



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

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Rectangular electric duct heaters

VEAB rectangular duct heaters are available in ratings of up to 2000 kW and are used for heating the supply air in duct systems, in central ventilation units and for various industrial processes. If correctly rated, rectangular duct heaters can provide heating for entire houses and buildings.

Our flexible production system enables us to adapt the duct heaters accurately to the application. This may concern heaters for air handling units, industrial processes or very arduous environments. This may involve the need for strengthened electrical insulation, the use of stainless steels, high power ratings, high operating temperatures or the like.

Get in touch with VEAB and we shall be pleased to assist you.

- Power ratings from 1.5 kW to 2000 kW
- Degree of protection IP 43 as standard. IP 55 to special order.
- With built-in regulator for external control.
- Can be installed both horizontally and vertically.
- Built-in overheating protections - one with automatic reset and the other with manual reset.



The duct heaters can be supplied complete with integrated control equipment or with separate control equipment. Built-in control equipment provides the control needed for the application and simplifies the installation work.

Design

The casing is made of Aluzinc-coated sheet steel and the heater elements are made of stainless steel EN 1.4541. The junction box includes the necessary terminal blocks for electrical connections.

The duct heaters are made to degree of protection IP 43.

Degree of protection IP 55 is available to special order.

Approvals

The duct heaters have been tested and approved by SEMKO in accordance with:

LVD Directive: EN 60355-1, EN 60335-2-30, and SEMKO 111 FA11982.

EMC Directive: EN 61000-6-2 and EN 61000-6-3.

Duct heaters with built-in control equipment are manufactured in accordance with the above directives and are tested, approved and C-marked in accordance with EMC Directive: EN 61000-6-2 and EN 61000-6-3.



Versions

The duct heaters are manufactured for the following installation ways:

- for flange mounting
- for mounting with PG slip clamps
- for insertion mounting in a duct

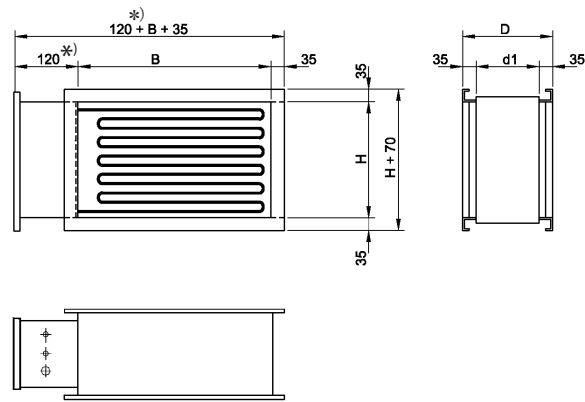
Range of sizes

The duct heaters are manufactured as standard with the following minimum and maximum dimensions. Customized heaters are available with the required dimensions.

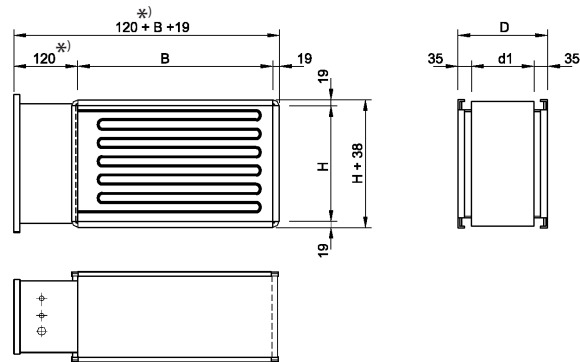
	Min	Max
B	200 mm	2000 mm
H	200 mm	2000 mm
D	270 mm	500 mm
(standard for D = 370 mm)		

Select dimension B and H to suit the duct to which the heater is to be connected. Care must also be taken to ensure that the minimum air velocity is 1.5 m/s.

