

Product Specification

SenseAir[®] *S8-PWM*

Miniature CO2 sensor safety switch

SenseAir[®] S8 Miniature infrared CO₂ sensor module

**Warning! ESD
sensitive device!**



Figure 1: **SenseAir[®] S8** Article no. 004-0-0054

General

The **SenseAir[®] S8-PWM** article number 004-0-0054, CO₂ sensor module is designed to be built-in into stationary ventilation equipment, such as window vent or duct exhaust actuators, serving as a linear transmitter of CO₂. The sensor utilizes reliable and highly accurate infrared gas sensing technology.

SenseAir[®] S8-PWM functional description

During normal operation, the sensor module measures ambient gas CO₂ concentrations at two seconds intervals. Measured CO₂ concentration is filtered and is transmitted to the PWM Output. The PWM Output continues to keep the last valid value in the case of measurement fault detected.

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Item	<i>SenseAir[®] S8-PWM</i>										
Target gas	CO2										
Operating Principle	Non-dispersive infrared (NDIR)										
Measurement range	350 to 2000 ppm (Note 1). Up to 10000ppm extended range (Note 2)										
Measurement interval	2 seconds										
Accuracy	±75ppm ±3% of reading (Notes 3 and 4)										
Pressure dependence	+ 1.6 % reading per kPa deviation from normal pressure										
Gas diffusion response time	2 minutes by 90%										
Operating temperature	5° to 30° C										
Operating humidity range	0 to 85% RH non condensed										
Storage temperature	-40° to +70°C										
Storage Environment	0-95% RH non condensed non corrosive gases										
Dimensions (mm)	61 x 20 x 8.5 mm (max dimensions)										
Weight	< 10 grams										
Power supply	4.5 to 7.0 VDC unprotected against surges and reverse connection										
Power consumption	300 mA peak, 30 mA average										
Life expectancy	5+ years in normal indoor / office environments										
Compliance with	Tested according Emission: EN 61000-6-3:2007, EN 61000-6-4:2007 Immunity: EN 61000-6-1:2007 RoHS directive 2011/65/EU										
PWM Output, Open Drain	Open drain FET; 7V/ 800mA, protected by a zener diode, 10kΩ pull-up resistor to power (+). <table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">Minimum output concentration</td> <td>350 ppm</td> </tr> <tr> <td>Output cycle period</td> <td>1004ms</td> </tr> <tr> <td>Output high level min duration</td> <td>177.0ms (@ 350 ppm)</td> </tr> <tr> <td>Output high level max duration</td> <td>1002ms (@ 2000 ppm)</td> </tr> <tr> <td>Resolution</td> <td>0.5ms (@ 1 ppm)</td> </tr> </table>	Minimum output concentration	350 ppm	Output cycle period	1004ms	Output high level min duration	177.0ms (@ 350 ppm)	Output high level max duration	1002ms (@ 2000 ppm)	Resolution	0.5ms (@ 1 ppm)
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Output high level max duration	1002ms (@ 2000 ppm)										
Resolution	0.5ms (@ 1 ppm)										
Maintenance	Forced calibration (assuming 400 ppm exposure).										
Self-diagnostics	Full self-diagnostics at power up and continuously running self-diagnostics at every measurement.										

Table 1: Key technical specification for the *SenseAir[®] S8-PWM*

Note 1: Accuracy is specified over operating temperature range. Specification is referenced to certified calibration mixtures. Uncertainty of calibration gas mixtures (+/-2% currently) is to be added to the specified accuracy for absolute measurements.

Absolute maximum ratings

Stress greater than those listed in Table III may cause permanent damage to the device. These ratings are stress ratings only. Operation of the device at any condition outside those indicated in the operational section of these specifications is not implied. Exposure to absolute maximum rating for extended periods may affect device reliability.

Parameter	Minimum	Maximum	Units	Notes
Ambient temperature under bias	- 40	85	C	
Voltage on G+ pin with respect to G0 pin	- 0.3	12	V	1
Maximum voltage on Calibration restore switch(S1) and (S2) inputs	- 0.3	3.8	V	1
Maximum voltage on PWM Output	- 0.3	G+ + 0.5	V	1,2

Table 2: Absolute maximum ratings specification for the *SenseAir® S8-PWM*

Note 1: Specified parameter relies on specification of subcontractor and is not tested by SenseAir

Note 2: OUT1 (PWM Output) pin is internally pulled up to G+. External pull up to higher voltage will provide resistive divider powering sensor via high resistance.

