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Section B – Electrical engineering

Part 4: Electroheat installations

The following delivery specifications of Wieland-Werke AG form part of the contract.
Any deviating specifications are to be agreed upon between the supplier/contractor and Wieland, and documented.

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1 General

1.1 Specifications

The specifications set out in EN 60519-2 (VDE 0721, part 411) must be observed.

1.2 Definition

These specifications cover all installations in which metals or plastics are heated or melted with the aid of electrical energy. Electrical, series-produced heating elements with an individual connected load < 3 kW are an exception and are excluded.

1.3 Electricity used for heating

For all electric heat consumers of 10,000 kWh/year or more, the electricity used for heating must be counted separately (kWh meters).

1.4 Cooling water

If cooling water is required, the following must be stated in the tender, with binding effect:

- Quantity of heat to be dissipated (kW)
- Water quantity
- Flow and return temperature (or ΔT)
- Water quality (e.g. hardness, conductivity, etc.)

Cooling water inlet and outlet temperatures as well as pressure and flow must be monitored for each cooling water branch; critical states must be reported.

A flow diagram must be provided.
If large amounts of lost heat have to be dissipated, it must be checked whether it would make sense to increase the cooling water outlet temperature in order to make a reasonable use of waste heat.

1.5 Temperature monitoring

All electroheat installations must be equipped with an independent temperature monitoring system that safely protects the installation from damage due to overtemperature (contacts in loggers are not permitted).

1.6 Power supply

For the Vöhringen plant, the electroheat installations shall generally be connected to the mains supply via isolating transformers and provided with an earth fault monitoring system (unless a TN mains system is used). This must have a continuous display with adjustable limit value.

1.7 Contactors

Contactors for switching the electroheat installations may only be loaded with 80% of their rated power in the case of purely resistive loads, and with only 60% in the case of inductive or capacitive loads. Series connections of contacts that are not on the same shaft are not permitted.

1.8 Devices for recording temperature

The necessary temperature sensors, controllers and recording devices must be agreed with our planning electrical department before the contract is awarded or must comply with our Delivery Specifications, Section B, Part 1, Chapter 5 (device selection).

2 Resistance heating

2.1 Chamber furnaces

Chamber furnaces with resistance heating shall generally have a three-phase connection. Ammeters and voltmeters shall be installed in all phases.

2.2 Semiconductor components

If semiconductor components are used to switch the power, they must not be operated in phase-fired control (three-phase power controller). The power must in each case be switched on and off in the zero crossing (wave packet control).

3 Conduction heating

3.1 Live parts

If the heating is by means of direct current flow (conduction) through the body being heated, it must be ensured that all touchable live parts or rather parts at a potential are permanently marked accordingly and that the touch voltage is below the maximum permissible values. Otherwise total enclosure is required.

3.2 Voltage regulation

If continuous voltage regulation is required in conductive heating systems, fully or semi-controlled three-phase bridges must be used on the transformer secondary side.

3.3 Current regulation

The current regulation shall be designed in such a way that even a short-circuit on the output side does not result in the destruction of fuses or power semiconductors (effective current limitation).

3.4 Rated operating points, power factor (cosφ)

For the rated operating points, the corresponding cosφ on the primary side of the supply transformer must be specified.

4 Induction heating

4.1 Compensation

For induction heating systems at 50 Hz, for single-phase connection and power > 500 kW the installation must be compensated to cosφ = 1 and balanced; for three-phase connection and simultaneous switching of all three phases, compensation to cosφ = 0.95 is sufficient.

4.2 Measuring instruments

Ammeters for the compensated and uncompensated current and voltmeters for coil voltage and mains voltage must be installed, also power factor (cosφ) meters in the supply.

4.3 Frequency converter feeds

Induction heating installations for frequencies > 50 Hz must be equipped with frequency converter feed and DC link. Detailed information on the type of frequency converter and the various voltages and currents must be provided.

4.4 Efficiencies

The efficiencies of the individual components shall be specified separately.

4.5 Control and monitoring scheme

A control and monitoring scheme must be submitted with the tender.

5 Induction melting

5.1 Electric smelting furnaces

For electric smelting furnaces, the instrumentation and the circuit design shall be discussed and agreed with our planning electrical department, with the points in section 4 applying analogously.