

VFL2-Ex, VTL2-Ex and VRA2-Ex
Rectangular electric duct heaters
for hazardous areas



VFL2-Ex, VTL2-Ex and VRA2-Ex

Rectangular electric duct heaters for hazardous areas

VEAB's rectangular ATEX-approved duct heaters are available for outputs up to 1000 kW and are used to heat air in duct systems, centralised air handling units and for various industrial processes in environments in which the risk of explosions is likely to occur occasionally (Zone 1 and Zone 2). Our flexible production enables us to adapt the duct heater to various areas of application such as offshore, chemical industry, oil industry and ships.

- Output range 1 kW - 1000 kW
- Temperature class T3 (200 °C max.)
- For use in areas in which the risk of explosions is due to gases or vapours (equipment category 2G)
- IP66 degree of protection
- Max. outlet temperature 40 °C
- Ambient temperature -50 °C to +40 °C
- Min. air velocity 2.5 m/s
- Can be mounted both horizontally and vertically
- Integrated overheating protection and temperature limiter
- VFL2-Ex has heating elements mounted in a removable magazine



Design

The casing can be made of stainless steel EN 1.4301 or from acid-resistant stainless steel EN 1.4404. The casing is available in three different designs, depending on the area of use. See page 6 for additional information. The duct heaters are manufactured with an IP66 degree of protection in accordance with EN 60529.

The heating elements are tubular heating elements made of stainless steel, EN 1.4301, or acid-resistant stainless steel, EN 1.4404, Incoloy 800 or Incoloy 825.

The surface effect is 1 W/cm² max. VFL2-Ex has heating elements mounted in a magazine. The magazine can be pulled out without the need for the duct section to be dismantled.

The terminal box is manufactured to comply with Ex eb (increased safety) requirements in accordance with EN 60079-7, and the integrated overheating protection devices and temperature limiter to comply with Ex db (explosion-proof enclosure)/Ex mb (encapsulation) requirements in accordance with EN 60079-1.

The terminal box contains Ex eb-certified terminals for the electrical connection of the heating elements, the overheating protection devices and the temperature limiter.

The duct heater must be equipped with cable entries with IP66 protection or higher, approved for EX eb or EX db execution. These are not included in the supply.

Approvals

VEAB's approved duct heaters meet the requirements of the ATEX directive 2014/34/EU.

VEAB's quality system is certified by Intertek in accordance with certificate ETL21ATEXQ0147 / ITS21UKQAN0357

Testing and certification are performed by Intertek in accordance with the following certificate: ITS10ATEX36956X / ITS21UKEX0246X

Testing standards applied:

IP66 degree of protection, EN 60529

General ATEX requirements EN 60079-0

Ex e (increased safety) EN 60079-7

The duct heaters are also tested and approved by Intertek in accordance with the following directives:

LVD directive: EN 60335-1 and EN 60335-2-30

EMC directives: EN 61000-6-3 and EN 61000-6-1

EMF-directives: EN 62233



Overheating Protection Devices/ Temperature Limiters

All duct heaters include two overheating protection devices for output stage 1, which limits the surface temperature of the heating elements to 200 °C (temperature class T3).

When there is a need for heating, the heating elements of output stage 1 must always be connected.

If the heater includes more than one output stage, output stage 1 must always be the one that is disconnected first whenever there is a need for heating.

Output stage number 1 must be the stage that is the last to be disconnected when the heater is switched off.

Furthermore, there is also an automatic temperature limiter, which limits the outlet temperature. Resetting the manual overheating protection devices is done inside the terminal box.

The overheating protection devices and the temperature limiter are designed with so-called intrinsic safety, i.e. a cut-off or leakage in the capillary system will cause the protection devices to permanently disconnect the safety circuits.

Anticondensation Heater in the Terminal Box

In order to further adapt the heater to your application you can choose to add an anticondensation heater in the terminal box. This is always recommended for damp environments and for outdoor installation in order to reduce the risk of insulation issues in the heating elements and to reduce the risk of condensation in the terminal box.

Please note that the anticondensation heater in the terminal box is an option that is not included as standard.

Dimensions

ATEX-approved duct heaters are manufactured according to the customers' requirements. Width and height are chosen in accordance with the duct or unit into which the heater is to be mounted. The dimensioning must account for the fact that the smallest air velocity flowing through the heater must be 2.5 m/s. The width (W) and height (H) dimensions must be at least 200 mm and may not exceed 3000 mm, the depth dimension must be at least 270 mm and will be specified by VEAB in the quote or in the order confirmation.