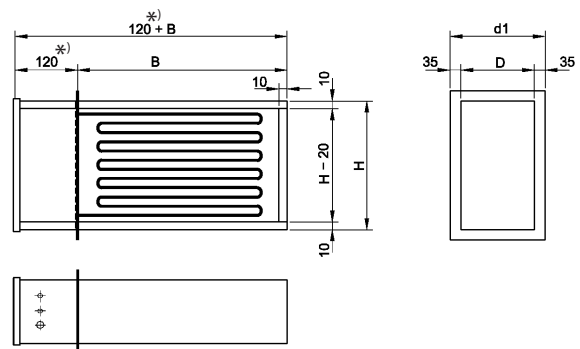
VFL - with flanges to ISO 13351



VFLPG - suitable for PG slip clamps



VTL - for insertion mounting in the duct



*) The dimension is 200 mm for duct heaters with built-in control equipment.

Project design/ordering

VEAB offers scope for adapting the duct heaters to specific applications in accordance with the standard selection table below.

Versions	VFL - with flanges to ISO 13351 VFLPG - suitable for PG slip clamps VTL - for insertion mounting in the duct	
Dimension B, Width Dimension H, Height	200 mm min., 2000 mm max. 200 mm min., 2000 mm max.	
Total output kW	Can be selected between 1.5 kW and 2000 kW	
Power supply voltage	1 x 230V = single-phase 230 V 2 x 400V = two-phase 400 V 3 x 400V = three-phase 400 V 3 x 230V = three-phase 230 V etc.	
Type of control equipment • External control • Built-in control	M MTEML MTXL	For external control equipment. Connected to duct or room sensor or to the main sensor in the room and a min./max. sensor in the supply air. The output is controlled by an external 0...10V control signal.
Casing material	A = Aluzinc-coated sheet steel S = Stainless steel SA = Stainless acid-proof steel	
IP-klass	IP 43 IP 55	
Insulation	NI = Normal insulation RI = Reinforced insulation	
Outlet air temperature	40C = 40°C max. outlet temperature 120C = 120°C max. outlet temperature	

EXAMPLE

Version	Dim. W Width	Dim. H Height	Total output kW	Power supply voltage, V	Type of control equipment	Casing material	Degree of protection	Electrical insulation	Outlet air temp.
VFLPG	1200	500	100 kW	3x400V	M	A	IP43	NI	40C

Number of steps and kW. Applies only to M

25 + 25 + 25 + 25

Installation and sizing

The duct heaters can be installed in horizontal or vertical ducts. The air flow through the duct heater must be in the direction of the arrow on the duct heater cover. In horizontal duct runs, the junction box can be located either on the right or on the left, although not at the top or the bottom. The duct heater must be mounted so that the air flow will be uniform across the whole of its cross-sectional area. We recommend that the distance to or from a duct bend, fan, damper, filter etc. should be at least the same as the diagonal dimension of the duct heater, i.e. from corner to corner at the connection face of the heater.

Interlock with fan/air flow rate

Electric duct heaters must be installed so that they are interlocked with the fan that delivers air into the duct or with the air flow rate through the heater.

Heater with built-in control equipment:

Heaters rated up to 27 kW, 400V, 3-phase have circuit boards with terminals for connecting a pressure switch or a flow switch. Heaters rated above 27 kW should be interlocked with the incoming control circuit.

Heaters with external control equipment:

Heaters with external control equipment should always be interlocked with the power supply.

Minimum air velocity and outlet air temperature

Duct heaters are designed for a minimum air velocity of 1.5 m/s and a maximum outlet air operating temperature of 40°C.

Ambient temperatures for duct heaters:

Without built-in control equipment = 40°C max.
With built-in control equipment = 30°C max.

Power demand

The air flowing through the duct heater is heated in accordance with the following formula:

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

P = Power, W
Q = Air flow rate, m³/h
Δ t = Temperature rise, °C

Get in touch with VEAB if you require a duct heater for a higher outlet air temperature or of special design.

