



**VFL, VFLPG, VTL and VRA**  
**Rectangular electric duct heaters**



# VFL, VFLPG, VTL and VRA

## Rectangular electric duct heaters

VEAB's rectangular duct heaters are supplied in customised sizes and with an output of up to 2000 kW. They are used to heat up the inlet air in duct systems, in centralised air handling units and for various industrial processes. When they are properly dimensioned, rectangular duct heaters can handle heating an entire house or building.

Our flexible production enable us to precisely adapt the duct heaters to the intended application. This may concern heaters for air handling units, industrial processes or very harsh environments. This may require reinforced electrical insulation, stainless materials, large power requirements, high temperatures or the like.

- Output range 0.5 kW – 2000 kW
- Degree of protection IP43 as standard, IP55 or IP65 upon request
- Integrated control equipment or for external feedback control
- Integrated overheating protection devices, at least on with automatic reset and one with manual reset
- Enclosed stainless tubular heating elements
- 50/60 Hz
- Can be mounted horizontally or vertically

### Standard Design

The casing is made of aluzinc-coated sheet steel, AZ 185, which meets the requirements for corrosion class C4. The heating elements are tubular heating elements made from stainless steel, EN 1.4301. The junction box contains all the terminals required for electrical connection. The casing is available in four different designs. See page 6 for further information. The duct heaters are manufactured with an IP43 degree of protection, but are also available with IP55 or IP65.

The products are customised in terms of size and output.

The heaters are suitable for a maximum outlet temperature of 50 °C, a minimum air velocity of 1.5 m/s and a maximum pressure of 1000 Pa.



### Overheating Protection

All duct heater models come with at least two overheating protection devices, one with an automatic reset and the other with a manual reset. All duct heaters feature a reset button for the overheating protection on the heater cover.

### Alarm Relay, Addition -L

All models can be equipped with an integrated relay with potential-free alarm contact, which indicates whether the manually resettable overheating protection device has tripped. An alarm relay is included as standard for models -MQXL, -MTXL, -MQYL, -MTYL, -MQCL, -MTCL, -MTUL, -MQUL, -MQEML and -MTEML.

### Electronic Flow Switch

You can choose to add an electronic flow switch to any duct heater for 40 A 3-phase max. (e.g. 27 kW, 3x400 V max.). The flow switch continuously monitors the airflow and switches off the heater if the air velocity drops below 1.5 m/s and thus prevents overheating.

When the air velocity rises above 1.5 m/s the heater is turned on automatically if heating is required.

This implies that heaters with an integrated flow switch meet the requirement for interlocking with the fan/air flow and can be installed without any external interlock. This results in a very simple installation.

### Approvals

Our duct heaters up to 1000 kW are tested and approved by Intertek Semko AB 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 directive: EN 62233

Power ratings below 1000 kW are provided with S and CE markings.

Power ratings above 1000 kW are provided with a CE marking.



## Control Unit Integrated Regulator

The integrated regulator provides for a simple installation, among others, because it requires less cabling, which reduces both the installation cost and the risk of misconnections. The regulator is electronic and regulates the output using a triac with so-called time-proportional control (pulse/pause technology). This results in very accurate temperature control. Since feedback control is performed electronically, its operation is completely noiseless and involves minimal wear. For higher outputs, parts of the output is regulated with a step controller. However, fine adjustment of the temperature is always performed by the electronic pulse/pause feedback control. Hinges in the cover facilitate maintenance and servicing. The following models are available with an integrated regulator:

### -MTEML / -MQEML / -MTUL / -MQUL, for One or Two Sensors

Duct heaters with integrated temperature regulator, for room or duct sensors. Can also be connected to a main sensor in the room and to a min./max. sensor in the inlet air. See page 9.

### -MQXL / -MTXL, for 0...10 V Control Signal

Duct heaters with integrated regulator for external 0...10 V control signal. See page 10.

### -MQYL / -MTYL, for 2...10 V Control Signal

Contact VEAB for more information.

### -MQCL / -MTCL, for 4...20 mA Control Signal

Contact VEAB for more information.

### Modbus

The duct heaters may be equipped with Modbus communication

Contact VEAB for further information.

