

# Control Systems

version 01/2015

# ebmpapst

The engineer's choice



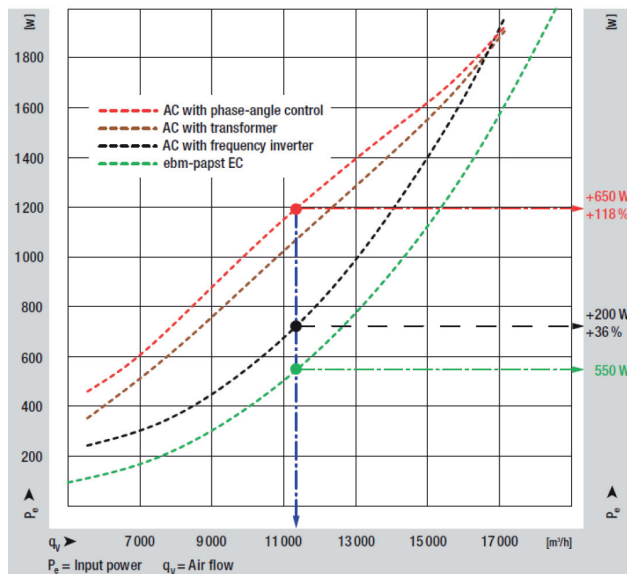
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# Introduction.

Whether we are talking about heating & ventilation, refrigeration and air conditioning, electronics, telecommunications, industrial engineering, agriculture or domestic appliances there is a need to save as much energy as possible wherever fans are employed. GreenTech EC technology leads by example: all our EC fans already surpass the requirements of the ErP directive for 2015.

In contrast to fans employing AC technology, GreenTech EC fans achieve efficiency levels in excess of 90% thus permitting substantial energy savings compared to conventional AC designs. Added to this, the speed of EC fans can be regulated more easily and efficiently to adapt the air volume in specific applications. This has the positive effect of considerably reducing energy consumption as well as noise.



**Power consumption for various control methods**



### Reducing energy consumption

Volume flow is directly proportional to rotational speed. The power input varies to the power of three of the change in rotational speed.

$$P_{r2} = P_{r1} \times \left(\frac{n_2}{n_1}\right)^3$$

$n = rpm$   $r = Impeller\ power$

What this equation means is that a 50% reduction in speed theoretically leads to an 87.5% reduction in power.

If the full ventilation, cooling, heating, dust extract rate, etc is not needed all the time, a significant amount of energy and money can be saved by reducing the fan speed to meet the load conditions.

There are benefits of fan speed control other than energy saving and money that can be just as important, such as reduced noise levels, longer operating life and indirect system energy savings.

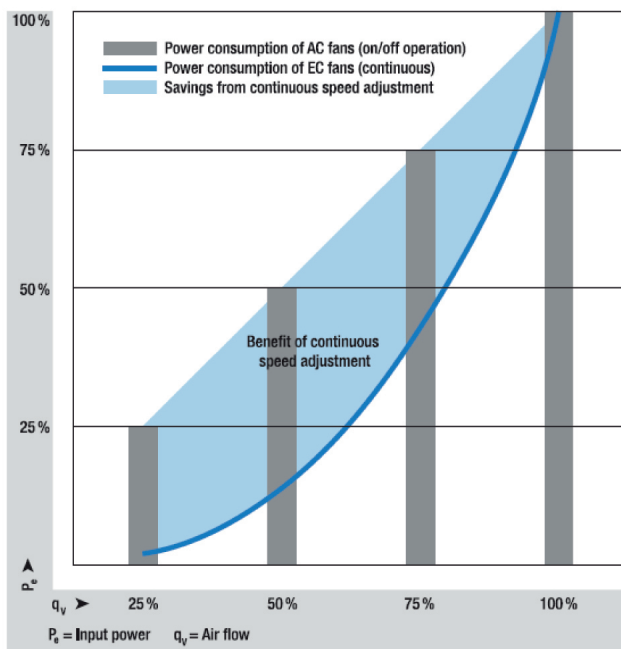
### Increasing life expectancy

Rotating the impeller at slower speeds reduces the wear and tear on the bearing systems. A 10% reduction in speed can lead to doubling the life expectancy of the product.

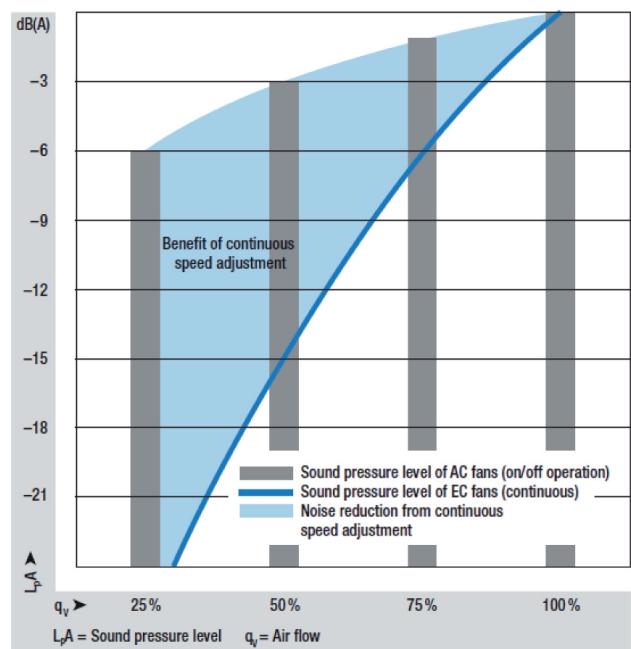
### Indirect system energy savings

Greater energy savings are often found beyond just that of the speed controlled fan. It has been shown that fully modulating the speed of the condenser fans on a refrigeration plant massively reduces the overall energy consumption of the plant when compared to stage, or bang-bang fan control methods. The fully modulating fan control keeps the entire condenser surface in use delivering a more stable refrigeration pressure which results in less frequent cycling of the compressors. This significantly reduces energy consumption, as the compressors are one of the largest energy consuming components in a refrigeration process.

### Comparison with conventional AC fan control



Lower energy consumption: The bars show the power consumption of fans which are switched in gradually as required for AC fans, this is known as 'staged' or 'bang-bang' control. The air performance and power drops by 50% if half the fans are switched off. The blue curve shows the improved power consumption with EC fan infinitely variable speed control, where all fans continue running but at a reduced speed.

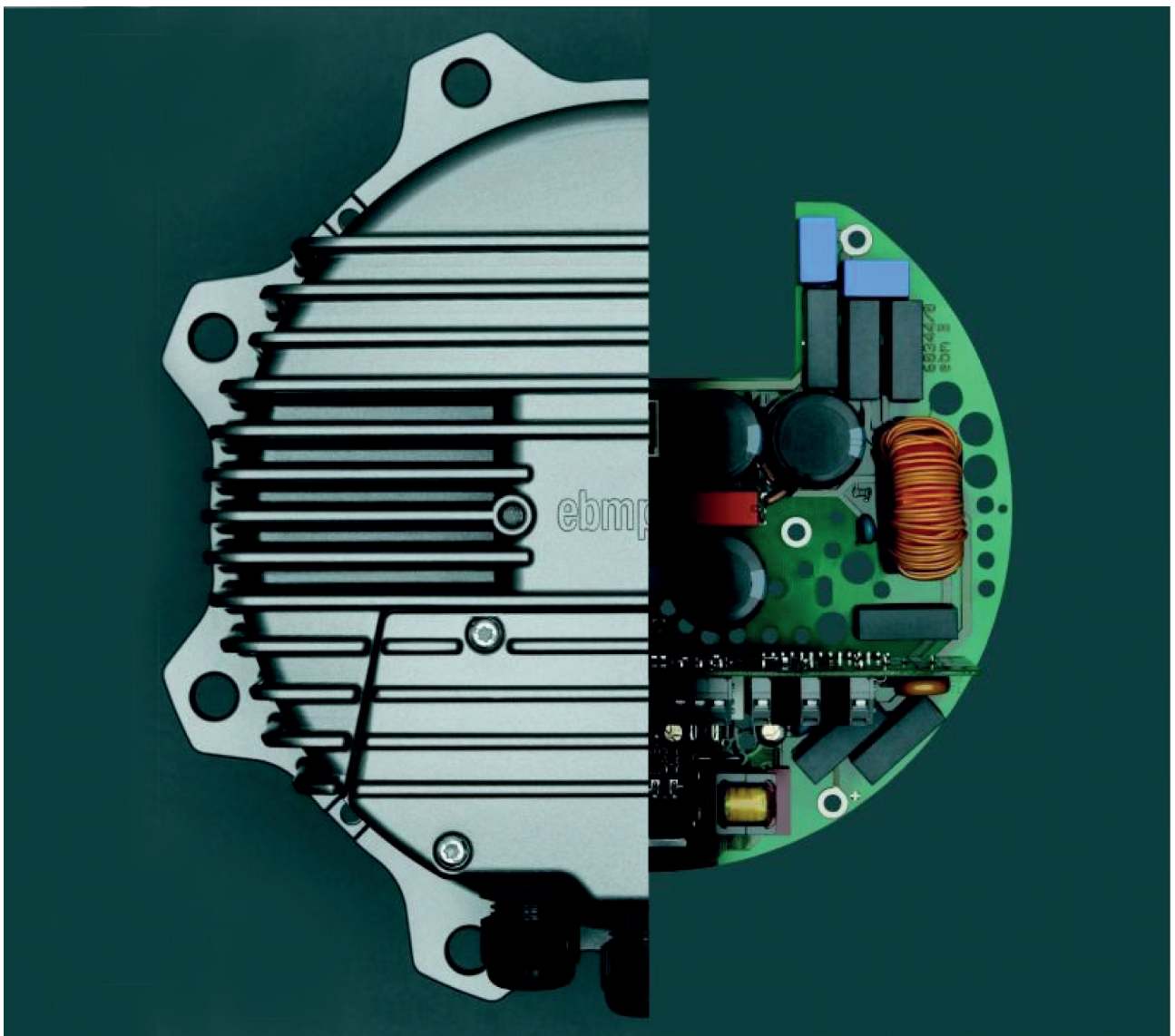


As the fan speed is reduced the noise of the fan is reduced. In a multiple fan application this is even more significant. Turning half the fans off in a process only reduces the noise by 3dB whereas running all the fans at half speed would reduce the noise level by 15dB.

## EC-Classic.

Building on the inventiveness of the EC technology pioneers in having the foresight to integrate a low cost 10V DC power supply within our mains supply powered EC motors, the EC Classic range uses patented technology to take advantage of this feature and provides elegant solutions to individual fan speed control and monitoring.

Today's technology has provided low power programmable integrated circuits that consume less energy than that available from the PSU within the fan. The result is control modules with the sensors, simple manual speed controllers or monitor boards that connect only to the EC fan without additional wiring and power supply costs.



# Manual 0-10v Controller

The RM-ECi controller is for use with the full range of ebm-papst EC fans. Powered by the 10VDC output from the motor, it provides infinitely variable, manual speed control between 0% and 100%.

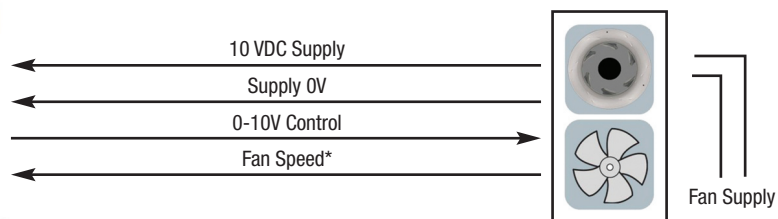


Part Number	Supply Voltage		IP Rating	Height mm	Width mm	Depth mm
	VDC	Maximum Ambient Temperature °C				
RM-ECi	10	50	54	65	65	80
CN1003 (Unboxed)	10	50	00	36	36	50

- Can control multiple fans running at the same speed
- Stepless control knob for infinitely variable speed setting
- Cable entries 4 x M16 or M20
- 4mm mounting holes



\*Optional



# Manual 0-10v controller with limits

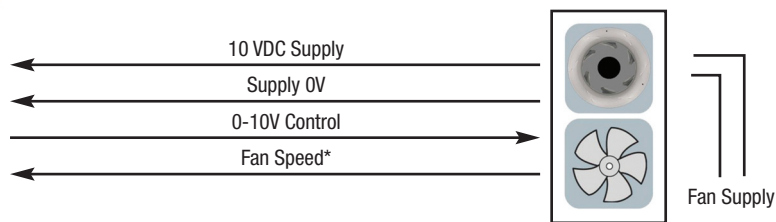
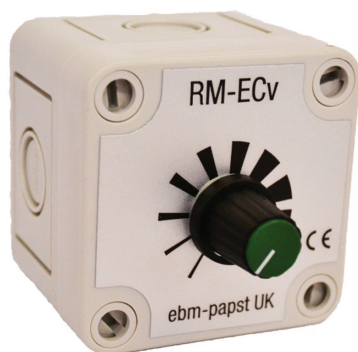


The RM-ECv controller is for use with the full range of ebm-papst EC fans. Powered by the 10V DC output from the motor, it provides infinitely variable, manual speed control between 0% and 100%.