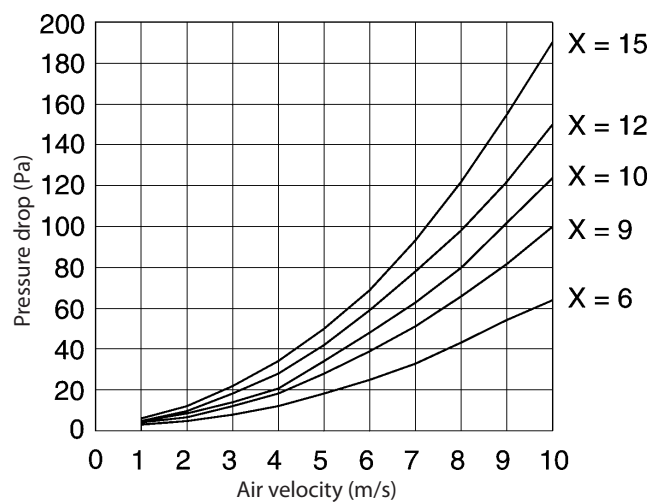
Air pressure drop across the duct heater

The pressure drop of the air flowing through the duct heater is dependent on the air velocity and the number of heater element rows in the heater.

The approximate number of heater element rows can be calculated from the following formula:

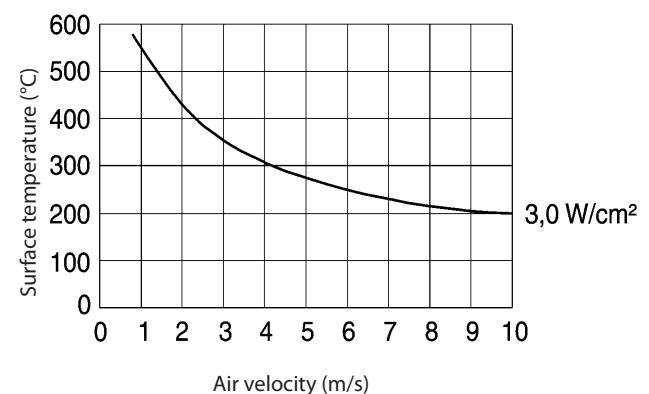
$$X = \frac{P}{A \times 15}$$

X = number of element rows
A = flow area of duct heater, W x H, m²
P = total power, kW



Heater element surface temperatures

The surface temperatures of the heater elements are dependent on the air velocity and the specific surface power of the elements. The specific surface power of the elements is around 3 W/cm². The graph shows the surface temperature of the heater elements when the outlet air temperature of the duct heater is around 20°C.



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Rectangular electric duct heaters With built-in control equipment

Duct heaters with built-in control equipment are ready for installation on delivery. This offers the following benefits:

- Minimum of cable runs - ready-wired control equipment
- Simple installation - reduced installation costs
- Minimized risk of incorrect wiring on installation
- Accurate control



Types of control equipment

- MTEML:

For connection to a duct or room sensor. Alternatively, can be connected to two sensors: one main sensor in the room and one min./max. sensor in the supply air.

The sensors must be ordered separately.

- MTXL:

The output is controlled by an external 0...10V control signal.

Control

The electronic temperature regulator controls the output by time proportional control (intermittent ON/OFF control). This provides very accurate temperature control. For higher ratings, part of the power is controlled by a stepping switch. However, electronic ON/OFF control is always used for fine control of the temperature. The control equipment has an alarm output with potential-free contacts to indicate tripping of the overheating protection.

Selecting the output

Duct heaters with built-in control equipment are available in various output groups in accordance with the table on the next page. The total output can be selected freely between 20 kW/m² and 200 kW/m² (i.e. kW per square metre of air flow area).