## External Regulator

There also are duct heaters without integrated regulator that can instead be complemented with an external one. The following model is available for an external regulator:

### -M(L)

The duct heater is complemented with an external temperature regulator or thermostat. See page 12.

## Additional Options

There are several options beyond the standard design that can be adapted to your application.

### Other Types of Materials

The casing can be made of stainless steel, EN 1.4301, or of acid-resistant stainless steel, EN 1.4404.

### Duct Heaters for Outlet Temperatures Ranging from 51 °C to 120 °C

The overheating protection is adapted to the operating temperature.

The junction box is provided with 25 mm insulation against the duct part.

### Duct Heaters for Outlet Temperatures Ranging from 121 °C to 400 °C

Acid-resistant or stainless casing. Overheating protection devices are adapted to the operating temperature. The junction box is provided with 100 mm insulation against the duct part. Air gap between duct and terminal box. IP30 degree of protection

### Reinforced Electrical Insulation

To avoid leakage currents to earth, the heating elements are mounted in electrically insulating material. Suitable for marine use, for example.

### Signal Lights

These are connected to the manual overheating protection and/or the operation indicator.

### Hoisting Rings

The duct heaters can be provided with hoisting rings to facilitate installation.

### IP55, IP65 Degree of Protection

Our duct heaters can be manufactured with an IP55 or IP65 degree of protection instead of the standard IP43.

### Standstill Heater in the Terminal Box

A standstill heater may be useful for humid environments, for example, to reduce the risk of moisture entering through the heating element ends or to reduce the risk of condensation in the terminal box when cold air is flowing through the duct.

### Circular Connection

If the output requirements or the connection diameter exceed what is available in the standard range for our circular duct heaters, CV, a rectangular duct heater is manufactured with circular connection.

### Different Voltage

The heaters can be manufactured with a different voltage up to 3 × 690 V for external control unit and up to 3 × 500 V for integrated control unit.

### Integrated Circuit Breaker

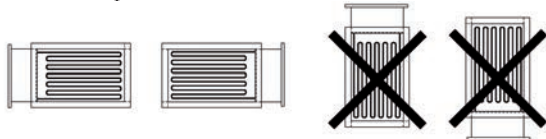
Only manufactured for models with integrated control equipment.

### Pressure Above 1000 Pa

Contact VEAB.

### Installation

These duct heaters can be mounted in horizontal or vertical ducts. The air flow through the duct heater must follow the air direction arrow on the duct heater cover. On a horizontal duct, the terminal box can be placed to the right or to the left, but not above or below. 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, etc. is at least equal to the diagonal dimension of the duct heater, i.e. from corner to corner within the heater's duct part.



### 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.

Models with an integrated electronic flow switch meet the requirement for interlocking with the fan/air flow and can be installed without any external interlock.

Models -MTEML, -MTUL and -MTXL with an output up to 27 kW 3×400 V include a port on the circuit board to connect a pressure or flow switch. For outputs greater than 27 kW, the heater must be interlocked via the inbound control circuit. Model -M must always be interlocked with the inbound power supply.

### Minimum Air Velocity and Output Temperature

The duct heaters are dimensioned by default for a minimum air flow of 1.5 m/s and a maximum operating temperature of 50 °C for the outlet air.

Ambient temperature during operation:

Without integrated control device = 40 °C max.

With integrated control device = 30 °C max.

The air velocity can be calculated using the following formula:

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

V = air velocity, m/s  
 Q = air flow, m<sup>3</sup>/h  
 A = sectional area of duct heater (W×H), m<sup>2</sup>

### 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 in W  
 Q = air flow in m<sup>3</sup>/h  
 Δt = temperature increase in °C



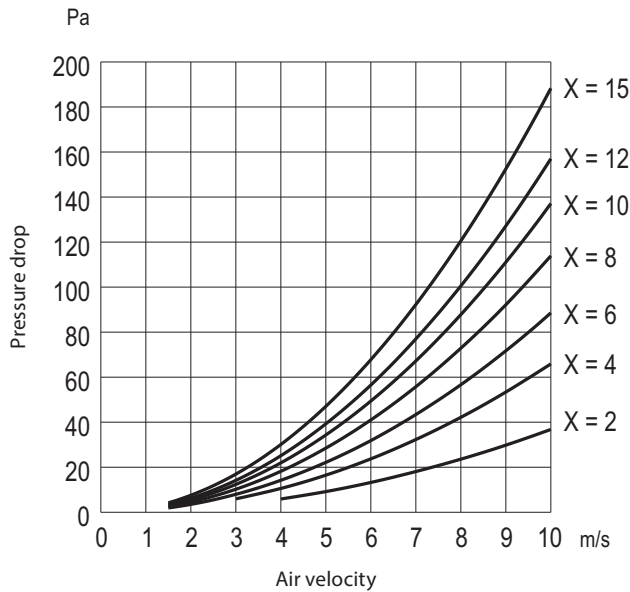
### Head Loss of Air Flowing through Duct Heater

