

4.1.2.10.7 Electrical testings on slip-ring rotors during speed

- ▶ Impedance measurement at rated speed (measuring current < 10 A)
- ▶ Insulation resistance at rated speed (measuring voltage 1,000 V or as agreed)
- ▶ Voltage testing at rated speed (measuring voltage 1,000 V or as agreed)

4.1.2.10.8 Final inspections of rotor (as agreed)

- ▶ Runout measurement in lathe (measuring points as agreed)
- ▶ Insulation resistance measurement (measuring voltage 1,000 V or as agreed)
- ▶ Measuring of ohmic resistance



Preparation of runout measurement in lathe

4.1.2.10.9 Parameters of roller bearing machines for roller-mounted balancing system

- ▶ max. rotor mass: approx. 15,000 kg
- ▶ min. rotor mass: approx. 1,000 kg
- ▶ length machine bed: approx. 8,000 mm
- ▶ max. rotor diameter above machine bed: approx. 2,500 mm
- ▶ max. bearing spacing: approx. 7,100 mm
- ▶ min. bearing spacing: approx. 500 mm
- ▶ shaft diameter: 35 mm to 300 mm

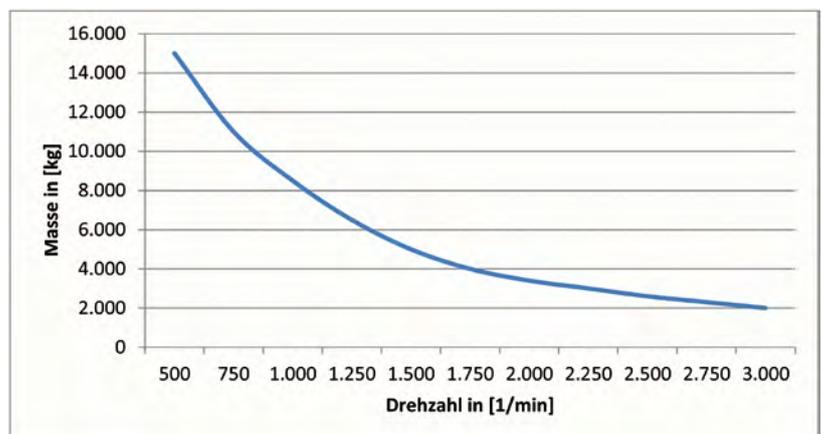
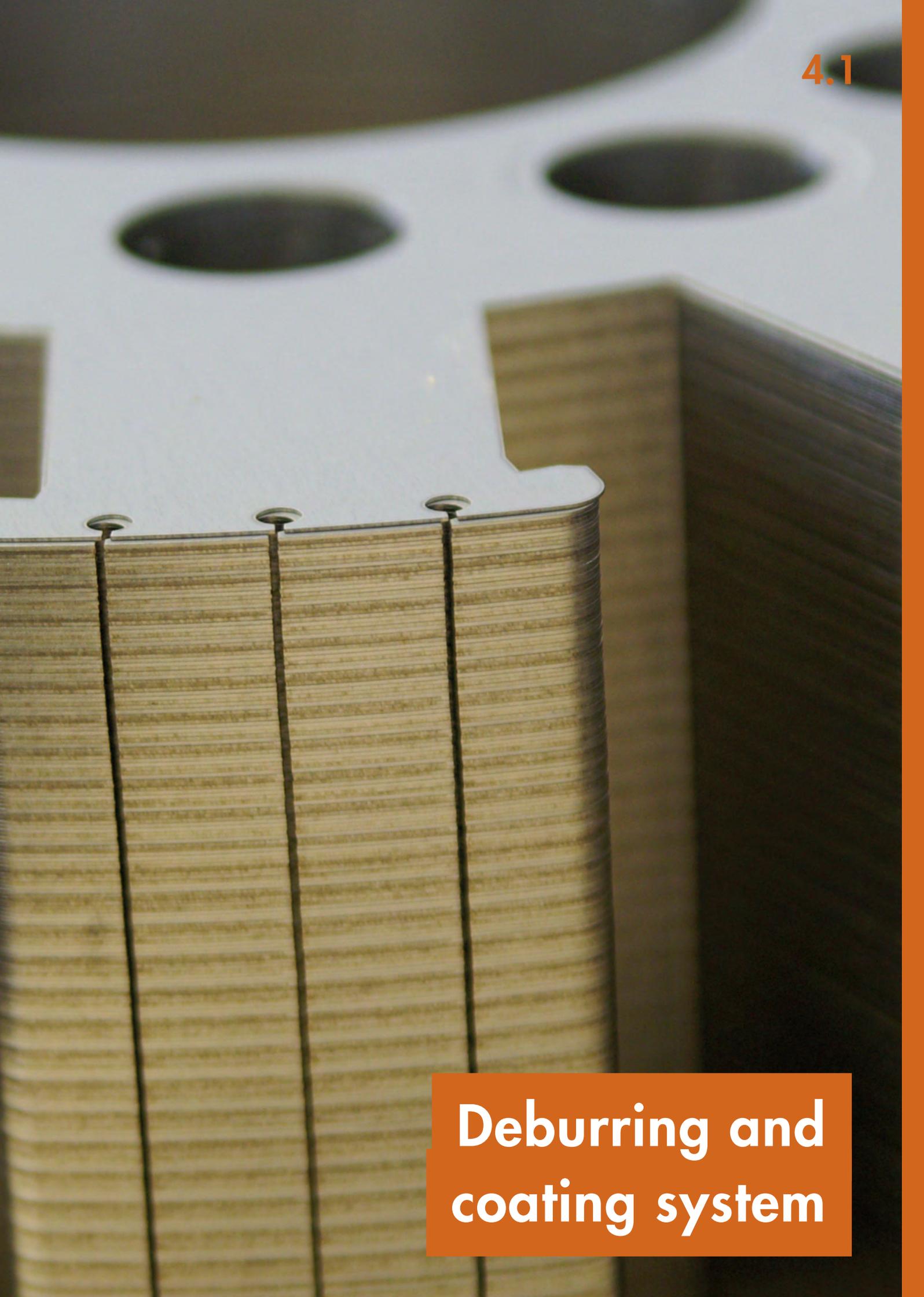


Diagram balancing speed range

A close-up photograph of a metal part, likely a gear or a similar component, with a complex shape and several circular holes. The part is mounted on a cylindrical metal shaft. The shaft is held in place by three vertical metal rods. The background is dark and out of focus. The text "4.1" is in the top right corner, and "Deburring and coating system" is in a white box at the bottom right.

**Deburring and
coating system**

4.1.2.11 Deburring and coating system for individual sheets

4.1.2.11.1 General description

Within the production of sheets a cutting burr is created, which can cause contacts between the sheets when pressing the laminated core. This facilitates the generation of eddy currents. In the worst case, this can result in the early breakdown of a machine. Deburring and recoating of sheets minimises this hazard potential, thus prolonging machine life and efficiency.

The burr is removed along the cutting edges and a new insulating layer is applied. This reduces the generation of eddy currents over various sheets and the associated thermal loss of the laminated core.

The production process is carried out with the following technological systems:

i 1. DEBURRING MACHINE

The burr caused during production is thoroughly removed by grinding on one side of the sheets along the cutting edges.

i 2. ROLLER COATER

Top and bottom side of the electrical sheet are coated with an insulating varnish with a layer thickness of approx. 4 µm to 7 µm using a rolling process.

i 3. DRYING AND COOLING LINE

The varnish dries at a temperature not exceeding 290 °C and hardens permanently. This step is followed by cooling the sheets to room temperature.



