

EO, EOS, EOSX Electric heaters

Installation

- Electric heaters are designed for the environment with the impact of normal class according to ČSN 33 2000-1 ed.2 (IEC 60361-1). Degree of protection is IP 40.
- The heater must be checked carefully before its installation, especially if it was stored for a longer time. It is necessary to check parts for damage, and in particular, whether the heating rods, thermal fuses, insulation of conductors, terminals, etc are in good condition.
- The heaters can operate in any position except the position with the wiring distribution box directed downwards.
- The heater must be installed so that the prescribed air flow direction through the heater will be retained. The prescribed air flow direction is marked on the terminal box by an arrow. The correct air flow direction can also be determined according to the position of the aluminium cooler, which must be situated in cold air flow (in front of the heating rods), (see fig. # 30).
- There is no need for individual suspensions to install the electric heaters. They can be inserted into the duct line, but they must not be exposed to any strain or torsion caused by the connected duct line.
- The heaters must be situated at a safe distance from flammable or easily inflammable materials. The location of the heater must allow free space for heater surface cooling.
- It is necessary to keep easy access to the heater, especially to its wiring distribution box.
- Before installation, paste up to +100 °C heat resistant sealing onto the connecting flange facing the heater.
- Heaters with dimensions up to 80-50 mm are connected to the air-handling duct by 20 mm wide bar flanges and four M8 screws on each flange. Heaters with dimensions up to 90-50 mm are connected to the air-handling duct by 30 mm wide bar flanges and four M10 screws on each flange. To brace the flanges with a side longer than 40 cm, it is advisable to connect them in the middle with another screw clamp which prevents flange bar gapping.
- The lid of the wiring distribution box of heaters up to 30 kW is fixed with four M4 screws, while the lid of the wiring distribution box of 45 kW heaters is fixed with six M4 screws.
- It is necessary to ensure conductive connection of the lid using fan-washers placed on both sides (at least on one connection), or use Cu conductor wiring.
- The electric heater must be provided with automatic control of the output. REMAK units are recommended to supply, control and protect electric heaters.

Wiring and Commissioning

- The installation of the heater must be performed in accordance with the project and catalogue (respectively Installation Manual). The installation can be performed only by an authorized company licensed in accordance with generally valid regulations.
- The wiring diagrams of terminals of electric heaters are attached on the following pages.
 - The wiring must be checked before putting the device into operation.
 - Proper functioning of protective and emergency thermo-

stats connection must be checked before commissioning the electric heater. When the circuit of emergency thermostats is disconnected, the control unit must disconnect the power supply to the heater power circuit, and signal failure of the heater due to overheating.

- The EOSX heaters are controlled by voltage of 10-40V/DC from the control unit. When connecting the heater, it is necessary to observe the proper polarity – the heater terminal Q14 (+). If the polarity is reversed, the heater will not heat.
- The control voltage of the EOSX heater is led through a limiting thermostat with a switching point of +45 °C, which is situated on the cooler of the SSR switching relays.
- The heater is provided with two emergency thermostats adjusted to +80 °C. The thermostats are connected to terminals E3 and GE.

The Wiring

- The heater supply cables must be dimensioned in accordance with valid technical standards, and maximum current, cable bedding and length must also be taken into account. The cable sections are valid for CYKY cables, type of cable bedding: B, C, E in air at ambient temperature up to +30 °C (ČSN 33 2000-5-523, resp. IEC 364-5-523).
- The cables are led through grommets into the wiring distribution box, which is an integral part of the heater. Inside the wiring distribution box, the cables are interconnected with inner wiring using screw-free clip terminals.
- The heating rods of all heaters are designed for 230V voltage.
- The heaters are provided with two-stage thermal protection with two stand-alone thermostats (for details, refer to the chapter "Thermal Protection").
- Simpler and cheaper heaters in the EO product line, designed for less demanding conditions, are switched by the contactor directly in the control unit.
- EOS and EOSX heaters are switched by electronic non-contact switching relays SSR (Solid State Relay) which are characterized by long service life (indefinite number of closures compared to contactors), low input (15 mW) to switch output rates in kW's, switching at zero voltage, abatable nuisance, without sparking, optically separated input and output (dielectric strength of 4 kV).