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:

$$X = \frac{P}{A \times 15}$$

$X$  = number of rows of heating elements  
 $A$  = flow passage area of duct heater,  $W \times H$  in  $m^2$   
 $P$  = total output in kW

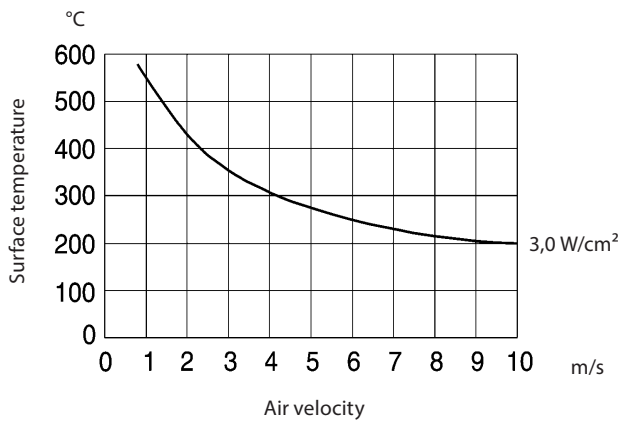


### Surface Temperature of Heating Elements

The surface temperature of heating elements is dependent of the air velocity and the heating elements' surface effect.

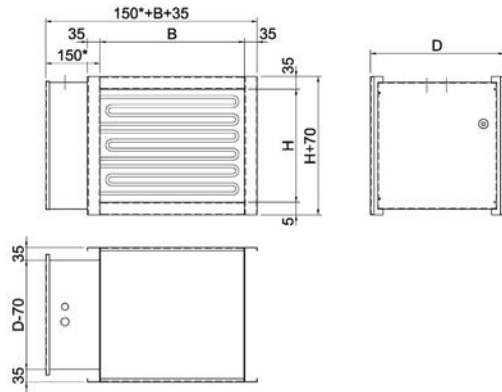
The surface effect of the heating elements is approximately  $3 \text{ W/cm}^2$ .

The table shows the surface temperature of the heating elements when the duct heater's outlet air temperature is about  $20 \text{ }^\circ\text{C}$ .

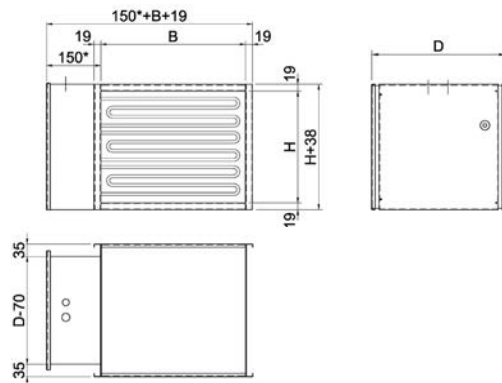


## Dimensional Drawing

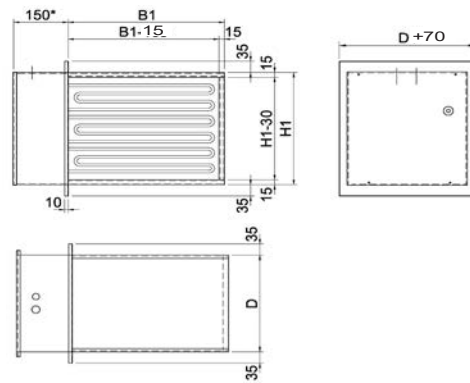
### VFL – with Flanges



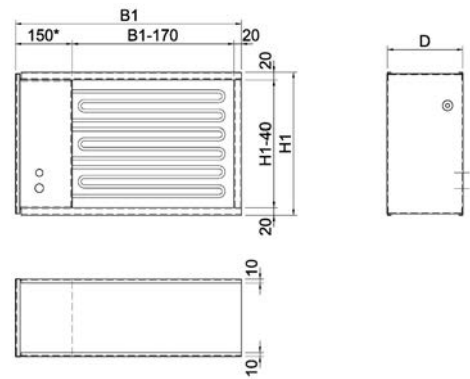
### VFLPG – Suitable for PG Guide



### VTL – for Plug-in Mounting to Ducts



### VRA – for Units



\*) The dimension is 200 mm for duct heaters with integrated control equipment.

