DC2 T
FCU Controller

D-Series Controls
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The **DC2** is a full featured FCU controller. The DC2 will operate "stand alone" or as an integral part of a Building Management System (BMS). The control parameters, such as damper stroke time, can be set by the BMS and are stored in non volatile memory (EEPROM) to prevent them from being lost when the power is removed. All connections to the DC2 are by means of plug-in screw terminal connectors which provides for quick, convenient installation, commissioning and maintenance. The heater current valve can optionally be upgraded to a 3kW capacity by means of a larger external heat sink.

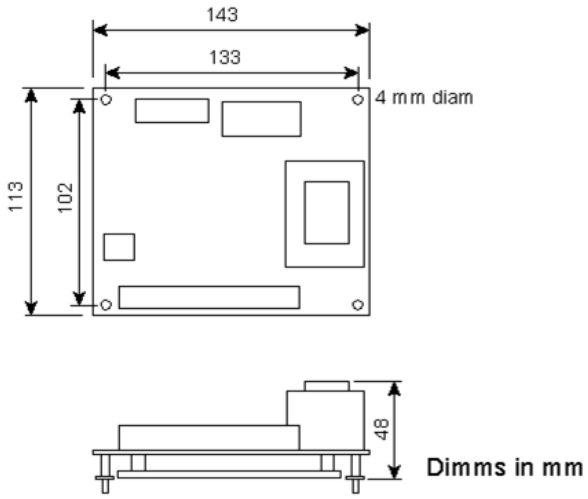
Features

- PI control
- 3 Point valve, pulse proportional valve or 1 step cooling output (24 VAC)
- Pulse proportional 2 kW heater output (Solid state relay)
- Pulse proportional heater control signal (24 VDC for external current valve)
- BMS communications support (Siemens Building Technologies System 600 compatible)
- External "dial" setpoint input
- Load shedding function for maximum demand limiting
- 3 Speed Fan on /off control output
- Fan run proof input
- Heater relay (Safety in case triac fails)
- Second temperature sensor input (Monitor only)
- Built-in 220 to 24 VAC transformer

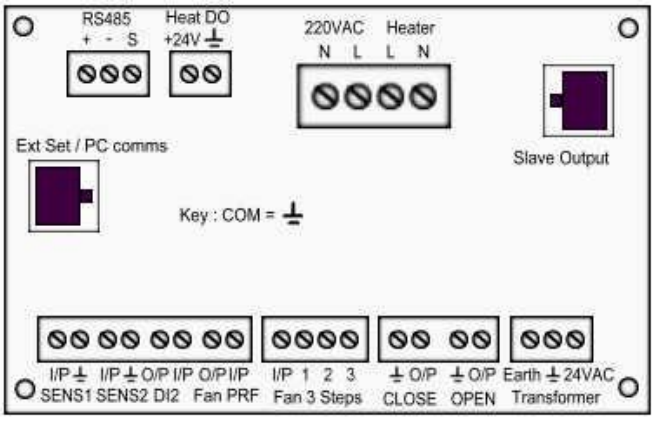
Technical Data

- Operating voltage 220 VAC
- Maximum 24 VAC load 4 VA + Controller consumption
- Temperature sensors
- Sensing elements - NTC thermistors 10k, 52k or 100k
- Temperature range -10 to 50ºC, 0.25ºC Resolution
- External setpoint, Temperature range 18 to 25ºC
- 3 Point valve, pulse proportional valve or 1 step cooling output, 24 VAC, 4 VA
- Pulse proportional heater control output 24 VAC, 3 VA
- 3 Position damper motor stroke period 1 to 255 Secs, 1 Sec Steps
- Pulse proportional heater control period 0.04 to 10 Secs, 0.04 Sec Steps
- Dead zone 0 to 50ºC, 0.25ºC Steps

Dimensions



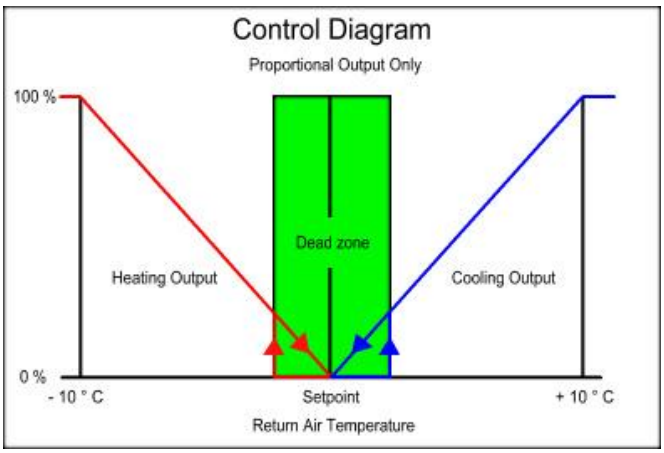
Connections



Control Sequence

When the DC2 is set to DAY mode {29} then the DC2 control functions are active. The selected fan speed {12} output is switched on. Once the fan proof {32} digital input is on then the DC2 will drive the heating / cooling outputs as required.