The maximum and minimum speeds can be varied during commissioning to limit the maximum speed and/or restrict the lower speed.

Part Number	Supply Voltage		IP Rating	Height mm	Width mm	Depth mm
	VDC	Maximum Ambient Temperature °C				
RM-ECv	10	50	54	65	50	84
CN1063 (Unboxed)	10	50	00	36	36	50

- Can control multiple fans running at the same speed
- Stepless control knob for infinitely variable speed setting
- Cable entries 4 x M16 or M20



\*Optional

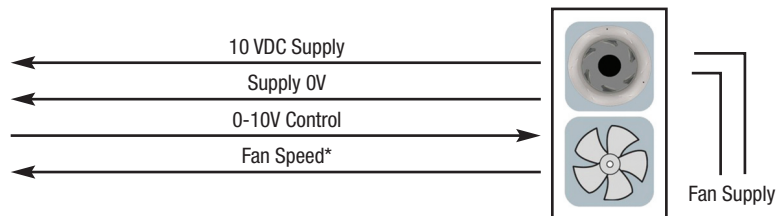
# Manual 5 speed steps controller

The RM-ECs controller is for use with the full range of ebm-papst EC fans. Powered by the 10VDC output from the motor, it provides variable speed control with 5 speed settings. Each setting can be adjusted during commissioning between 0% to 100% speed.



Part Number	Supply Voltage		IP Rating	Height mm	Width mm	Depth mm
	VDC	Maximum Ambient Temperature °C				
RM-ECs	10	50	54	94	94	80
CN1064 (Unboxed)	10	50	00	68	60	73

- Can control multiple fans running at the same speed
- Step control knob for 5 variable speed setting
- Cable entries 4 x M16 or M20
- 4mm mounting holes
- No separate power supply required



\*Optional



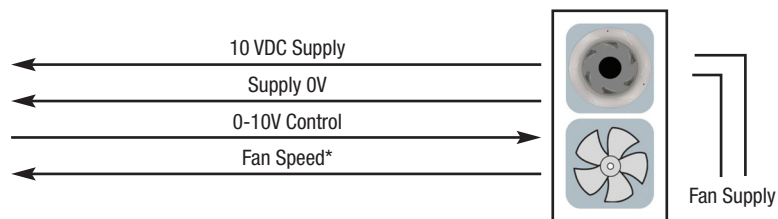
# Manual 0-10v controller with display

The RM-ECd controller is for use with the full range of ebm-papst EC fans. Powered by the 10VDC output from the motor, it provides infinitely variable, manual speed control between 0% and 100%. The control voltage 0-10v is displayed on the LCD for ease of commissioning. A DIP switch allows display of rpm instead if a tach fan is used.



Part Number	Supply Voltage	Ambient Temperature	IP Rating	Height	Width	Depth
	VDC	°C				
RM-ECd	10	-20 to +60	54	94	94	55
CN1100 (Unboxed)	10	-20 to +60	00	71	71	20

- Can control multiple fans running at the same speed
- Stepless control knob for infinitely variable speed setting
- LCD screen showing 0-10v or rpm
- Pulses / rev selectable using DIP switch
- Cable entries 4 x M16 or M20
- 4mm mounting holes
- No separate power supply required



# EC Temperature Controller

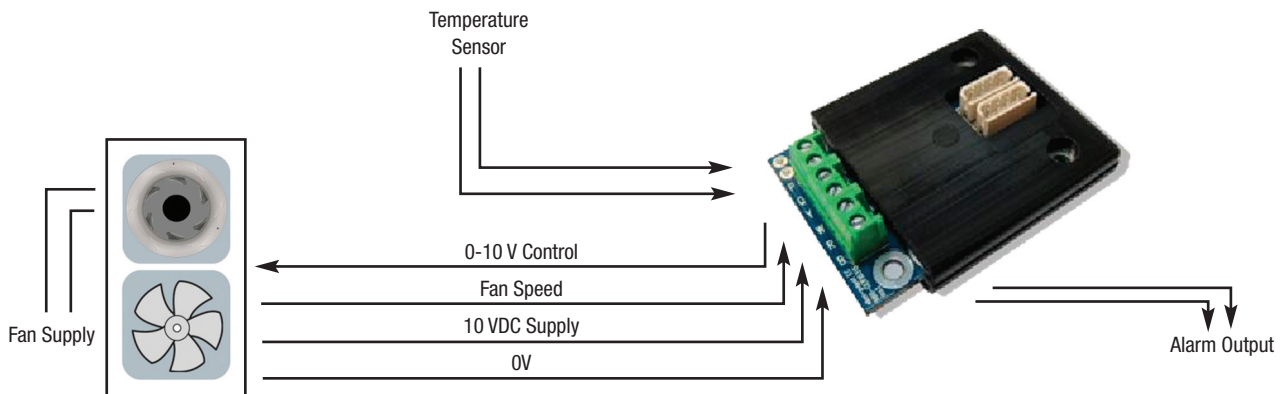
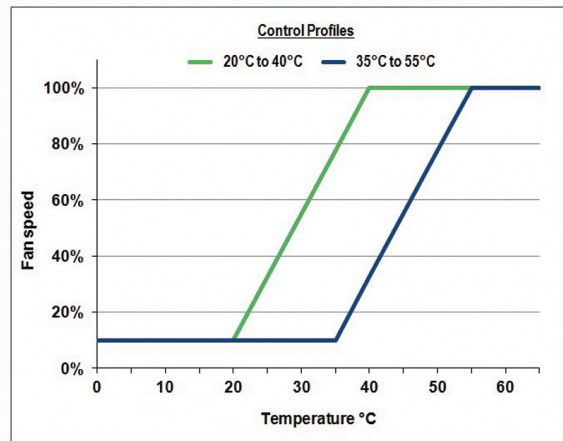
This simple, low cost, credit card sized controller provides closed loop, temperature sensitive speed control for the full range of ebm-papst EC fans. Its patented design connects to the 10VDC output from the EC fan motor and requires no additional power supply.

The controller regulates fan speed against a pre-programmed temperature profile and also incorporates a combined fan fail, sensor fail and over-temperature alarm. Under alarm conditions the controller fails safe to demand maximum fan speed.



Part Number	Supply Voltage	Temperature Profile		Ambient Temperature	Max Humidity	Height	Width	Depth
	VDC	°C	°C	°C		mm	mm	mm
CEC102040MC-000	10	22-40	-20 to +75	90	45	56.5	8	
CEC102245UN-000	10	22-45	-20 to +75	90	45	56.5	8	
CEC103555MC-000	10	35-55	-20 to +75	90	45	56.5	8	

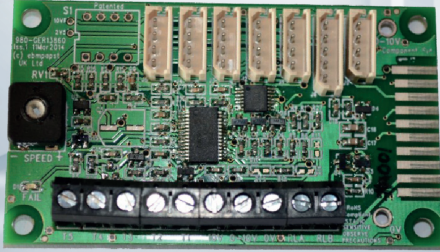
- Temperature sensitive speed control
- Alarm output, open collector interface
  - Fan failure
  - Over-temperature
  - Sensor failure
- Customised temperature profiles available on request
- Rugged over-moulded construction
- Significantly reduces energy consumption
- Supplied with 2M NTC temperature sensor



# Fan Coil Monitor / Controller

Primarily designed for use with our EC fan coil fans. This provides a simple and low cost monitoring solution for up to 5 EC fans per board, with fan alarm relay output, and LED to identify failed fan.

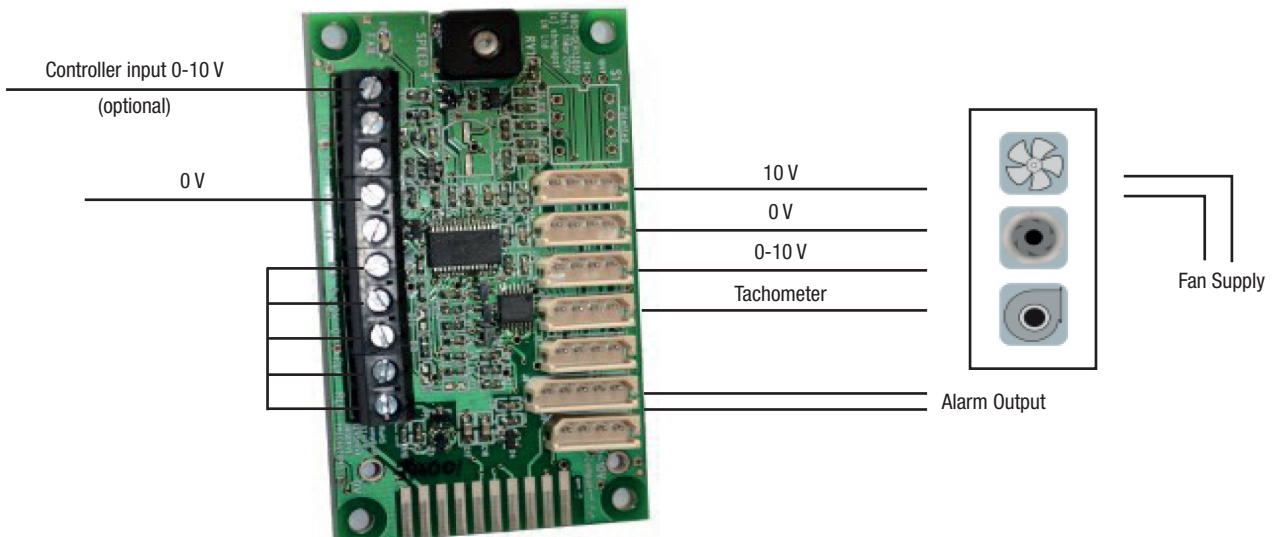
Fan speed set potentiometer.



Supply Voltage  
Ambient Temperature  
Height  
Width  
Depth

Part Number	VDC	°C	mm	mm	mm
CN1101	10	-20 to +60	78	45	14

- Fan tachometer monitor with SSR Relay output, contacts open for Fan Alarm or Power Fail.
- Powered via the fan 10V 1mA supply.
- Up to 5 fans can be monitored per board.
- Boards can be linked to permit the monitoring of up to 10 fans.
- Alarm is generated when a fan falls below 300 rpm (contact ebm-papst UK for options).
- LED pulses to identify failed fan(s)
- On-board trimmer potentiometer sets 0-10V fan speed control output
- Screw Terminal connection and plug / socket connection
- Patent 2431303, controller powered from EC\_Fan

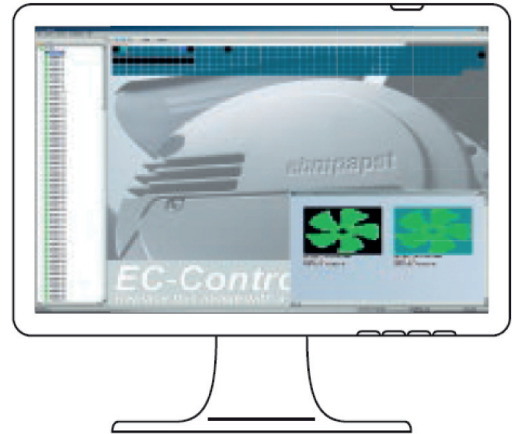


## EC-Control.

There are hardly any multiple fan applications in which the numerous communication options provided by our GreenTech EC technology do not work to your benefit. All the necessary information from speed to motor temperature and operating fault messages are available at all times from our larger motors in the range M3G084 and above. Thanks to its open and simple protocol, MODBUS has become established as a standard control of devices such as fans and actuators.