Examples of ratings of duct heaters with built-in control equipment

Main power supply 400 V		
kW	Regulator	Voltage
1,5	Thyristor	400 V 2-phase
2,0	Thyristor	400 V 2-phase
3,0	Thyristor	400 V 2-phase
5,0	Thyristor	400 V 2-phase
6,0	Thyristor	400 V 3-phase
7,5	Thyristor	400 V 3-phase
9,0	Thyristor	400 V 3-phase
13,0	Thyristor	400 V 3-phase
15,0	Thyristor	400 V 3-phase
17,0	Thyristor	400 V 3-phase
19,0	Thyristor	400 V 3-phase
24,0	Thyristor	400 V 3-phase
27,0	Thyristor	400 V 3-phase
30,0	Thyristor + one step	400 V 3-phase
34,0	Thyristor + one step	400 V 3-phase
39,0	Thyristor + one step	400 V 3-phase
43,0	Thyristor + one step	400 V 3-phase
47,0	Thyristor + one step	400 V 3-phase
54,0	Thyristor + one step	400 V 3-phase
60,0	Thyristor + two steps	400 V 3-phase
67,5	Thyristor + two steps	400 V 3-phase
75,0	Thyristor + two steps	400 V 3-phase
81,0	Thyristor + two steps	400 V 3-phase
96,0	Thyristor + three steps	400 V 3-phase
108,0	Thyristor + three steps	400 V 3-phase
120,0	Thyristor + four steps	400 V 3-phase
127,5	Thyristor + four steps	400 V 3-phase
135,0	Thyristor + four steps	400 V 3-phase

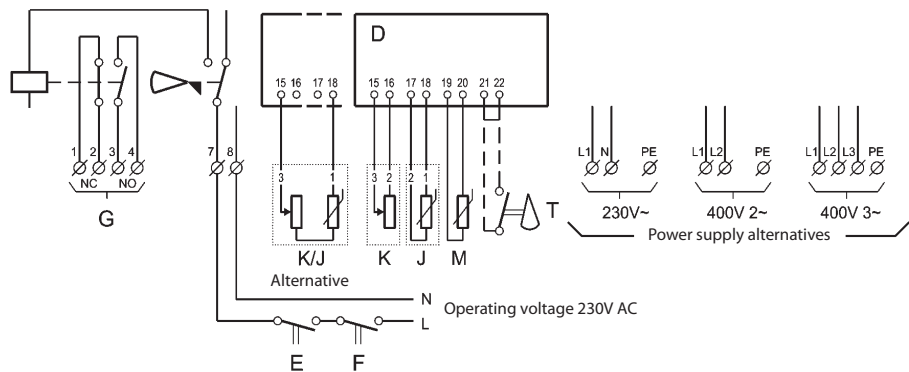
Main power supply 230 V		
kW	Regulator	Voltage
1,5	Thyristor	230 V AC
2,0	Thyristor	230 V AC
3,0	Thyristor	230 V 3-phase
5,0	Thyristor	230 V 3-phase
6,0	Thyristor	230 V 3-phase
7,5	Thyristor	230 V 3-phase
9,0	Thyristor	230 V 3-phase
13,0	Thyristor	230 V 3-phase
15,0	Thyristor	230 V 3-phase
17,0	Thyristor + one step	230 V 3-phase
19,0	Thyristor + one step	230 V 3-phase
24,0	Thyristor + one step	230 V 3-phase
27,0	Thyristor + one step	230 V 3-phase
30,0	Thyristor + one step	230 V 3-phase
34,0	Thyristor + two steps	230 V 3-phase
39,0	Thyristor + two steps	230 V 3-phase
43,0	Thyristor + two steps	230 V 3-phase
47,0	Thyristor + two steps	230 V 3-phase
54,0	Thyristor + three steps	230 V 3-phase
60,0	Thyristor + three steps	230 V 3-phase
67,5	Thyristor + four steps	230 V 3-phase
75,0	Thyristor + four steps	230 V 3-phase

For higher ratings than those in the tables above and to the left, select our duct heaters for external control equipment.