## Project Design/Orders

Versions	VFL – with flanges VFLPG – suitable for PG guide VTL – for plug-in mounting to ducts VRA – for units	
Model	-MTEML / -MQEML / -MTUL / -MQUL  -MQXL / -MTXL  -MQYL / -MTYL  -MQCL / -MTCL  -M(L)	To be connected to a duct and/or room sensor. See page 9.  Output is controlled by an external 0...10 V control signal.  Output is controlled by an external 2...10 V control signal.  Output is controlled by an external 4...20 mA control signal.  For external control device.
Width dimension, W Height dimension, H	160 mm min. 3000 mm max. (open surface for air flow) 160 mm min. 3000 mm max. (open surface for air flow)	
Total output kW	Selectable between 0.5 kW and 2000 kW	
Main voltage	1 × 230 V = 1-phase 230 V 2 × 400 V = 2-phase 400 V 3 × 400 V = 3-phase 400 V 3 × 440 V = 3-phase 440 V	3 × 230 V = 3-phase 230 V 3 × 460 V = 3-phase 460 V 3 × 500 V = 3-phase 500 V 3 × 690 V = 3-phase 690 V
Casing material	A = Aluzinc, AZ 185 S = Stainless steel, EN 1.4301 SA = Acid-proof stainless steel, EN 1.4404	
Degree of protection	IP43 / IP55 / IP65	
Electric insulation	NI = Normal electrical insulation RI = Reinforced electrical insulation	
Outlet air temperature	50C = Outlet temperature 50 °C max. 120C = Outlet temperature 400 °C max.	

VFL / VFLPG / VTL / VRA

### Type Designation VFL- and VFLPG-

The type designation of a duct heater can, for example, be VFLPG-M-1200-500-100-3×400V-SA-IP44-NI-50C 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	Outlet air temp.
VFLPG	M	1200	500	100 kW	3 × 400 V	SA	IP43	NI	50C

25 + 25 + 25 + 25

Number of stages and kW.  
Only applies to model -M

### Type Designation VRA- and VTL-

Design	Model	Width dimension, W1	Height dimension, H1	Total output kW	Main voltage V	Casing materials	Degree of protection	Electrical insulation	Outlet air temp.
VRA	M	1400	540	100 kW	3 × 400 V	SA	IP43	NI	50C

# VFL, VFPLG, VTL and VRA

## Rectangular electric duct heaters with built-in control equipment for one or two sensors

Duct heaters with integrated control equipment are supplied ready for installation.

This provides the following advantages:

- Minimum amount of cabling—fully connected control equipment
- Easy installation—reduced installation cost
- Minimum risk of misconnections during installation
- Accurate feedback control



### - MTEML

To be connected to a duct or room sensor.

The setpoint is set externally, e.g. on the room sensor.

Can also be connected to two sensors, one main sensor in the room and one min./max. sensor in the inlet air.

Sensors are to be ordered separately. Includes a potential-free alarm contact, which indicates whether the manually resettable overheating protection device has tripped.

-MTEML is available with up to 635 ampere (440 kW, 3 x 400 V)

### - MTUL

To be connected to a sensor, e.g. A duct sensor in the inlet air.

The setpoint is set on the duct heater cover.

Includes a potential-free alarm contact, which indicates whether the manually resettable overheating protection device has tripped. Sensors are to be ordered separately.

- MTUL is available with up to 635 ampere (440 kW, 3 x 400 V)

### - MQEML

Same as MTEML plus an integrated electronic air flow switch that shuts off the heater at air velocities below 1.5 m/s.

-MQEML are available with up to 40 ampere (27 kW, 3 x 400 V)

### - MQUL

Same as MTUL plus an integrated electronic air flow switch that shuts off the heat at air velocities below 1.5 m/s.