Gas diffusion area

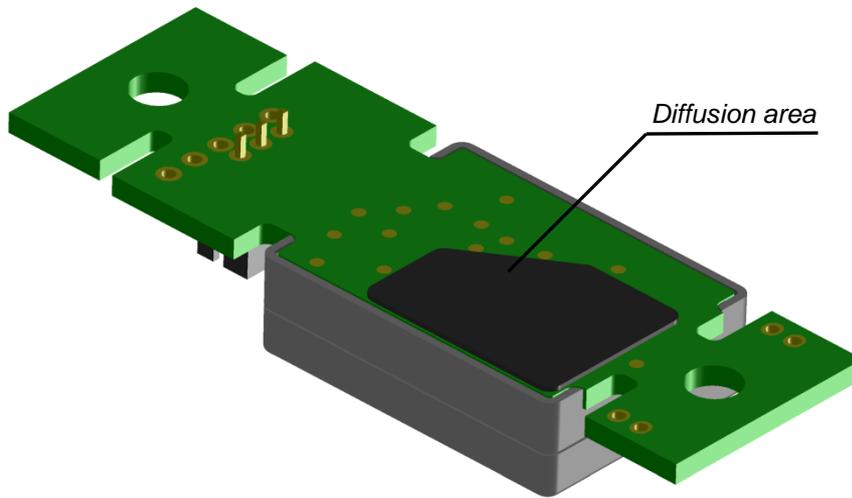


Figure 2: Gas diffusion area *SenseAir[®] S8-PWM*

Pin assignment

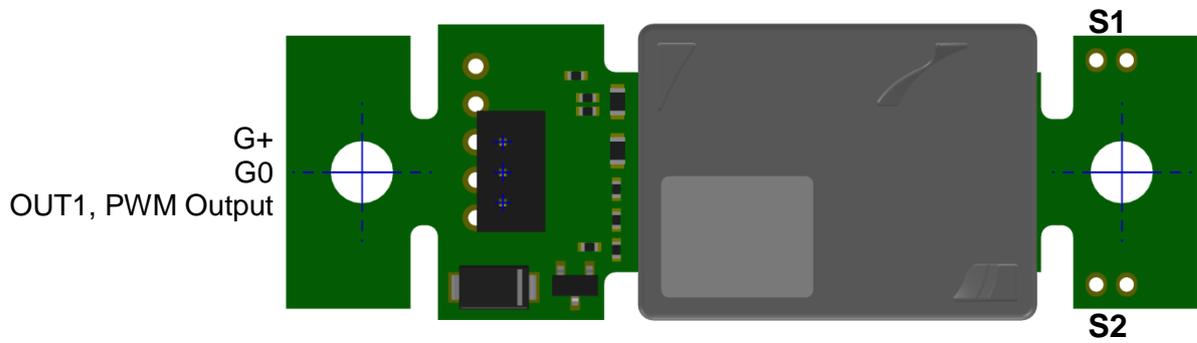
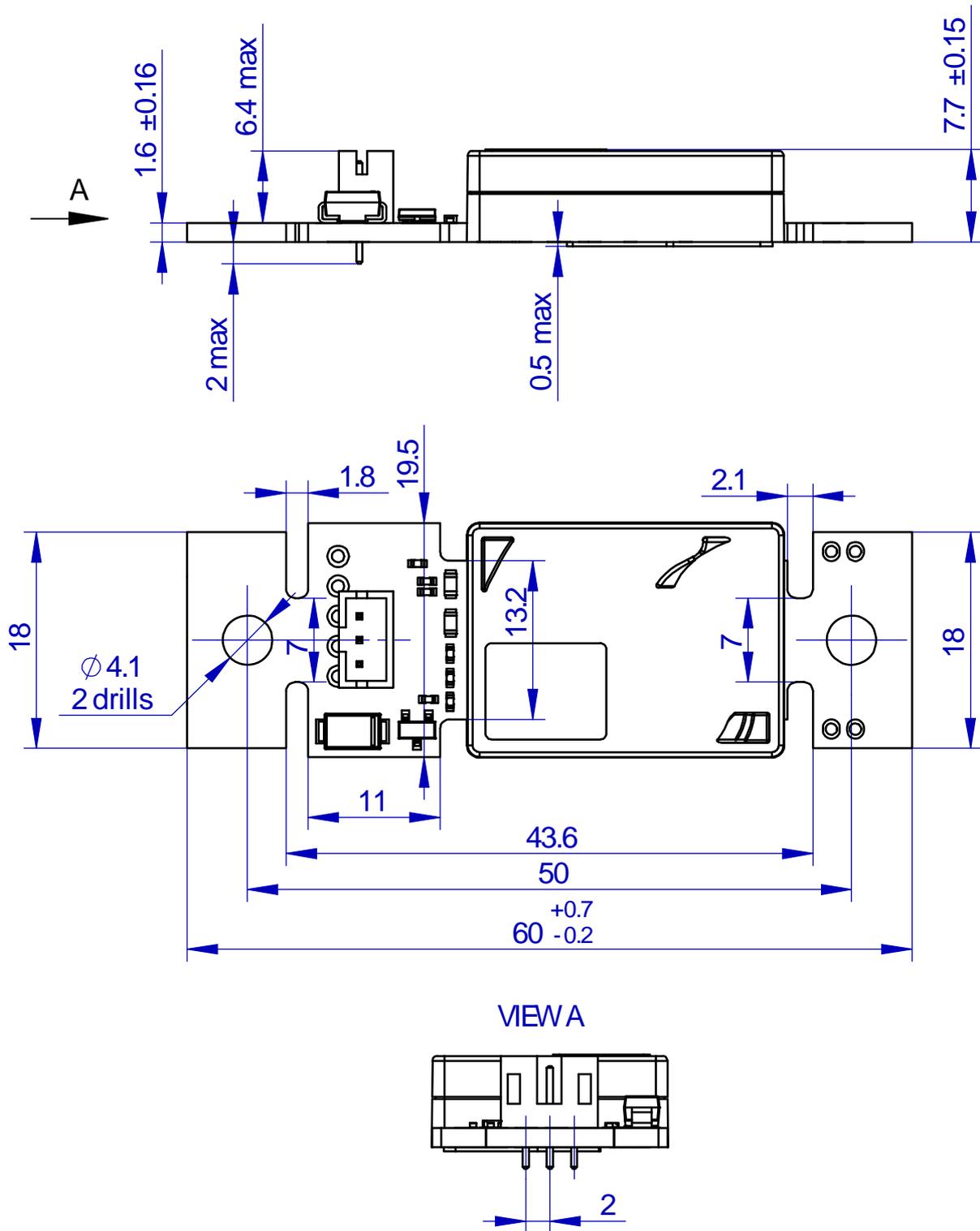