Markings

See page 5 for a description.

Control Unit

ATEX-approved duct heaters must be controlled by appropriate control equipment that has been approved for the specific environment in which the control equipment is placed. The control unit must also have a separate sensor that automatically limits the outlet air temperature from the heater battery to 40 °C. Follow local regulations applicable to control equipment for ATEX-certified duct heaters.

Voltage

The voltage can be adapted to the customer's requirements up to 690 VAC 3-ph.

Output Allocation

The total output can be allocated to any number of output stages with 63 A max. per stage.

If more than one output stage is used, we recommend all stages to be of the same size.

Circular Connection

A transition to a circular connection can be supplied as a separate accessory for VFL2-Ex. Diameter dimension 100-800 mm.

Pressure Above 1000 Pa

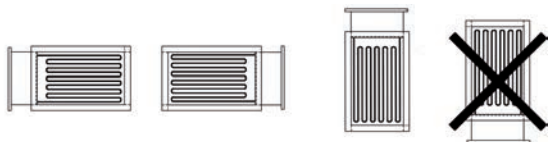
Contact VEAB.



II 2 G Ex db eb mb IIC T3 Gb

Installation

The duct heaters may be installed either horizontally or vertically. The air flowing through the heater must follow the air direction arrow on the duct heater cover. On a horizontal duct, the terminal box can be placed either to the right or to the left, but not downwards. The duct heater must be installed in such a way that it receives an even air flow over the entire surface. We recommend that the distance to or from duct bends, fans, dampers or such is at least equal to the diagonal dimension of the duct heater, i.e. from corner to corner within the heater's duct part. In other cases, air distribution plates must be fitted.



Duct Heaters with More than One Output Stage

For duct heaters with more than one output stage the integrated overheating protection devices are installed in output stage 1.

Output stage 1 must always be the first to be switched on when there is a need for heating and the last to be disconnected when the heater is switched off.

Interlocking with Fan/Air Flow

Electric duct heaters must always be installed in such a way that they are interlocked with the fan, which blows air into the duct, or with the air flow streaming through the heater. The duct heater power must be cut off, should the fan be shut off or if the airflow ceases. For outputs higher than 30 kW, we recommend letting the fan keep blowing for at least 3 minutes before it is stopped.

Minimum Air Velocity and Output Temperature

The duct heaters are dimensioned by default for a minimum air flow of 2.5 m/s and a maximum operating temperature of 40°C for the outlet air.

Ambient temperature during operation: -50...+40 °C.

The air velocity can be calculated using the following formula:

$$V = \frac{Q}{3600 \times A}$$

V = air velocity, m/s
 Q = air flow, m³/h
 A = sectional area of duct heater (W×H), m²

Power Requirements

The volume of air that goes through the duct heater is heated according to the following formula:

$$P = Q \times 0.36 \times \Delta t$$

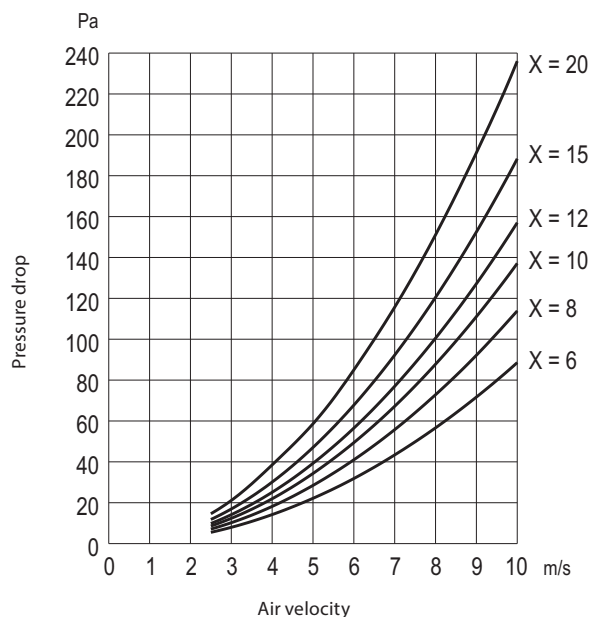
P = output, W
 Q = air flow, m³/h
 Δt = temperature increase, °C

Head Loss of Air Flowing through Duct Heater

The head loss of the air flowing through a duct heater depends on the air velocity and the number of rows of heating elements in the heater. The approximate number of rows of heating elements can be calculated using the following formula:

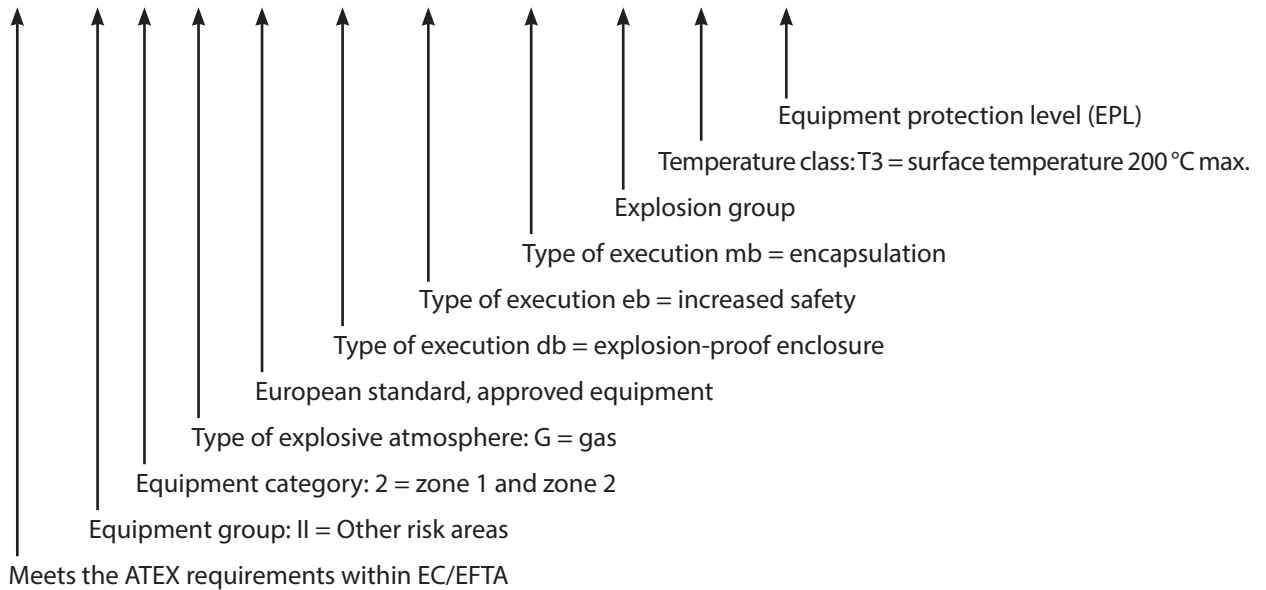
$$X = \frac{P}{A \times 5}$$

X = number of rows of heating elements
 A = flow passage area of duct heater, W x H in m²
 P = total output in kW





II 2 G Ex db eb mb IIC T3 Gb



Classification of risk area (Defines likelihood, duration and frequency of explosive gas mixture)

Zone 2	Zone 1	Zone 0
Explosive gas mixture is not expected to occur during normal handling. If it does occur, it is rare and of short duration.	Explosive gas mixture is expected to occur during normal handling	Explosive gas mixture is expected to be continuously present or present for long periods.
Heaters can be used in		
3 G		
2 G (VEAB ATEX heater)		
1 G		

Explosion groups (Defines the spark energy required to ignite a gas mixture)

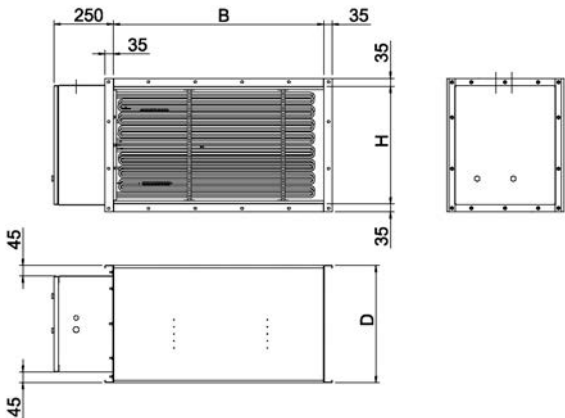
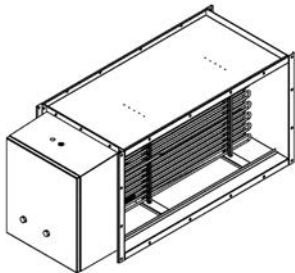
IIA	IIB	IIC
Propane, acetone, benzene, petrol, diesel	Ethylene, town gas, ethylene glycol	Acetylene, hydrogen
Heaters can be used in		
IIA		
IIB		
IIC (VEAB ATEX heater)		

