Technical Information

Applications of Heate

Electric heaters are intended for air heating, from simple venting installations to sophisticated air-handling systems. They are designed to be installed directly in square air ducts. Ideally, they can be used along with other components of the Vento modular system which ensure inter-compatibility, balanced parameters, safety and efficiency of operation.

Working Environment

Electric heaters are intended for normal environmental conditions in accordance with ČSN 33 2000-3 (IEC 364-3). The transported air must be free of corrosive chemicals or chemicals aggressive to aluminium, copper and zinc, respectively to plastics. Further, the transported air must be free of solid, fibrous, sticky, aggressive, flammable or explosive impurities.

- Degree of protection: IP 40
- Permissible air temperature: -25 °C to +40 °C
- Location: indoor, or outside under projecting roof

Dimensional and Output Range

Electric heaters are delivered in a range of nine standardized sizes according to the A x B dimensions of the connecting flange, and in a range of three types according to the method of control - EO, EOS, EOSX. Electric heaters can be connected to air ducts in the same way as any other Vento duct system component. Several output versions of electric heaters are manufactured for each standardized size (see table # 1). According to the heating output, in total nine electric heater versions of gradually growing maximum heating output from 3 kW to 45 kW are manufactured. Higher outputs can be reached by assembling several heaters in series.

Table 1 – Output Range

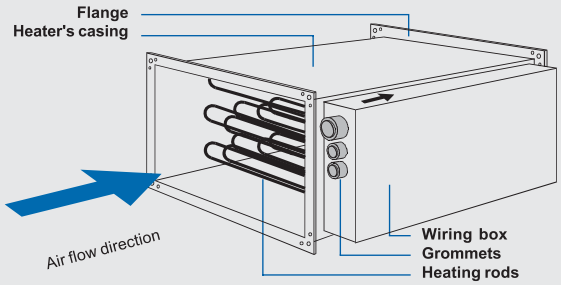
Type	Dimensional range	Output [kW]								
		3,0	4,5	6,0	7,5	12,0	15,0	22,5	30,0	45,0
EO	30-15									
	40-20									
	50-25									
	50-30									
	60-30									
	60-35									
	70-40									
	80-50									
	90-50									
EOS	30-15									
	40-20									
	50-25									
	50-30									
	60-30									
	60-35									
	70-40									
	80-50									
	90-50									
EOSX	30-15									
	40-20									
	50-25									
	50-30									
	60-30									
	60-35									
	70-40									
	80-50									
	90-50									

Position and Location

The heaters can operate in any position except the position with the wiring distribution box directed downwards (there is a risk of condensate penetration from the air duct). When projecting the layout of the heater location, we recommend observing the following principles:

- An air filter must be installed at a sufficient distance in front of the heater to avoid its fouling (according to fire regulations, direct installation of the air filter just in front of the heater is forbidden).
- We recommend adding a 1 m long piece of straight duct to the heater's inlet to reduce thermal load of connected devices.
- The heater's casing must be situated at a safe distance from flammable or easily inflammable materials (min. 5 cm).
- The location of the heater must allow free cooling.
- Free access to the heater must always be ensured to enable checks and service.
- The prescribed air flow direction through the heater is marked on the heater's wiring box by an arrow (see figure # 1).

Figure 1 - Air flow direction

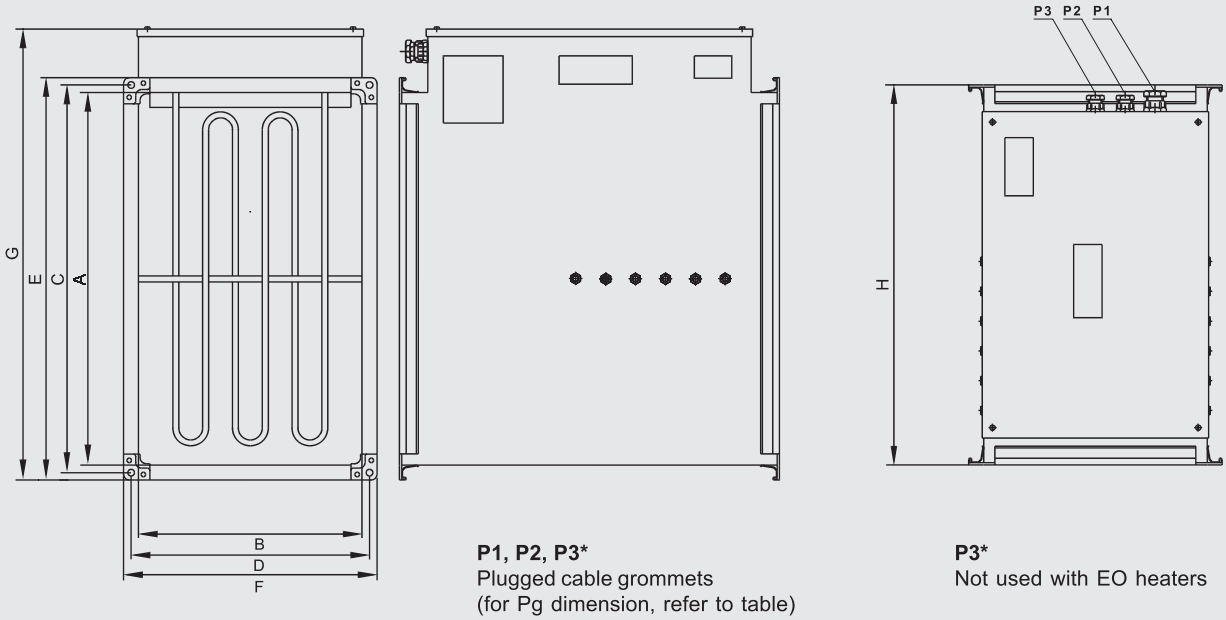


Materials and Design

As standard, the external casing of the heater, casing of the wiring box and connecting flanges are made of galvanized sheet steel (protecting layer of 275 g/m2 Zn). Heating rods are made of stainless steel. The heating rods of the 50-25 and larger heater sizes are fixed to aluminium braces to eliminate vibrations. The cooler of the power semiconductor relays is made of ribbed sectional aluminium. Plastics, copper, aluminium and brass are used in the internal wiring. All components and materials are carefully checked so they ensure long life service and reliability of the heaters.
put.