Once the return air temperature {1} drops below the setpoint {3} by more than the dead zone {9} then the heating mode becomes active. The heating output will start at level calculated by the proportional band which is fixed at 10 º C as shown in the diagram below.



Once the heating mode becomes active the integral component of the output starts to accumulate. This integral component increases (decreases) by a small amount each time the pulse period {10} timer elapses. The actual heating output {6} is the sum of the proportional and integral components. When the setpoint is reached the proportional component will be zero and the actual output will be the integral component only. In the event of an overshoot, where the return air temperature goes above the setpoint, the proportional component will go negative and the integral component will start to slowly decrease. Should the sum of the proportional and the integral components be negative then the actual heating output will be held at zero while the integral component slowly decreases. Once integral component decreases to zero then the heating mode will become inactive.

Once the return air temperature {1} rises above the setpoint {3} by more than the dead zone {9} then the cooling mode becomes active. The cooling mode PI control is the same as the heating mode PI control described above.

If the DC2 is set to NIGHT mode {29} while the heating mode is active then the fan will continue to run for a 3 minute heater cool down period before turning off.

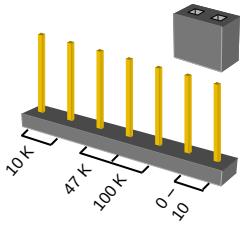
Fan Speed Selection

The fan speed outputs will switch from STEP 1 to STEP 2 to STEP 3 to OFF as the fan speed button is repeatedly pressed. Should the DC2 be in heating mode at the time that the Fan speed OFF is selected then the fan speed will pulse on and off for the 3 minute heater cool down period. The OFF selection can be skipped by a setting in the DC2 configure bits {8}.

Controller Setup

The controllers must each be programmed with an address for BMS operation. The configuration program can be run from any IBM or compatible PC. The controller is connected to the PC serial port by means of the PC configuration cable.

Sensor Type



The sensor type jumper must be set to the type of NTC thermistor that is used. There are 2 sensor type jumper selectors, one for the room temperature sensor and the other for the supply temperature sensor.

DC2 Points list (BMS)

Point	Description	Units	ON / OFF	Slope	Intercept	Type
1	Room Temp	Deg C	ON.OFF	0.25	-10	LAI
2	Monitor Temp	Deg C	ON.OFF	0.25	-10	LAI
3	Setpoint	Deg C	ON.OFF	0.25	-10	LAO
4	Setpoint Dial	Deg C		0.25	-10	LAI
5	Cooling	PCT		0.5	0	LAI
6	Heating	PCT		0.5	0	LAI
7	Min Pos	PCT		0.5	0	LAO
8	Configure	Bits		1	0	LAO
9	Dead Zone	Deg C		0.25	0	LAO
10	Pulse Period	Secs		0.0417	0	LAO
11	3 Point Total	Secs		1	0	LAO
12	Fan Speed	Bits		1	0	LAO
29	DAY.NGT		ON.OFF	1	0	LDO
30	Heat Disable		ON.OFF	1	0	LDI
32	Fan Proof		ON.OFF	1	0	LDI
32	DI 2		ON.OFF	1	0	LDI

DC2 Configure Bits

The configure bits point (number 8) on the BAS system can be used to configure the DC2 controller once it is communicating on the LAN. These are the user changeable settings such as reversing disable.

This number represents 7 separate settings and to calculate the required number for the DC2 setup simply add the equivalent value from the table listed below.

Bit	Description	Value	Comment
0	Day (ON)	0	Use DAY command
0	Night (OFF)	1	Use NIGHT command
1	Use reversing	0	Use with second sensor
1	No reversing	2	
2 & 3	Cooling pulsed output (PWM)	0	
2 & 3	Cooling 1 Step (ON / OFF)	4	
2 & 3	Cooling valve	8	Same as damper but no min
2 & 3	Cooling damper	12	Usual setting
4	Current valve heating	0	Usual setting
4	Contactor heating	16	10 minute cycle (PWM)
5	Cooling [1 to 255] secs	0	
5	Cooling [0.04 to 10.2] secs	32	For very fast acting motors
6	Use OFF with FAN Speed	0	
6	Skip OFF with FAN Speed	64	
7	Use EXT setpoint	0	
7	Ignore Ext setpoint	128	

Typical DC2 Application