MQUL heaters are available with up to 40 ampere (27 kW, 3 x 400 V)

## Project Design/Orders

### Description – MQEML / MQUL

Duct heater, VEAB type VFPLG-MQEML-800-400-25 kW-3x400V-A-IP43-NI-50C (see page 7), with casing made of aluzinc-coated sheet steel, AZ 185, which meets the requirements for corrosion class C4. Heating elements made of stainless steel, EN 1.4301. Includes a potential-free alarm contact, which indicates whether the manually resettable overheating protection device has tripped. Includes an integrated electronic flow switch.

Feedback control is achieved by means of the integrated temperature regulator for room or duct sensors. Sensors and a possible external setpoint adjuster must be ordered separately.

### Description – MTEML / MTUL

Duct heater, VEAB type VFPLG-MTEML-1200-500-100 kW-3x400V-A-IP43-NI-50C (see page 7), with casing made of aluzinc-coated sheet steel, AZ 185, which meets the requirements for corrosion class C4. Heating elements made of stainless steel, EN 1.4301. Includes a potential-free alarm contact, which indicates whether the manually resettable overheating protection device has tripped.

Feedback control is achieved by means of the integrated temperature regulator for room or duct sensors. Sensors and a possible external setpoint adjuster must be ordered separately.



## Accessories

### Sensors for MQUL and MTUL

The setpoint is set on the duct heater cover.

Opt. 1



TG-K330 as inlet air sensor.

Opt. 2



TG-R530 (IP30) or TG-R630 (IP54) as room sensor.

### Sensors for MQEML and MTEML

The setpoint is set externally.

Opt. 1



TG-R430 as setpoint adjuster and room sensor.

Opt. 2



TG-R430 as setpoint adjuster and room sensor.

Opt. 3



TG-R530 (IP30) or TG-R630 (IP54) as room sensor.

Opt. 4



TG-R530 (IP30) or TG-R630 (IP54) as room sensor.

Opt. 3



TG-R430 as setpoint adjuster.

Opt. 4



TG-R430 as setpoint adjuster.

Opt. 5



TG-K330 as inlet air sensor.



TG-K360 as min./max. inlet air sensor.

Opt. 5



TG-R430 as setpoint adjuster.

Data for all sensors, see page 15.  
For a complete connection diagram, refer to the manual on our website [www.veab.com](http://www.veab.com) (select Products/Duct Heaters – Electric).

# VFL, VFLPG, VTL and VRA

## Rectangular electric duct heaters with built-in control equipment for 0...10V external control signal

Duct heaters with integrated control equipment are supplied ready for installation. This provides the following advantages:

- Minimum amount of cabling—fully connected control equipment
- Easy installation—reduced installation cost
- Minimum risk of misconnections during installation
- Accurate feedback control

### - MQXL

To be connected to an external 0...10 V control signal. Includes a potential-free alarm contact, which indicates whether the manually resettable overheating protection device has tripped. The heater includes an integrated electronic flow switch (see page 2).  
-MQXL are available with up to 40 A 3-phase (27 kW 3×400 V).

### - MTXL

To be connected to an external 0...10 V control signal. Includes a potential-free alarm contact, which indicates whether the manually resettable overheating protection device has tripped.  
-MTXL are available with up to 440 kW.