Parameters

Figure 3 - Dimensions and weights



P1, P2, P3*
Plugged cable grommets
(for Pg dimension, refer to table)

P3*
Not used with EO heaters

Table 2 - Dimensional Range

	A	B	C	D	E	F	G	H	Weight*	P1	P2	P3*
Type / Dimensions	mm	mm	mm	mm	mm	mm	mm	mm	kg	Pg	Pg	Pg
EO.. 30-15/3	300	150	320	170	340	190	407	360	6,5	13,5	11	11
EO.. 30-15/4									6,8			
EO.. 40-20/6	400	200	420	220	440	240	507	390	9,3	16		
EO.. 40-20/12								510	12,6			
EO.. 50-25/7	500	250	520	270	540	290	607	390	11,5	21		
EO.. 50-25/15								510	16,5			
EO.. 50-25/22								630	19,5			
EO.. 50-30/7		300		320		340		390	12,3			
EO.. 50-30/15								510	17,0			
EO.. 50-30/22								630	22,2			
EO.. 60-30/15	600		620		640		707	510	18,6			
EO.. 60-30/22								630	23,5			
EO.. 60-30/30								750	30,5			
EO.. 60-35/15		350		370		390		510	19,5			
EO.. 60-35/22								630	25,8			
EO.. 60-35/30								750	30,8			
EO.. 70-40/15	700	400	720	420	740	440	807	510	21,0			
EO.. 70-40/45							852	750	33,5			
EO.. 70-40/30							807	990	45,0	29		
EO.. 80-50/15	800	500	820	520	840	540	907	510	24,0	21		
EO.. 80-50/30							907	750	37,2			
EO.. 80-50/45							952	990	50,5	29		
EO.. 90-50/30	900		930	530	960	560	1015	750	43,7	21		
EO.. 90-50/45							1060	990	57,0	29		

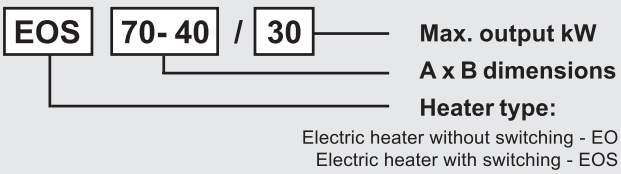
* Weight ±10 %

Parameters

Designation of Heaters

Type designation of the electric heaters in projects and orders is defined by the key in figure # 2. The heater's type designation includes its rounded up max. output.

Figure 2 - Type designation



Output and Pressure Loss Determination

EO, EOS and EOSX electric heaters are dimensioned according to required heating output **Q** according to maximum air flow rate **V** and required heating-up **ΔT**.

- Preliminary correlations of parameters (Q, V, DT) for all output ranges of standard heaters are included in the graph, see figure # 4. Heating-up DT for the corresponding air flow rate is valid providing the heater works at maximum output. If a control unit is used, the heaters' output will be controlled according to actual need in relation to the required outlet air temperature.
- Pressure losses of EO, EOS and EOSX electric heaters are included in the nomogram, see figure 5.

Each heater in the table is marked with a number ❶❷❸❹❺ in accordance with its output and connecting dimensions, and each number comports with one pressure loss/air flow rate correlation characteristic.

(1 This function must be ensured by the control unit..

(2 For details on blocking of individual controllers' stages, refer to the controllers' documentation, respectively fan output control on page # 122.

Planning the heater

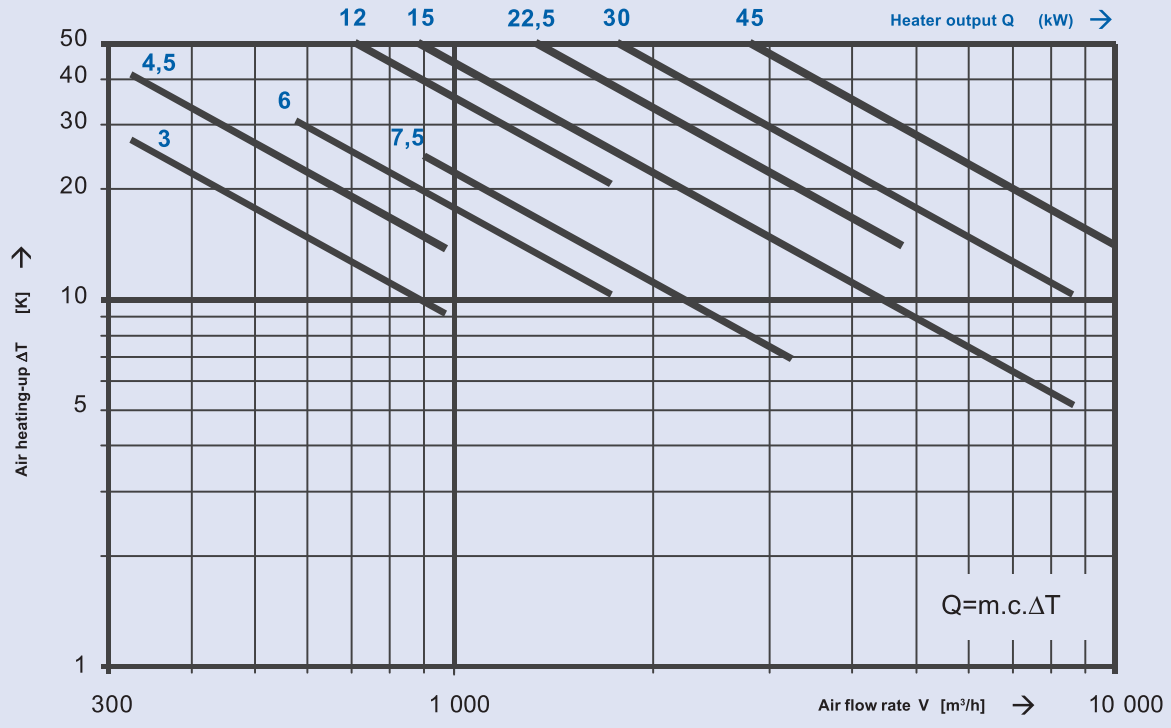
When dimensioning and planning the electric heater, it is necessary to observe the following safety principles:

- 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.
- To reduce the heat loading (by heat radiation and/or conduction) of connected devices, we recommend inserting at least a 1 m piece of air duct in front of and behind the heater.
- At a minimum distance of 1–1.5 m in front of the heater, an air filter must be installed to avoid its fouling. Without using an air filter, there is a danger of the heating rods fouling and eventually being damaged due to insufficient cooling.

According to fire regulations, direct installation of the air filter just in front of the heater is forbidden!

- It is necessary to keep free access to the heater, especially to its wiring distribution box, to enable easy checks, inspections and service.
- The heaters can operate in any position except the position with the wiring distribution box (switchboard) directed downwards (there is a risk of condensate penetration from the air duct).
- The heater output must be automatically controlled so that the outlet air temperature is limited to +40°C.
- The operation of the heater must be blocked if the fan is out of operation for any reason. (1
- Either the air-handling device is switched off manually or automatically the heater must be switched off first, and then with a time delay sufficient for heater cooling, the dampers can be closed and the fan switched off.
- 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 above-mentioned value.(2

Figure 4 - The air temperature growth in the heater in relation to the air flow rate