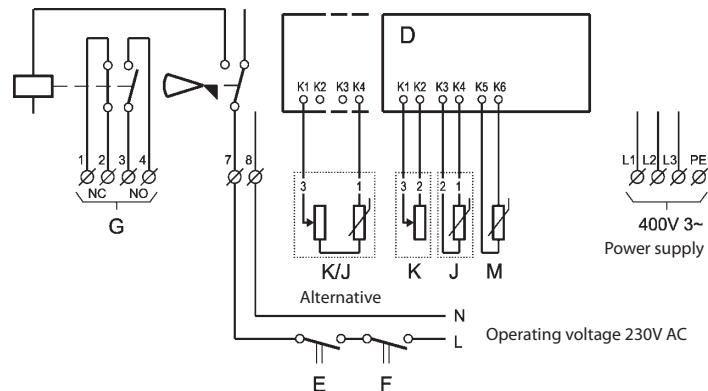
RECTANGULAR ELECTRIC DUCT HEATERS
WITH BUILT-IN CONTROL EQUIPMENT

Circuit diagrams

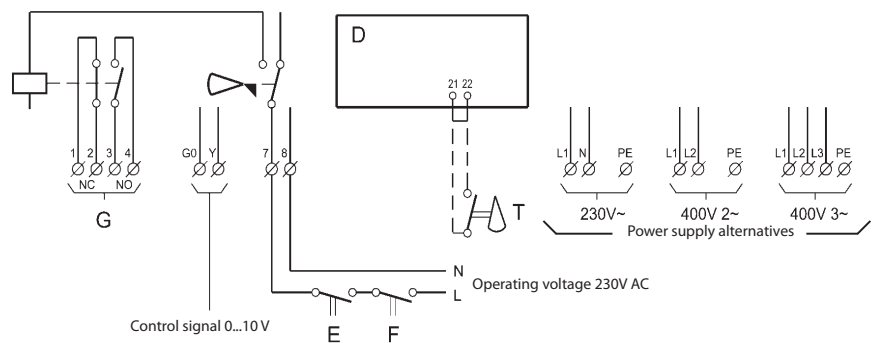
Type MTEML heater
Without stepping switch
(≤ 40A)



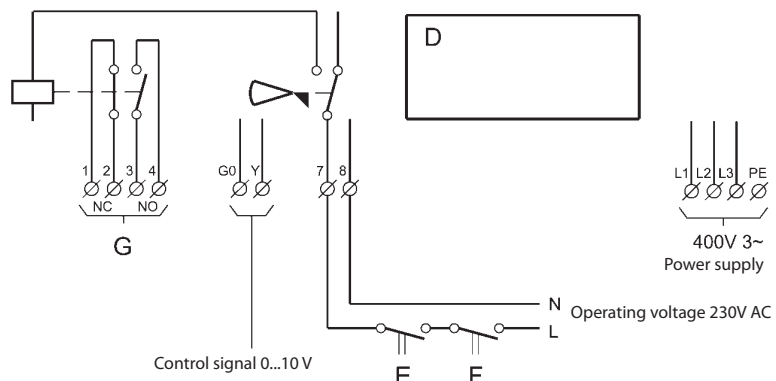
Type MTEML heater
With stepping switch (> 40A)



Type MTXL heater (≤ 40A)



Type MTXL heater (> 40A)



- | | | | |
|---|--|-----|---|
| D | Control equipment | K | Setpoint potentiometer |
| E | Interlock | K/J | Combined room sensor and setpoint potentiometer |
| F | Control switch | M | Limiting sensor (min./max. sensor) |
| G | Potential-free contacts for indicating tripping of the
overheating protection | T | Alternative interlock |
| J | Main sensor | | |

Accessories

	Product	Range	Degree of protection
	Duct sensor TG-K330	0-30°C	IP 20
	Duct sensor TG-K360 Min./max. sensor for MTEML	0-60°C	IP 20
	Room sensor TG-R430 with setpoint adjustment	0-30°C	IP 30
	Room sensor TG-R530	0-30°C	IP 30
	Room sensor TG-R630	0-30°C	IP 65
	Pressure switch DTV200, incl. connection kit	20 - 300 Pa Max. 5A, 230V AC	IP 54
	Pressure switch AFS-222	10 - 3000 Pa Max. 15A, 230V AC	IP 20
	Connection kit ANS	For AFS-222	

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Rectangular electric duct heaters For external control equipment

The ducts heaters are supplemented with external control equipment. It is important for this equipment to be matched to the duct heater and the power to be controlled. The table below provides guidance for suitable control equipment.