## Project Design/Orders

### Description – MQXL

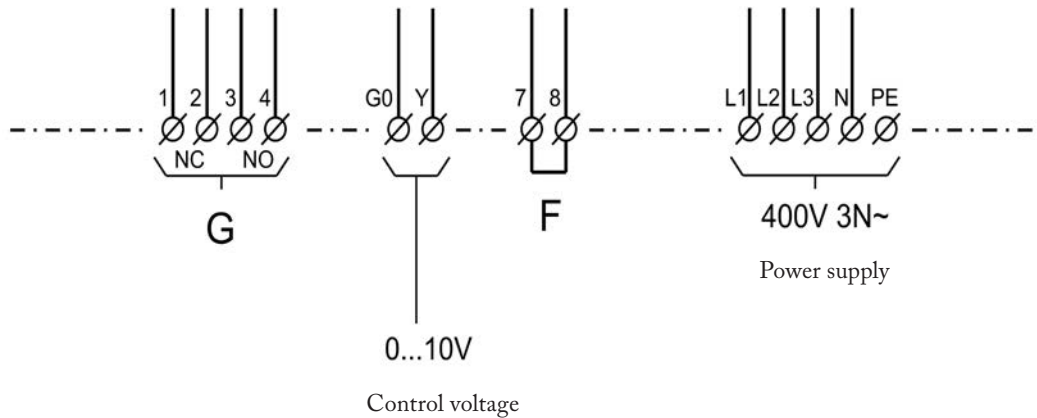
Duct heater, VEAB type VFLPG-MQXL-800-400-25kW-3x400V-A-IP43-NI-50C (see page 7), with casing made of aluzinc-coated sheet steel, AZ 185, which meets the requirements for corrosion class C4. Heating elements made of stainless steel, EN 1.4301. Includes a potential-free alarm contact, which indicates whether the manually resettable overheating protection device has tripped. Includes an integrated electronic flow switch. Feedback control is achieved by means of an integrated regulator for external 0...10V control signal.

### Description – MTXL

Duct heater, VEAB type VFLPG-MTXL-1200-500-100kW-3x400V-A-IP43-NI-50C (see page 7), with casing made of aluzinc-coated sheet steel, AZ 185, which meets the requirements for corrosion class C4. Heating elements made of stainless steel, EN 1.4301. Includes a potential-free alarm contact, which indicates whether the manually resettable overheating protection device has tripped. Feedback control is achieved by means of an integrated regulator for external 0...10V control signal.

## Wiring Example

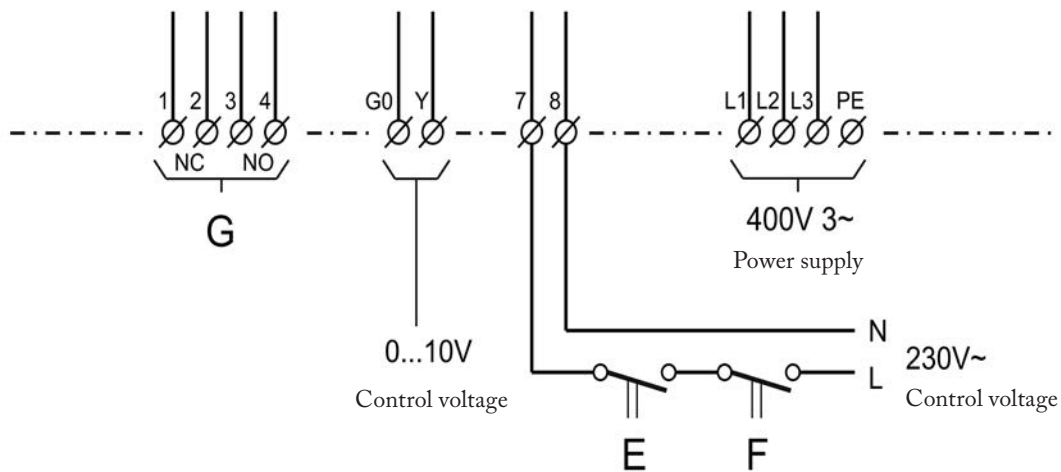
### - MQXL



- F = Jumper can be replaced with control switch or other interlocking device (option)
- G = Alarm contacts for indication of tripped overheating protection
- NO = Normally open contact (closes in the event of overheating alarm)
- NC = Normally closed contact (opens in the event of overheating alarm).

## Wiring Example

### - MTXL



- E = Interlock
- F = Control switch
- G = Alarm contacts for indication of tripped overheating protection
- NO = Normally open contact (closes in the event of overheating alarm)
- NC = Normally closed contact (opens in the event of overheating alarm).

# VFL, VFLPG, VTL and VRA

## Rectangular electric duct heaters for external control equipment

The duct heaters are complemented with external control equipment. It is essential that the equipment is suitable for the heater and the output to be controlled. The table on p. 13 provides guidance on suitable control equipment.

### - M

A PULSER or TTC regulator is most suitable for its external feedback control.

### Choice of Output

The total output for duct heaters for external control equipment can be freely selected from 0.5 kW and up. The output can be broken down into any desired number of output stages with a minimum of 0.3 kW and a maximum of 43 kW per output stage (63 A).

