

### System description

The de-icing system KUPRO was developed for the treatment of overhead contact wires against ice formation. The system can be installed in various vehicles (e.g. a maintenance vehicle, a freight wagon, a container on a railway wagon, etc.) with a pantograph that holds the insulated spray unit. The compact "pump and control unit" is installed directly in the vehicle. The device is connected via the supply line to the "spray unit" mounted on the pantograph. The "spray unit" consists of a spray bar with 7 nozzles and a position sensor which detects the exact position of the contact wire. The exact position is transmitted to the controller which, depending on it, activates the spray nozzle with the shortest distance to the contact wire. Thus the spraying agent gets uniformly and economically on the contact wire. The system covers a spray area of up to +/- 40 cm from the middle of the track. The device can be easily operated from the driver's cockpit via the "safety radio remote control". Kummler+Matter provides the customer with expert support during the installation of the system.

### System facts

Module	Name	Function
1	<b>Pump and control unit</b>	Dimensions (LxDxH): 750mm x 600mm x 1000mm Tank volume of approx. 135 liters Power supply: 230V/50Hz (CE) or 120V/60Hz (UL/CSA) Optional: 24V DC supply possible Optional: 24V DC/50Ah battery for 10h usage System pressure of up to 10 bar by a diaphragm pump Continuous pressure control by sensor technology Adjustable spray pressure for output regulation Filtering of the liquid through a suction filter Continuous tank level control by sensor technology Possibility to suck from an external container PLC switching and control unit for operation and settings Flushing the system with water Cleaning of the nozzles by blowing out with compressed air
2	<b>Radio Remote Control</b>	Safety radio remote control incl. charger Average range up to 100 m Battery life up to 10 hours Sealing according to IP65 Start/stop of the spray function Checking the system pressure Possibility to adjust the pump pressure Tank level control
3	<b>Spray Unit</b>	Installation on new or existing pantograph Proved for catenary voltages up to 1500V Catenary wire detection by sensor technology Contactless impregnating of the overhead contact wire Spraying the liquid with full cone nozzles Individual nozzle control

### Principle diagram of the de-icing system KUPRO

The functional principle of the de-icing system KUPRO is shown schematically in the following figure. In standard operation, the pump sucks the de-icing fluid from the integrated tank. The valve control also makes it possible to suck in liquid from an external tank, e.g. for spraying, flushing or for refilling the tank via pump. The de-icing fluid then flows through the filter unit into the pump. From the pump, the de-icing fluid is conveyed to the spray bar at the set pressure (max. 10 bar). Meanwhile, the wire position sensor continuously determines the position of the contact wire. On the basis of this information, the valves of the nozzles are controlled in such a way that only the nozzle closest to the contact wire (in borderline cases also two nozzles) sprays liquid. Thus, the contact wire is economically de-iced or impregnated with de-icing fluid.

At an overpressure (> 10 bar) in the system, the overpressure valve opens and transports the liquid directly back into the tank. Likewise, when the shut-off valve is open, the medium is conveyed directly into the tank.

For the power supply the device is equipped with a 230 V (CE) or 120 V (UL) mains connection. In addition, it is possible to operate the device autonomously via an optional 24 V Li-Ion battery.

The device can be operated and calibrated via the integrated operating display. All functions are available to the user on that display. Furthermore, the device contains an additional radio remote control, which serves the driver to control the device from the driving cab. The radio remote control only provides the driver with for him important functions, such as starting and stopping the device, EMERGENCY STOP, setting whether more or less pressure (= spread rate) is required, as well as a display with operating values and fault messages.