Deburring and coating system

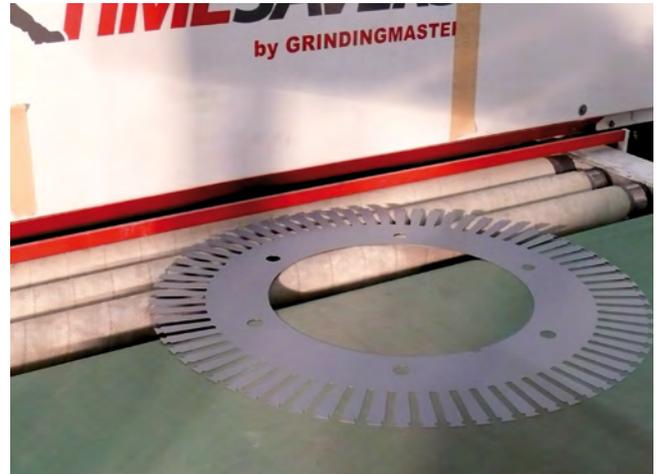
4.1.2.11.2 Technical parameters

System data

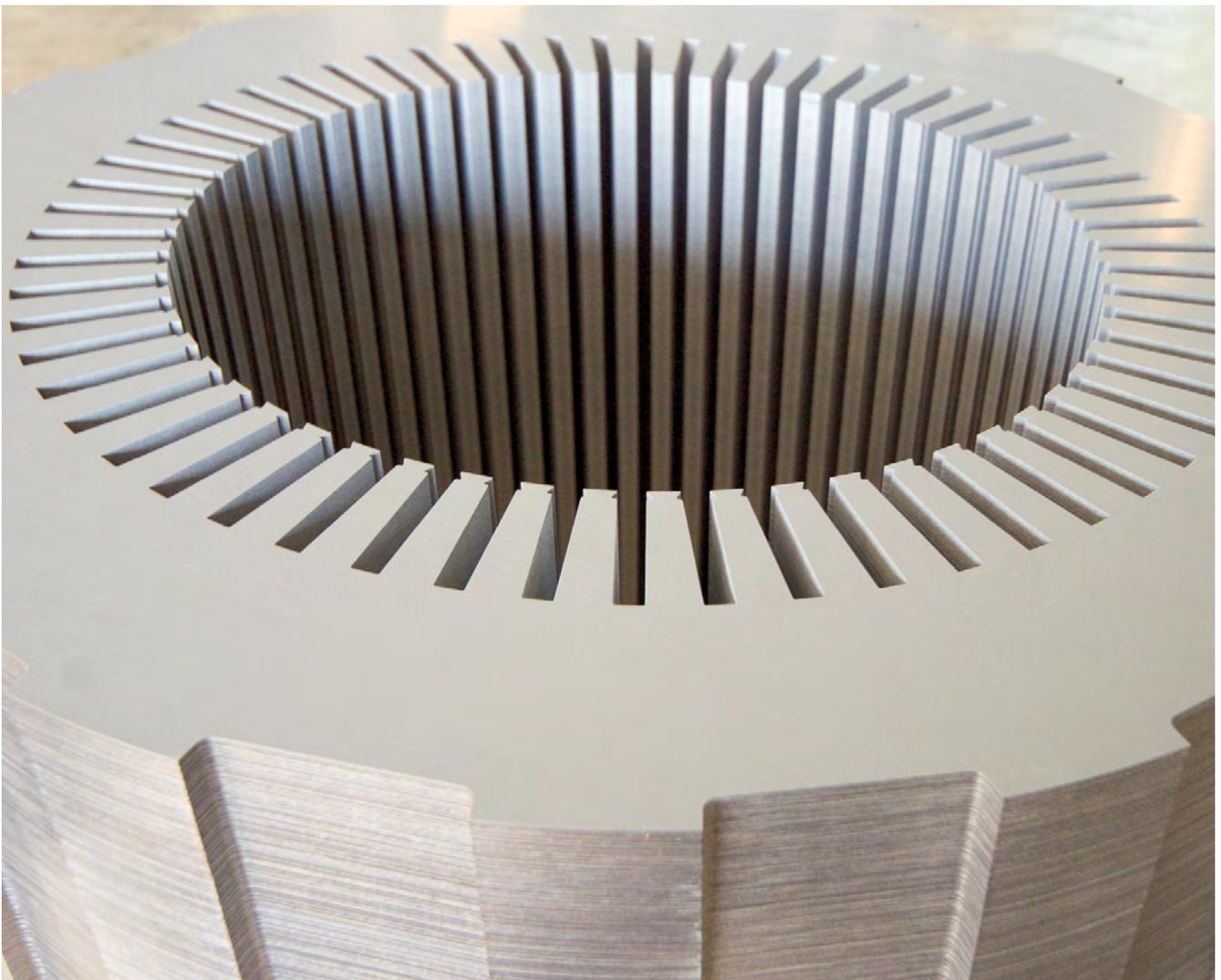
- ▶ Workpiece length: 350 mm to 1,250 mm
- ▶ Workpiece width: 350 mm to 1,250 mm
- ▶ Workpiece thickness: 0.35 mm to 1.0 mm
- ▶ Coating material is a standard, water-based insulating varnish, suitable for roller coating

Coating specifications

- ▶ Viscosity range: 60 to 150 DIN 4s
- ▶ Usual application thickness: 4 μm to 7 μm dry / side
- ▶ Thickness in case of double application: 8 μm to 12 μm dry / side
- ▶ Tolerance application thickness: 1 μm
- ▶ Varnish drying temperature: max. 290 °C



Electrical sheet is introduced into the system



Deburred and coated electrical sheets



Heavy-duty lathe

4.1.2.12 Heavy-duty lathe

4.1.2.12.1 General description

The concentricity can be measured and recorded using a special computer. Tolerances and surface qualities can be agreed depending on the type of project and material. Please contact us directly to discuss your requirements.

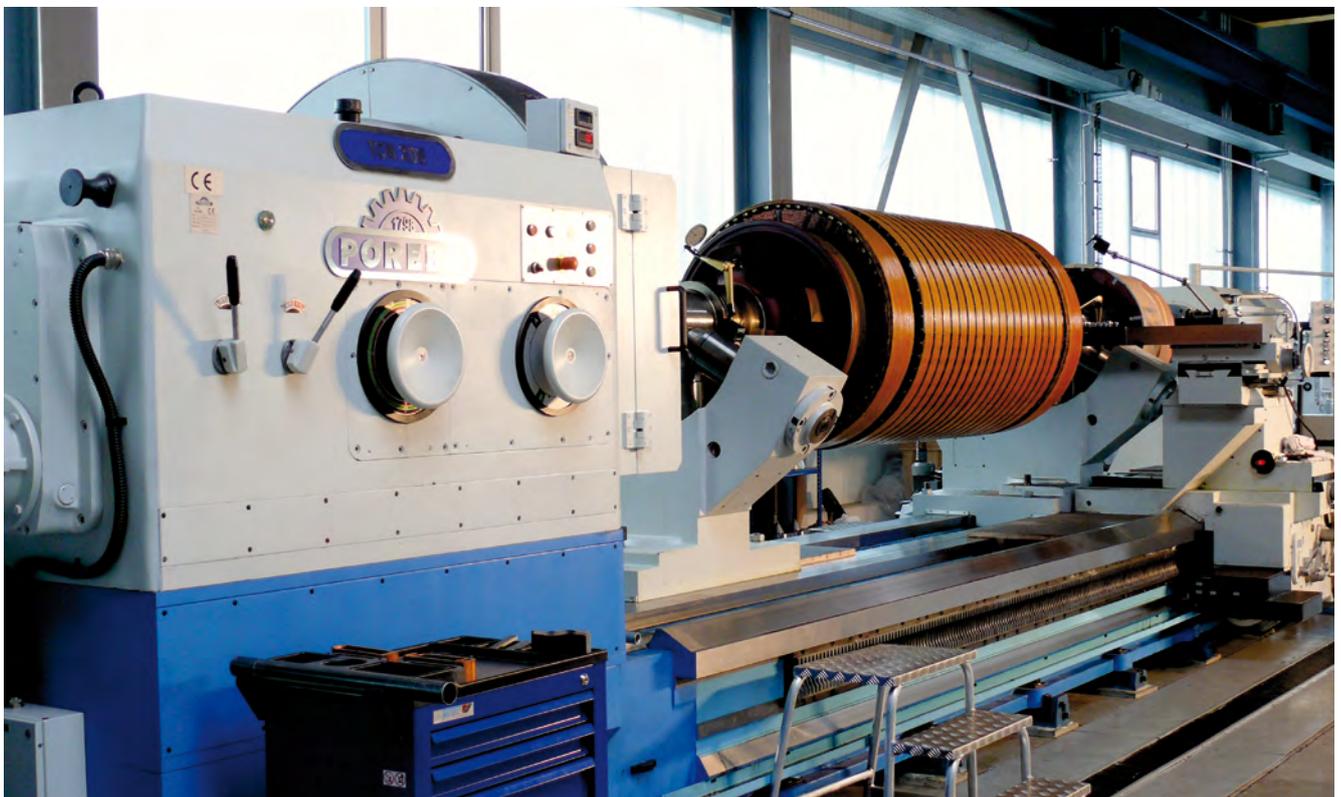
The lathe has been installed and approved according to DIN 8607.