EC Control software permits the visualisation and programming of ebmBUS and MODBUS fan networks and can be configured for USB as well as serial and Ethernet interface converters. For version 2.0 and above, the Bluetooth adaptor is also supported. The software supports a maximum number of devices permitted by the bus protocol concerned (up to 7,905 fans with ebmBUS and 247 with MODBUS).

Even if the fan does not directly have the MODBUS connections on board, we can provide control solutions for simple tacho fans that can then interface to a MODBUS system on request.



# Bluetooth Interface Adapter - RS485

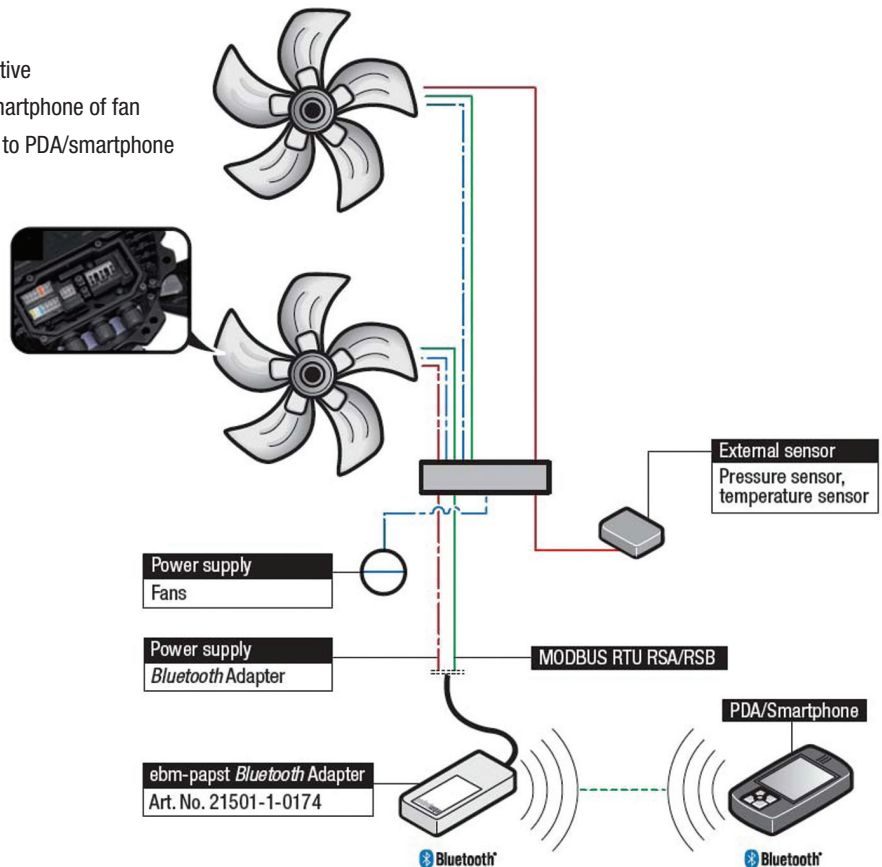
For wireless programming and monitoring, ebm-papst fans equipped with an RS485 interface can communicate with Pocket PCs PDAs or smartphones via the ebm-papst Bluetooth Adaptor.

Only one Bluetooth Adapter is needed for communication with a system.



Part Number	Supply Voltage VDC	Ambient Temperature °C	Current Draw mA	Transmitting Power mW	Width mm	Height mm	Length mm	IP Rating
21503-1-0174	15-24	-10 to +70	30	1	25	50	100	20

- Two wire mode operation, automatic switchover between send & receive
- Molex minifit socket connection
- ISM band (2402-2480 MHz)
- Status Display via LED
  - Green: power supply ok
  - Yellow (flashing): Bluetooth connection active
  - Red (top): data transmission from PDA/smartphone of fan
  - Red (bottom): data transmission from fan to PDA/smartphone
- Plastic housing



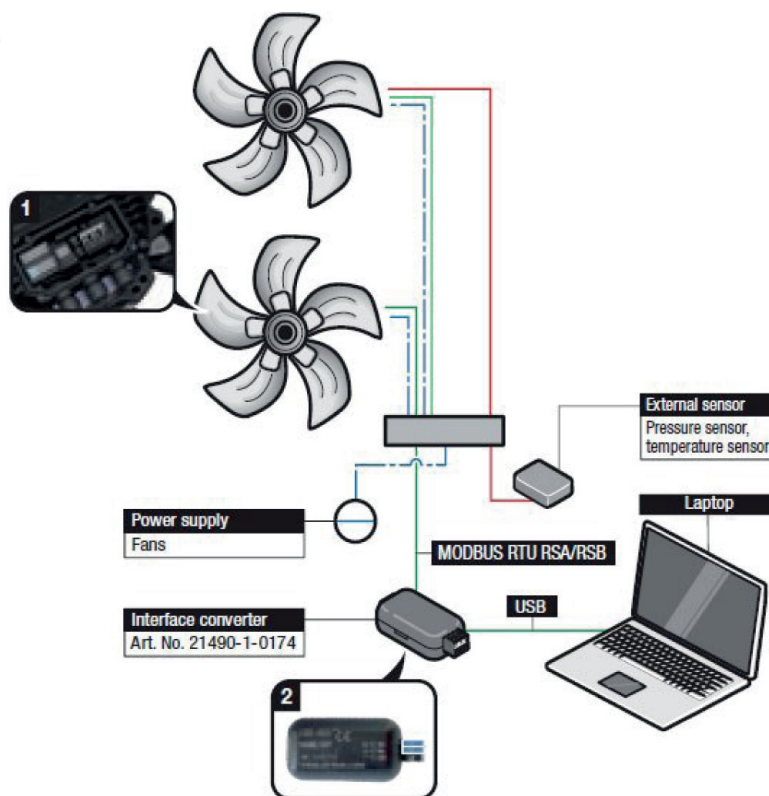
# USB to RS485 Adaptor

The ebm-papst USB RS485 adapter is used to connect RS485 devices to a PC. ebm-papst EC Control software as of version 2.0 is required for this purpose. The software also contains the USB drivers needed for operation of the adapter.



Part Number	Supply Voltage	Current	IP Rating	Height	Width	Depth
	VDC	VDC		mm	mm	mm
21490-1-0174	5 (via USB)	100 (via USB)	10	56	31.2	24.5
25714-2-0199	EC Control Software					
25716-2-0199	EC Clone Software					

- Operating mode: RS485, 2 wire operation with terminating resistor (pre-configured)
- RS485 connection: - 2-wire
  - Max. cable length 1,200 m (9,600 bits/s), 1,000 m (19,200 bits/s)
- Data rate: - Up to 3 Mbits/s
- Insulation: - 2,500 V (overvoltage protection)
- Status Display: - Via LED
  - Green: Rx, receive
  - Red: Tx, transmit
  - Yellow: Power ON
- Housing: - Plastic housing
  - Adapter
  - Plug-in screw terminal
  - USB cable



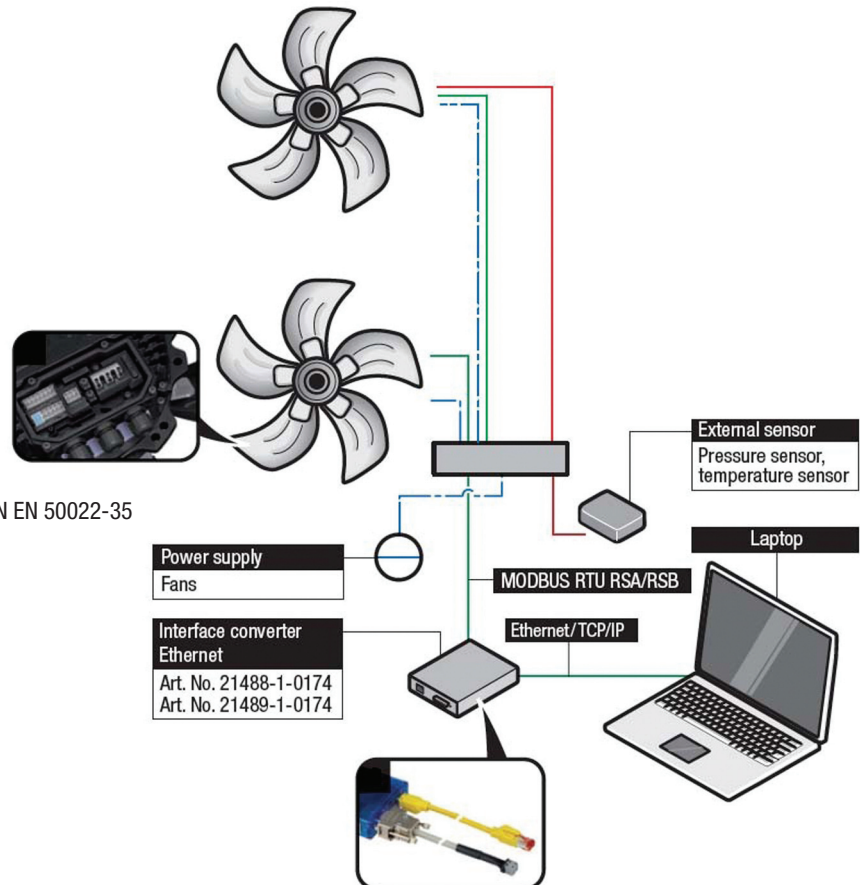
# Ethernet Interface Converter - RS485

Interface converter for bi-directional connection of RS485 units and Ethernet-compatible PCs or Notebooks using EC Control (Art. No. 25714-2-0199) or EC Clone (Art. No. 25716-2-0199) software.



Part Number	Supply Voltage VAC	Frequency Hz	Power Supply VDC	Current Draw mA	Ambient Temperature °C	Width mm	Height mm	Length mm	IP Rating
21488-1-0174	100-240	50/60	12-48	85	0 to +50	75	22	105	10

- Operating mode: RS485, 2-wire operation with automatic switching between transmit and receive.
- Safety: Electrical isolation between Ethernet and RS485
- Electrical isolation: min. 500 V
- Ethernet connection: 8-pole RJ45 socket  
10/100 Mbit autosensing
- RS485 connection: 9-pin SUB-D connector
- Protocols used:
  - TCP
  - Telnet (for configuration only)
- Status display: By way of LEDs
  - Green (left): Power supply
  - Green (right): Data communication
  - Red: Fault
- Housing: Plastic housing
- Type of protection: IP 10
- Installation: Standard rail mounting as per DIN EN 50022-35
- Scope of delivery:
  - Interface converter
  - Plug-in power supply
  - RS485 cable D-Sub to screw terminal
  - Network cable (crossover, Cat 5)
  - Product description DE and EN



# USB Relay Box

The USB Relay Box is a relay actuator and isolated digital input module for USB bus. It provides 8 optically-isolated digital inputs with isolation protection of 2,500 VDC for collecting digital inputs in noisy environments and 8 relay actuators for serving as on/off control devices or small power switches. For easy monitoring, each relay is equipped with one red LED to show it's on/off status. The USB Relay Box's eight optically-isolated digital input channels are ideal for digital input in noisy environments or with floating potentials.



Part Number	Input Voltage VDC	Power Consumption mA	Ambient Temperature °C	Length mm	Width mm	Height mm
10450-1-0174	5 ... 30	60 ... 400	0 ... 60	132	80	32

- Compatible with USB 1.1/2.0
- Portable
- Bus-powered
- 8 relay output channels and 8 isolated digital input channels
- LED indicators to show activated relays
- 8 Form C type relay output channels
- High-voltage isolation on input channels (2,500 VDC)
- High ESD protection (2,000 VDC)
- Wide input range (5-30 VDC)
- Interrupt handling capability
- Detachable screw terminal on modules
- Suitable for DIN-rail mounting
- One lockable USB cable for secure connection included



# vbk Handheld Interface

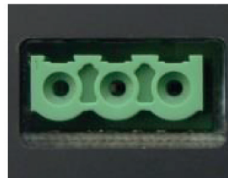
This device can be used for service purposes on site as well as to program EC fans in laboratories and on production lines. Additionally, it has full networking capability and can be used in complex network structures. A limited basic parameter setting is also available for ease of use.