Figure 3: Pin assignment *SenseAir[®] S8-PWM*

8. General PCB overview



Note: unspecified tolerances are ±0.1 mm

Figure 3a. Mechanical drawing *SenseAir® S8-4B*.

Terminals description

The table below specifies terminals and I/O options of the *SenseAir® S8-PWM*

The *SenseAir® S8-PWM* is equipped with a 3-pin connector (G+, G0, PWM Output). Part number of the connector is B3B-PH-SM4-TB, manufacturer JST (www.jst.com).

Pin Function	Pin description / Parameter description	Electrical specification
Power supply		
G+	Power supply positive terminal.	Unprotected against reverse connection!
G0	Power supply negative terminal. Sensor's reference (ground) terminal.	Unprotected against reverse connection!
Outputs		
OUT1, PWM Output	Open Drain FET transistor switch output. Internal protection. Absolute max voltage range(Note 1) Internal pull up to G+ resistor Max sink current (Note 1)	G0 - 0.3V to G+ + 0.5V 10k 800mA
Jumpers		
Calibration restore switch (S1)	Digital input forcing background calibration. Background calibration is activated when closed for minimum 30 seconds assuming 400 ppm CO2 sensor exposure. Calibration occurs every 30 seconds during switch grounding (Note 2) Absolute max voltage range(Note 1) Internal pull up resistor Input low level (Note 1) Input high level (Note 1)	No internal protection, Internal pull-up to 3.3V at processor reset (power up and power down) - 0.3V to 3.8V 120K - 0.3V to 0.75V 2.3V to 3.6V

Table 3: I/O notations, description and electrical specification

Note 1: Specified parameter relies on specification of subcontractor and is not tested by SenseAir.

Note 2: Do not ground S1 input for a long time. FLASH resource will be exhausted in 3.5 months in case of permanent S1 grounding.