Temperature class (Defines the highest surface temperature on the equipment with respect to the ignition temperature of gas mixtures)

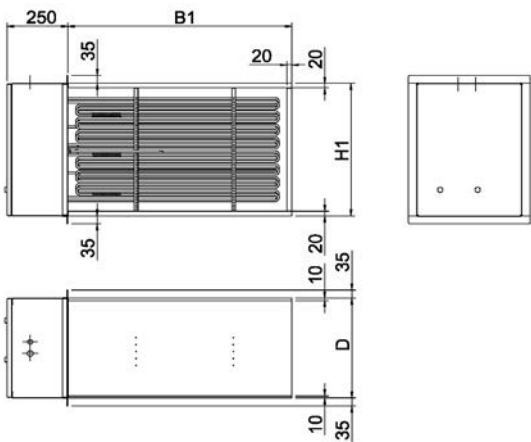
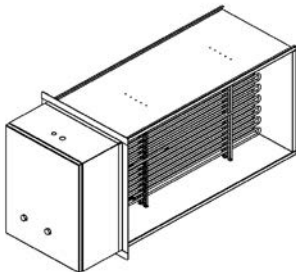
T1	T2	T3	T4	T5	T6
≤450 °C	≤300 °C	≤200 °C	≤135 °C	≤100 °C	≤85 °C
Heaters can be used in					
T1					
T2					
T3 (VEAB ATEX heater)					
T4					
T5					
T6					

Dimensional Drawing

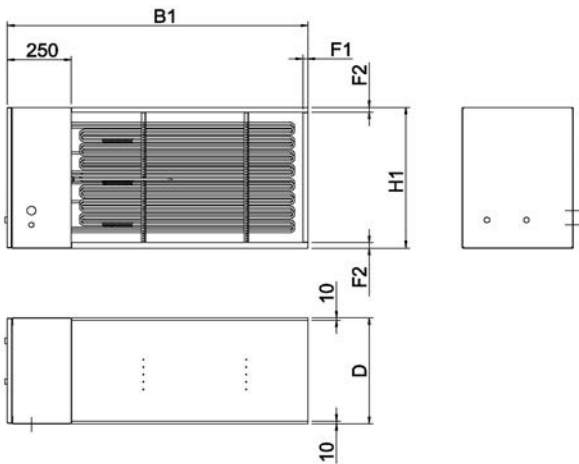
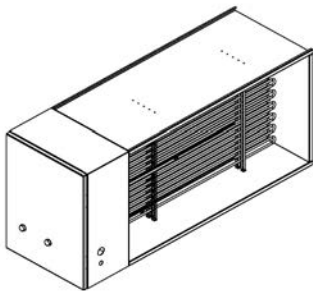
VFL2 – with Flanges



VTL2 – for Plug-in Mounting in Ducts



VRA2 – for Units



Project Design/Orders

Versions	VFL2-Ex – Heater for flange connection in duct system VTL2-Ex – Heater for plug-in mounting in duct system VRA2-Ex – Heater for air handling units
Model	M = Heater with integrated overheating protection and for external control
Width dimension, W Height dimension, H	200 mm min. 3000 mm max. (open surface for air flow) 200 mm min. 3000 mm max. (open surface for air flow)
Total output kW	Selectable between 1 kW and 1000 kW
Main voltage / max load per output stage	1× 230 V = 1 phase 230 V / 14.5 kW 2× 400 V / 25 kW 3× 230 V / 25 kW 3× 400 V / 43 kW 3× 440 V / 48 kW 3× 460 V / 50 kW 3× 500 V / 54 kW 3× 690 V / 75 kW
Casing material	S = Stainless steel, EN 1.4301 SA = Acid-proof stainless steel, EN 1.4404
Degree of protection	IP66
Electric insulation	NI = Normal electrical insulation
Temperature class	T3 = 200 °C max. on radiating surfaces
Outlet air temperature	40C = Outlet temperature 40 °C max.