All devices have a powerful rechargeable Lithium-Ion battery with special charge control, amber light full graphic display, real-time clock and clear and simple menu guide by push encoder. The 'scan network' function with subsequent monitor display of connected devices makes control and operation of fan networks so much easier.



Part Number	Ambient Temperature	IP Rating	Weight	Height	Width	Depth
	°C					
vbk-2054	0-40	20	350	18	185	38
vbk-2055	ebmBus vbk cable					
vbk-2056	ModBus vbk cable					

- Voltage supply:
  - Rechargeable Li-Ion battery; 3.7 V—2,300 mAh
  - USB-interface, incl. 5 V power supply
  - Automatic charge state detection incl. safety switch-off
- Use: Handheld for inside application, protection grade IP20 (acc. EN 60529)
- Temperature: 0°C ... 40°C. Ambient temperature at stock and usage.
- Display: Amber coloured full graphic display
- Access: easy access push encoder (IGR)
- Time base: Real-time clock



## EC-System.

The EC-System starts in the heart of the motor within the fan and in the heart and mind of the inventor. When the pioneer Gert Hauessermann, Director of EC technology at ebm-papst, first imagined EC technology he realised the full environmental benefits would only be realised when the fan's speed is controlled. With his background in control systems, the solution was not going to be a simple 2 or 3 speed setting, but an intelligent system with fully modulating control and the ability to communicate fault situations to the outside world.

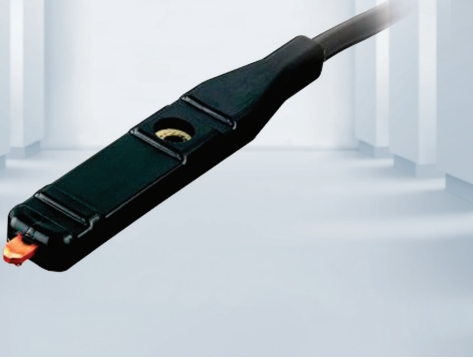
A range of control units are available to complement the range of motor functionality and to further enhance their capabilities particularly for the smaller EC motors with only a 0-10V and tacho available. The controllers are designed to support different applications particularly in refrigeration, air conditioning and heating and ventilation using various accessories available to support pressure and temperature measurement.

The larger fans are available with integrated control functionality. They can be set to either rotate at a programmed speed or adjust their speed depending on an external sensor. The latter is more complex and is an indication of the potential of the integrated control. Different sensors can be connected directly to the fan and the fan programmed to act independently based on a set of defined parameters offering full PID functionality if required. No other hardware is required, just an external sensor such as temperature, pressure, mass flow, etc.

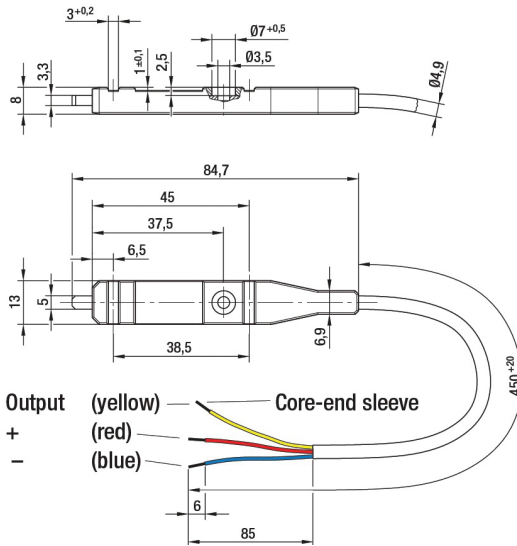


# Temperature Control Module

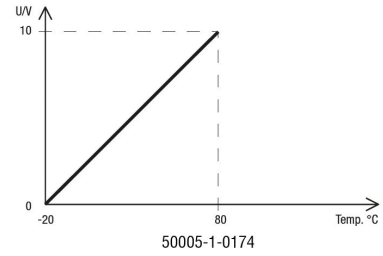
Two temperature sensors with differing profiles allow users to vary the speed of EC by temperature. Each sensor will operate from the 10V output of EC fans. The modules are supplied in a self contained, slim lined over moulded body that allows for easy installation.



Part Number	Supply Voltage		Current Draw		Output Voltage		Output Current		Output Impedance		Ambient Temperature		Mass
	VDC	mA	VDC	mA	VDC	mA	kΩ	°C					
50002-1-0174	18-60	10	2-10	0.1	6.8	+30... +55	0.02						
50003-1-0174	18-60	10	0-10	0.1	6.8	+10... +45	0.02						
50005-1-0174	15-30	10	0-10	1.0	1.1	-20... +80	0.02						

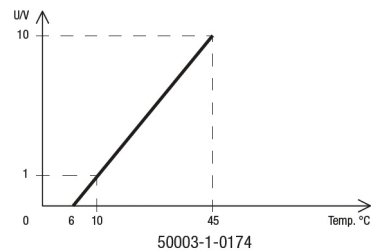
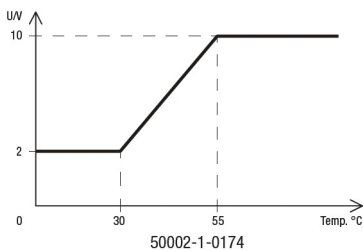


Output voltage depending on temperature:



Tolerance  $\pm 3K$

Control function: Both designs operate in cooling mode



# Differential Pressure Controller

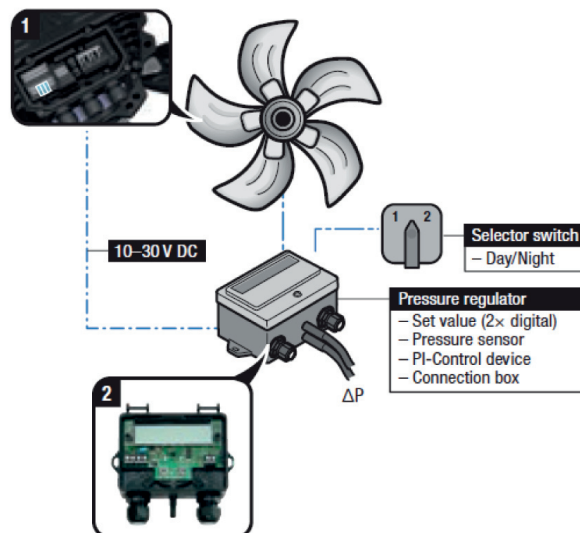
The DPC differential pressure controller is suitable for non-corrosive media. The controller outputs a 0-10V DC signal suitable for controlling ebm-papst EC fans. The DPC can display and control based on pressure or volume as a closed loop system. For volume control a K factor needs to be input into the controller.



Part Number	Supply Voltage	Current input at 10 VDC		Measuring ranges available	Ambient Temperature	Weight
	VDC	mA	mA			
DPC200-EP50	10... 30	7	12	0... 50	0... +50	90
DPC200-EP500	10... 30	7	12	0... 500	0... +50	90
DPC200-EP1000	10... 30	7	12	0... 1000	0... +50	90
DPC200-EP2000	10... 30	7	12	0... 2000	0... +50	90
DPC200-EP4000	10... 30	7	12	0... 4000	0... +50	90

• Functions:

- Selection of control or measurement mode
- Analogue output 0 ... 10V, with adjustable limitation in control mode
- 2 set values can be set in the device
- PI algorithm with separate input of P and I parameters and control response as for ebm-papst products
- Switchable measurement quantities (differential pressure or air flow)
- Switchable units (metric or imperial)
- 'Standard' or 'Inverse' control response
- Air flow calculation following input of k-factor



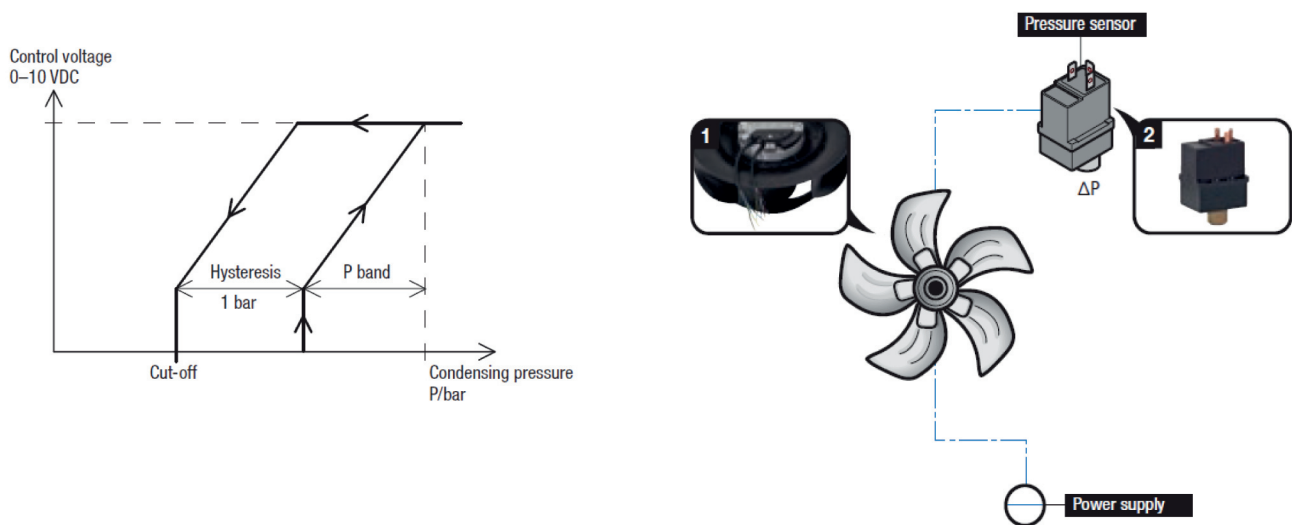
# Pressure Sensor Regulator

These two pressure sensor speed control devices are for refrigeration pressure control applications. The 0-10 V DC signal output is proportional to the refrigerant pressure. The output can be connected directly to ebm-papst EC fans providing a closed loop control.



Part Number	Nominal Voltage VDC	Max. input current mA	Adjustment Range Cut-off bar	Factory setting Cut-off bar	Test pressure bar	Max. operating pressure bar	Max. media temperature °C	Ambient Temperature °C	Weight g
40100-4-7380	10	1	4... 12,5	7.8	30	27	70	-20 to +65	125
40101-4-7380	10	1	10... 21	15.5	36	32	70	-20 to +65	125

- Material: Housing made of PA, brass pressure connection
- Type of protection: IP 65 as per EN 60529 / IEC 529
- Refrigerant: Suitable for standard refrigerants ( A) R134A; ( B) R407C, R404A, R507)
- Installation: Simple installation via pressure connection with 7/16"-20 UNF internal thread with Schrader valve opener
- Power Supply: Above 10 VDC
- Speed Setting: 0-10 VDC actuating output signal for pressure dependent speed setting of fan
- Delivery: Individual pack



# Pressure Control

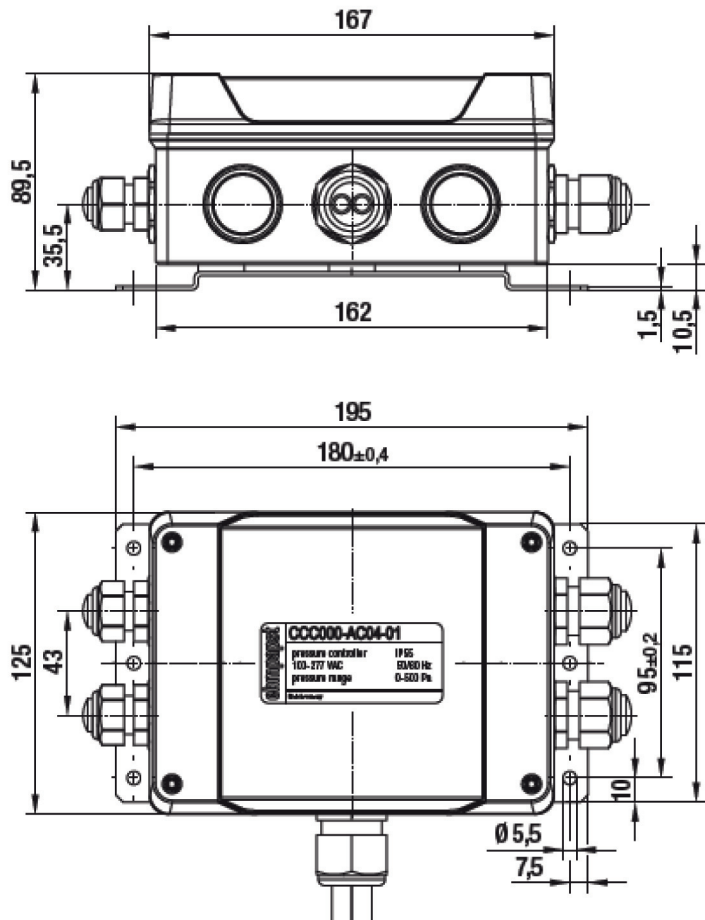
with integrated pressure sensor

A single phase PID EC fan speed controller for constant pressure. The pressure set point can be set by internal potentiometers or an external linear input.



