

Resistor and cooling integrated units

MS designs and manufactures integrated units with braking resistor and liquid radiator cooler. This equipment reduces space and weight typically needed for these applications. As a rough analysis, Microelettrica foresees a 25% saving for space and weight compared to separated solutions. The RCU (Resistive Cooling Unit) can be placed on the roof of the train, inside the machine room in locomotive or underframe. They are suitable for all the operating conditions: from the cold weather in Finland to the desert of Australia. They are needed in all main line trains, like EMU or freight Loco working at 3000 Vdc, but they can be adopted also for urban networks, in LRV and Metro applications with operating voltage of 750-1000 Vdc.

RCU satisfies the main International standards: EN 45545, ROHS, REACH, IEC60322, EN 50124, EN60077, EN 50125, EN 61373, EN 60349 and others. Microelettrica is fully available to discuss and define customizations according to new requests.

The braking resistor withstands braking power up to some Megawatts, dissipating the heat through forced cooling. The resistive part, made of stainless steel and able to work up to 700 °C, is designed to guarantee the proper ohmic value range, power and insulation. The temperature of the resistor can be monitored through several auxiliaries: a costless and high reliable PT100 or thermo-switch or a more accurate electronic component called "Thepsys" made in Microelettrica. The "Thepsys" provides an analogic or digital diagnostic signal to the TCU. The customer can set a threshold value to avoid possible operating issues or monitor step by step the temperature of the resistor.

The braking resistor is cooled by COMET motorfans that provide the airflow and the static pressure able to win the pressure drop of the complete circuit. The AC motor is typically fed by an inverter and has a high efficiency. Since noise is nowadays an important topic in the railway sector, Microelettrica can provide solutions with more poles motors that allow the customer to reduce the dBa when approaching the station. Customer can also modify, as well, the feeding frequency through its inverter reducing power consumption and noise. The cooling unit is composed by several components. The radiator can cool different equipments and with different cooling liquids. Water/glycole is typically used for motors and converters, which dissipating power have a typical range from some kW to 50-60 kW. Other case is the transformer, where the radiator must dissipate power of 100 or more kW with oil as a cooling liquid. Microelettrica

Applications

Rail Vehicles



provides radiators that are certified for salt mist and corrosive atmosphere. If the environment is considered particularly harsh, then a filter can be applied to protect the radiator itself.

Microelettrica provides also pumps, fittings, sensors and connections, supplying the complete system according to the requirements provided from the customer: main components (es. converter) and pipes pressure drops, and operating temperature range. All these components come from first class suppliers recognized all over the world for their quality.

Microelettrica engineering fully characterizes from thermal-fluid dynamic and mechanical point of view the system and the single components. CFD and FEM analysis are performed during tender and design phase, while thermal and electric tests are executed during the validation phase. Furthermore, Microelettrica tests all its forced cooled systems in COMET AMCA chamber certified according to ISO standards. This allows the full analysis of the air flow vs pressure drop curve.

Microelettrica needs the following basic inputs to provide a first proposals:

General data:

- Position on the train (underframe, on the roof, inside machine room)
- Environmental temperature
- Max operating Altitude
- Noise restrictions (if applicable)

Resistor:

- Operating Voltage
- Ohmic value Range
- Power to be dissipated

Cooling unit:

- Thermal power of the heat exchanger
- Liquid outlet temperature
- Liquid Inlet temperature
- Liquid pressure drop from Customer side (ex. Converter, pipes)

Other requirements can be discussed and agreed during the tender phase.