Type Designation VFL2-EX

The type designation of a duct heater can, for example, be VFL2-Ex-M-1200-500-80kW-3×400V-S-IP66-NI-T3-40C and describes the product's execution. The type designation is structured as follows:

Design	Model	Width dimension, W	Height dimension, H	Total output kW	Main voltage V	Casing materials	Degree of protection	Electrical insulation	Temperature class	Outlet air temp.
VFL2-EX	M	1200	500	80 kW	3 × 400 V	S	IP66	NI	T3	40C

40+40

No. of kW/stage

Type Designation VRA2-Ex and VTL2-Ex

Design	Model	Width dimension, W1	Height dimension, H1	Total output kW	Main voltage V	Casing materials	Degree of protection	Electrical insulation	Temperature class	Outlet air temp.
VRA2-Ex	M	1200	500	80 kW	3 × 400 V	S	IP66	NI	T3	40C

Example of Order Document

Sample text – VFL2-Ex

ATEX-approved duct heater of VEAB type VFL2-Ex-1200x500-80kW-3x400V-M-S-IP66-T3-40C, with casing made of stainless steel EN 1.4301 and heating elements made of stainless material EN 1.4301. Complete with integrated anticondensation heater in the terminal box. The heating elements are installed in a removable magazine.

Marking: Ex II 2 G Ex db eb mb IIC T3 Gb

Air volume: 7000 m³/h.

Width dimension: 1200 mm

Height dimension: 500 mm

Depth dimension: VEAB will specify the depth in the quote and in the order confirmation

Output: 80 kW

Output stages: 40 kW + 40 kW

Voltage: 3x400 V

Model: M

Casing material: Stainless steel EN 1.4301

Degree of protection: IP66

Temperature class: T3 (200 °C max.)

Max. outlet air temperature: 40 °C

Heating element material: EN 1.4301

Anticondensation heater: Yes

Sample text – VTL2-Ex

ATEX-approved duct heater of VEAB type VTL2-Ex-1200x500-80kW-3x400V-M-S-IP66-T3-40C, with casing made of stainless steel EN 1.4301 and heating elements made of stainless material EN 1.4301. Complete with integrated anticondensation heater in the terminal box.

Marking: Ex II 2 G Ex db eb mb IIC T3 Gb

Air volume: 7000 m³/h.

Width dimension: 1200 mm

Height dimension: 500 mm

Depth dimension: VEAB will specify the depth in the quote and in the order confirmation

Output: 80 kW

Output stages: 40 kW + 40 kW

Voltage: 3x400 V

Model: M

Casing material: Stainless steel EN 1.4301

Degree of protection: IP66

Temperature class: T3 (200 °C max.)

Max. outlet air temperature: 40 °C

Heating element material: EN 1.4301

Anticondensation heater: Yes

Sample text – VRA2-Ex

ATEX-approved duct heater of VEAB type VRA2-Ex-1200x500-80kW-3x400V-M-S-IP66-T3-40C, with casing made of stainless steel EN 1.4301 and heating elements made of stainless material EN 1.4301. Complete with integrated anticondensation heater in the terminal box.

Marking: Ex II 2 G Ex db eb mb IIC T3 Gb

Air volume: 7000 m³/h.

Width dimension: 1200 mm

Height dimension: 500 mm

Depth dimension: VEAB will specify the depth in the quote and in the order confirmation

Output: 80 kW

Output stages: 40 kW + 40 kW

Voltage: 3x400 V

Model: M

Casing material: Stainless steel EN 1.4301

Degree of protection: IP66

Temperature class: T3 (200 °C max.)