Output groups

The total output of a duct heater for external control equipment can be selected freely from 1.5 kW upwards. The output can be divided into a free number of output groups, with at least 0.3 kW and a maximum of 43 kW per output group. The total output per m² (W x H) must be between 20 kW/m² and 200 kW/m².

Connection of output groups

Standard

Main power supply 400V, 3-phase

0,3-3,5 kW: 400 V, 2-phase

3,6-43,0 kW: 400 V, 3-phase

Main power supply 230V, 3-phase

0,3-1,99 kW: 230 V AC

2,0-43,0 kW: 230 V, 3-phase

To special order

0,3-3,6 kW: 230 V AC

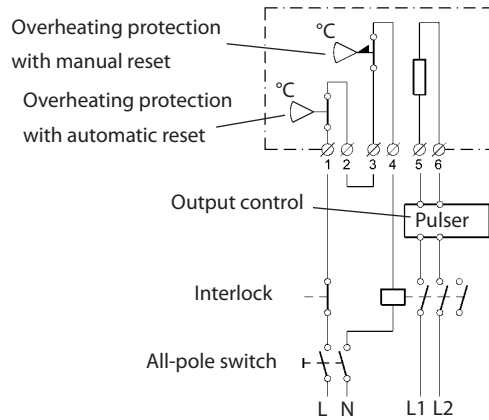
0,3-6,0 kW: 400 V, 2-phase

1,0-43,0 kW: 400V, 3-phase or 230V, 3-phase

Total output	Output groups	Regulators
1,5 - 6,0 kW	1 group, 400V, 2-phase	PULSER
6,1 - 17,0 kW	1 group, 400V, 3-phase	TTC 25 or TTC 2000
17,1 - 27,0 kW	1 group, 400V, 3-phase	TTC 40 F
17,1 - 34,0 kW	2 groups (1/2 + 1/2), 400V, 3-phase	TTC 2000 + TT-S1
28,0 - 54,0 kW	2 groups (1/2 + 1/2), 400V, 3-phase	TTC 40 F + TT-S4/D
55,0 - 81,0 kW	3 groups (1/3 + 1/3 + 1/3), 400V, 3-phase	TTC 40 F + TT-S4/D
82,0 - 108,0 kW	4 groups (1/4 + 1/4 + 1/4 + 1/4), 400V, 3-phase	TTC 40 F + TT-S4/D
109,0 - 135,0 kW	5 groups (1/5 + 1/5 + 1/5 + 1/5 + 1/5), 400V, 3-phase	TTC 40 F + TT-S4/D
136,0 - 200,0 kW	Output ratio (1 + 1 + 2 + 4) 400V, 3-phase	TTC 40 F + TT-S4/D