Parameters

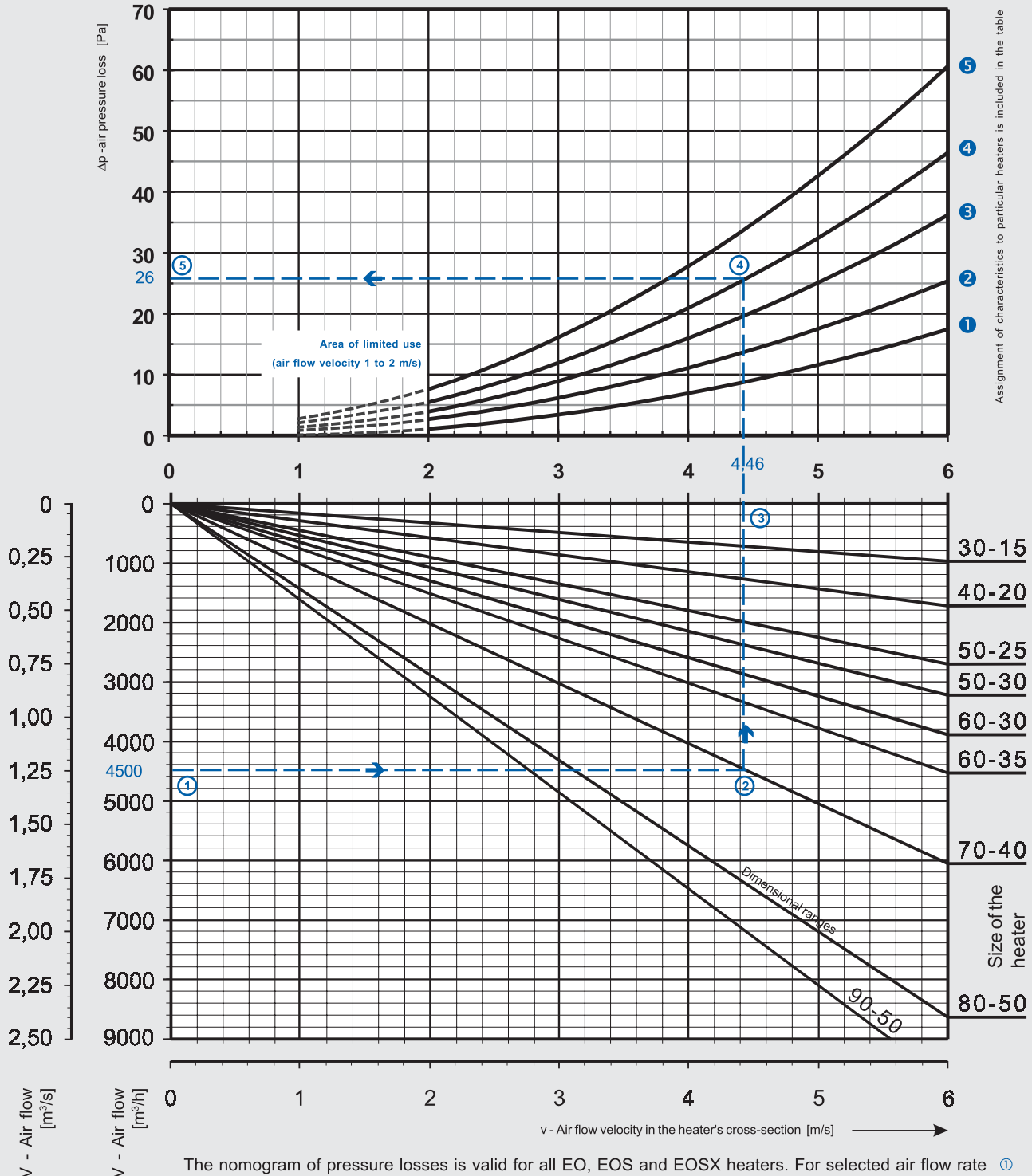
Figure 5 - Pressure losses in heaters

Each EO, EOS or EOSX heater in the table is marked with one number in accordance with its output and connecting dimensions:

❶❷❸❹❺

Each number comports with one pressure loss/air flow rate correlation characteristic.

Output / dimension	30-15	40-20	50-25	50-30	60-30	60-35	70-40	80-50	90-50
3,0 kW	❷								
4,5 kW	❸								
6,0 kW		❸							
7,5 kW			❷	❷					
12,0 kW		❺							
15,0 kW			❹	❹	❸	❷	❷	❶	
22,5 kW			❺	❺	❹	❸			
30,0 kW					❺	❹	❹	❷	❷
45,0 kW							❹	❷	❸



The nomogram of pressure losses is valid for all EO, EOS and EOSX heaters. For selected air flow rate ① the air flow velocity ③ in the free heater's cross-section ② can be read, and then the corresponding heater's air pressure loss ⑤ can be determined in the upper part ④.

Example: At an air flow rate of 4,500 m³/h, the velocity of the air flow in the electric EOS 70-40/30 heater will be 4.46 m/s. The heater's air pressure loss for the above-mentioned air flow rate according to the table will be 26 Pa on curve ❹.

Control

Basic Differences in Control

EO Heaters

The ON/OFF control of the heater's output is used for both units in a basic EO heater arrangement with a control unit, while the full output rate is connected upon any request for heating output (see figure # 8A).
Heating output is switched by the contactor in a control unit. Taking into account the type of switching (by the contactor) it is advisable to use EO heaters especially for applications not too demanding for switching.

EOS Heaters

The ON/OFF control of the heater's output is used for both units in a basic EOS heater arrangement with a control unit, while the full output rate is connected upon any request for heating output (see figure # 8A).
The control unit can be optionally configured for a pulse functioning mode of width modulation (PV current valve). If this is the case, the heating output will be fed precisely in accordance with the request from the control unit, which will always switch the full output for a short time period. The switching interval is 4 seconds.

EOSX Heaters

The design of EOSX electric heaters uses sequential switching of individual sections. The control unit switches individual sections of the EOSX heater according to requests of the heating mode (see figure # 8C). These heaters can be judged as more favourable as far as stability of the mains is considered. [3]

Table 3 -Types of control

Type of control	Type of heater		
	EO	EOS	EOSX
A	●		
A		●	
A	●		
A		●	
B		●	
C			●

The control unit must be configured for each type of control!

Control and Protection Correlations

EO, EOS, EOSX electric heaters are powered, controlled and protected by the control unit.
■ Connection of EO, EOS and EOSX heaters to the control unit is shown in figures 6 and 7.

