

Model aSENSE™ - VAV

carbon dioxide & temperature controller for wall and duct mounting

PRODUCT DESCRIPTION

aSENSE™ - VAV is a microprocessor based controller with built-in sensors for installation in the climate zone or in a ventilation duct. It measures both CO₂ concentration and temperature in the ambient air, transforms the data into analogue and digital output signals, which are used for controlling air supply on demand.

aSENSE™ - VAV is a key component for energy-effective, healthy climate control of rooms with varying numbers of people like schools/nurseries, cinemas/theatres, sports centers etc.



aSENSE™ - VAV-D
aSENSE™ - VAV-D
aSENSE™ - VAV-K-D

FEATURES

- cost-optimized for direct linear control of dampers and speed regulated fans
- alternative /complementary control outputs:2 analogue + 1 relay + 1 open collector (or a third analogue output)
- contributes to lower energy costs when applied in Demand Controlled Ventilation
- internal automatic self diagnostics. Maintenance interval > 5 years
- available for different measurement ranges and with several housing options
- serial communication port for connection to PC, GSM-module or local network
- LonWorks™ digital network communication interface for advanced building automation as an option
- internal 2- or 3-channel logger as option
- RoHS compliant

APPLICATIONS

A common application for aSENSE™ - VAV is controlling ventilation in rooms occupied by people. The sensor is flexible and designed to suit many different ventilation strategies.

According to European building regulations, the fresh air flow should, in rooms where people stay more than occasionally, be at least 7 l/s and person. If the room occupants are adults with a light work-load and the outdoor CO₂ concentration is 350 ppm, this air flow answers directly to an indoor CO₂ concentration of 1 040 ppm.

According to National Boards of Occupational Safety and Health, the CO₂ concentration can therefore be used as an indicator of the Indoor Air Quality (IAQ). A CO₂ concentration below 1 000 ppm should then always be the aim



Model aSENSE™ - VAV

FUNCTIONAL DESCRIPTION ***

aSENSE™ - VAV can be programmed from a PC to perform a variety of control tasks. Any change from the default is programmed from the free software *UIP (version 4.0)*. In the tool box there are 6 programmable P-bands (linear functions) with set points, 2 additional general purpose P-bands, plus 1 timer function, regulator controlled by the DI1 input. In addition, the different regulator blocks may be mixed together using 3 logical multiplexers (4:1). To each of the 4 hardware outputs, the largest value of 4 regulator blocks is transformed to an output signal. The outputs can be limited within defined MIN and MAX values that can be set/updated from the push button menu.

Default settings: OUT1, OUT2 and OUT3 are, by default, pre-programmed *alternative* outputs for demand controlled ventilation. OUT4 is intended for connection to a linear heat activator, if requested.

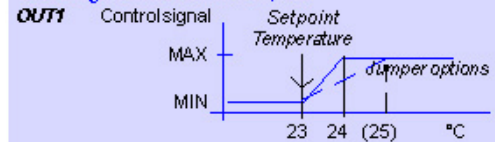
- OUT1 control signal for demand of cooling and air quality (with reduced flow by extreme cold)
- OUT2 control signal for demand of air quality alone
- OUT3 ON/OFF for demand of air quality alone
- OUT4 control signal for heat demand

Set point values of temperature (air cooling and additional heating) and air quality (CO₂), can be adjusted individually by the unit's *maintenance push buttons*. The different functions with associated outputs are seen to the right. When a set point value is changed, the control curves of that parameter are parallel displaced!

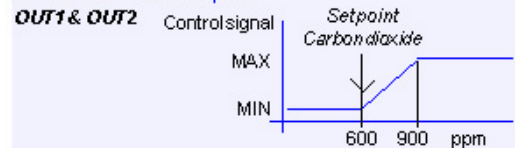
PUSH BUTTON FUNCTIONS

Two push buttons are used for service and setting of parameters. The push buttons give access to functions according to the table. In "display mode", the user cannot change the settings - only change the display presentation. The "service mode" is reached by a PIN code push button sequence.