Part Number	Voltage range VAC	Frequency Hz	Supply voltage VDC	Pressure control range Pa	Ambient Temperature °C	IP Rating
CCC 000-AC04-01	1~ 100-277	50/60	20@50 mA	50-500	-25...+60	55

- Integrated PID controller
- Day/night/linear set point preset
- Pressure sensor is 0-500 Pa in built



# EC Controller

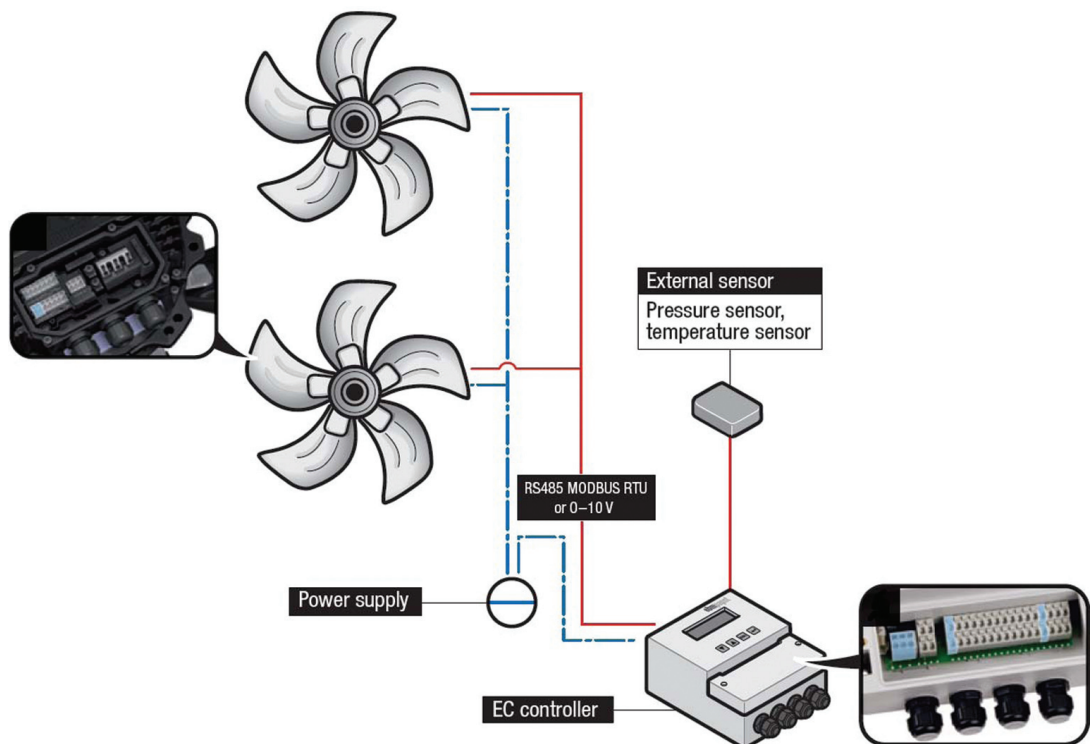
Stand alone control device for refrigeration and air-conditioning technology in conjunction with the corresponding sensors. Using the controlled 0-10V output or RS485 MODBUS RTU connection, ebm-papst fans with a corresponding input can be triggered.

The function includes multi functional pressure and temperature control as well as display and entry of various parameters. The integrated LCD display provides easy operation across multiple levels.



Part Number	Nominal Voltage VAC	Frequency Hz	Supply Voltage Sensor VDC	Power Consumption W	Output Current mA	Ambient Temperature °C	Width mm	Height mm	Length mm	IP Rating
CCC000-AD06-02	1~200-480	50/60	24	15	120	0 to +60	167	76	200	54

- Analogue inputs for connecting up to 2 sensors per type
- 4 digital inputs
- 2 programmable relay outputs, 2 voltage outputs 0-10 v
- RS485 / ModBus

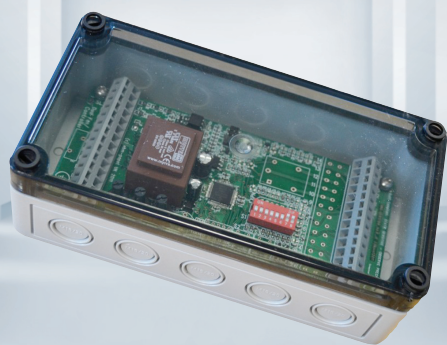


# Dual EC Fan Controller

The Dual EC fan controller is a mains powered, twin fan controller with enclosure, suitable for all ebm-papst EC 0-10V speed controllable fans.

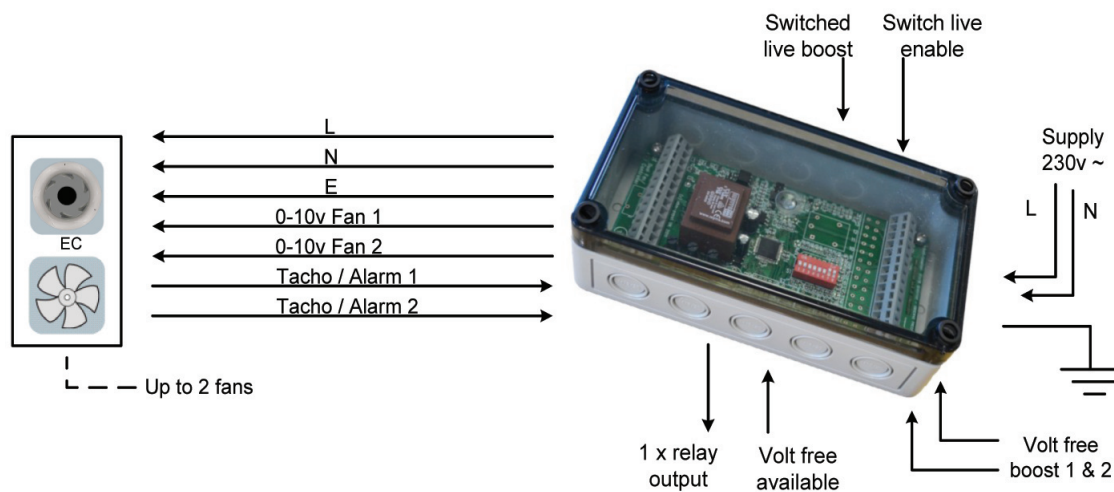
The fans run alternately based on a selectable change over period. Potentiometers allow setting of the two fan speeds, normal and boost. The fan speeds are selected by a switched live or from volt free contacts.

There is also an optional single-fan operation mode.



Part Number	Supply Voltage VAC	Frequency Hz	Max Humidity % RH	Ambient Temperature °C	Length mm	Width mm	Height mm	IP Rating
CN1082	230	50	95	-30...+60	180	93	58	66
CN1082U (Unboxed)	230	50	n/a	-30...+60	157	71	31	00

- Two switched live inputs:
  - Normal / Boost speed select (option for boost speed delay start and run-on)
  - Remote on / off
- Alarm output for fan fail, solid state relay 60V / 0.2A contacts
  - LED's - Fan ok / Fault
  - LED's Fan1 / Fan2 run
- Duty share / change over
  - 3/6/12/24 hour set via DIP switch
- Boost Speed Start Delay option select via DIP switch. Three minute fixed timer.
- Boost Speed Run-On, period selectable 0-50 minutes by potentiometer
- Remote Enable Input, Volt Free Contacts

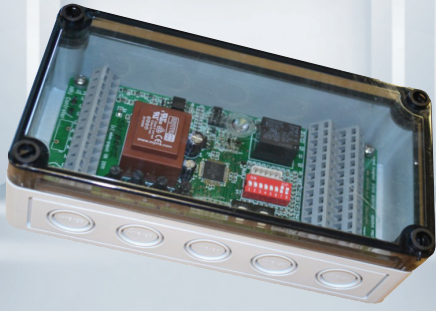




# Industrial / Commercial HRU Controller

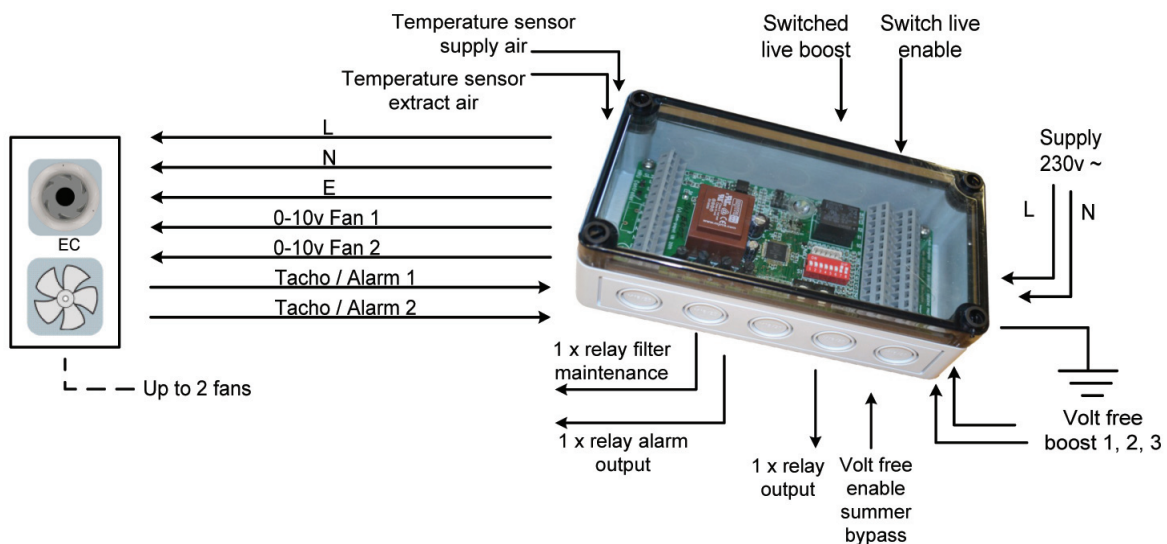
The HRU (Heat Recovery Unit) controller is designed specifically for industrial / commercial heat recovery applications. The controller is a mains powered, twin fan controller suitable for all ebm-papst EC 0-10V speed controllable fans.

Both fans are independently controlled with each speed set via an individual potentiometer.