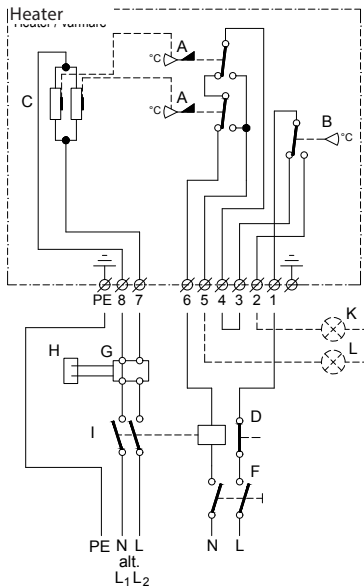
Max. outlet air temperature: 40 °C

Heating element material: EN 1.4301

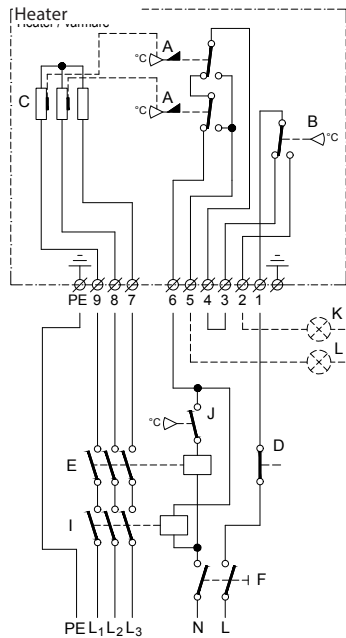
Anticondensation heater: Yes

Connection Diagram

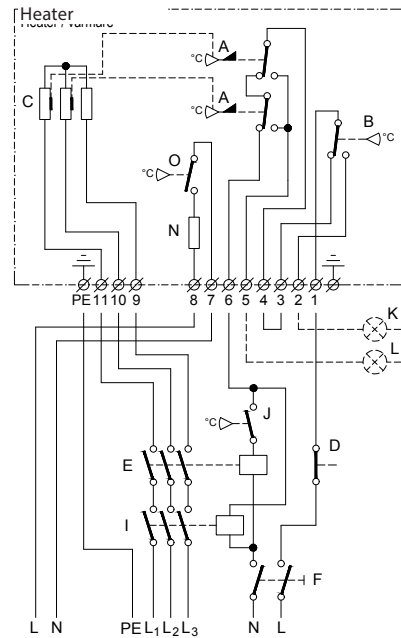
Wiring example 1
230 VAC 1-ph. and 400 VAC 2-ph.



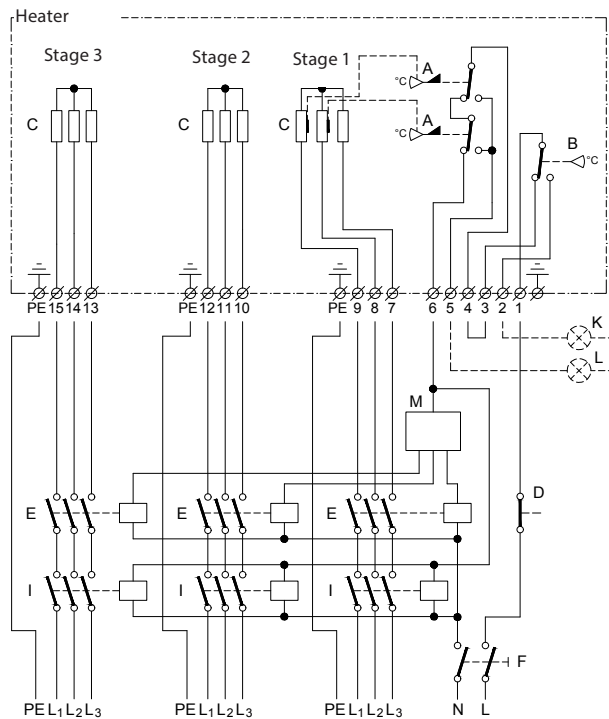
Wiring example 2
43 kW max., 400 VAC 3-ph. (63 A)



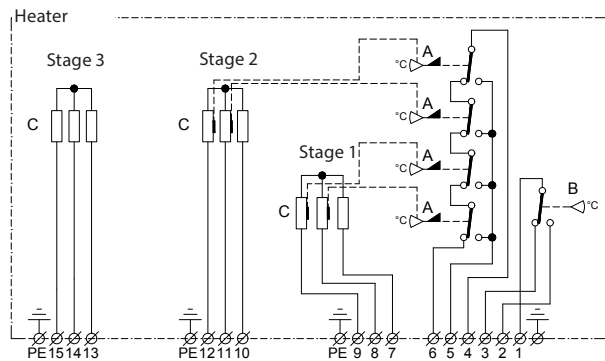
Wiring example 3
43 kW max., 400 VAC 3-ph. (63 A)
with anticondensation heater



Wiring example 4
129 kW max., 400 VAC 3-ph., 3 output stages ($\frac{1}{3} + \frac{1}{3} + \frac{1}{3}$)



Wiring example 5 with thyristor control
129 kW max., 400 VAC 3-ph., 3 output stages ($\frac{1}{3} + \frac{1}{3} + \frac{1}{3}$)



- A 2 temperature limiters with manual reset that limit the surface temperature of the heating elements. Mounted on heating elements in output stage 1.
- B Thermostat for limitation of outlet air temperature
- C Load
- D Interlock
- E Contactor
- F Omnipolar circuit breaker
- G Output control
- H Sensors
- I Safety contactor
- J Thermostat
- K Signal, high outlet temperature
- L Signal, triggered temperature limiters
- M Regulator
- N Thermostat feedback control
- O Anticondensation heater, 50 W



VEAB Heat Tech AB
Tel +46(0)451-485 00
www.veab.com • veab@veab.com
Sweden