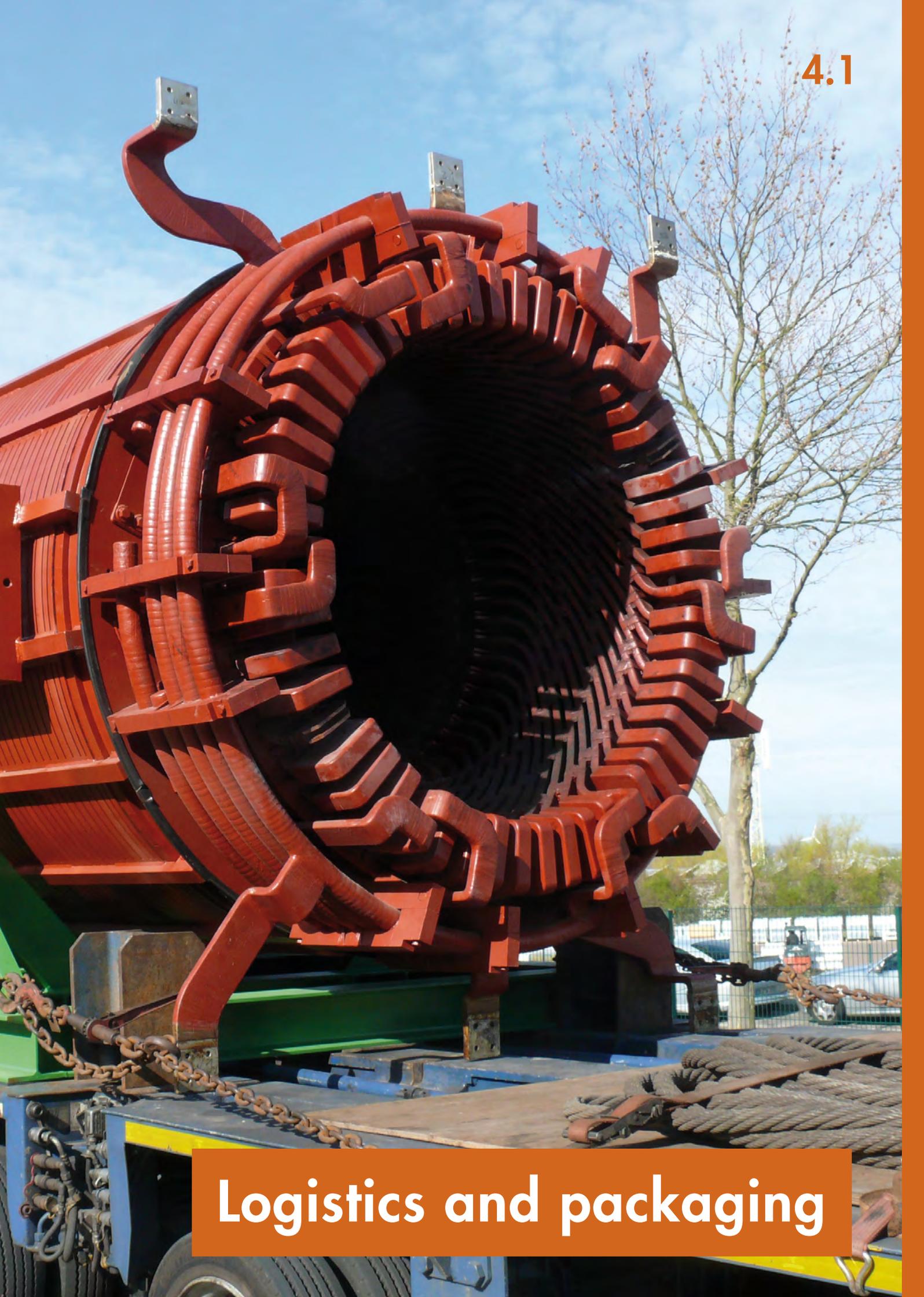
Operating unit POREBA

4.1.2.12.2 Technical parameters:

- ▶ Distance between centres: 10,000 mm
- ▶ Swing above carriage: max. 1,680 mm
- ▶ Workpiece weight: max. 32,800 kg
- ▶ Four-jaw chuck:
 - 1,600 mm chucking capacity \varnothing 230 to 1,400 mm
- ▶ 3-way bed without crank, bed width: 1,500 mm
- ▶ Speed range: 1 to 200 U/min
- ▶ Spindle bore: 105 mm
- ▶ Power main motor: 75 kW
- ▶ Quill diameter: 280 mm
- ▶ Two ways for the carriage
- ▶ Two ways for the tailstock (support runs past the workpiece along the entire length)
- ▶ Standard single tool holder
- ▶ 2 fixed steady rests
 - \varnothing 250 to 800 mm
- ▶ Hydrostatic bearing
- ▶ Capacity per steady rest: 20 t
- ▶ 3-axis digital readout
 - HEIDENHAIN ND 780 with air purge in Z
- ▶ Strap hinge - chip conveyor



Heavy-duty lathe POREBA TCH 200 x 10,000



Logistics and packaging

4.1.2.13 Logistics and packaging

With respect to the repair and production processes performed within the PARTZSCH Group, we take care of the entire logistic handling, including pickup, return transport and professional packaging of your goods. We have a variety of forklifts with a load capacity of up to 100 kN and portal cranes with a load capacity of up to 2 x 600 kN at our disposal. Our range of services is not limited to the sole transport of products and goods, but also includes a shuttle service to the surrounding transport hubs.

SHUTTLE SERVICE

You are arriving at a regional airport or taking the train and don't really know the best way to get to our company premises? Don't worry – we'll pick you up!



Professional packaging of goods



Transportation of a packaged machine

i PACKAGING AND DISPATCH

Do you have highly sensitive or bulky goods that you wish to transport by sea or air? No problem! Benefit from our many years of experience within the PARTZSCH Group in the worldwide dispatch of goods and, particularly, the packaging of entire electric machines and their components.

Our services include:

- ▶ Vacuum packaging for protection against moisture and dirt
- ▶ Production of special transport frames for rotors of all sizes
- ▶ Production of transport securing devices for machines of all kinds
- ▶ Production of transport crates for individual coils and coil sets
- ▶ Production of packaging suitable for sea freight
- ▶ Customised solutions for excess length, width, height and weight

We thus guarantee the arrival of all goods maintaining our high quality standards!

Convince yourself of our services and take advantage of our expert knowledge!

Apart from the paperwork associated with transports to European countries or even countries outside of Europe, we take care of all matters related to shipping.

Independent of cargo or container shipping, we organise transports to all countries worldwide whether by road, by rail, sea or air. This helps you save valuable time for your core business activities.

We would be pleased to show you how to ship your goods professionally, economically and environmentally sound.



4.2 PARTZSCH Spezialdrähte e. K.

4.2.1 General information

The company PARTZSCH Spezialdrähte e. K. has become a significant business of the PARTZSCH Group. Whether it is the production or repair of motors, generators or transformers – our special wires meet every challenge. Through the close cooperation with engineers from development, engineering and production departments in the field of electrical engineering, we have gathered many years of experience and have the necessary know-how for the manufacture of high-quality



wires. We produce flat wires in all standard dimensions with a variety of insulation types. Apart from the manufacture and insulation of flat wires we dispose of yarn-covering systems for round wires that allow finishing bare or enamelled round wires with different types of insulations.

Starting in 2017 we expect a potential overall volume of 6,000 t per year.

With continuous quality controls performed by our advanced equipment and the ongoing monitoring through our test facility, we can guarantee the compliance with all customer-specific parameters. Our quality management system is certified according to DIN EN ISO 9001 and forms the basis for an individual customer service and the realisation of shortest delivery times.



ZERTIFIKAT



Hiermit wird bescheinigt, dass

PARTZSCH Elektromotoren e.K.
 Oswald-Greiner-Straße 3, Gewerbegebiet Ost
 04720 Döbeln

mit den im Anhang gelisteten Standorten

ein **Qualitätsmanagementsystem** eingeführt hat und anwendet.

Geltungsbereich:
 Entwicklung, Herstellung, Vertrieb und Service von Niederspannungs- und Hochspannungs-
 Motoren und -generatoren, Spulen, Rotorstäben, Wickeldraht, Blechpaketen und
 Windgeneratoren, Hochpräzisionsteilen und Baugruppen für den Maschinen-, Geräte- und
 Anlagenbau

Durch ein Audit, dokumentiert in einem Bericht, wurde der Nachweis erbracht,
 dass das Managementsystem die Forderungen des folgenden Regelwerks erfüllt:

ISO 9001 : 2008

Zertifikat-Registrier-Nr.	101865 QM08
Gültig ab	2014-10-30
Gültig bis	2017-10-20
Zertifizierungsdatum	2014-10-30



Deutsche
 Akkreditierungsstelle
 D-ZM-18074-01-00

DQS GmbH

G. Blechschmitt
Götz Blechschmitt
 Geschäftsführer



Akkreditierte Stelle: DQS GmbH, August-Schanz-Straße 21, 60433 Frankfurt am Main

1 / 2



Anhang zum Zertifikat
Registrier-Nr. 101865 QM08

PARTZSCH Elektromotoren e.K.
 Oswald-Greiner-Straße 3, Gewerbegebiet Ost
 04720 Döbeln



Standort

513758 PARTZSCH Elektromaschinenbau GmbH Am Fuchsloch 12 04720 Mochau	339995 PARTZSCH Spezialdrähte e.K. Oesig Nr.9 04741 Roßwein
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Dieser Anhang (Stand: 2014-10-30) ist nur gültig
 in Verbindung mit dem oben genannten Zertifikat.

2 / 2

4.2.2 Manufacturing fields

4.2.2.1 Manufacturing of profile wires from bare wires

4.2.2.1.1 Range of services

With our machinery we are able to produce flat wires in the following dimensions:

- ▶ Copper wires according to DIN EN 13601
 - ▶ Width 2.50 – 30.00 mm
 - ▶ Thickness 1.00 – 7.00 mm
- ▶ Round wires according to DIN EN 13602
 - ▶ Diameters from 3.80 – 6.00 mm

4.2.2.1.2 Machinery

The production of the profile wires mentioned in 4.2.2.1.1 is realised with 3 rolling mills, 2 compliance systems and 2 drawing machines.



Drawing machine

4.2.2.2 Heat treatment

4.2.2.2.1 Range of services

After rolling the copper the structure becomes harder. However, in electrical engineering, a relatively high ductility is required. At the same time, this ductility is a quality feature of the manufactured wires. We can offer quality R200 according to DIN EN 13 601 to our customers. After consultation customer-specific limits can be realised (softer wires).



Bare flat wire

4.2.2.2.2 Machinery

In order to achieve the quality given in 4.2.2.2.1 we use state-of-the-art machinery: 3 retort annealing lines, 6 cooling stations and an annealing furnace.



Annealing line

4.2.2.3 Wire enamelling

4.2.2.3.1 Range of services

We can offer wire enamelling for flat wires with various wire dimensions in a variety of thicknesses. The following dimensions of enamelled wires are available:

- ▶ Width 3.00 – 20.00 mm
- ▶ Thickness 1.00 – 6.00 mm

4.2.2.3.2 Machinery

Our machinery comprises 4 vertical wire enamelling plants. These plants produce in a continuous shift system.

4.2.2.4 Tape-covered wires

4.2.2.4.1 Range of services

Apart from wire enamelling we offer the tape-covering of flat and round wires in dimensions of \varnothing width 2.50 – 30.00 mm / \varnothing thickness 1.00 – 7.00 mm according to DIN EN 13601 with various additional insulating materials. Wire insulations can be realised using kraft paper, Nomex, film, mica and polyimide film (e.g.: Kapton®).

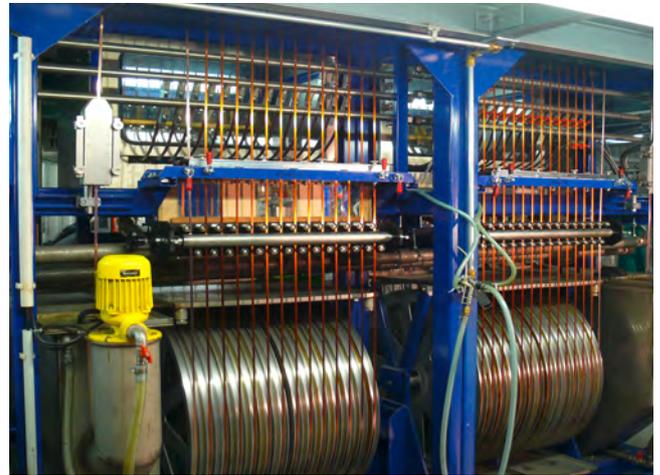
4.2.2.4.2 Machinery

All insulation types mentioned above can only be realised with the help of suitable machinery. For the production of film, Nomex and mica wires we can use 12 flat-wire and 12 round-wire taping machines. Another 4 machines are used for the production of polyimide film wires.