Thermal Protection

Generally, if the electric heaters are not properly protected and controlled, they can be dangerous. Aside from electrical protection, attention must also be paid to thermal protection. When creating the project layout, we recommend observing the following principles.

- The electric heater output must be automatically controlled.
- The operation of the heater must be blocked if the fan is out of operation for any reason, or the speed of the air flow is limited to below the accepted level.

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- Either the air-handling device is switched off manually or automatically the heater must be switched off first, and then with time delay sufficient for heater cooling, the dampers can be closed and the fan switched off.
 - An air filter must be placed at a sufficient distance in front of the heater. Without using an air filter, there is a danger of the heating rods fouling and being damaged due to insufficient cooling. Sufficient protection can be ensured by a KFD filter with a filter insert.
 - Gradual filter fouling causes a reduction in the air flow rate. Therefore, it is necessary to monitor the filter condition via the differential pressure sensor, and change the filter insert in due time.
 - The speed of the air flow in the electric heater should not fall below 1 – 2 meters per second. If the output of the fan is controlled by the TRN controller, it is possible to block the lower stages of the controller so that the speed of the air flow will not fall below the limit value. As a consequence of breakdown or failing to observe any of the above-mentioned recommendations, an emergency situation could occur due to overheating. Complex and system protection can be ensured by proper connection of the electric heater to the control unit.
- As standard, all heaters are equipped with stand-alone thermal limiters in accordance with the ČSN 33 2000-4-42 (IEC 364-4-42) standards. The thermal limiters (thermostats) permanently prevent the limit temperature in the air-duct and in the wire distribution box from being exceeded.

Basic (emergency) thermal protection

Thermal protection of all electric heaters is ensured by two emergency thermostats connected into a serial loop. The thermostats are adjusted in production to +80 °C; one reads the temperature among the heating rods while the other reads the temperature inside the wiring distribution box. If the thermo-contact in the loop trips (due to the heater overheating), the power supply of the heater must be disconnected.

Extended thermal protection

The thermal protection of EOS and EOSX electric heaters is extended by a protective SSR circuit. The temperature of the cooler of the SSR switching relays is read by the third protective thermostat adjusted to a switching point of +45 °C. When this temperature is exceeded, the control signal to SSR is interrupted. After cooling down, the thermostat will automatically switch the control circuit, while the fans work without stopping all the time.

Operation, Maintenance and Service

The electric heater needs to be regularly checked at least at the beginning of each heating season.

- During operation, the heater must be checked for surface cleanliness, surface temperature, and the connected cables for damage.
- It is necessary to inspect the proper switching functions of protective devices. If the air-handling device is stopped by the emergency system due to heater overheating, it is necessary to find and remove the failure following the respective installation manual.

Troubleshooting

When you start the air-handling system for the first time, you can face an undesirable situation. The following text includes common sources of problems and their removal:

- **Permanently low output air temperature**
 - Too low temperature was adjusted on the control unit.
 - Too low heater output for the given air flow and ΔT .
 - Wrong connection (polarity) of Q14, GC terminals.
 - The limiting thermostat is defective.
 - The electric heater's control circuit has been disconnected
- **Permanently high output air temperature**
 - Required temperature (set in control unit) too high
 - SSR Switching relay fault

- **The output air temperature fluctuates**

- Too high EO, EOS heaters output for the given air flow and ΔT .

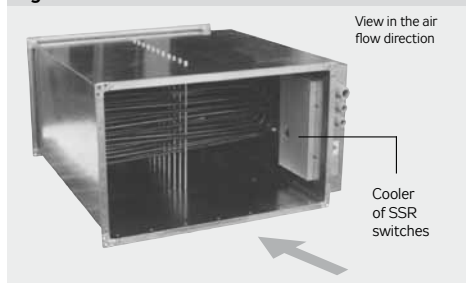
In regulation quality terms, in normal conditions higher temperature fluctuation can be expected with EO and EOS electric heaters controlled by a control unit than with EOSX heaters or EOS heaters with a current valve.