Part Number	Supply Voltage VAC	Frequency Hz	Max Humidity % RH	Ambient Temperature °C	Length mm	Width mm	Height mm	IP Rating
CN1083	230	50	95	-30...+60	180	93	58	66
CN1083U (Unboxed)	230	50	n/a	-30... +60	157	71	31	00

- Two switched live inputs:
  - Normal / Boost speed select (DIP switch options: boost speed Delay Start 3min, Run On 20min).
  - Remote on / off.
- Alarm output for fan or thermistor fail, solid state relay 60V / 0.1A contacts.
  - LED's—Fans and Thermistors ok / Fault.
  - LED's Fan1 / Fan2 run.
- Thermistor connections, Supply and Extract air temperatures, includes 2 off remote thermistors with 2m cable.
- Low temperature shut-off of supply fan to prevent freezing, DIP rotary switch for temperature adjustment.
- High temperature activation of summer bypass relay, DIP rotary switch for temperature adjustment.
- Summer bypass control relay, change-over contacts rated 230VAC, 5A.
- PIR / CO2 / Humidistat / thermostat inputs for boost select.
- BMS remote enable input.
- Filter maintenance alarm LED and solid state relay output, DIP switch selectable period 3 / 6 / 12 months, with reset switch and disable.

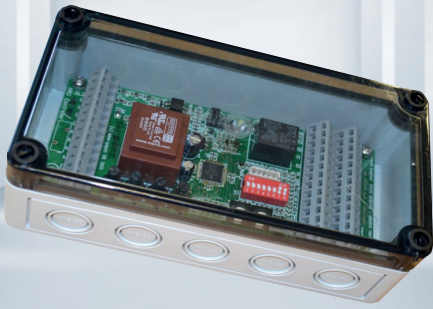


# Demand Ventilation Controller

The Demand Ventilation Controller (DVC) is a demand control ventilation unit designed specifically for industrial / commercial applications. The controller is a mains powered, single / multiple fan speed controller suitable for all ebm-papst EC 0-10V and most PWM Open Collector speed controllable fans.

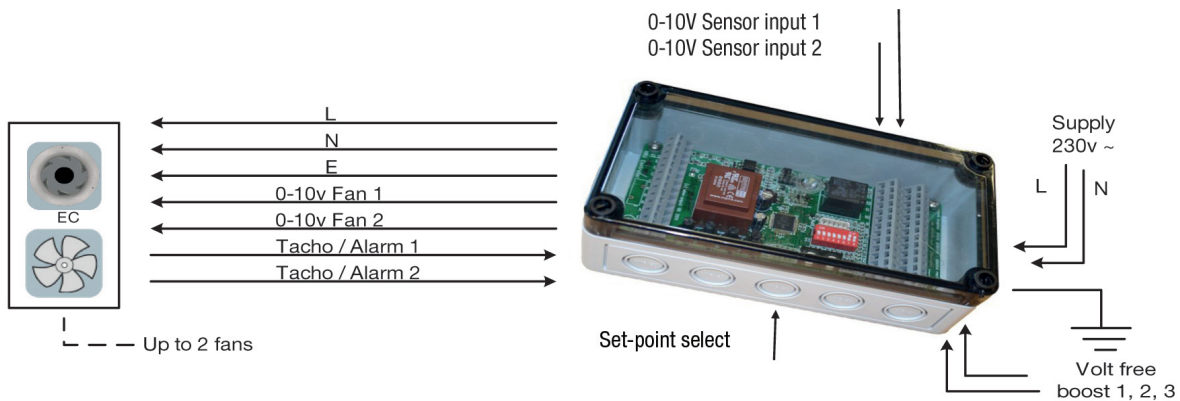
Configurable Closed Loop PID control, single sensor, for e.g. Constant Pressure / Constant Volume applications. Configurable Open Loop Proportional Band control, either one or two sensors, e.g. for use with Temperature, Humidity, CO2 sensors etc.

Compatible with 0-10V type sensors. Single or multiple fans.



Part Number	Supply Voltage VAC	Frequency Hz	Max Humidity % RH	Ambient Temperature °C	Length mm	Width mm	Height mm	IP Rating
CN1090	230	50	95	-30...+60	180	93	58	66
CN1090U (Unboxed)	230	50	n/a	-30... +60	157	71	31	00

- Switched Live and Volt Free inputs:
  - Stop / Run control
  - Fan Speed / Set-point select input
- Alarm output for fail, solid state relay 60V / 0.1A contacts
  - LED's - Fans ok/Fault
  - LED's Fan1 / Fan2 run
- 0-10V Sensor input connections, 24VDC Sensor Supply output, One or Two sensors.
- Proportional Band Control set-points for up to two sensors, minimum & maximum fan speed cap set
- Closed Loop PID Control set-points, PID response & maximum speed cap set
- Selectable either Simultaneous or Alternate Fan Run, selectable change-over period, selectable Single Fan use.
- Tachometer monitoring up to Two fans, Control of 1-24 Fans per controller, maximum 12 Fans per 0-10V/PWM output.
- BMS remote enable input



# Refrigeration Head Pressure Controller

The Head Pressure Controller (HPC) varies the speed of EC fans to control the head pressure of a refrigeration circuit. The pressure sensor input and speed control output to the EC fans are 0-10VDC, control of 24 fans maximum.

The set point may be set locally by means of a trim device on the control PCB.

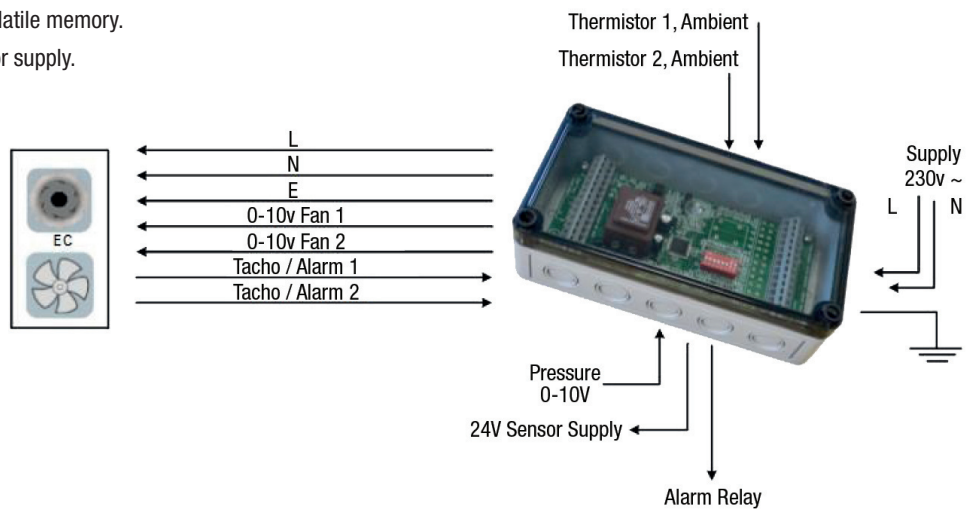
An optional PC interface allows set-point configuration and data logging from a PC.

The controller allows the refrigeration system to be operated with a Floating Head Pressure, which can provide substantial energy saving and reduced compressor workload leading to increased service life.



Part Number	Supply Voltage VAC	Frequency Hz	Ambient Temperature °C	Length mm	Width mm	Height mm	IP Rating
CN1089	230	50	-35...+60	180	93	58	66

- 0-10V Pressure Sensor input
- Pressure Set-point set by on board Potentiometer or from PC interface
- Microcontroller uses PID program with configurable P, I and D gains for optimum combination of response speed and stability
- Two 0-10V Fan Speed Control outputs (Open Collector output option by DIP switch setting).
- Control of 1-24 EC Fans per controller, maximum 12 EC Fans per 0-10V output.
- Fan speed offset option for the two 0-10V outputs provides Ultra Low Volume control for maximum energy saving at low ambient temperatures.
- The controller also optionally monitors Condenser and Ambient Temperatures (using two thermistors) to provide optimised energy use at high ambient temperatures.
- For small systems (1-2 fan systems 230VAC, 13A maximum fan load) the fans may be powered via controller PCB. This avoids the need for any additional connector blocks, wiring and associated enclosure.
- For Tachometer Output fans on small systems, 1-2 fans, the controller can monitor Fan Tachometer signals. For other systems, 1-24 Fans, the controller can monitor Relay Alarm type fans.
- Controller relay alarm output, contacts rated 60VDC, 100mA, Fan or Thermistor Alarm.
- Optional PC Interface for Configuration and Data Logging.
- Parameters may be set from PC interface, overriding PCB controls.  
Settings stored on PCB in non-volatile memory.
- 24VDC output for Pressure Sensor supply.



# DC-Management.

The DC motor technology has been a cornerstone of the ebm-papst fan products for the last 40 years. The brushless commutation technology broke new ground when it was first introduced, but it is by no means old expertise as the technology has been continually developed and has become the foundation of EC technology.

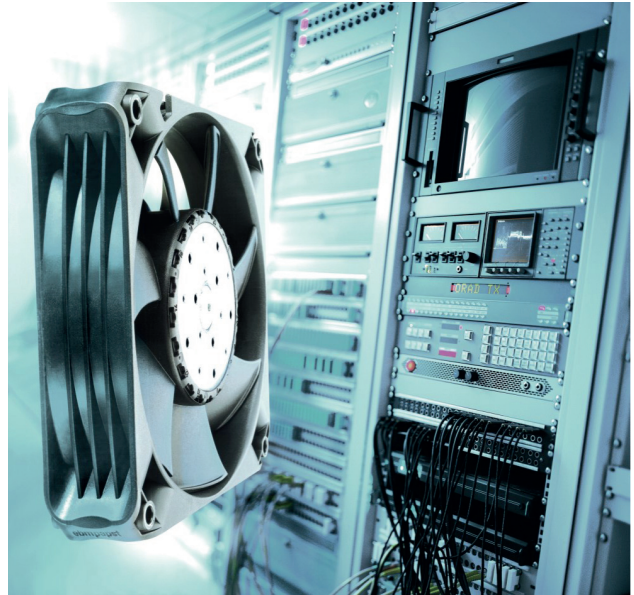
DC fans are an important part of the Information Communication Technology market (ICT) used primarily to dissipate heat from electronics, Telecoms and computer equipment. Fan noise can be intrusive in these areas and developers have had to manage the necessity for airflow versus fan noise by adjusting the fan speed.

ebm-papst DC fan technology provides a number of solutions to speed control to provide an efficient and guaranteed solution rather than simple variation of the supply voltage which could damage the fan. The first two of these solutions use extra control connections which link to the internal microprocessor. These control lines, either an analogue 0-10V DC voltage or a pulse width modulated (PWM) signal, give signals directly to the fan electronics to change the fan speed, based on the voltage or pulse width change.

Where these control methods are not available, typically on small compact fans, then a current control unit is available that reduces power to the DC motor without restricting the supply to the microprocessor or damaging the internal electronics.

The single fan control options are based on the ebm-papst EC-Matrix technology. Standard versions are available, for example with a temperature sensor with pre-programmed parameters; however any temperature and control range setting can be rapidly provided by the electronics development team at ebm-papst, for volume quantities.

A bespoke Thermal Management System (TMS) for telecommunication network cooling is also available which has an interface to control and monitor up to 4 fans independently based on temperature and can be programmed for specific thermal requirements as well as providing alarm functionality.



# DCP Temperature Controller

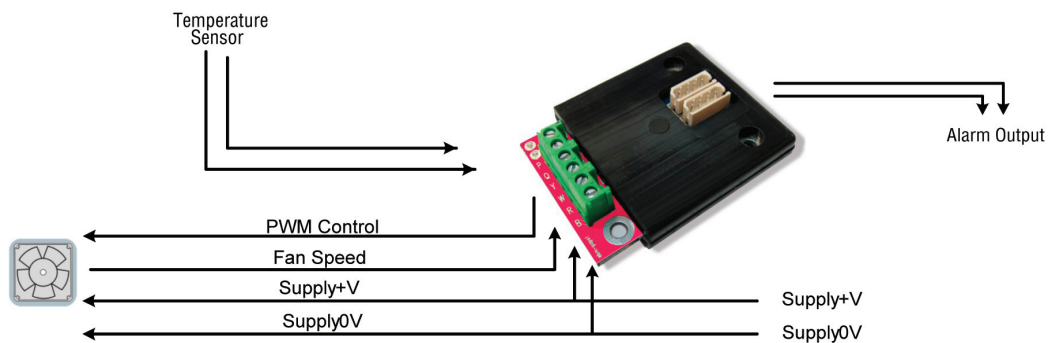
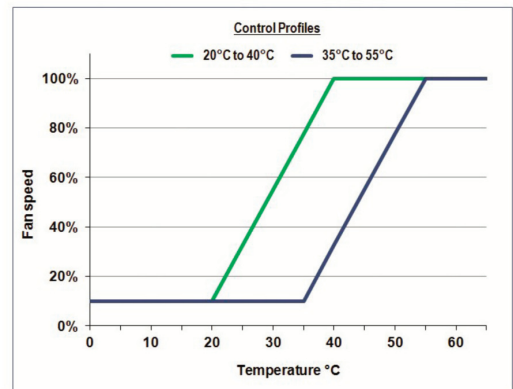
The DCP temperature controller provides closed loop, temperature sensitive speed control for ebm-papst 4-wire PWM controlled DC fans. The controller voltage is matched to the fan so that with its very low power consumption, there is no need for a separate, dedicated power supply.