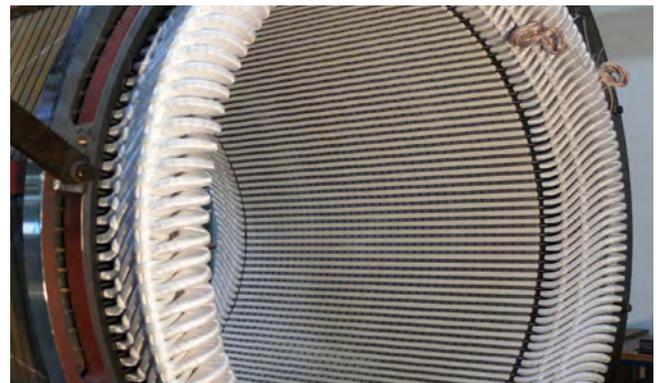
4.2.2.5 Yarn-covered wires

4.2.2.5.1 Range of services

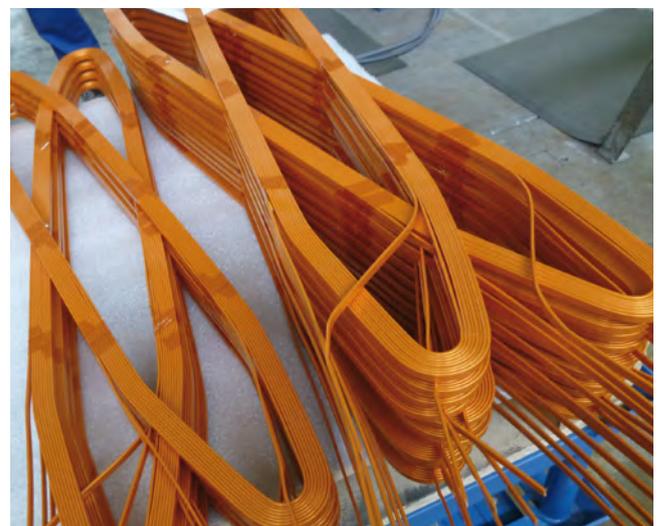
Wires that are exposed to high levels of stress, vibrations, temperatures and variations in temperature are usually covered with yarn in different designs and materials. For instance, there are yarns made of glass fibre and so-called blended yarns (Daglas). The individual yarns differ in the number of single yarns, thus a variety of designs can be realised, depending on customer requirements, stress levels and field of use.



Enamelling plant



Stator with preformed coils and mica-film insulated wire



Coils in fish design with Kapton insulated wire

4.2.2.5.2 Machinery

For covering flat wires with yarn in the field of Dagleas and / glass fibre insulation we have a total of 10 plants at our disposal.

Furthermore, there is the option of finishing bare or enamelled round wires with a variety of yarns or polyimide films in our yarn-covering machine for round wires.

The manufacturing is completed by the application of our tape cutting machines and the respective cross coil machines, used for mica material and glass fibre / Dagleas. These machines enable us to respond flexibly to all our customers' needs.



Tape cutting machine



Rolling mill



Annealing furnace retorts



Glass fibre and blended yarn insulation line



Breakdown test

4.2.3 Tests and documentation

All wires manufactured in our company are tracked through permanent quality controls from goods receipt to goods issue or for in-house processing. Our production facilities record and document various test parameters with integrated measurement equipment.

EQUIPMENT

- ▶ Rolling mills: dimensional checks
- ▶ Compliance systems: profile and dimensional checks
- ▶ Enamelling plants: voltage testings, surface inspections
- ▶ Kapton insulation systems: voltage testings
- ▶ Mica film insulation systems: Monitoring of overlapping and offset with camera

Apart from that workers check the quality of their own work every hour. The data recorded here are documented in the procedure documentation as well. In our test facility each batch of the wire is controlled according to inspection plans. The results are documented in inspection protocols. With every delivery the customer receives an acceptance test certificate 3.1 according to DIN EN 10204.

The following tests are carried out in our company:

MECHANICAL TESTS

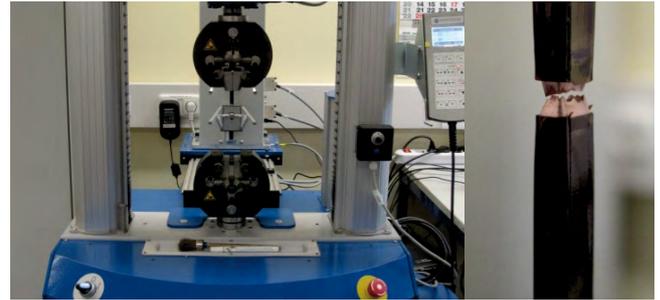
Based on the standards DIN EN 13601; 13602 and customer specifications

- ▶ Tensile strength
- ▶ Elongation at break
- ▶ Yield strength 0.2%
- ▶ Elastic recovery

DIMENSIONAL CHECKS

Based on the standards DIN EN 60317-0-1; 60317-0-2 and customer specifications

- ▶ Width
- ▶ Thickness
- ▶ Edge radii



Breakdown and tensile test

ELECTRICAL TESTS

Based on the following standards: DIN EN 60317-0-1; 60317-0-2; 60317-0-6; 60317-27; 60317-31; 60317-32; 60317-43; 60317-44; 60317-52; 60317-53; 60317-58 and customer specifications

- ▶ Breakdown tests (at room temperature, elevated temperature)
- ▶ Resistance tests

DUCTILITY AND ADHESION

Based on the following standards: DIN EN 60317-0-1; 60317-0-2; 60317-0-6; 60317-27; 60317-31; 60317-32; 60317-43; 60317-44; 60317-52; 60317-53; 60317-58 and customer specifications

- ▶ Elongation tests
- ▶ Winding tests (bending tests)

PROFILE TESTS

- ▶ Preparation of micrographs

ADDITIONAL TESTS

Based on the following standards: DIN EN 60317-0-1; 60317-0-2; 60317-0-6; 60317-27; 60317-31; 60317-32; 60317-43; 60317-44; 60317-52; 60317-53; 60317-58 and customer specifications

- ▶ Determination of the content of glass and binding agents
- ▶ Behaviour towards solvents
- ▶ Thermal shock tests
- ▶ Determination of baking degrees for enamelled wires

4.3 PARTZSCH Elektromaschinenbau GmbH

4.3.1 General information

Yet another company within the PARTZSCH Group is the PARTZSCH Elektromaschinenbau GmbH located in Döbeln/Grosssteinbach. This enterprise specialises

in 3 fields: the manufacture of the magnetic circuit of gearless wind generators, the production of machine parts and components for textile machine engineering.



4.3.2 Manufacturing fields

4.3.2.1 Generators

4.3.2.1.1 Range of services

For these generators we offer the laminated core, which is made of sheet segments, winding, impregnation, inspection and packaging – a one-stop service for our customers.

Due to the dimensions of generators, the sizes of our halls and the load capacities of our cranes have been adapted accordingly.

4.3.2.1.2 Machinery

The impregnation of these generators is performed using the vacuum pressure process with subsequent rolling curing in the drying oven.

Our impregnation container has the following dimensions: (width x depth) 5,200 mm x 2,100 mm

Our drying oven has the following dimensions (depth x width x height) 4,500 mm x 5,500 mm x 6,000 mm

For the manufacturing of the coils we apply spreading machines, fish winding machines and taping machines arranged in a complete production line. For transports within the company we further have crane bridges with the following load capacities at our disposal: 2 x 32 t and 2 x 36 t.



CNC turning



CNC milling



Impregnation system



Large-scale furnace

4.3.2.2 General mechanical engineering

4.3.2.2.1 Range of services

This manufacturing segment specialises in the production of machine components, primarily for electrical engineering. We thus produce shafts, end shields, transmission components, such as pulleys, couplings, terminal boxes and similar components. Apart from that, we provide welded constructions, colouring and special parts.

4.3.2.2.2 Machinery

The following machines are available for mechanical manufacturing:

Manufacturing segment milling

- ▶ Boring mill BFKF 110
- ▶ Hedelius T8-3200
- ▶ Hedelius C80M
- ▶ AXA VPC40-U
- ▶ DMG DMU 70/50
- ▶ Hermle C500V
- ▶ multiple conventional milling machines

Manufacturing segment turning

- ▶ EMCO MaXXturn 110x3500
- ▶ Monforts RNC 500
- ▶ Traub TND 350/360
- ▶ Index G 200
- ▶ multiple conventional lathes

Manufacturing segment grinding

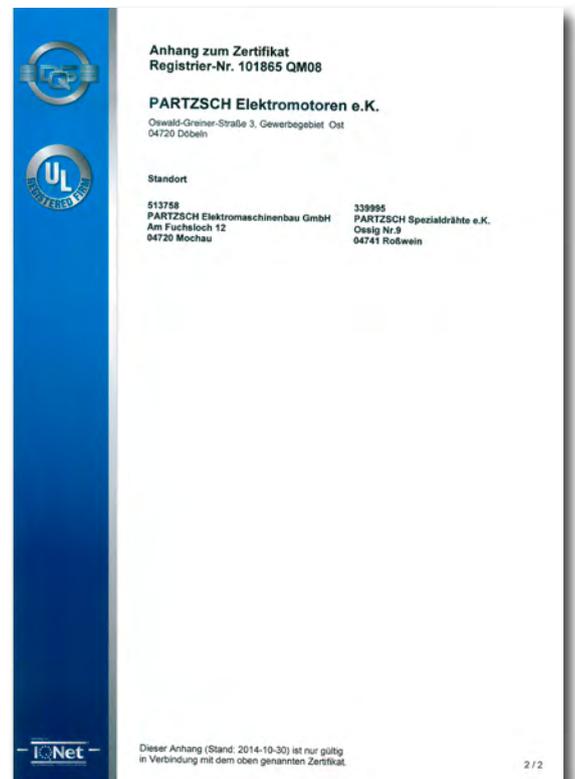
- ▶ SAGU - 1000
- ▶ TOS BUA-25
- ▶ Vibratory grinding machine

Manufacturing segment sawing

- ▶ Wagner band saw WPB 340A



ROMER measuring arm



4.3.2.3 Special machine engineering for the textile industry

4.3.2.3.1 Range of services

Parts of our machinery, as well as some employees come from textile machine engineering. We thus have the necessary expertise and production know-how in this field. In this area, surfaces and runout accuracy have to comply with stringent quality standards.