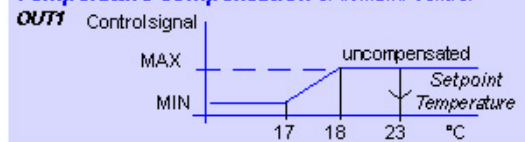
Cooling demand with set point



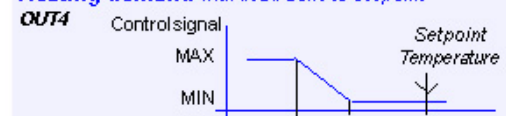
Air demand with set point



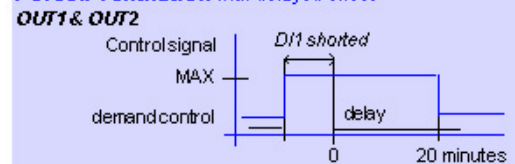
Temperature compensation of demand control



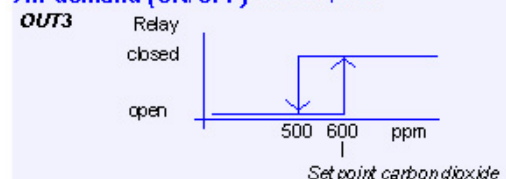
Heating demand with dead zone to set point



Forced ventilation with delayed effect



Air demand (ON/OFF) with set point



*** Functional description in detailed block diagram form, installation manuals etc, are available on the Internet!

function	display	description
Default mode	temperature / CO ₂	Present values (alternating)
Status info	diagnostic code	
Parameter info	present set point	Information after push button press
Service mode		
Increase/decrease temp.	temp. set point	Push button +/-
Increase/decrease CO ₂	CO ₂ setpoint	Push button +/-
Select output	OUT1 – OUT4	Address output for temporary work
Increase/decrease MIN limit	SEtL	Puts selected output in MIN position
	MIN limit (%)	Push button +/- gives new MIN limit
Increase/decrease MAX limit	SEtH	Puts selected output in MAX position
	MAX limit (%)	Push button +/- gives new MAX limit
Calibration of CO ₂ sensor	bCAL	Calibration with fresh air
	CAL	Calibration with zero gas (art.No F0005)



aSENSE™ - VAV Technical Specification

General Performance

Compliance with	EMC directive 89/336/EEC RoHS directive 2002/95/EG
Operating Temperature Range ¹	0 - 50 °C
Storage Temperature Range	-20 to +70 °C
Operating Humidity Range	0 to 95% RH (non-condensing)
Warm-up Time	≤ 1 min. (@ full specs ≤ 15 minutes)
Sensor Life Expectancy	> 15 years
Maintenance Interval	no maintenance required ^{2,4}
Self Diagnostics	complete function check of the sensor
Status LED Indicators	yellow = maintenance support, red = relay closed
Display	4 Digits, 7 segments LCD with ppm / °C / % indicator
Pushbuttons ⁵	offer a selection of installation support, calibration and operation functions

Electrical/Mechanical

Power Input	24 VAC/VDC±20%, 50-60 Hz (half-wave rectifier input)
Power Consumption	≤ 3 Watts average ²
Wiring Connections	max 1,5 mm wires
Main terminal block	screw terminals
Digital/Analog inputs block	spring load terminals
UART connector	5-pin, 2.54 mm pitch, slide connector
Dimensions without housing	9.7 x 6.1 x 1.9 cm (L x W x D)