Mechanical properties

Sensor PCB may be colour green or black. Optical bench assembly (OBA) may be colour silver or black.

Please refer to mechanical drawing for detailed specification of dimensions and tolerances.

WARNING!

Under no circumstances should any force be applied to the OBA, this may permanently harm the sensor and most definitely affect performance.

Sensor should be handled holding PCB only. Never touch sensor with bare hands, make sure that operators use ESD gloves.

Note! ESD sensitive device!

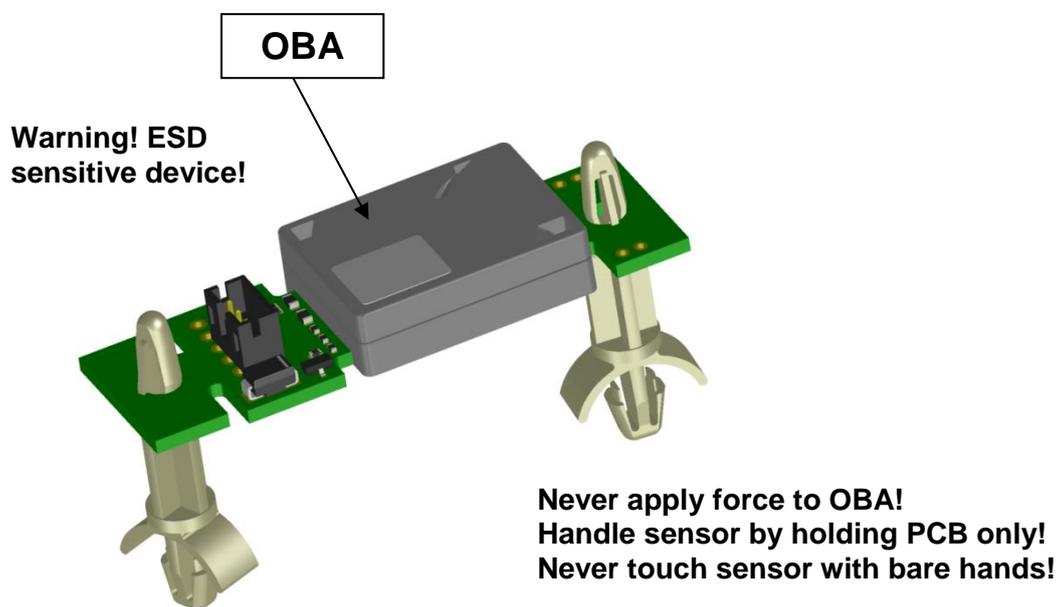


Figure 4: Mechanical properties *SenseAir*[®] *S8-PWM* Article No 004-0-0054

Installation and soldering

During installation and assembly of sensor to PCB it is essential that compatible materials are used and that soldering process is managed. Avoid introduction of stress to the sensor's PCB or OBA. SenseAir recommends hand soldering only.

NB! Transport, handling and assembly may affect calibration. If for some reason the sensor needs to be re-calibrated, please refer to paragraph Maintenance.

Please, contact SenseAir for further information!