Figure 6 - Example of heater connection (VCB unit)

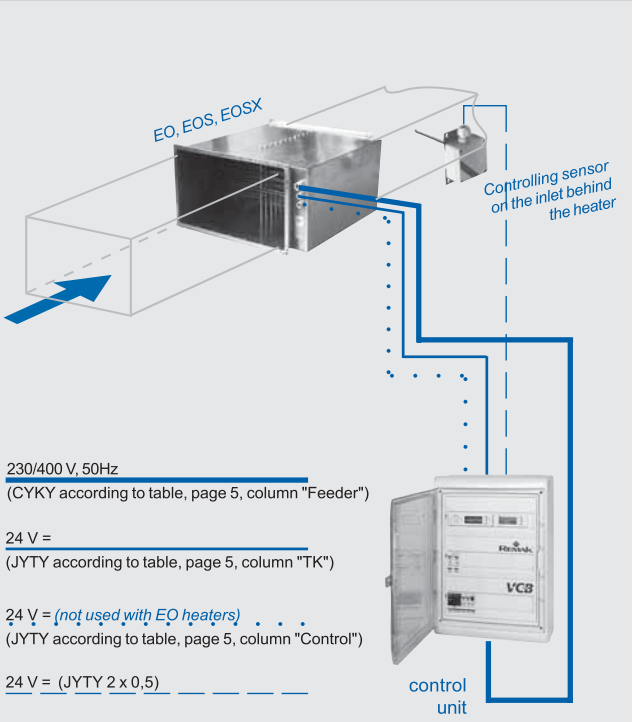
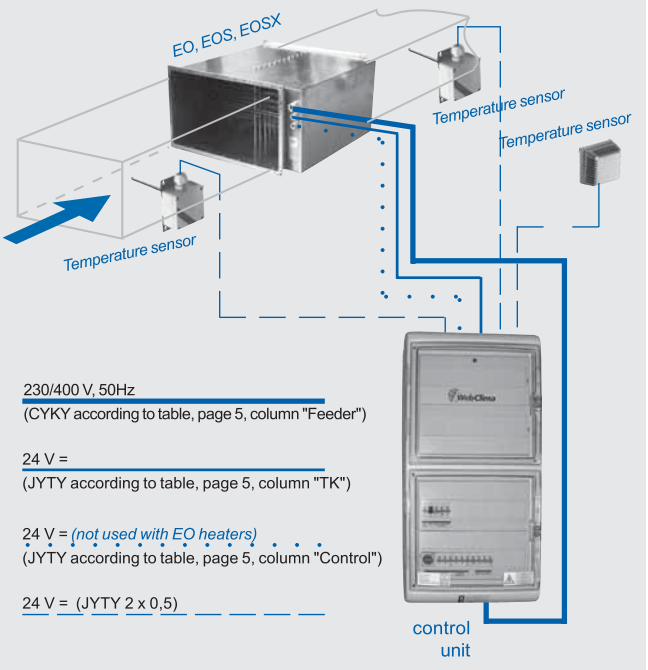


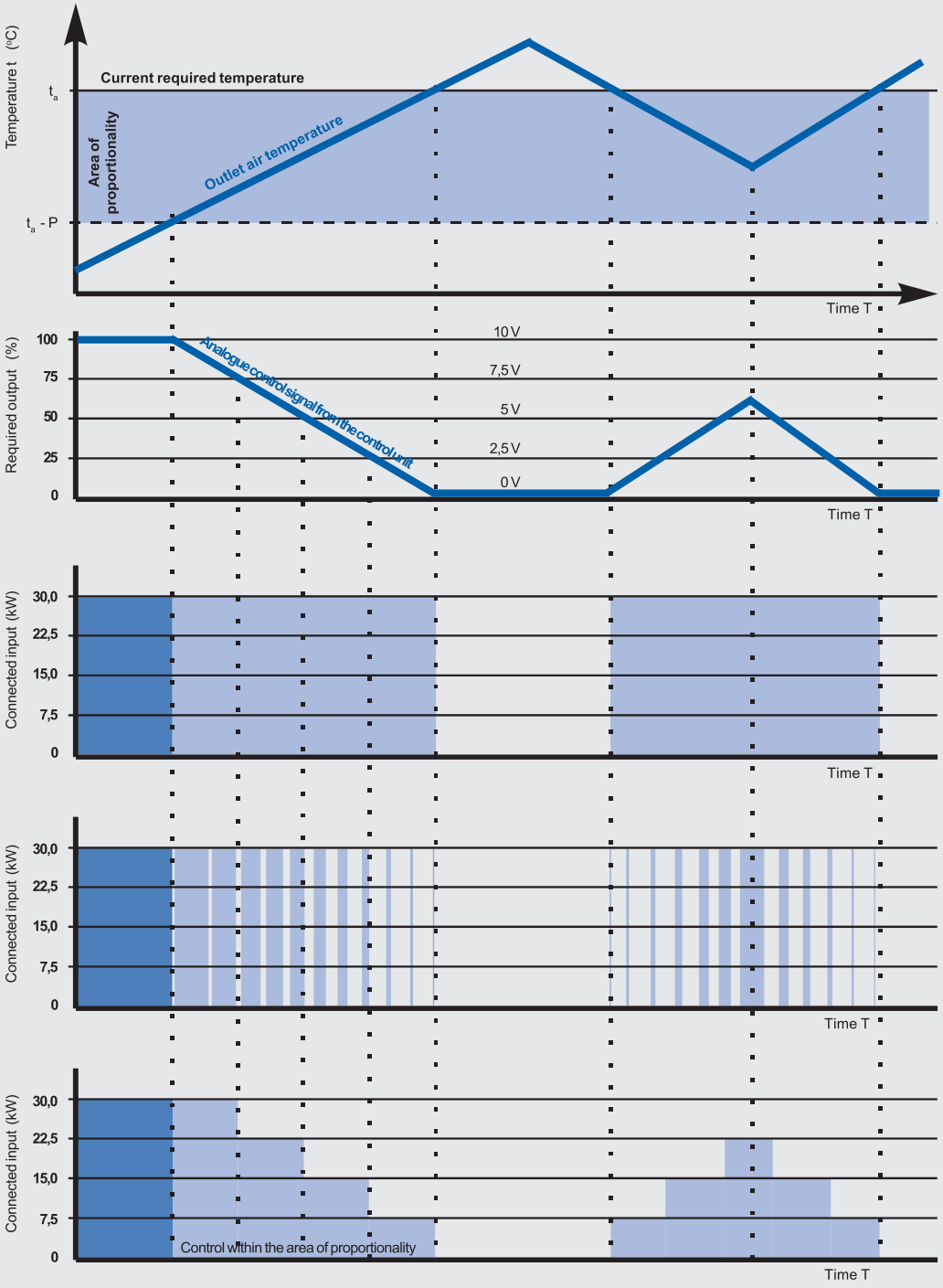
Figure 7 - Example of heater connection (WBC unit)



[3] (3 EOSX heaters are manufactured with an output from 12 kW and higher, because the symmetry of the phase loading distribution into the sections cannot be ensured at lower outputs.

Control

Figure 8 - Simplified model of switching (control) of electric heaters depending on the temperature course (4



Temperature course
Schematic diagram of the temperature course in the duct behind the electric heater.

Required output
Schematic diagram of the course of the control unit's request for the heating output. The request is represented by the value of the control voltage in the range 0 - 10V.

Control A

Two-step ON/OFF control. Electrical input is connected by steps (see figure # 8A), however, heating output has a continuous course because of thermal inertia.