4.3.2.3.2 Machinery

- ▶ Index G200
- ▶ CNC lathes Femco HL-25
- ▶ CNC lathe Hanwha SL 26H
- ▶ TBT ML 200-2-8

4.3.3 Quality assessment

4.3.3.1 Test and measuring equipment

- ▶ Mitutoyo measuring machine Euro-C-A9106
- ▶ Measuring arm RA-7525 SE
- ▶ TESA micro-hite M900
- ▶ Shaft measuring system Twinner T12
- ▶ Hardness testing technology
- ▶ Welding: MAG, TIG (ISO 9606-1), resistance spot and build-up welding as well as hard soldering

4.3.3.2 Certificates

This company is certified according to DIN ISO 9001.



Add-on and spare parts



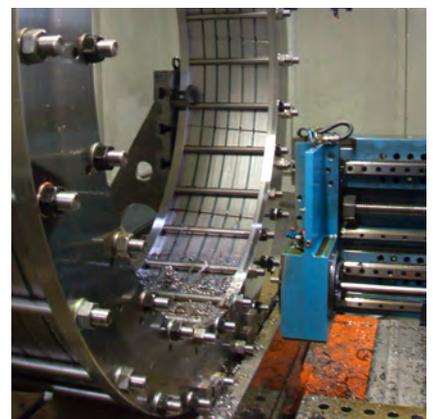
Assembly production



Press ring



Coupling



Stator processing

4.4 PAMO Reparaturwerk GmbH

4.4.1 General presentation

As a service provider in electrical engineering the PARTZSCH Group also offers services outside its production halls.

From troubleshooting to the repair and assembly on site we will do our best to solve problems relating to motors and generators at our customers' locations. Our services include inspections, disassembly and assembly of air-cooled generators up to 250 MVA.

In addition to our assembly services, PAMO is the specialist supplier for works on DC machines within the group of companies.

The production of components, such as round-wire and preformed windings and the repair of electric machines in low- or high-voltage ranges complete our range of services.



On-site assembly

4.4.2 Manufacturing fields

4.4.2.1 Manufacturing field F1 - Repairs

4.4.2.1.1 Range of services

Regarding the repair services offered by our company, these can be provided for all standard and transnorm machines up to size 800 and not exceeding a rated voltage of 11 kV.

4.4.2.1.2 Machinery

In addition to the standard workshop equipment we dispose of:

- ▶ Vacuum pressure impregnation systems with the following dimensions: \varnothing 1.80 m x 1.60 m
- ▶ Drying ovens
- ▶ Lifting equipment
- ▶ Balancing system up to individual unit weight of 4 tons

4.4.2.2 Manufacturing field F2 - Direct current

4.4.2.2.1 Range of services

Within the group of companies PAMO is the specialist for DC machines. This means that all windings, such as lap or wave windings, can be produced, installed, connected and checked in any dimension. These services are available for repair and new windings. We can further open commutators in case of insulation defects and apply a new insulation. This service eliminates the need for time-consuming procurement of new commutators.

4.4.2.2.2 Machinery

For the production of DC windings specific technological equipment is required. In addition to wire cutting and end stripping machines a variety of coil-shaped workpieces are used. Regarding insulation we apply the VPI and the resin-rich process with the corresponding insulation systems, e.g. hot coil presses and taping machines.

As a specialist for DC machines PAMO Reparaturwerk GmbH can count on 50 years of experience, primarily in the field of traction drives. The largest DC rotor repaired in our facilities had a weight of 75 tons.



DC machines



DC machine

We further have the following systems in place:

- ▶ Commutator milling machines, laser guided
- ▶ Commutator welding machines
- ▶ Commutator clamping rings in varying dimensions for commutator forming
- ▶ Taping machines

4.4.2.3 Manufacturing field F3 - Preformed coils

4.4.2.3.1 Range of services

In close cooperation with PARTZSCH Elektromotoren e. K. we have established an additional facility to the production plant in Döbeln, thus expanding our manufacturing capacity.

For the future it is strived to ensure shortest delivery times, so our customers don't need to worry about schedule difficulties. The entire range of services offered by PARTZSCH Elektromotoren is also provided by PAMO Reparaturwerk.

This means that both resin-rich and VPI impregnation can be carried out with a rated voltage between 690 V and 12 kV.

4.4.2.3.2 Machinery

The range of services mentioned above can be realised with the following machinery:

- ▶ Fish winding machines
- ▶ Coil spreading machines
- ▶ Insulation winding machines
- ▶ Lifting and transport equipment
- ▶ Impregnation and drying systems

4.4.2.4 Manufacturing field F4 - Round-wire windings

4.4.2.4.1 Range of services

Similar to preformed windings, we have also expanded our manufacturing capacity within the group in this field through the cooperation with PAMO. Our customers consequently benefit from extensive capacities with regard to delivery times. All technical parameters are identical to those of PARTZSCH Elektromotoren.



Preformed windings



Taping of preformed windings



Taping of round-wire windings

4.4.2.4.2 Machinery

Equipment is identical to that used by PARTZSCH Elektromotoren.

Equipment of our mobile service teams

- ▶ Measurement unit with HV transformer for partial discharge and tanDelta measurement up to 35 kV and 140 kVA
- ▶ Service vehicle for small inspections
- ▶ Service container for large inspections
- ▶ Rotor retraction device
- ▶ 4-channel oscilloscope for shaft voltage measurements and 3-phase power measurement
- ▶ Video endoscope for visual inspections in inaccessible locations
- ▶ Travelling-wave measurement device for fast rotor winding inspection when installed
- ▶ Interturn fault testing devices up to 25 kV and insulation measurement equipment with DAR, PI, DD and C
- ▶ Wedge-pressure testing device for measuring residual spring travel on machines with slot-top ripple spring
- ▶ Performance of vibration measurement and analysis on site
- ▶ Inductor cap puller (portable) up to a cap diameter of 1,300 mm
- ▶ Devices for laser-optical alignment

Upon request, our engineers coordinate the general overhaul and repair of your generators and motors beyond our service teams in Europe. These services include all assembly operations, including the provision of cranes, the transport of machines for repair and the reinstallation and adjustment of the overhauled parts.



Interturn fault testing device Tektronix TPS 2024B



On-site assembly



Endoscopy on a generator rotor



Interturn fault testing

4.4.3 Services in test facilities

4.4.3.1 Test and measuring equipment

100% traceability, transparent test procedures, state-of-the-art measurement equipment – when it comes to the quality of our work we make absolutely no concessions in terms of cost or time pressure.

- ▶ Professional work according to inspection report and quotation
- ▶ Runout inspection for all types of rotors
- ▶ Inspection reports on surge voltage testing for winding tests
- ▶ Inspections protocols for all types of machines
- ▶ Thermal spectrographs for laminated core tests
- ▶ tanDelta measurement
- ▶ PD measurement
- ▶ Static and dynamic balancing activities
- ▶ HV motor testing with nominal voltage in test facility

4.4.3.2 Certificates

The PAMO quality management is certified according to DIN EN ISO 9001.



Certificate DIN EN ISO 9001:2008



SCC Certificate

4.5 PARTZSCH Windgeneratoren Service GmbH

4.5.1 General information

As a part of the PARTZSCH group of companies, PARTZSCH Windgeneratoren Service GmbH complements our services with its comprehensive range of services in the considerably grown field of wind turbines. As a full service provider our customers

can benefit from our services for all types of wind turbines with intermediate gearing. With the on-site service included in our service programme, downtimes of wind turbines can be significantly reduced.

4.5.2 Range of services

- ▶ Laser-optical alignment of the generator gearing unit
- ▶ Vibration measurement, including bearing diagnosis
- ▶ Repair with bearing replacement
- ▶ Repair and maintenance of slip-ring chambers, incl. replacement of brush holders and brushes
- ▶ Replacement and renewal of slip-ring assemblies
- ▶ Replacement of rotor lines for generators of various manufacturers

Our engineers coordinate the general overhaul and repair of your wind turbines also outside of Europe. These services include all assembly operations, including the provision of cranes, the transport of

generators for repair in our factory as well as the reinstallation and adjustment. In order to minimise your downtimes, we have a huge number of replacement generators available. In addition, spare parts for all conventional generators are kept in stock. These include:

- ▶ New and refurbished slip-ring assemblies
- ▶ Deep-groove ball bearings in various sizes
- ▶ Fan motors
- ▶ Brush holders for various generator types
- ▶ Brushes in various dimensions



Source: Fotolia_97913269

4.5.3 Equipment

In order to offer the best possible customer service throughout Europe, the company acquired five new Mercedes-Benz Vito.

A special highlight here is the innovative shelf system, which offers space for numerous assembly tools and spare parts. With these, our employees are well equipped and can react quickly to problems occurring during repair services on site.

In our service vehicles the following measuring equipment and tools are available:

- ▶ Motor analyser, manufacturer: Schleich
- ▶ Milliohm meter Metra Hit 27M, manufacturer: GOSSEN Metrawatt
- ▶ Vibration measuring instrument VT 60, incl. software, manufacturer: Brüel & Kjaer Vibro
- ▶ Laser-optical alignment measuring tool Rotalign, manufacturer: Prüftechnik AG
- ▶ Hydraulic torque wrench, manufacturer: Hydratight, 200 to 1,800 Nm
- ▶ Manual torque multiplier, manufacturer: Lösomat, 540 to 4,000 Nm

4.5.4 Workshop services

Within the scope of major repairs we can offer the following workshop services:

- ▶ Disassembly, electr. / mech. diagnoses
- ▶ Cleaning (washing and drying)
- ▶ Rewinding of stator and rotor windings
- ▶ Repair or replacement of defective laminated cores of stators and rotors in a very short time due to in-house production using laser cutting
- ▶ Reconditioning of bearing seats in the end shield and on rotor shafts
- ▶ Replacement of bearings, mounting
- ▶ Dynamic balancing and overspeed testing of rotors and couplings
- ▶ Colouring
- ▶ Operation in test facility



3D model Gamma / Source: Nordex SE



Runout inspection on slip-ring assembly



Laser-optical alignment control measurement

4.5.5 Quality assessment

4.5.5.1 Test and measuring equipment

i ELECTRICAL TEST AND MEASURING EQUIPMENT

- ▶ SCHLEICH milliohm meter
RESISTOMAT type 2316-V0001
- ▶ SCHLEICH motor analyser 1-XL
- ▶ Insulation resistance measuring instruments
GOSSEN-Metrawatt METRISO 5000 A
- ▶ Insulation resistance measuring instruments
GOSSEN-Metrawatt METRISO PRIME
- ▶ Multimeter METRAHIT 27 M
- ▶ Various digital multimeters

Our test and measuring equipment is sent in for calibration at defined intervals.