### Connecting Stages

#### Standard

Main voltage 400 VAC 3-ph.

0.3-3.5 kW: 400 VAC 2-ph.

3.6-43.0 kW: 400 VAC 3-ph.

Main voltage 230 VAC 3-ph.

0.3-1.99 kW: 230 VAC 1-ph.

2.0-25.0 kW: 230 VAC 3-ph.

### Upon Request

0.3-3.6 kW: 230 VAC 1-ph.

0.3-6.0 kW: 400 VAC 2-ph.

1.0-43.0 kW: 400 VAC 3-ph. or 230 VAC 3-ph.



## Project Design/Orders

### Description – M

Duct heater, VEAB type VFLPG-M-1200-500-100kW-3x400V-A-IP43-NI-50C (see page 7), with casing made of aluzinc-coated sheet steel, AZ 185, which meets the requirements for corrosion class C4. Heating elements made of stainless steel, EN 1.4301.

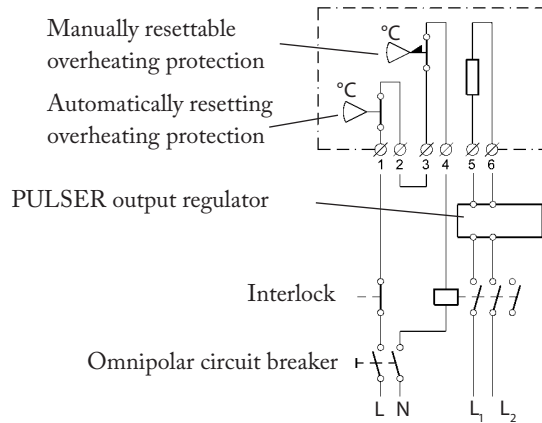
Total output 100 kW.

Output stages 25 kW + 25 kW + 25 kW + 25 kW.

Feedback control is achieved by means of an external regulator to be ordered separately.

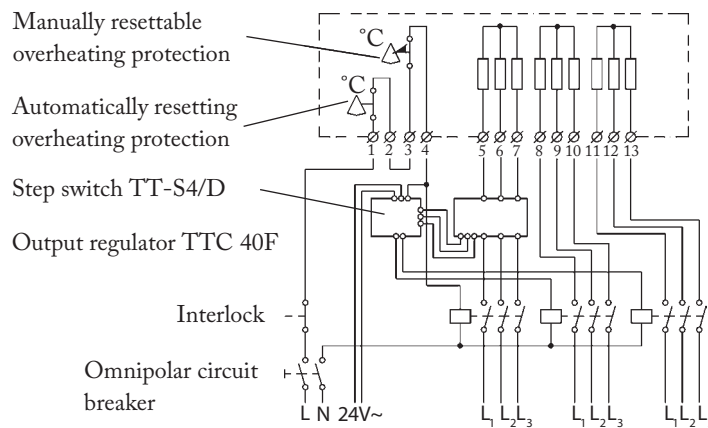
## Wiring Example

6 kW max. 400 VAC 2-ph.



## Wiring Example

81 kW max. 400 VAC 3-ph.



## Choice of Regulator

Total output	Output stage	Regulators
0.5-6.0 kW	1 stage, 400 VAC 2-ph.	PULSER
6.1-17.0 kW	1 stage, 400 VAC 3-ph.	TTC 25 or TTC 2000
17.1-27.0 kW	1 stage, 400 VAC 3-ph.	TTC 40 F
17.1-34.0 kW	2 stages (1/2 + 1/2), 400 VAC 3-ph.	TTC 2000 + TT-S1
28.0-54.0 kW	2 stages (1/2 + 1/2), 400 VAC 3-ph.	TTC 40 F + TT-S4/D
55.0-81.0 kW	3 stages (1/3 + 1/3 + 1/3), 400 VAC 3-ph.	TTC 40 F + TT-S4/D
82.0-108.0 kW	4 stages (1/4 + 1/4 + 1/4 + 1/4), 400 VAC 3-ph.	TTC 40 F + TT-S4/D
109.0-135.0 kW	5 stages (1/5 + 1/5 + 1/5 + 1/5 + 1/5), 400 VAC 3-ph.	TTC 40 F + TT-S4/D
136.0-215.0 kW	Output ratio (1 + 1 + 2 + 4, 400 VAC 3-ph.)	TTC 40 F + TT-S4/D



## Regulators



PULSER



PULSER D



TTC 2000



TTC 40F



Step switch  
TT-S4/D

### PULSER Series

A range of electric heating regulators that regulate the output using a so-called time-proportional control (pulse/pause technology). This results in very accurate temperature control.