Control B

Two-step control using pulse width modulation. Electrical input is connected by pulses with continuous change of the switching time within a constant time period of 4 seconds (see figure # 8). The switching time, i.e. aliquot part of the time period of 4 seconds, is proportionate to the request for heating output. Output distribution is controlled an electronic module inside the control unit (the so-called PV current valve). Providing the output is properly dimensioned and the control pressure data points of the control unit are properly set, the fluctuation of the outlet temperature behind the heater will be within ± 0.5 °C. Control mode B is suitable for installations requiring minimum fluctuation of the outlet temperature.

Control C

Cascade type of control by switching individual sections of the heater. Electrical input is connected gradually by cascades of the particular EOSX heater according to the request for heating output (see figure # 8). This type of control is especially suitable for installations requiring distribution of the electrical input due to loading of the mains.

(4 This example shows only a simplified model.

Installation, Service and Maintenance

Installation

EO, EOS and EOSX electric heaters, including other Vento elements and equipment, are not intended, due to their concept, for direct sale to end customers. Each installation must be performed in accordance with a professional project created by a qualified air-handling designer who is responsible for proper selection of the heater and accessories.

- 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 is retained. The prescribed air flow direction is marked on the terminal box with 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).
- 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 flange using fan-washers placed on both sides, at least on one flange connection.
- The electric heater output must be automatically controlled. 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 and commissioning can be performed only by a company specialized in wiring and licensed in accordance with valid regulations.

- For the wiring diagrams of terminals of electric heaters, refer to page 152.
- The wiring must be checked before putting the device into operation.
- Before putting the device into operation, all the checks and settings must be performed in accordance with the Service Manual. The Service Manual (provided by the manufacturer) includes a detailed description of steps to activate the device and to perform regular inspections. Results of inspections are recorded in the record sheet inserted into the Service Manual.
- Proper functioning of the protective and emergency thermostats connection must be checked before commissioning the electric heater. When the circuit of the 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 a voltage of 10-40V/DC from the control unit. When connecting the heater, it is necessary to observe the proper polarity - the heater Q14 terminal (+). 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 (5. The thermostats are connected to terminals E3 and GE.

Troubleshooting

When you start the air-handling system for the first time, you could face an undesirable situation. The following text includes the most common problems and their causes:

- **Permanently low output air temperature**
  - Too low a temperature was set on the control unit.
  - Too low heater output for the given air flow and ΔT.
  - Incorrect 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**
  - Too high a temperature was set on the control unit.
  - The SSR switching relay is defective.
- **The output air temperature fluctuates**
  - Too high EO or EOS heater output for the given air flow and ΔT.

As far as the control quality is concerned, higher temperature fluctuation can be expected with EO and EOS heaters connected to the control unit than with EOSX or EOS heaters equipped with a current valve

- **Repeated activation of emergency temperature protection**
  - No air flow due to incorrect installation.
  - Failure of the emergency thermostat.
  - The emergency circuit has been disconnected.
  - The SSR switching relay is defective

The above-mentioned failures, which repeatedly activate thermal protection, are serious and must be removed immediately.

(5) First thermostat is adjusted to +80 °C. The second one can be adjusted in a range of +50 °C to +90 °C; factory default setting is +80 °C. If a change in temperature is required, it is advisable to use only the range +50 °C to +80 °C (table 6, page 119).

Installation, Service and Maintenance

Electrical Equipment

For basic electrical parameters and recommended cables to connect the electric heaters to the control unit, refer to Table 6 on page 150. The markings used in this table have the following meaning:

Feeder - Power supply of the heater
TK - Protecting thermo-contact circuit
Control - Control and governing circuit(s)

The heater supply cables must be dimensioned in accordance with valid technical standards, and the 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.

Table 4 - Switching options

Type of heater >	EO	EOS	EOSX
Without switching [1]	●		
Output switching by SSR [2]		●	
Output switching by SSR in cascades [2]			●

- EOS and EOSX heaters are switched by electronic non-contact SSR (Solid State Relay) switching relays 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). Possible methods of control are described in a separate section..

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 (6.
- 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 falls below the accepted level.[6]
- 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 (6.
- An air filter must be placed at a sufficient distance in front of the heater. Without 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 time [7].

- 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 (8.

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) in cooperation with a control unit permanently prevent the limit temperature in the air-duct and in the wire distribution box from being exceeded (table # 5).

Table 5 - Protecting thermostats

Type of the heater >	EO	EOS	EOSX
I. Protecting thermostat 50-90°C (80°C)*	●	●	●
II. Protecting thermostat 80°C	●	●	●
III. Protecting thermostat 45°C		●	●

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 +80oC; 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 electric heater must be disconnected.[6]

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 set 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.

[6] This function must be ensured by the control unit

[7] This function is normally ensured by the control unit in association with a P33N differential switch is situated of the filter

[8] For detailed description of blocking of individual controller's stages, refer to the section concerning TRN output controllers.