Maintenance

Calibration switch S1

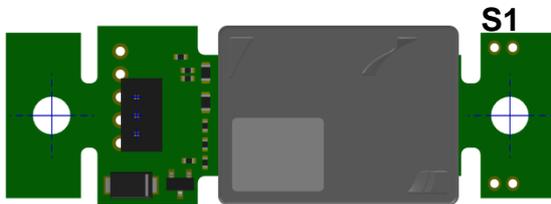


Figure 5: Position of calibration switch S1

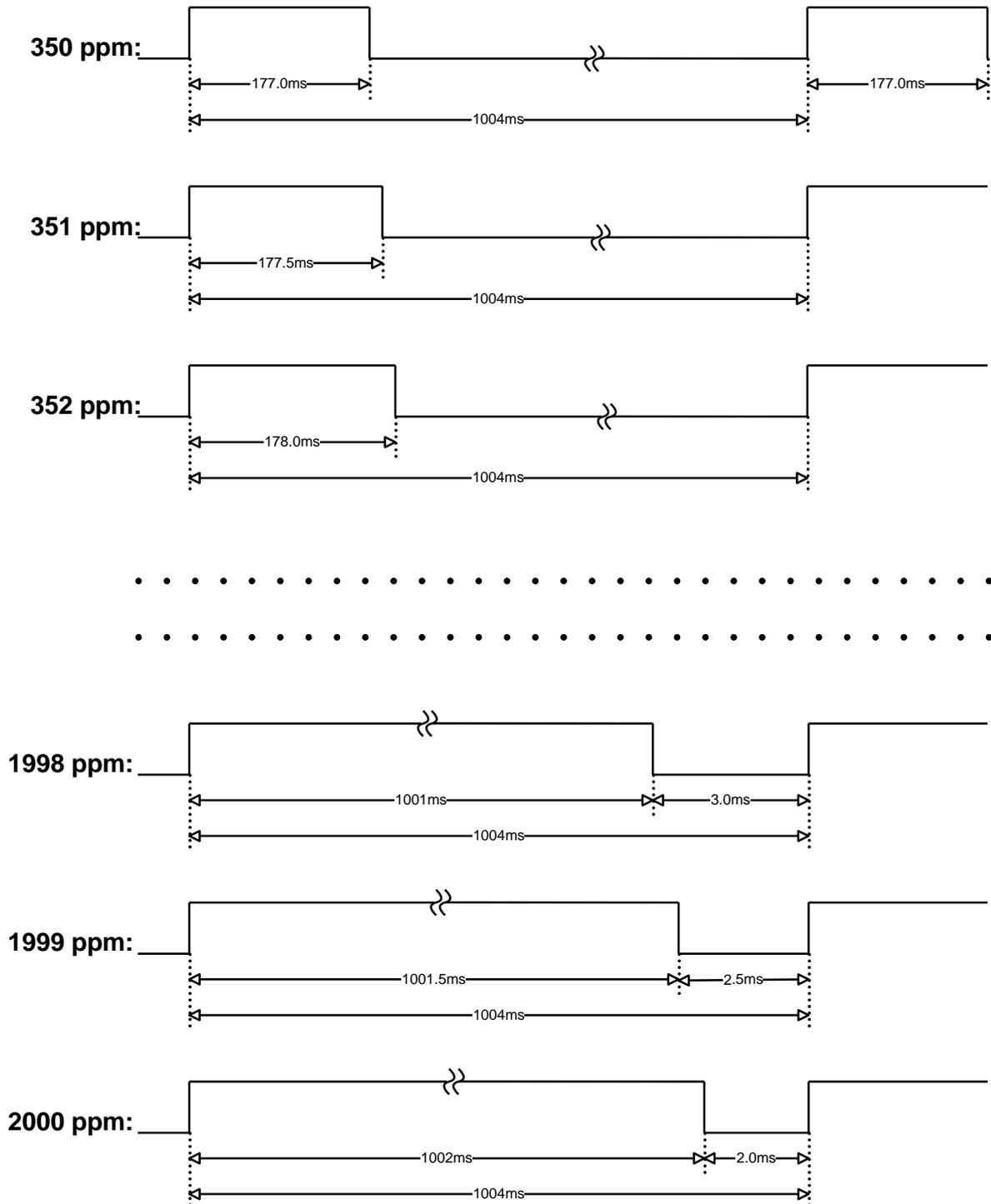
If for some reason the sensor needs to be re-calibrated, this is possible to do by a qualified operator, provided that the sensor is exposed to fresh air during the whole process (~400 ppm CO₂).

The process is actuated by creating an electrical short-cut between the two holes labelled S1. As soon as the micro-controller detects this manually shorted switch terminal S1, calibration is restored to fresh air concentration value.

The delay between the shorting of the switch contact S1 and the actual calibration may be up to 30 seconds.

If the operator keeps the sensor with S1 closed for some period of time, the sensor will continue to recalibrate fresh air concentration target value every 30 seconds, until the switch is released.

Sensor PWM output timing diagram



SenseAir® AB

Box 96
Stationsgatan 12
SE- 82060 Delsbo
Sweden

Phone: +46(0)653 – 71 77 70
Fax: +46(0)653 – 71 77 89
E-mail: info@senseair.com
Web page: www.senseair.com

**Beijing DiHui Technology
Co.Ltd**

Room 1706.Building1.
BiXing Garden
Luozhuangxili,Zhichun Road
Haidian district,Beijing
China

Mobile: 13520502013
Phone: +86-(0)10-517 366 16
Fax:+86-(0)10-517 366 16-805
E-mail: dihuitech@126.com
Webpage:www.dihuitech.net