- **Repeated activation of emergency temperature protection**

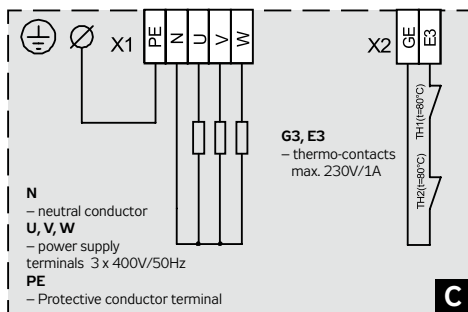
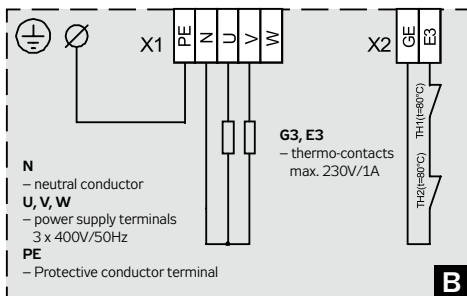
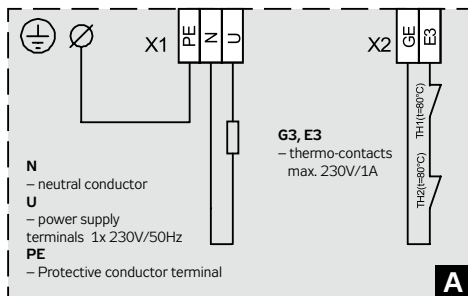
- No air flow due to wrong installation.
- Failure of the emergency thermostat.
- The emergency circuit has been disconnected.
- Defective SSR switching relay.

The above-mentioned failures which cause repeated activation of the temperature protection are serious, and need to be repaired immediately.

Figure 26 – Location of SSR cooler switches

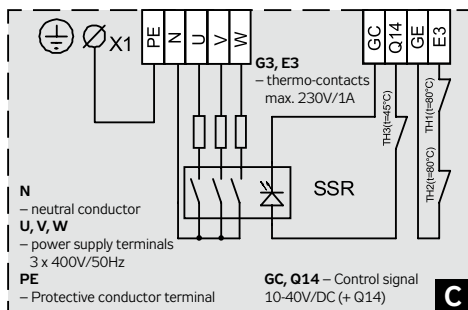
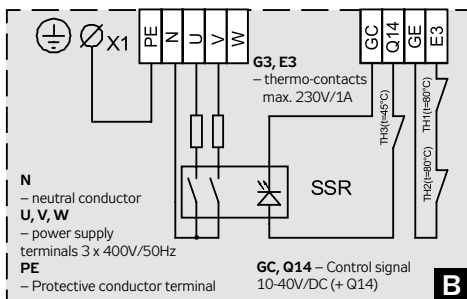
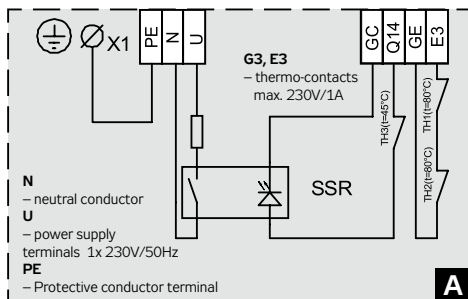