Installation, Service and Maintenance

Table 6 - Basic electrical parameters

	Dimensional range	Type / size	Output	Voltage	Current	Heating rods	Output spliting	Output of section s	Feeder	TK	Control
		Designation	Q	U	I	n	1/s	Qs	Recommended cables		
			kW	V	A	ks x kW		kW	CYKY	JYTY	JYTY
EO	30-15	EO 30-15/3	3,0	3 x 400	6,5	2 x 1,5	1/1	3,0	5C x 1,5	2A x 1	–
		EO 30-15/4	4,5			3 x 1,5		4,5			
	40-20	EO 40-20/6	6,0		8,7	3 x 2,0		6,0			
		EO 40-20/12	12,0		17,4	6 x 2,0		12,0	5C x 6		
	50-25	EO 50-25/7	7,5		10,9	3 x 2,5		7,5	5C x 2,5		
		EO 50-25/15	15,0		21,7	6 x 2,5		15,0	5C x 6		
		EO 50-25/22	22,5		32.6	9 x 2,5		22,5	5C x 10		
	50-30	EO 50-30/7	7,5		10,9	3 x 2,5		7,5	5C x 2,5		
		EO 50-30/15	15,0		21,7	6 x 2,5		15,0	5C x 6		
		EO 50-30/22	22,5		32,6	9 x 2,5		22,5	5C x 10		
	60-30	EO 60-30/15	15,0		21,7	6 x 2,5		15,0	5C x 6		
		EO 60-30/22	22,5		32,6	9 x 2,5		22,5	5C x 10		
		EO 60-30/30	30,0		43,5	12 x 2,5		30,0	5C x 16		
	60-35	EO 60-35/15	15,0		21,7	6 x 2,5		15,0	5C x 6		
		EO 60-35/22	22,5		32,6	9 x 2,5		22,5	5C x 10		
		EO 60-35/30	30,0		43,5	12 x 2,5		30,0	5C x 16		
	70-40	EO 70-40/15	15,0		21,7	6 x 2,5		15,0	5C x 6		
		EO 70-40/30	30,0		43,5	12 x 2,5		30,0	5C x 16		
		EO 70-40/45	45,0		65,2	18 x 2,5		45,0	5C x 35		
	80-50	EO 80-50/15	15,0		21,7	6 x 2,5		15,0	5C x 6		
		EO 80-50/30	30,0		43,5	12 x 2,5		30,0	5C x 16		
		EO 80-50/45	45,0		65,2	18 x 2,5		45,0	5C x 35		
	90-50	EO 90-50/30	30,0		43,5	12 x 2,5		30,0	5C x 16		
		EO 90-50/45	45,0		65,2	18 x 2,5		45,0	5C x 35		
EOS	30-15	EOS 30-15/3	3,0	3 x 400	6,5	2 x 1,5	1/1	3,0	5C x 1,5	2A x 1	2A x 1
		EOS 30-15/4	4,5			3 x 1,5		4,5	5C x 1,5		
	40-20	EOS 40-20/6	6,0		8,7	3 x 2,0		6,0	5C x 1,5		
		EOS 40-20/12	12,0		17,4	6 x 2,0		12,0	5C x 6		
	50-25	EOS 50-25/7	7,5		10,9	3 x 2,5		7,5	5C x 2,5		
		EOS 50-25/15	15,0		21,7	6 x 2,5		15,0	5C x 6		
		EOS 50-25/22	22,5		32,6	9 x 2,5		22,5	5C x 10		
	50-30	EOS 50-30/7	7,5		10,9	3 x 2,5		7,5	5C x 2,5		
		EOS 50-30/15	15,0		21,7	6 x 2,5		15,0	5C x 6		
		EOS 50-30/22	22,5		32,6	9 x 2,5		22,5	5C x 10		
	60-30	EOS 60-30/15	15,0		21,7	6 x 2,5		15,0	5C x 6		
		EOS 60-30/22	22,5		32,6	9 x 2,5		22,5	5C x 10		
		EOS 60-30/30	30,0		43,5	12 x 2,5		30,0	5C x 16		
	60-35	EOS 60-35/15	15,0		21,7	6 x 2,5		15,0	5C x 6		
		EOS 60-35/22	22,5		32,6	9 x 2,5		22,5	5C x 10		
		EOS 60-35/30	30,0		43,5	12 x 2,5		30,0	5C x 16		
	70-40	EOS 70-40/15	15,0		21,7	6 x 2,5		15,0	5C x 6		
		EOS 70-40/30	30,0		43,5	12 x 2,5		30,0	5C x 16		
		EOS 70-40/45	45,0		65,2	18 x 2,5		45,0	5C x 35		
	80-50	EOS 80-50/15	15,0		21,7	6 x 2,5		15,0	5C x 6		
		EOS 80-50/30	30,0		43,5	12 x 2,5		30,0	5C x 16		
		EOS 80-50/45	45,0		65,2	18 x 2,5		45,0	5C x 35		
	90-50	EOS 90-50/30	30,0		43,5	12 x 2,5		30,0	5C x 16		
		EOS 90-50/45	45,0		65,2	18 x 2,5		45,0	5C x 35		
EOSX	40-20	EOSX 40-20/12	12,0	3 x 400	17,4	6 x 2,0	1/2	6-6	5C x 6	2A x 1	3A x 1
	50-25	EOSX 50-25/15	15,0		21,7	6 x 2,5	1/2	7,5-7,5			
		EOSX 50-25/22	22,5		32,6	9 x 2,5	1/3	7,5-15	5C x 10		
	50-30	EOSX 50-30/15	15,0		21,7	6 x 2,5	1/2	7,5-7,5	5C x 6		
		EOSX 50-30/22	22,5		32,6	9 x 2,5	1/3	7,5-15	5C x 10		
	60-30	EOSX 60-30/15	15,0		21,7	6 x 2,5	1/2	7,5-7,5	5C x 6		
		EOSX 60-30/22	22,5		32,6	9 x 2,5	1/3	7,5-15	5C x 10		
		EOSX 60-30/30	30,0		43,5	12 x 2,5	1/4	7,5-7,5-15	5C x 16		4D x 1
	60-35	EOSX 60-35/15	15,0		21,7	6 x 2,5	1/2	7,5-7,5	5C x 6		3A x 1
		EOSX 60-35/22	22,5		32,6	9 x 2,5	1/3	7,5-15	5C x 10		
		EOSX 60-35/30	30,0		43,5	12 x 2,5	1/4	7,5-7,5-15	5C x 16		4D x 1
	70-40	EOSX 70-40/15	15,0		21,7	6 x 2,5	1/2	7,5-7,5	5C x 6		3A x 1
		EOSX 70-40/30	30,0		43,5	12 x 2,5	1/4	7,5-7,5-15	5C x 16		4D x 1
		EOSX 70-40/45	45,0		65,2	18 x 2,5	1/3	15-15-15	5C x 35		
	80-50	EOSX 80-50/15	15,0		21,7	6 x 2,5	1/2	7,5-7,5	5C x 6		3A x 1
		EOSX 80-50/30	30,0		43,5	12 x 2,5	1/4	7,5-7,5-15	5C x 16		4D x 1
		EOSX 80-50/45	45,0		65,2	18 x 2,5	1/3	15-15-15	5C x 35		
	90-50	EOSX 90-50/30	30,0		43,5	12 x 2,5	1/4	7,5-7,5-15	5C x 16		
		EOSX 90-50/45	45,0		65,2	18 x 2,5	1/3	15-15-15	5C x 35		

Installation, Service and Maintenance

Operation, Maintenance and Service

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

Figure 9 - Location of the switches' cooler

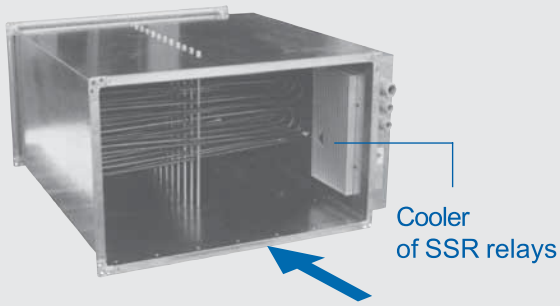


Figure 10 - View into the EO wiring box

EO... / 3–45 (switching relays are not included)

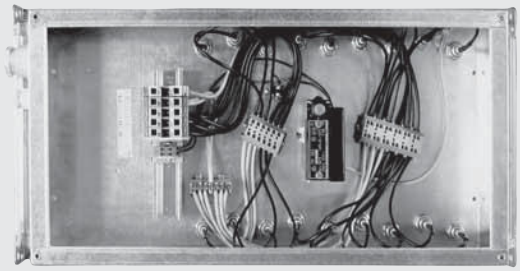


Figure 11 - Wiring boxes of EOS heater

EOS... / 3 (two single-phase SSR switching relays are included)

View into the EOS 30-15/3 wiring box after removing the protecting cover.