4.5.5.2 Certificates

The regular training of our employees is of high significance in our company. All employees have acquired the corresponding certificates obligatory for the performance of our assembly services. These include medical examinations G41, safety at height training with abseil exercises of the German Red Cross, training as electrically trained person (EUP) and trainings on fire safety. Trainings are provided in-house by appropriate specialists or held at the employers' liability insurance association in Dresden.

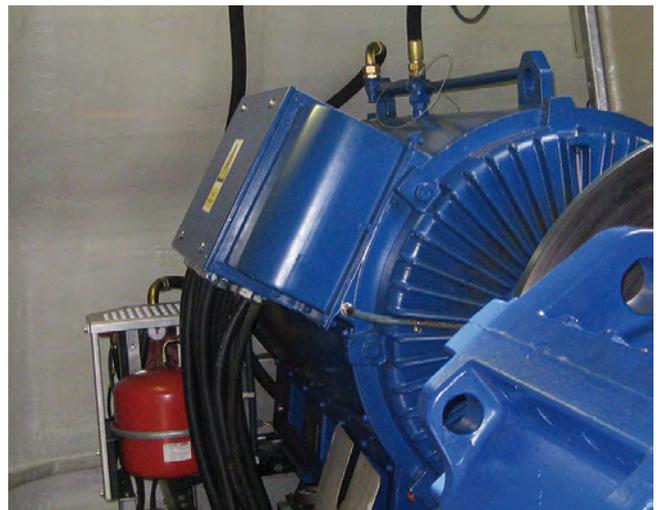
Basic knowledge on the control of plants serviced by us is ensured by various trainings provided by our customers.

4.5.6 Fleet

Our fleet comprises seven service vehicles type Mercedes-Benz Vito, equipped with the shelf system SORTIMO and all necessary tools for the repair of generators.

i MECHANICAL TEST AND MEASURING EQUIPMENT

- ▶ Alignment measuring tool ROTALIGN laser ALI 3.610
- ▶ Vibration measuring instrument VIBROTEST VT60
- ▶ Dial gauges / callipers
- ▶ Mechanical outside micrometres
- ▶ Mechanical inside micrometres
- ▶ Torque wrenches in the following sizes:
10 – 100 Nm / 80 – 400 Nm / 250 – 850 Nm
- ▶ Mechanical torque multiplier, manufacturer:
Lösomat, 540-4,000 Nm
- ▶ Hydraulic torque wrench, manufacturer:
Hydratight, 200-1,800 Nm



Generator in a wind turbine



Service vehicle

4.6 GENET GmbH

4.6.1 General information

GENET is a new engineering and sales company based in Ingolstadt, Germany. The team consists of experts with longtime and international experience in the development and manufacturing of synchronous generators for power generation.

With its comprehensive vertical integration and state-of-the-art machinery PARTZSCH offers ideal conditions and realises the entire manufacturing of the machines within this cooperation.

4.6.2 Profile

4.6.2.1 Hydro power

Hydro power has a huge potential for power generation and is becoming an increasingly important source of energy. It is one of the major sources of renewable energy. Hydroelectric power plants can be controlled and easily adapted to meet the demand for electricity. For this application GENET delivers horizontal and vertical generators up to a power range of 20 MVA.

4.6.2.2 Steam turbines

Steam turbines play an essential role in combined heat and power, in steam power plants and in several industrial applications. Furthermore, steam turbines are deployed in the field of renewable energies for biomass applications, waste combustion and applications for solar thermal energy. For this application GENET delivers generators up to a power range of 18 MVA.

4.6.2.3 Frequency converters

Rotating frequency converters are used for increasing or decreasing the mains frequency in isolated operation. Furthermore, the output voltage can be adapted. Rotating frequency converters are often used in civil and military applications as ground power units. For this purpose GENET delivers frequency converters up to a power range of 5 MVA.

TOGETHER, we provide customised solutions in the field of special machine engineering for power ranges up to 20,000 kVA and voltages not exceeding 15,000 V. We specialise in the manufacturing, maintenance, repair and commissioning of generators for the following applications:



Author: Markus Haack / Fotolia.de



Author: photosoup / Fotolia.de



4.6.2.4 Marine and stationary applications

GENET also offers generators for power generation for the on-board power supply of civil and military vessels as well as generators for stationary applications (on-shore and offshore). For this purpose, we cooperate with established classification societies.

For these applications GENET delivers generators up to a power range of 20 MVA.



Special machine engineering

4.6.3 Products and services

4.6.3.1 Generators

Protection class

- ▶ IP23
- ▶ IP43 (equipped with filter)
- ▶ IP44
- ▶ IP44R and IP54

Cooling

- ▶ Open-circuit ventilation
- ▶ Separate air inlet and outlet
- ▶ Air/air cooling and air/water cooling

Designs

- ▶ Double bearing design IM1001 (B3) or IM1101 (B20) and
- ▶ Single bearing design IM1205 (B2) or IM1305 (B16) or B5/B16

Bearings

- ▶ Roller or plain bearings

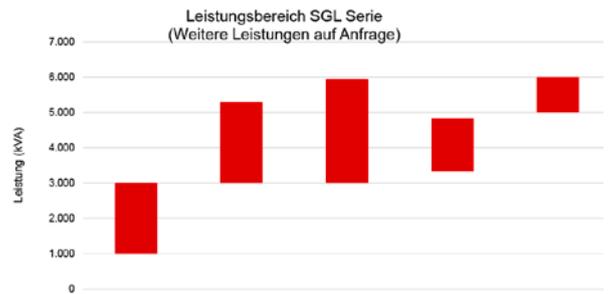
Standards

- ▶ IEC / EN 60034
- ▶ VDE 0530
- ▶ Ship classifications ABS, BV, LR, DNV, GL etc.

Additional products upon request:

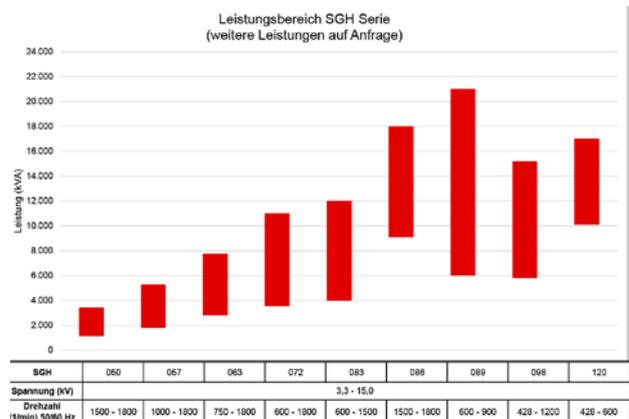
- ▶ Number of poles: 2-pole and 16 to 32 poles
- ▶ Output: 20,000 kVA – 25,000 kVA
- ▶ Voltages: 15 kV – 20 kV

Performance data SGL generators



SGL	043	050	057	063	072
Spannung (V)	400 - 690				
Drehzahl (1/min) 50/60 Hz	750 - 1800	750 - 1800	600 - 1800	600 - 900	600 - 900

Performance data SGH generators



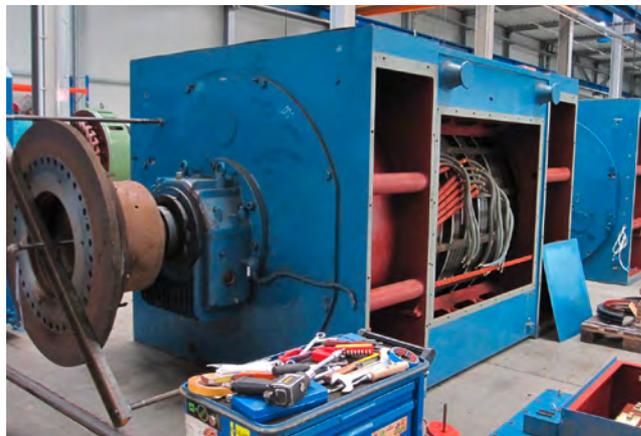
SGH	060	067	063	072	083	088	089	098	120
Spannung (kV)	3,3 - 15,0								
Drehzahl (1/min) 50/60 Hz	1500 - 1800	1000 - 1800	750 - 1800	600 - 1800	600 - 1500	1500 - 1800	600 - 900	428 - 1200	428 - 600

4.6.3.2 Repair and maintenance

Through the cooperation with the PARTZSCH Group we have created ideal conditions for the repair and maintenance of your generators. Also, the complete re-production and production of prototypes are part of our range of services.

With our comprehensive vertical integration, such as the in-house production of special wires, the lasering of electrical sheets and our own mechanical production, we can guarantee shortest delivery times.

The PARTZSCH Group is certified according to DIN EN ISO 9001.



Repair

4.6.3.3 On-site service

Commissioning, maintenance and technical assistance on site are all performed by our 25 service technicians. Our technicians are equipped with the latest measuring instruments and other equipment.

For generators that are serviced at the facilities of the PARTZSCH Group, we provide full service from on-site assessment to recommissioning.

4.6.4 Contacts

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Joseph-Baader-Str. 1, 85053 Ingolstadt

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Sales

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✉ mario.seuffert@genet-in.com



On-site service



4.7 PARTZSCH Elektrowerke GmbH

4.7.1 General information

The company is a commercial, service and sales company, offering expert consulting and demonstrations for all products.