IP30 degree of protection (PULSER D IP20).

Max. load 230 VAC 1-ph. 3200 W and 400 VAC 2-ph. 6400 W

#### PULSER M

Includes an integrated room sensor and a setpoint adjuster.

Can be configured to operate with an external main sensor, e.g. duct sensor TG-K330.

Comes with an outlet for a minimum or maximum limiting sensor, used when the inlet air needs to be limited to a minimum or maximum value in connection with room feedback control.

Automatic switch-over between 230 VAC 1-ph. and 400 VAC 2-ph.

#### PULSER D

Operates with an external sensor.

Includes an integrated setpoint potentiometer, can also be connected to an external setpoint adjuster.

For DIN rail mounting

Automatic switch-over between 230 VAC 1-ph. and 400 VAC 2-ph.

#### PULSER 230 X010 and PULSER 400 X010

These regulators are controlled with an external 0...10 V control signal.

Voltage 230 VAC 1-ph. or 400 VAC 2-ph. respectively.

### TTC Series

A range of electric heating regulators that regulate the output using a so-called time-proportional control (pulse/pause technology). This results in very accurate temperature control. The setpoint is adjusted on the regulator or externally. The TTC series includes outputs for external main sensors and min./max. sensors. Use TG-K360 as min./max. sensor. As an alternative, the TTC series can be controlled by an external 0...10 V control signal.

#### TTC 2000

For wall mounting.

Maximum installed output: 17 kW, 400 VAC 3-ph.

Automatic switch-over: 210...415 VAC 3-ph.

Degree of protection: IP30

#### Circuit Board TT-S1

To be installed in TTC 2000 to control a fixed main stage of 17 kW max. At least 50% of the total output must be controlled via the TTC 2000 and 50% max. via TT-S1. Together, TTC 2000 and TT-S1 are capable of controlling up to 17 kW + 17 kW = 34 kW.

#### TTC 25, TTC 40F and TTC 63F

For mounting on DIN rail in a control cabinet.

Automatic switch-over: 210...415 VAC 3-ph.

Degree of protection: IP20

Maximum power outputs:

TTC 25: 25 A, 400 V, 17 kW

TTC 40F: 40 A, 400 V, 27 kW

TTC 63F: 63 A, 400 V, 43 kW

#### Step switch TT-S4/D

To be used together with TTC 25, TTC 40F or TTC 63F to regulate the parts of the total output that exceeds their capacity. Includes four relay outputs operating in sequential or binary mode.

Outputs: 4X2 A 240 VAC 1-ph. NO

Supply voltage: 24 VAC 1-ph.

## Accessories

	Product	Range	Degree of protection
	Duct sensor TG-K330 for 220-400 V*	0-30 °C	IP20
	Duct sensor TG-K930 for 415-500 V*		
	Duct sensor TG-K360 Min./max.sensor for TTC series for 220-400 V*	0-60 °C	IP20
	Duct sensor TG-K960 Min./max.sensor for TTC series for 415-500V*		
	Room sensor TG-R430 With setpoint adjustment for 220-400 V*	0-30 °C	IP30
	Room sensor TG-R930 With setpoint adjustment for 415-500V*		
	Room sensor TG-R530 for 220-500 V*	0-30 °C	IP30
	Room sensor TG-R630 for 220-500 V*	0-30 °C	IP54
	Pressure switch DTV300 incl. connection set	20 - 300 Pa 1 A max. 230 VAC 1-ph.	IP54
	Pressure switch AFS-222	10 - 3000 Pa 15A max. 230 VAC 1-ph.	IP20
	Connection set ANS	For AFS-222	

\* Refers to duct heater supply voltage



**VEAB Heat Tech AB**  
Tel +46(0)451-485 00  
[www.veab.com](http://www.veab.com) • [veab@veab.com](mailto:veab@veab.com)  
Sweden