The controller regulates fan speed between 0% and 100% against a pre-programmed temperature profile and also incorporates a combined fan fail, sensor fail and over-temperature alarm.



Part Number	Temperature Profile °C	Supply Voltage VDC	Ambient Temperature °C	Max Humidity %RH	Width mm	Height mm	Depth mm
CPC122040SC-000	20-40	12	-20...+75	90	45	56.5	8
CPC242040SC-000	20-40	24	-20...+75	90	45	56.5	8
CPC482040SC-000	20-40	48	-20...+75	90	45	56.5	8
CPC123555SC-000	35-55	12	-20...+75	90	45	56.5	8
CPC243555SC-000	35-55	24	-20...+75	90	45	56.5	8
CPC483555SC-000	35-55	48	-20...+75	90	45	56.5	8

- Temperature sensitive speed control
- Alarm output
  - Fan failure
  - Over-temperature
  - Sensor failure
- Consumes <1mA
- Customised temperature profiles available on request
- Rugged over-moulded construction
- Significantly reduces energy consumption
- Supplied with 2m NTC temperature sensor

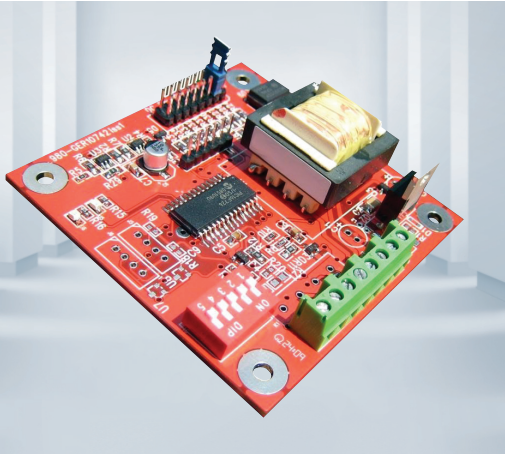


# DC Temperature Controller

The DC temperature controller provides closed loop, temperature sensitive speed control for ebm-papst 2-wire and 3-wire DC fans. The controller regulates the electrical power supplied to the fan to maintain optimum performance and reliability.

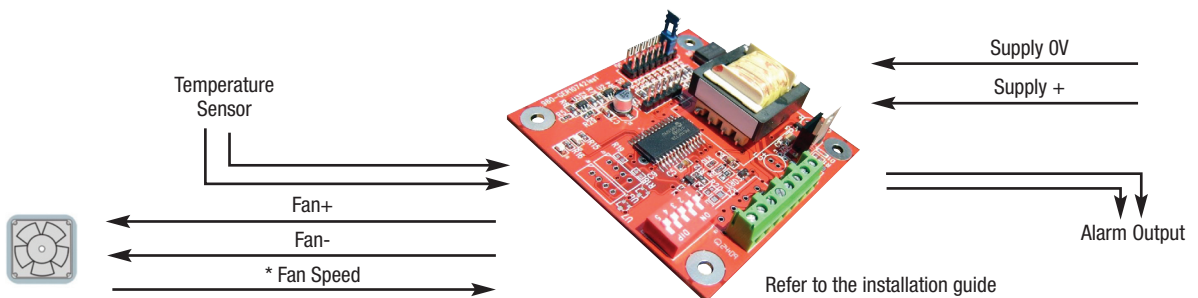
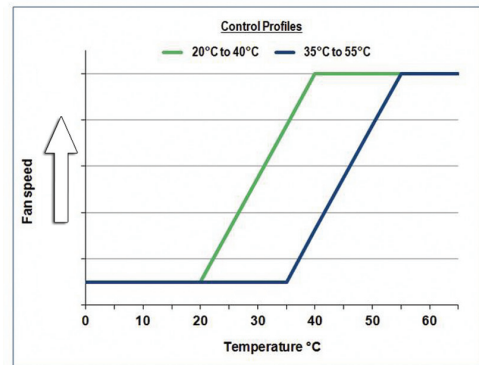
The controller regulates fan speed between 0% and 100% against the selected temperature profile and also incorporates a combined fan fail, sensor fail and over-temperature alarm.

**Note:** Due to the variations in motor electronics, a small number of mainly high speed fans may not work correctly with this controller.



Part Number	Temperature Profile	Supply Voltage	Ambient Temperature	Max Humidity	Alarm Output	Width	Length	Height
	°C	VDC	°C	%RH		mm	mm	mm
CDC122055UC-000	20-40 / 35-55	12	-20...+75	95	Open Collector	72.4	71.1	35
CDC122055UR-000	20-40 / 35-55	12	-20...+75	95	Relay	72.4	71.1	35
CDC242055UC-000	20-40 / 35-55	24	-20...+75	95	Open Collector	72.4	71.1	35
CDC242055UR-000	20-40 / 35-55	24	-20...+75	95	Relay	72.4	71.1	35
CDC482055UC-000	20-40 / 35-55	48	-20...+75	95	Open Collector	72.4	71.1	35
CDC482055UR-000	20-40 / 35-55	48	-20...+75	95	Relay	72.4	71.1	35

- DIP- switch selection for:
  - Temperature profile
  - Minimum fan speed
  - Soft start
- Alarm output
  - Fan failure\*
  - Over-temperature
  - Sensor failure
- Supplied complete with 2m NTC temperature sensor
- Up to 17W total fan load

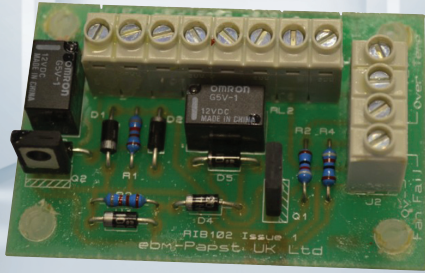


\*3-wire fans only

## 2 Channel Interface Board

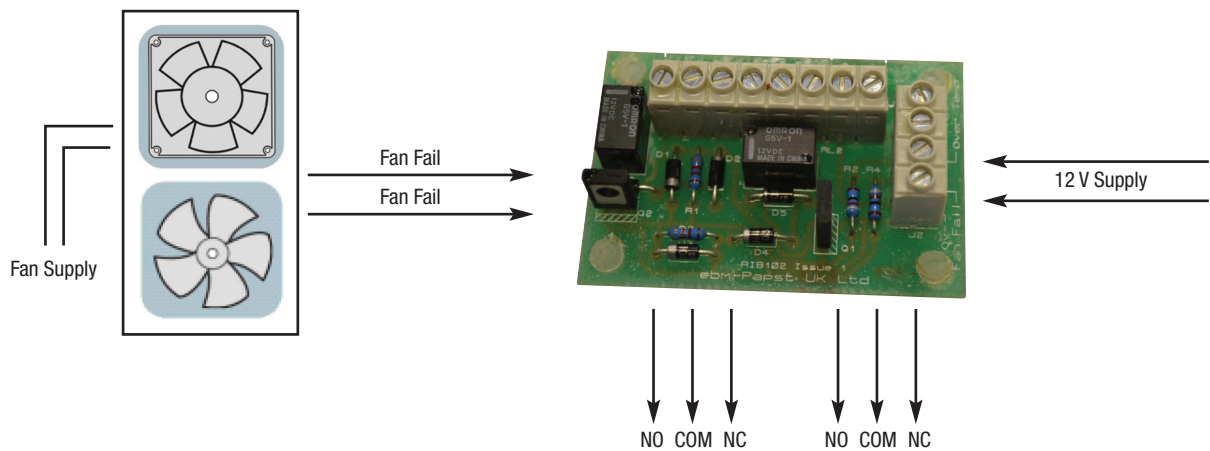
This interface board has been designed to be used in conjunction with ebm-papst range of fans and controllers, to convert an open collector alarm signal (relay output) to a volt free contact (relay output) to interface between otherwise incompatible hardware. The interface board provides 2 independent channels.

Fan fail signals such as /17 /19 /37 or /39 can then trigger a NO or NC relay output.



Part Number	Supply Voltage VDC	Max current to fan A	Max Humidity % RH	Ambient Temperature °C	IP Rating	Width mm	Height mm	Depth mm
RIB102	12	2	85	0... +40	65	65	45	17.8
RIB103	24	2	85	0... +40	65	65	45	17.8

- Relay contacts (30W max)
  - 125 VAC, 0.5A
  - 60VDC, 0.3A
  - 30VDC, 1A
- Conformally coated



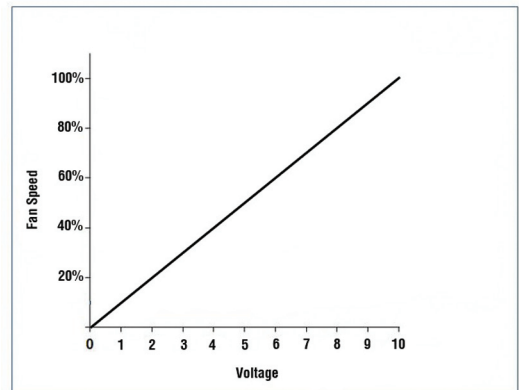
# A2P Interface

The A2P interface is a 0-10 volt to open collector PWM converter and is designed to work with ebm-papst 4 wire PWM controlled DC fans. The interface translates the analogue voltage input to an equivalent PWM signal. The interface is matched to the fan so that with its very low power consumption, there is no need for a separate dedicated power supply.

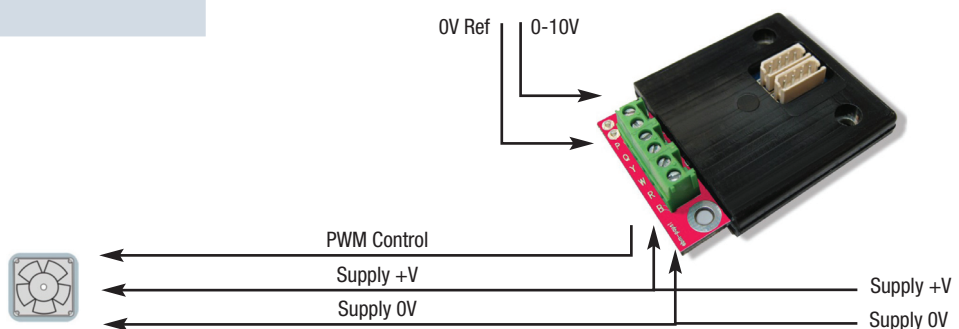


Part Number	DC Voltage V	Supply voltage VDC	Ambient Temperature °C	Max Humidity %RH	Output Duty %	Width mm	Height mm	Depth mm
CPC48VV10UN-100	0-10	11-55	-20... +75	90	0-100	45	56.5	8

- Compatible 0-10 volt input
- Consumes <1mA
- Wide operating supply voltage
- Rugged over-moulded construction



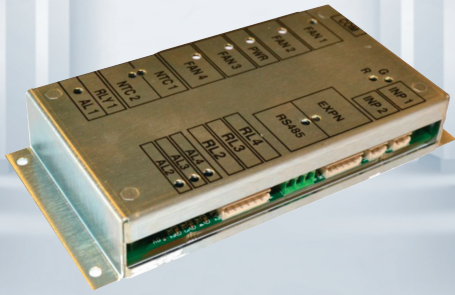
Connection Table	
P	0-10 Volt input
Q	0 Volt reference input
Y	PWM control output
W	No Connection
R	+ Supply (12-48Vdc)
B	- Supply (0V)