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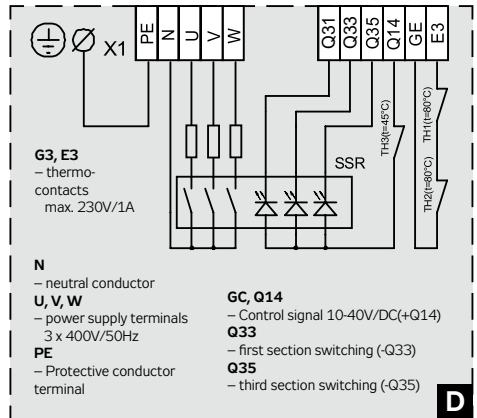
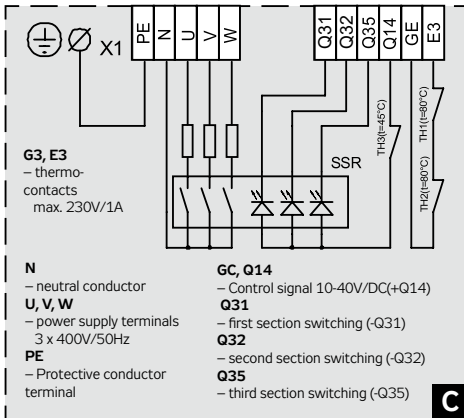
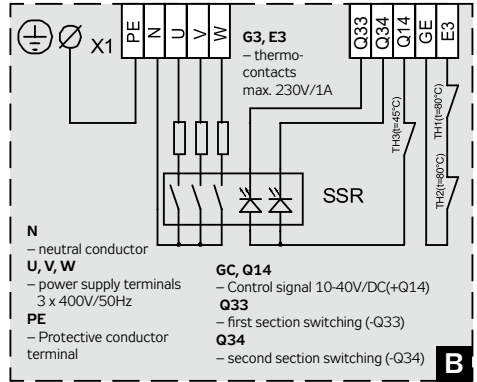
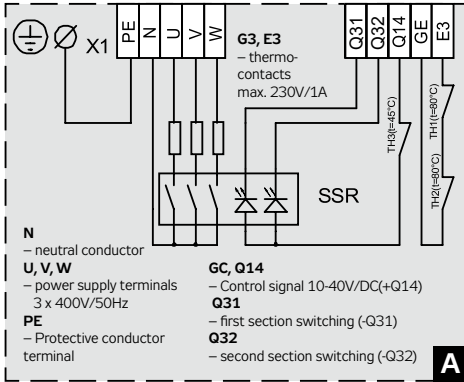
Type/ size	Output (kW) / wiring scheme															
	1,5	2	2,5	3	4	4,5	5	6	7,5	10	12	15	22,5	30	37,5	45
EO 30-15	A			B		C										
EO 40-20		A			B						C					
EO 50-25			A				B			C	C		C	C		
EO 50-30							B			C	C		C	C		
EO 60-30										C	C		C	C		
EO 60-35										C	C		C	C		
EO 70-40										C	C		C	C		
EO 80-50											C		C	C	C	C
EO 90-50												C	C	C	C	C
EO 100-50												C	C	C	C	C

EOS Electric heaters



Type/ size	Output (kW) / wiring scheme															
	1,5	2	2,5	3	4	4,5	5	6	7,5	10	12	15	22,5	30	37,5	45
EOS 30-15	A			B		C										
EOS 40-20		A			B						C					
EOS 50-25			A				B			C	C		C	C		
EOS 50-30							B			C	C		C	C		
EOS 60-30										C	C		C	C		
EOS 60-35										C	C		C	C		
EOS 70-40										C	C		C	C		
EOS 80-50											C		C	C	C	C
EOS 90-50												C	C	C	C	C
EOS 100-50												C	C	C	C	C

EOSX Electric heaters



Type/ size	Output (kW) / wiring scheme					
	12	15	22,5	30	37,5	45
EOSX 40-20	A					
EOSX 50-25		A	B			
EOSX 50-30		A	B			
EOSX 60-30		A	B	C		
EOSX 60-35		A	B	C		
EOSX 70-40		A	B	C	C	D
EOSX 80-50		A	B	C	C	D
EOSX 90-50		A	B	C	C	D
EOSX 100-50		A	B	C	C	D