Apart from that, as our customer you can benefit from our comprehensive service programme.

We provide the following products:

- ▶ Electric motors and generators
- ▶ Geared motors
- ▶ Converters
- ▶ Emergency power generators
- ▶ Power tools
- ▶ Pumps
- ▶ Fans
- ▶ Ventilators and blowers

4.7.2 Product range

4.7.2.1 Electric motors from TECO

- ▶ Advisory service on the energy efficiency of electric motors
- ▶ Sales
- ▶ Rental
- ▶ Repair/maintenance

4.7.2.2 Generators

- ▶ Advisory service
- ▶ Sales
- ▶ Repair/maintenance

4.7.2.3 Geared motors

- ▶ Advisory service
- ▶ Sales
- ▶ Repair/maintenance

4.7.2.4 Converters from TECO

- ▶ Advisory service
- ▶ Sales
- ▶ Repair/maintenance

4.7.2.5 Emergency power generators

- ▶ Advisory service
- ▶ Sales
- ▶ Rental
- ▶ Repair/maintenance

4.7.2.6 Power tools

- ▶ Advisory service
- ▶ Sales
- ▶ Rental
- ▶ Repair/maintenance

4.7.2.7 Pumps

- ▶ Advisory service
- ▶ Sales
- ▶ Repair/maintenance

4.7.2.8 Fans

- ▶ Advisory service
- ▶ Sales
- ▶ Repair/maintenance

4.7.2.9 Ventilators and blowers

- ▶ Advisory service
- ▶ Sales
- ▶ Repair/maintenance

4.7.2.10 Purchase of electric motors and generators

We purchase your motors and generators up to 10,000 kVA. Upon request, we can also carry out disassembly, transport and disposal.

4.8 PARTZSCH Grundstücksverwaltung GmbH & Co. KG

4.8.1 General information

The company PARTZSCH Grundstücksverwaltung GmbH & Co. KG owns and manages the properties and buildings of the PARTZSCH Group. Buildings include the production halls and storage facilities, offices and staff buildings that are rented to the manufacturing companies of the PARTZSCH Group.

4.8.2 Site plans and locations

The site plans correspond to the plans given under 2 'Organisational chart and site plan' on pages 2 to 4.

4.8.3 Use and distribution of buildings

Under 2 'Organisational chart and site plan' on pages 2 to 4 you can find a detailed overview of the use and distribution of buildings.

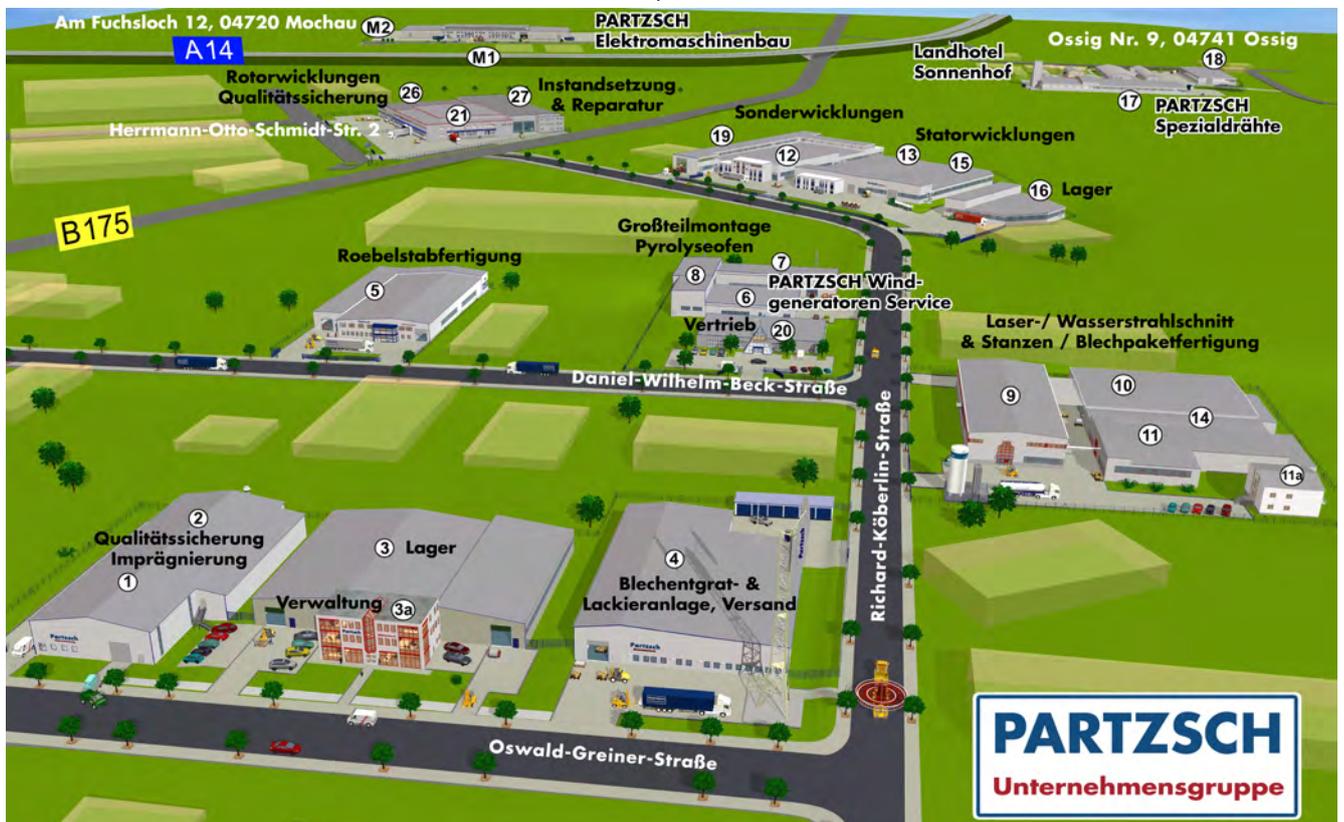


PARTZSCH Group Döbeln



PAMO Reparaturwerk GmbH Bitterfeld

Use and distribution of halls within the PARTZSCH Group



4.9 Landhotel Sonnenhof GmbH

4.9.1 General information

Landhotel Sonnenhof was built in 1820. It had undergone an extensive renovation in 2000 and been a sleeping beauty since 2003. The hotel was reopened in September 2016, now offering the core areas hotel, restaurant, catering and events in one location on this beautiful four-sided courtyard.

The Landhotel forms part of the PARTZSCH Group and is located on the company premises. It therefore provides the ideal platform for mixing business with pleasure. In addition to seminar and conference rooms, restaurant and hotel rooms our guests can use the bowling alley, sauna, a gym and a 50-metre underground shooting range.



Restaurant



Courtyard and beer garden

4.9.2 Range of services

4.9.2.1 Restaurant

The old stables dating from 1820 have now turned into the restaurant of the Sonnenhof.

Under the original vaulted ceiling up to 70 people can be seated. In the adjoining winter garden there is room for additional 50 people, offering more space for private functions or further seating for restaurant guests. Also, the winter garden can be used for conferences and seminars.

Our lunch guests can choose between eating à la carte or two changing lunch offers.



Restaurant

i 'FRESH AND REGIONAL PRODUCTS'

This is our restaurant's guiding principle. For our dishes we primarily order fruits and vegetables from the region around Radebeul, asparagus from the Spreewald and pasture-fed beef from Saxony. With this, we can guarantee high-quality dishes.

In our house you can enjoy traditional Saxon culinary specialties, but also selected upscale dishes.

i OPENING HOURS

We are open daily as follows:

Breakfast buffet

06:00 am – 10.00 am

Lunch menu

11:00 am – 02:00 pm

Come enjoy our fresh, homemade cakes with a cup of coffee during the afternoon.

Dinner menu

05:00 pm – 10.00 pm



Herb garden



Fresh and regional products

4.9.2.2 Hotel rooms

Landhotel Sonnenhof is located in Ossig, near Döbeln. The hotel has 26 comfortable hotel rooms, which are housed in the three buildings pertaining to the Sonnenhof. All rooms feature a bathroom (shower, toilet), TV, minibar and safe. Our suites, in addition, offer a spacious bathtub for our guests. Hotel guests can use wireless LAN throughout the whole hotel complex. There is a lift to the single and double rooms in the main building (completion in May 2017).

Our hotel guests and day trippers are invited to relax in our sauna or solarium. In the hotel's restaurant and beer garden of the four-sided courtyard our guests can enjoy tasty specialties prepared with fresh ingredients from regional producers.

For business events and meetings conference rooms are available in various sizes. All conference and seminar rooms are equipped with a projector.

Another special feature of the hotel is the generously designed culture barn, offering the ideal location for larger family celebrations and weddings. The culture barn offers a small stage and a bar. Our in-house catering takes care of our guests' wishes within the location, but can also be booked without the room.



Hotel reception

OUR ROOMS

Sonnenhofzimmer

Our Sonnenhofzimmer are accommodated in the main building of Landhotel Sonnenhof. Most of these comfortable, yet spacious rooms are equipped with daylight bathroom with shower, toilet and hairdryer.

The rooms further feature a flat screen TV, room safe, minibar (including initial filling) and free wireless LAN. This offer is completed with free parking in the hotel car park (depending on availability).

Landhauszimmer

Our Landhauszimmer are accommodated in the annexe building of Landhotel Sonnenhof. These rooms are comfortable, yet spacious and equipped with daylight bathroom with shower, toilet and hairdryer.

The rooms further feature a flat screen TV, room safe, minibar (including daily refill) and free wireless LAN. This offer is completed with free parking in the hotel car park (depending on availability).

Flats

Our two flats are accommodated in the annexe building of Landhotel Sonnenhof, guaranteeing pleasant living comfort through modern furnishing. The interior offers an open living-dining area and a modern fitted kitchen. The daylight bathroom features a shower, bathtub and a separate toilet.

Flat screen TV, room safe, minibar (including daily refill), free wireless LAN and free parking in the hotel car park (depending on availability) make your stay at Landhotel Sonnenhof complete.