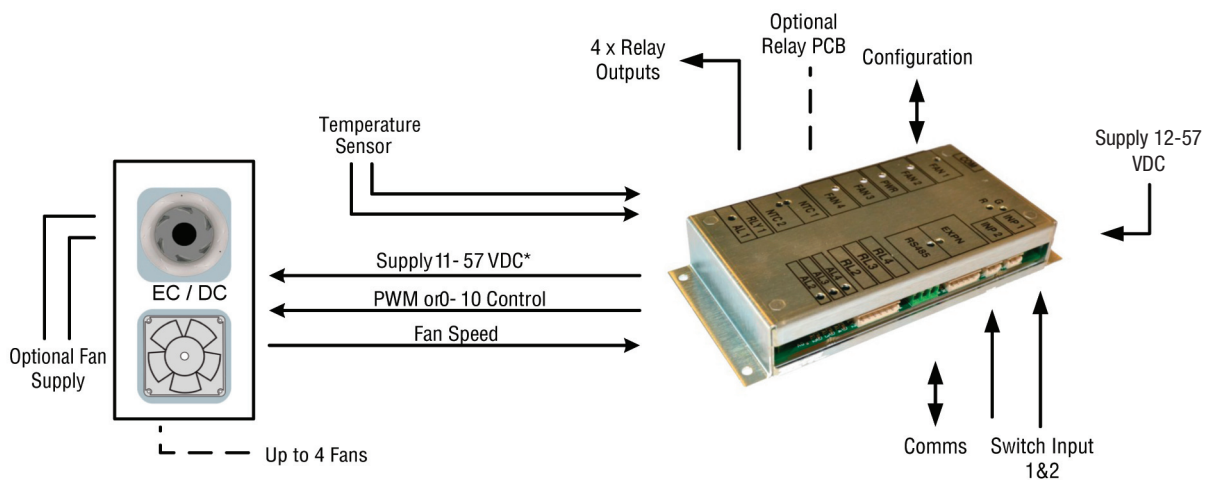
# Thermal Management System (TMS)

The Thermal Management System (TMS) is a flexible and fully configurable controller that can be used with EC/DC four wire speed controlled fans. Each fan can be individually speed controlled against one of the two temperature sensor inputs. The controller has four Solid State Relays (SSR's) that can be individually configured to give an alarm output against speed or temperature.



Part Number	Temperature Profile		Ambient Temperature	Max Humidity	Width	Height	Length
	A	VDC					
CN1065 (Boxed)	0-70	12-57	-40... +70	95	69	23	143
210-HAR11887	Configuration Cable						

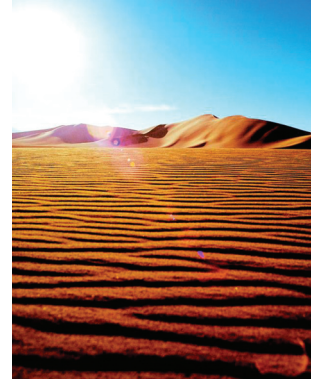
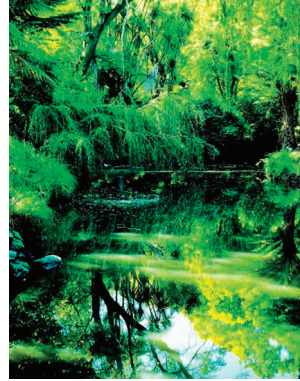
- Works on any DC supply voltage between 12 and 57 Volts
- Fan speed based on temperature profile, independent profile for each fan
- Compatibility with both 0-10V PWM and open collector PWM four-wire fans
- 11A max supply for fans running at full speed powered by the controller PCB
- 2 x Thermistor inputs to configure temperature selection to control each fan
- 2 x Switch inputs suitable to control door alarms, test switch, fan boost
- 4 x Relay alarm outputs
- Daughter board option for two 230VAC 10A relays
- PC Interface for configuration, electrically isolated



\*For 0-10 V fans, minimal supply voltage is 16 VDC  
For open collector fans, minimum supply is 11 VDC

# Accessories.

ebm-papst UK provides a range of accessories to complement your fan and controller choice to help provide an optimum control solution for your application. In turn these accessories allow the system to operate in the most energy efficient way. The accessories, covering temperature and pressure sensors, are designed and tested to work with the ebm-papst UK range of products to ensure your complete satisfaction.



# DS85 Series

## Differential pressure sensor



The DS85 series of differential pressure sensors are suitable for measuring pressure difference in air or any other non-aggressive gas. Two pressure tapplings feed either side of a silicon membrane which deflects to convert the pressure difference into a 0-10V DC signal. The output is linear and proportional to the pressure difference with respect to the range of the sensor. For example, a difference of 250Pa measured on a DS85 with a range of 0-500 Pa will give an output of 5V DC.

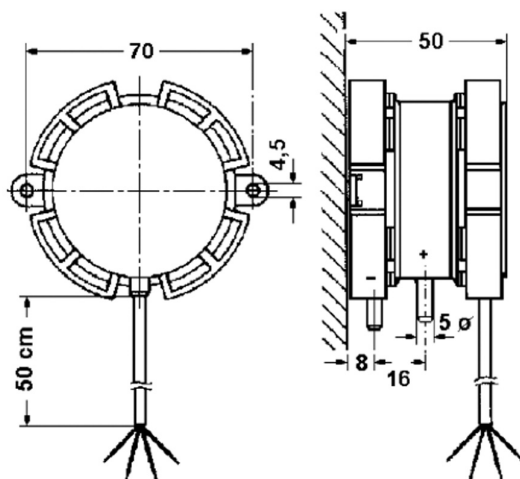
The DS85 can be connected directly to ebm-papst EC centrifugal fans with integrated electronics or suitable controller with a 0-10V input. When used with a special inlet ring incorporating its own pressure tapping a constant air volume system can also be created.

Part Number	Range Pa	Supply Voltage* A	Current mA	Output VDC	Ambient Temperature °C	IP Rating	Weight mm
DS85-50	0-50	24	12	0-10	0... +50	65	0.09
DS85-200	0-200	24	12	0-10	0... +50	65	0.09
DS85-500	0-500	24	12	0-10	0... +50	65	0.09
DS85-1000	0-1000	24	12	0-10	0... +50	65	0.09

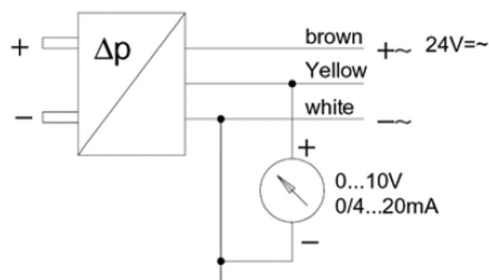
\*Supply voltage range is 15 to 30 V DC or 24V AC +/- 15%

The unit must be mounted vertically. Air connection by plastic hose, internal diameter 4mm.

### Dimensions



### Wiring Diagram



# PT2-25 Refrigerant Pressure Transmitter

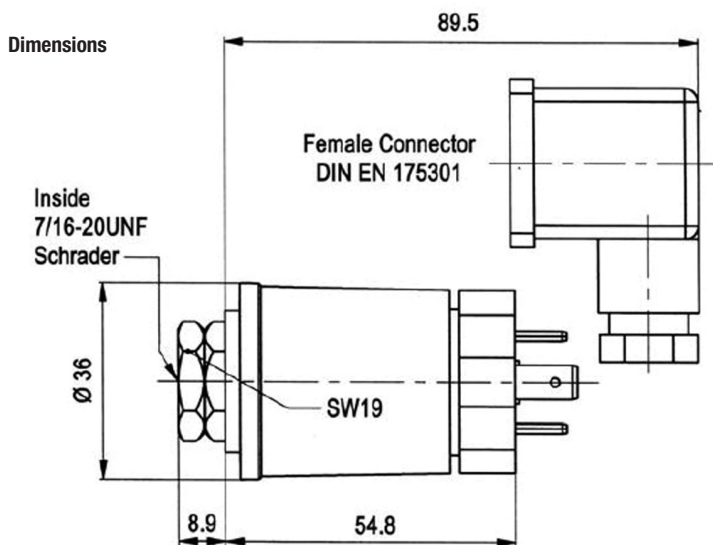
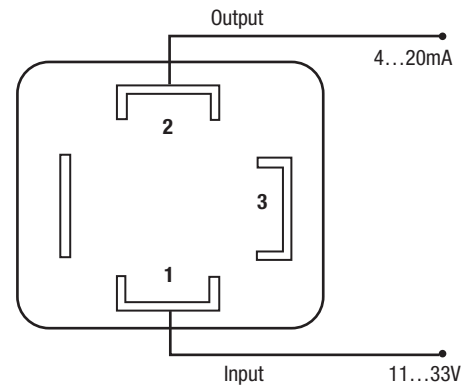
Specially developed for the industrial refrigeration industry, the PT2-25 refrigerant pressure transmitter provides a linear 4 - 20mA output signal proportional to the sensed refrigerant pressure. It is ideally suited for use with ebm-papst EC fans with integrated electronics where it can be connected directly to the fan to provide closed loop speed control. The sensor has a male DIN EN 175301-803-A connection and the mating IP65 female connector can be supplied separately if required.



Part Number	Supply Voltage		Current Draw max	Ambient Temperature	IP Rating	Range
	VDC	mA	°C		Bar	
PT2-25	24	20	-40...+80	65	2-25	
PT2-25-103510	Connector					

- Electrical connection: DIN EN 175301-803-A (2 Wire)
- Refrigeration connection: 7/16-20 UNF Schrader
- Max overload pressure: 75 Bar

## Wiring Diagram



# PVT100

The PVT100 is a negative temperature coefficient device (or NTC) for use with ebm-papst controllers. The device is supplied separately to facilitate a location anywhere within the equipment.



Ambient Temperature

Part Number

°C

PVT100

-40 to +125

- Supplied as a single component
- Accurate over a wide temperature range
- UL recognised
- 100k at 25°C
- Tolerance <+/-3%
- RoHS and WEEE compliant

# Controller Function Cross Reference.

Controller types	Part no.	Controller inputs							
		manual dial	manual switch	0-10V	degC	Pa	bar	Digital inputs	Switch live input
<b>EC-Classic</b>									
Manual 0-10v	RM-ECi	✓							
Manual 0-10v with limits	RM-ECv	✓							
Manual 5 speed steps	RM-ECs		✓						
Manual 0-10v with display	RM-ECd	✓							
EC Temperature controller	CECxxx				✓				
Fan coil controller / monitor	CN1101	✓							
<b>EC-Control</b>									
Bluetooth interface adaptor	21503-1-0174								
USB to RS485 adaptor	21490-1-0174								
Ethernet interface converter	21488-1-0174								
USB Relay box	10450-1-0174								
Handheld interface	VBK-2054	✓							
<b>EC-System</b>									
Temperature control module	50010-1-0174 / 50011-1-0174				✓				
Differential Pressure Controller	DPC200-EPxx					✓		✓	
Pressure sensor regulator	40100-4-7380 / 40101-4-7380	✓					✓		
Pressure Controller	CCC000-AC04-01	✓				✓			
EC Controller	CCC000-AD06-02				✓	✓	✓	✓	
Dual Fan Controller	CN1082	✓	✓					✓	✓
HRU Controller	CN1083	✓	✓		✓			✓	✓
Demand ventilation controller	CN1090	✓	✓	✓		✓		✓	✓
Head pressure controller	CN1089	✓	✓	✓	✓	✓	✓	✓	
<b>DC-Management</b>									
DCP temperature node 4 wire	CPCxxx			✓	✓				
DC temperatire controller 2 wire	CDCxxx				✓				
2 channel alarm interface	RIB102								
2 channel alarm interface	RIB103								
A2P	CPC48VV10UN-100			✓					
TMS	TMSB00000-01		✓	✓	✓			✓	
<b>Accessories</b>									
Air pressure sensor	DS85					✓			
Refrigeration pressure sensor	PT2-25						✓		
NTC thermistor	PVT 100				✓				



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