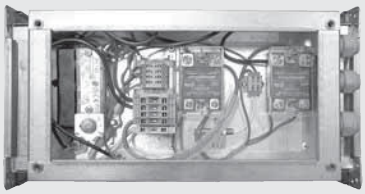
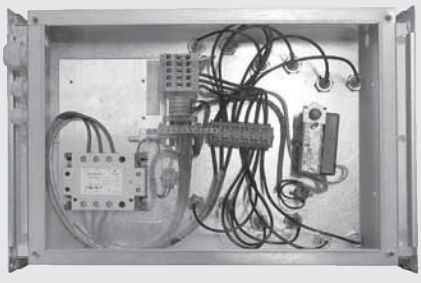


Figure 12 - EOS heater wiring box - cover removed

EOS... / 4–15 (one single-phase SSR switching relay is included)

View into the EOS 50-30/15 wiring box after removing the protecting cover



- During operation, the heater must be checked for surface cleanness, 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.

Figure 13 - EOSX heater wiring box

EOS... /22 – 45
EOSX .../12 – 45
(two or three three-phase SSR switching relays are included)
View into the EOS 70-40/30 heater's wiring box

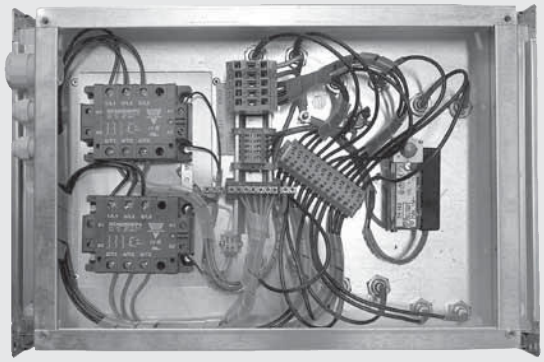
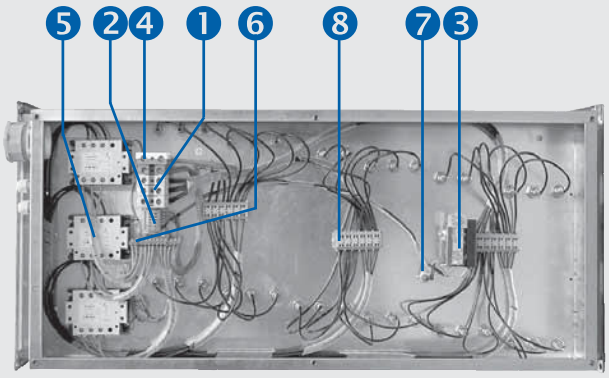


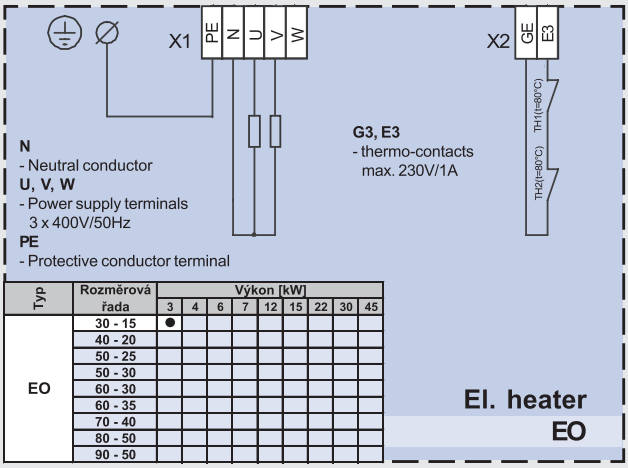
Figure 14 - Wiring box after removing the cover

The EOS 70-40/30 heater's wiring box - protecting cover removed

1. Power supply
2. Control and signalling of emergency failure
3. Adjustable limiting thermostat
4. Protective conductor terminal
5. SSR switching relay with varistors
6. Neutral bus bar
7. Ground screw
8. Interconnecting bus bar of heating blocks

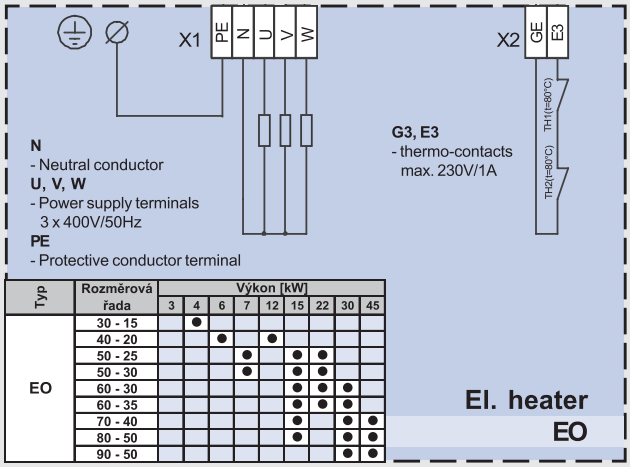


Wiring diagrams



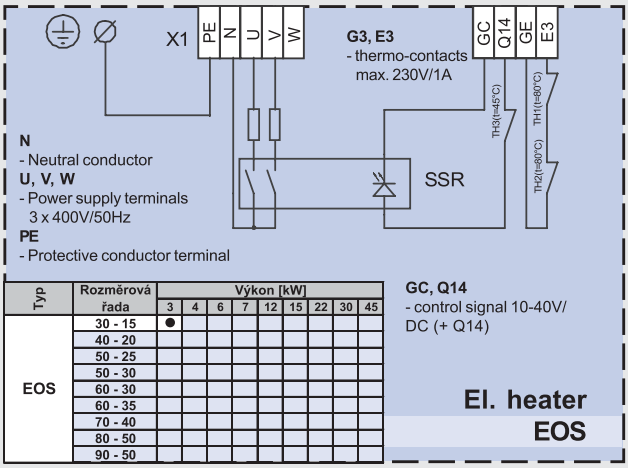
Typ	Rozměrová řada	Výkon [kW] 3	4	6	7	12	15	22	30	45
EO	30 - 15	●								
	40 - 20									
	50 - 25									
	50 - 30									
	60 - 30									
	60 - 35									
	70 - 40									
	80 - 50									
	90 - 50									

El. heater EO



Typ	Rozměrová řada	Výkon [kW] 3	4	6	7	12	15	22	30	45
EO	30 - 15		●							
	40 - 20			●		●				
	50 - 25				●		●	●		
	50 - 30				●		●	●		
	60 - 30						●	●	●	
	60 - 35						●	●	●	
	70 - 40						●		●	●
	80 - 50						●		●	●
	90 - 50								●	●

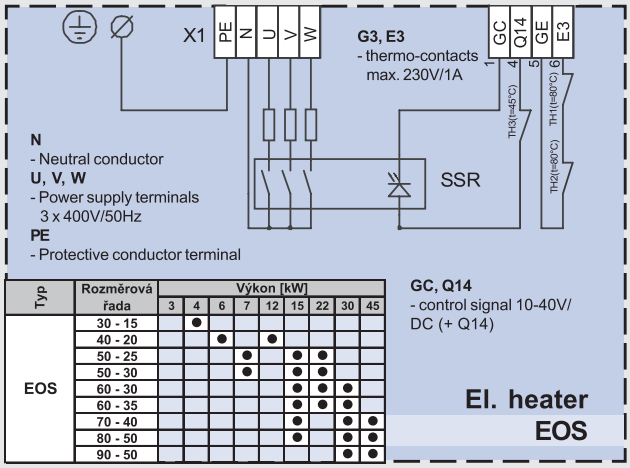
El. heater EO



Typ	Rozměrová řada	Výkon [kW] 3	4	6	7	12	15	22	30	45
EOS	30 - 15	●								
	40 - 20									
	50 - 25									
	50 - 30									
	60 - 30									
	60 - 35									
	70 - 40									
	80 - 50									
	90 - 50									