Hofzimmer

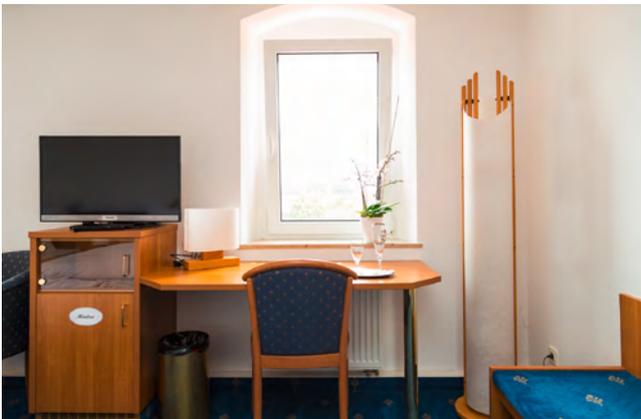
These rooms are accommodated in the seminar building of Landhotel Sonnenhof, partly equipped with daylight bathroom with shower and toilet. The rooms provide every possible comfort, such as flat screen TV, room safe, minibar (including initial filling) and free wireless LAN. This offer is completed with free parking in the hotel car park (depending on availability).



Double room Sonnenhof



Double room Landhaus



Sonnenhofzimmer



Bathroom Landhaus



Flat – double room



Seminar and conference room



Flat



Various conference rooms are available

4.9.2.3 Seminar, conference and function rooms

There are many sound reasons for arranging seminars outside the usual environment. If you wish to primarily focus on concentration, learning and creativity, much speaks for a peaceful place off the beaten track. With this in mind, we pick up the original concept of the Sonnenhof – a seminar hotel.

Being close to unspoilt nature and enjoying the nice ambience of this 200 year old property will help seminar participants concentrate on the essentials. Our seminar rooms are tailored to the various needs of our customers and individual offers regarding communications equipment, seating, catering and hotel accommodation can be provided.

The seminar concept can be completed with events arranged outdoors in our beautiful courtyard.



Conference and seminar rooms



Example conference room

i OUR CONFERENCE AND SEMINAR OFFERS

All conference package rates apply for groups with a minimum of 10 people and provide the following inclusive services:

- ▶ Provision of the seminar room and the desired conference technology
- ▶ Wireless LAN in the entire hotel complex, including hotel rooms
- ▶ Car park usage

i 'SONNENHOF CONFERENCE PACKAGE 1'

Conference package 1 is available at a rate of € 59.00 per person and provides the following inclusive services:

- ▶ Energy break in the morning with coffee and tea, fruit and healthy snacks
- ▶ Lunch buffet 'Quick Lunch' or 3-course menu (as selected by hotel), including 1 soft drink
- ▶ Coffee break in the afternoon with coffee and tea, fruit and little treats from our bakery
- ▶ Diverse dinner buffet or 3-course menu (as selected by hotel) for a pleasant get-together at the end of the day, including 1 soft drink
- ▶ Coffee, tea and soft drinks during conference hours

i 'SONNENHOF CONFERENCE PACKAGE 2'

Conference package 2 is available at a rate of € 44.00 per person and provides the following inclusive services:

- ▶ Energy break in the morning with coffee and tea, fruit and healthy snacks
- ▶ Lunch buffet 'Quick Lunch' or 3-course menu (as selected by hotel), including 1 soft drink
- ▶ Coffee break in the afternoon with coffee and tea, fruit and little treats from our bakery
- ▶ Coffee, tea and soft drinks during conference hours

Additional packages can be provided upon request. Of course we can also arrange a customised package for your event.

4.9.2.4 Skittle and bowling alley

The skittle and bowling alley provided at the Sonnenhof is the ideal place for business, family and group events. Both facilities are equipped with 2 lanes each that can be booked either together or separately. The joint area of skittle and bowling alley provides room for up to 50 people.

With its own kitchen, during skittles or bowling meals and beverages can be chosen from a special menu and enjoyed at the bar.

Our highlight: watch our cooks prepare your special steak platter at our bar. (Upon request - group reservation)

4.9.2.5 Shooting range

Our house features a 50-metre underground shooting range, which has already been used by the police, special forces, numerous rifle clubs and sports marksmen.

With the supervision by our qualified shooting instructor, a safe and proper operation is ensured. This way, you can easily use our shooting range and participate in organised shooting events.

4.9.2.6 Additional offers



HOTEL FOR TOURING RIDERS

Our hotel is located at the heart of Saxony. Dresden, Elbe Sandstone Mountains or the Czech Republic – all these destinations can be explored in a day trip. As a motorcyclist, we invite you to visit these destinations, starting at or coming back to our motorcycle-friendly hotel.

Our motorcycling guests can park their vehicles safely in an enclosed area of the hotel. This area also comprises a washing and maintenance corner with the most common tools. Clothing wet from rain can be dried in a drying room. In our reception area there is comprehensive information material available, offering tour suggestions for Saxony.

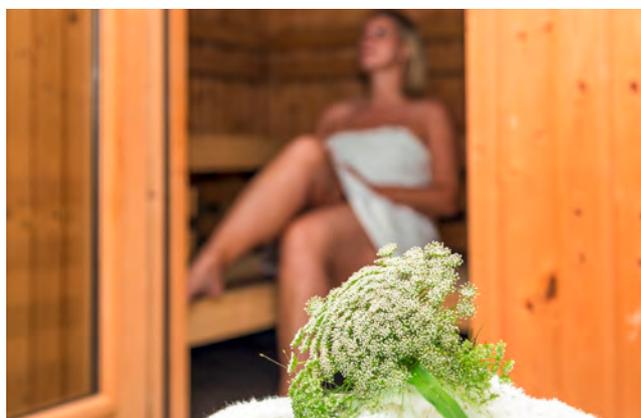
Breakdown! Well then? Your motorcycle breaks down during a day trip? We'll help you with our pick-up service: if your motorcycle breaks down during a day trip



Skittle and bowling alley



Fitness area



Sauna



Hotel for touring riders

started at our house, we'll take it to a local motorcycle workshop.

i ACTION & RELAXATION AT THE SONNENHOF

In addition to hiking and walking you can also explore the scenic surroundings with one of our rental bikes. Those looking for more physical activity may keep fit with various sport equipment in the fitness room belonging to the hotel.

After physical exercise or simply in between: relaxing in our hotel sauna will help your stay become a true holiday pleasure.

i EXTERIOR AREA

In the outside area of the Sonnenhof you can enjoy our petting zoo with goats, pigs, runner ducks and rabbits. Above this, in our mouflon enclosure you can already find 20 Cameroon sheep. We plan to build a large playground in spring 2017.

i ATTRACTIONS

As it is sung in a famous German hiking song, the region around the Sonnenhof offers beautiful hiking routes



Mouflon enclosure with currently 20 Cameroon sheep

and forests that invite you to enjoy nature to the full. Whether you want to visit on foot, by bike or by car – all attractions are within easy reach. In our bike rental you can hire up to 6 bikes and explore the beautiful region on your own.

Döbeln

In no more than a five minutes' drive from the Landhotel you will reach Döbeln in the valley of the Freiberger Mulde. The historic old town offers various places of interest worth seeing, such as the Döbelner Riesenstiefel, reminding of the town's shoemaking business, and the horsecar. Around the market square there are numerous shopping opportunities.

Rosswein

From the Landhotel you'll get to Rosswein within a 10 minutes' drive. Well worth seeing is the over 200-year-old camellia, the second oldest camellia north of the Alps. In the nearby silver mine tours are offered above and below ground.

Buch Monastery

Directly on the banks of the Freiberger Mulde you can find Buch Monastery. The former Cistercian monastery invites its guests to visit numerous events, such as concerts or farmers' markets, especially in summer.

Mildenstein Castle

Not far from Buch Monastery there is the small town of Leisnig. Here the Mildenstein Castle soars high above the course of the Mulde River. Come visit and immerse yourself in almost 1,000 years of history of the former imperial castle.

Porcelain and wine town Meissen

This picturesque town located on the Elbe River is world-famous for its porcelain manufacturing. Come visit the manufactory and explore the well-preserved medieval old town during a tour. Get on a pleasure boat in Meissen and see the region's wine-growing areas on your way towards Dresden.

Dresden

Located on both sides of the Elbe River, the capital of Saxony offers a range of attractions. Take a tour of the city during a day trip to Dresden to see the most important sights: Semperoper, Frauenkirche or the Dresden Zwinger. But also by night the city offers plenty of entertainment options. In addition to little bars, restaurants and clubs, particularly during the summer months, guests come to enjoy the Dresden film nights and concerts on the banks of the Elbe River.

Elbe Sandstone Mountains

The national park provides all kinds of possibilities for physical activity. Whether it is climbing, hiking, rafting tours, high rope courses or cave tours – all guests will find what they're looking for.

Leipzig

The trade fair city is very appealing as it offers a variety of attractions that can be explored on foot, by bus or boat. The Leipzig Zoo has become famous throughout Germany with its own television programme and is a definite must for every guest in town. The Monument of the Battle of Nations, Gohlis Palace and Schiller House are only a few examples for the turbulent history of the city. A popular destination for water sports enthusiasts is the lake scenery around Leipzig.

Those seeking entertainment for the whole family should visit the Belantis amusement park with its huge offer of riding attractions.

Chemnitz

The third largest city in Eastern Germany was first mentioned in 1143 and is considered the cradle of German machine tool engineering. Karl Marx Monument, the Chemnitz Parkeisenbahn – a rideable miniature railway – and the Versteinerte Wald, which is a petrified forest exhibited in the Museum of Natural History, attract many visitors each year. With its proximity to the Ore Mountains, Chemnitz is a good base for excursions.

4.9.3 Address and contact information

Landhotel Sonnenhof GmbH
Ossig Nr. 9e
04741 Rosswein / Germany

You can reach our reception team
Monday through Friday from 6:00 am to 10:00 pm.

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☎ +49 34322 6952060

✉ info@landhotel-ossig.de

🌐 www.landhotel-ossig.de

Courtyard and beer garden

