

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 |



DQS GmbH



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

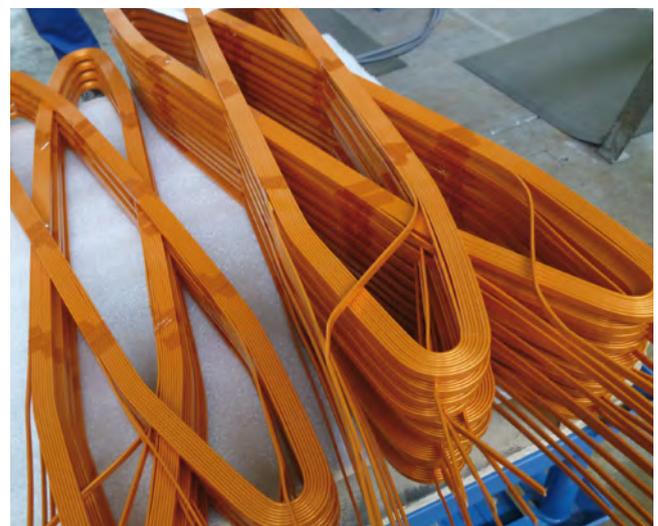
Wires that are exposed to high levels of stress, vibrations, temperatures and variations in temperature are usually covered with yarn in different designs and materials. For instance, there are yarns made of glass fibre and so-called blended yarns (Daglas). The individual yarns differ in the number of 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

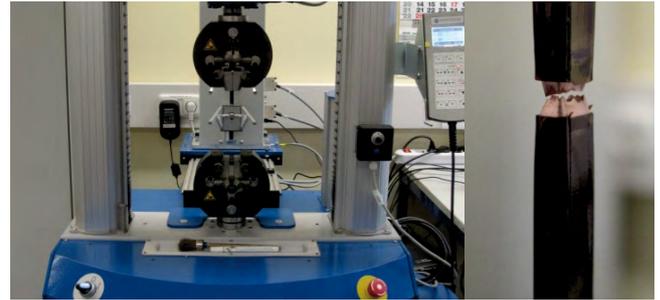
Based on the standards DIN EN 13601; 13602 and customer specifications

- ▶ 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