GC, Q14
- control signal 10-40V/ DC (+ Q14)

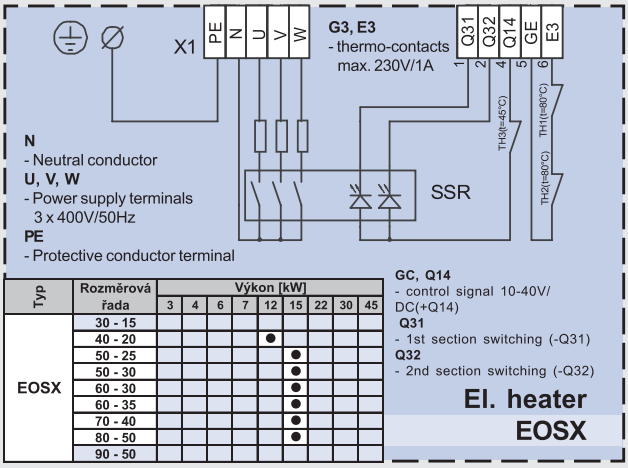
El. heater EOS



Typ	Rozměrová řada	Výkon [kW] 3	4	6	7	12	15	22	30	45
EOS	30 - 15		●							
	40 - 20			●		●				
	50 - 25				●		●	●		
	50 - 30				●		●	●		
	60 - 30						●	●	●	
	60 - 35						●	●	●	
	70 - 40						●		●	●
	80 - 50						●		●	●
	90 - 50								●	●

GC, Q14
- control signal 10-40V/ DC (+ Q14)

El. heater EOS



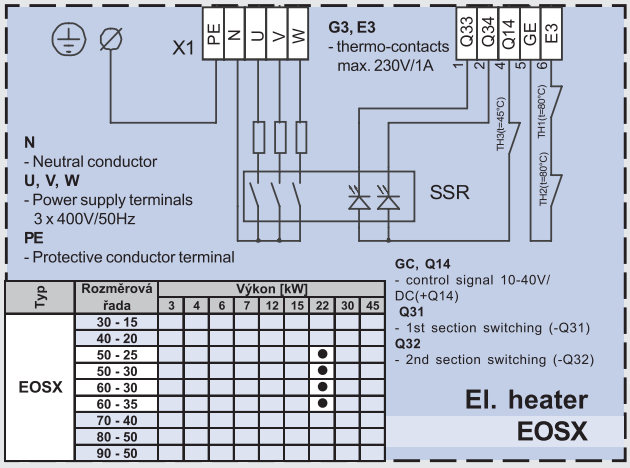
Typ	Rozměrová řada	Výkon [kW] 3	4	6	7	12	15	22	30	45
EOSX	30 - 15									
	40 - 20					●				
	50 - 25						●			
	50 - 30						●			
	60 - 30						●			
	60 - 35						●			
	70 - 40						●			
	80 - 50						●			
	90 - 50						●			

GC, Q14
- control signal 10-40V/ DC(+Q14)

Q31
- 1st section switching (-Q31)

Q32
- 2nd section switching (-Q32)

El. heater EOSX



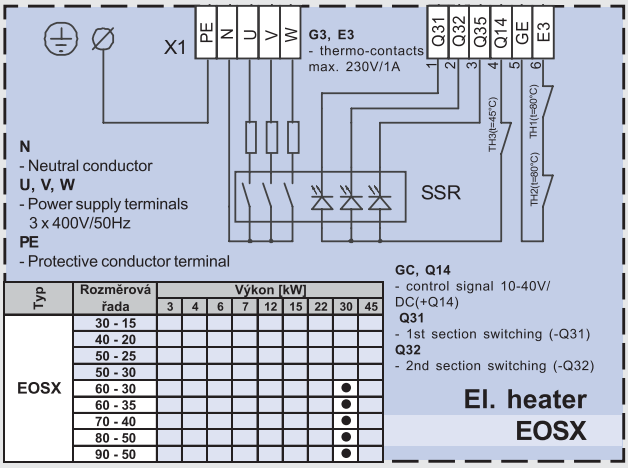
Typ	Rozměrová řada	Výkon [kW] 3	4	6	7	12	15	22	30	45
EOSX	30 - 15									
	40 - 20									
	50 - 25							●		
	50 - 30							●		
	60 - 30							●		
	60 - 35							●		
	70 - 40									
	80 - 50									
	90 - 50									

GC, Q14
- control signal 10-40V/ DC(+Q14)

Q31
- 1st section switching (-Q31)

Q32
- 2nd section switching (-Q32)

El. heater EOSX



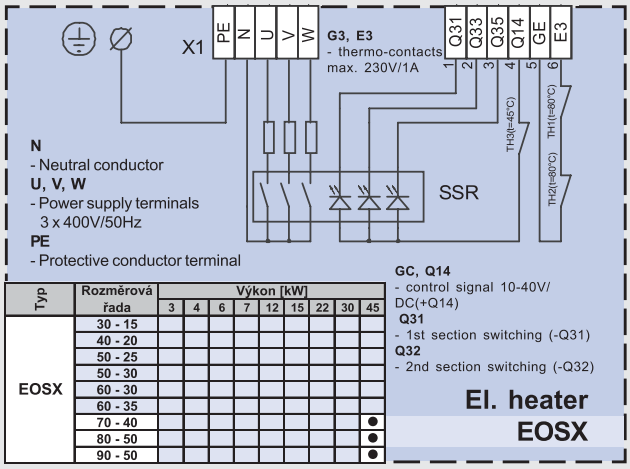
Typ	Rozměrová řada	Výkon [kW] 3	4	6	7	12	15	22	30	45
EOSX	30 - 15									
	40 - 20									
	50 - 25									
	50 - 30									
	60 - 30								●	
	60 - 35								●	
	70 - 40								●	
	80 - 50								●	
	90 - 50								●	

GC, Q14
- control signal 10-40V/ DC(+Q14)

Q31
- 1st section switching (-Q31)

Q32
- 2nd section switching (-Q32)

El. heater EOSX



Typ	Rozměrová řada	Výkon [kW] 3	4	6	7	12	15	22	30	45
EOSX	30 - 15									
	40 - 20									
	50 - 25									
	50 - 30									
	60 - 30									
	60 - 35									
	70 - 40									●
	80 - 50									●
	90 - 50									●

GC, Q14
- control signal 10-40V/ DC(+Q14)

Q31
- 1st section switching (-Q31)

Q32
- 2nd section switching (-Q32)

El. heater EOSX