Connection example

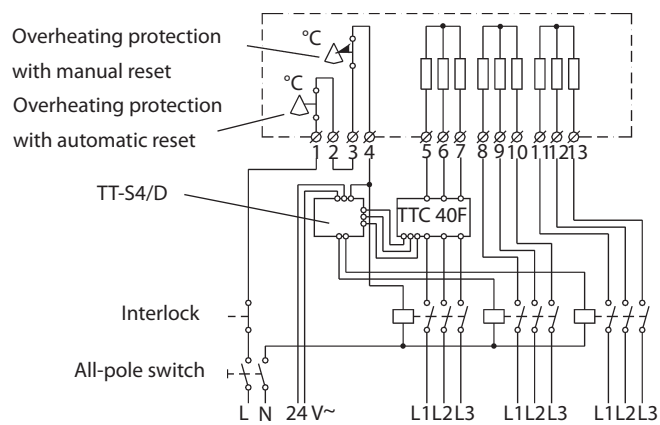
Max. 6 kW, 400V, 2-phase



VFL / VFL PG / VTL

Connection example

Max. 81 kW, 400V, 3-phase



Electric heater regulators



PULSER



PULSER D



TTC 2000



TTC 40F



Stepping switch
TT-S4/D

PULSER series

PULSER is a series of electric heater regulators that regulate the output by means of time proportional control (intermittent ON/OFF control).

This provides very accurate temperature control.

Degree of protection: IP 30 (PULSER D IP20)
Max. load: 230V AC, 3200 W
400V, 2-phase, 6400 W

PULSER

The PULSER operates with one sensor, i.e. the built-in room sensor, or an external sensor, e.g. a duct sensor. Automatic switching between 230V AC and 400V, 2-phase.

PULSER M

M stands for min. sensor or max. sensor, which means that in addition to, for example, a main sensor (room sensor), a minimum sensor in the supply air duct* can be connected. PULSER M then controls the room temperature, at the same time maintaining a minimum supply air temperature.

Automatic switching between 230V AC and 400V, 2-phase.

*Use duct sensor/min. sensor TG-K330.

PULSER ADD

The PULSER ADD does not have its own sensor, but is under slave control of another PULSER and operates in parallel with it. This means that twice the power can be controlled from one sensor.

Automatic switching between 230V AC and 400V, 2-phase.

PULSER 200 X010 and PULSER 380 X010

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

TTC Series

Electric heater regulators that control the output by time proportional control (intermittent ON/OFF control), which provides very accurate temperature control. The setpoint is preset either on the regulator or externally. The TTC series has terminals for external main sensor and min./max. sensor. Use the TG-K360 as min./max. sensor. Alternatively, the TTC series can be controlled by an external 0...10V signal.

TTC 2000

For wall mounting
Maximum installed power: 17 kW, 400V, 3-phase
Automatic switching: 210V AC - 415V 3-phase
Degree of protection: IP 30
Terminals: For 0...10V external control signal

Circuit board TT-S1

Fitted in the TTC 2000 for controlling one step of up to 17 kW. At least 50 % of the total output must be controlled via the TTC 2000 and a maximum of 50 % via the TT-S1. The TTC 2000 and TT-S1 can jointly control up to 17 kW + 17 kW = 34 kW.

TTC 25, TTC 40F and TTC 63F

Operate like the TTC but are intended for mounting on a DIN rail in an electrical cubicle.

Automatic switching: 210V AC - 415V 3-phase
Degree of protection: IP 20
Terminals: For 0...10V external control signal

Maximum power at the terminals:






TTC 25: 25 A, 400 V, 17 kW
TTC 40F: 40 A, 400 V, 27 kW
TTC 63F: 63 A, 400 V, 43 kW

Stepping switch TT-S4/D

Used together with the TTC 25, TTC 40 F or TTC 63F for controlling the parts of the total output that exceeds their capacities. Has four relay outputs that operate in sequence, or by binary signals.

Outputs: 2A, 240V AC normally open
Power supply: 24V AC

Accessories

	Product	Range	Degree of protection
	Duct sensor TG-K330	0-30°C	IP 20
	Duct sensor TG-K360 Min./max. sensor for the TTC series	0-60°C	IP 20
	Room sensor TG-R430 with setpoint adjustment	0-30°C	IP 30
	Room sensor TG-R530	0-30°C	IP 30
	Room sensor TG-R630	0-30°C	IP 65
	Pressure switches TV200, incl. connection kit	20 - 300 Pa Max. 5A, 230V AC	IP 54
	Pressure switch AFS-222	10 - 3000 Pa Max. 15A, 230V AC	IP 20
	Connection kit	For AFS-222	



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