Outputs

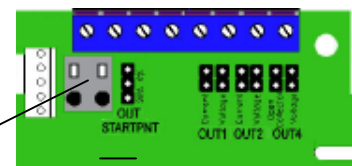
Analog ⁶	
Protection	PTC fuse (auto reset) on signal return <i>M</i> , short-circuit safe
Output limits	MIN & MAX limits may be individually set to all outputs
Linear outputs OUT1 & OUT2	0/2-10 VDC $R_{OUT} < 100 \text{ OHM}$, $R_{load} > 5k \text{ OHM}$ (0/1-5 VDC optional) 0/4-20 mA $R_{load} < 500 \text{ OHM}$
Linear output OUT4	0-10 VDC $R_{OUT} < 100 \text{ OHM}$, $R_{load} > 5k \text{ OHM}$
D/A Resolution	10 bits, 10 mV / 0.016 mA
D/A Conversion Accuracy	voltage mode: ± 2% of reading ± 50 mV current loop : ± 2% of reading ± 0.3 mA
ON/OFF	
Relay (OUT3)	isolated N.O., 1mA/5V up to 1A/50VAC/24VDC.
Open collector OUT4	in ON/OFF mode: max 0.5A/55VDC (halfwave rectifier for AC)
UART Serial com port	
Protocol	SenseAir protocol (see <i>comprot 0700xx rev 3_04.pdf</i>) ⁸
PC-interface	RS232 UART cable with sliding contact and driver (model <i>A232 Cable</i>)
PC User Interface Program	UIP version 4.0 (or higher) ⁷
RS485 network com.	(accessory <i>-485</i>) RS485 terminal slide-on port, network capabilities up to 30 units
LonWorks™ network com.	(accessory <i>-LON</i>) LonWorks™ add-on PCB

Inputs

Extra terminal:

9,10 DI1 switch input to delay timer & regulators

switch input for forced ventilation or regulator selection



- Note 1:** Lower temperature operation range can be reached by adding a box heater assembly.
- Note 2:** In normal IAQ applications. Some industrial applications may require an annual zero gas purge, which automatically recalibrates the CO₂ sensor
- Note 4:** For *-RH* models, in applications with elevated temperatures and high humidity levels the relative humidity probe calibration may have to be maintained.
- Note 5:** Different menus exist for different models. Push-buttons are available only in models having a LCD.
- Note 6:** The specifications are valid for the output load connected to ground *G0* or common signal return *M*.
- Note 7:** Free download from SenseAir's home page www.senseair.com
- Note 8:** For more information, please contact SenseAir AB



CO₂ Measurement

Operating Principle Non-dispersive infrared (NDIR) with Automatic Baseline Correction (ABC)⁸
 Gas Sampling Mode diffusion
 Response Time (T_{1/e}) 2 min. diffusion time (20 sec. with tube connection at 0.1 litre/minute gas flow)
 Accuracy⁹ ± 1% of measurement range ± 5 % of measured value
 Pressure Dependence + 1.58 % reading per kPa deviation from normal pressure, 100 kPa
 Annual Zero Drift⁹ < ±0.3 % of measurement range

Models - Measurement ranges

Model – option code	Sensor type	Measurement range	+/- accuracy	Digital output range	Digital resolution	Factory calibration span gas (typical)
none	L	0 - 3000 ppm	30 ppm + 5 % rel.	0 - 9999 ppm	1 ppm	1700 ppm
-0.6 %	L	0 - 6000 ppm	60 ppm + 5 % rel.	0 - 9999 ppm	1 ppm	5000 ppm
-10 % *	H	0 - 10 % vol. *	0.1 % vol. + 5% rel.	0 - 100 % vol.	0.01 % vol.	8 % vol.

* available in IP54 wall and IP65 duct housing only

Temperature Measurement

Operating Principle Thermistor
 Measurement Range -20 to +60 °C
 Accuracy ± 0.5 °C
 Digital Resolution 0.1 °C (0.01 °C via UART)

Relative Humidity Measurement (model options -RH)

Operating Principle capacitive polymer in a monolithic IC
 Measurement Range¹⁰ 0 to 100 % RH
 Accuracy ± 2 % RH
 Digital Resolution 0.1 %RH (0.01 %RH via UART)

Note 8: The ABC function is the key for maintenance free operation. It assumes normal IAQ environments, or applications where *some* ventilation will occur (at least during *some* moment over a week period). For CO₂ sensors this function automatically corrects for any possible zero drift

Note 9: In normal indoor air environment. Accuracy is defined at continuous operation (3 weeks minimum after installation)

Note 10: Extended exposure to > 90 % RH causes reversible shift of 3 %.

Note 11: In normal IAQ applications.

Address: SenseAir AB, Box 96, SE-820 60 Delsbo, Sweden
 Phone: +46-(0)653-71 77 70 · Fax: +46-(0)653-71 77 89
 E-mail: senseair@senseair.se · Home page:
www.senseair.com

