Air Lab&PM2.5 Particle Sensor

Description

The air lab & PM2.5 particle sensors are specifically designed to monitor and air pollution in offices and other indoor spaces. The sensors complement applications for a healthy indoor climate. ModBus RTU&TCP/IP, BACnet MSTP&IP for direct digital reading on all models.

Highlights

- Accurate : Laser scatter method, particles are sized with a resolution of 0.3 $\mu\text{m}.$

- User defined sampling period prolongs sensor life.
- Fast Response : response time less than 10 seconds.
- Real-time display monitoring data on LCD .
- Supports ModBus TCP/IP & BACnet IP protocol over WIFI.
- Supports ModBus RTU & BACnet MSTP protocol over RS485.
- TVOC sensor can detect Glycerin (Vaping smoke).

Specifications

General								
Power		15-24V +/- 10%, AC or DC,3VA@24VAC						
Display Re	solution	130x80 d	130x80 dot matrix, backlit					
Temperatu	re Limt	-20~+50	°C, 0~95% RH(Non condensing)					
Plastic Ho	using	Flammat	pility rating UL 94 file E56070					
Particulate	Matter Sensor Life time	8 years o	continuous, adjustable to decades i	ntermittent				
Wifi		2.4G , 80)2.11 b/g/n					
		ModBus	TCP/IP & BACnet IP protocol over	WIFI				
Communio	ations	ModBus	RTU & BACnet MSTP protocol ove	r RS485,RS485				
		Baudrate	2:9600,19200,38400,57600,115200	,76800				
	Mass concentration range		0 to 100 ug/m ³					
			PM1.0	0.3 to1.0um				
			PM2.5	0.3 to2.5um				
	Mass concentration size ra	inge	PM4	0.3 to4.0um				
			PM10	0.3 to10.0um				
			PM0.5	0.3 to 0.5um				
			PM1.0	0.3 to 1.0um				
Range	Number concentration size	range	PM2.5	0.3 to 2.5um				
			PM4	0.3 to 4.0um				
			PM10 0.3 to10.					
	Number concentration rang	ge	0 to 3000 1/cm ³					
	Relative Humidity		0~100% non condensing					
	Temperature		-30~70°C (-22~158 °F)					
	CO2		0-40000PPM					
Accuracy	PM0.5 PM1 PM2.5 PM4	PM10	0 to 100 ug/m ³ 100 to 1000 ug/m ³					
	Relative Humidity		5%RH (25 ℃,20-80%,RH) 1					



	Temperature	<±0.5℃@25℃
Accuracy	CO2	±70PPM OR ±5% of reading
	Relative Humidity	<10s(25°C,in slow air)
Response-	Temperature	<10s
Time	CO2	20s
	PM0.5 PM1 PM2.5 PM4 PM10	<8s

AQI levels as defined by the China Ministry of Environmental Protection

Air Quality Index	Air Pollution Level	PM2.5	PM10		
		24hr avg(ug/m ³)	24hr avg(ug/m³)		
0~50	Good	0~35	0~50		
50~100	Moderate	35~75	50~150		
100~150	Unhealthy for Sensitive Groups	75~115	150~250		
150~200	Unhealthy	115~150	250~350		
200~300	Very Unhealthy	150~250	350~420		
>300			>420		

AQI levels as defined by the US Environmental Protection Agency

Air Quality Index	Air Pollution Level	PM2.5	PM10	
		24hr avg(ug/m³)	24hr avg(ug/m ³)	
0~50	Good	0~12	0~54	
51~100	Moderate	12.1~35.4	55~154	
101~150	Unhealthy for Sensitive Groups	35.5~55.4	155~254	
151~200	Unhealthy	65.5~150.4	255~354	
201~300	Very Unhealthy	150.5~250.4	355~424	
301~500		250.5~500.4		

Total volatile organic compounds (TVOC) and why this quantity is related to indoor air quality (IAQ) and the so called IAQ levels. Since Sensirion's SGP gas sensor is responsive to a broad range of volatile organic compounds (VOC) and other gases relevant for indoor air quality, the

present gas sensing technology is well suited for monitoring TVOC concentrations and for translating those into IAQ levels. In order to meet Sensirion's high quality standards, each SGP sensor is production calibrated.

TVOC (= Total Volatile Organic Compounds) corresponds to the sum of volatile organic co pounds (VOC1). The sum of VOC concentrations, or simply TVOC2, is used as an indication for VOC contamination. VOC contamination is an established concept in regulatory and scientific literature. Note that the specific TVOC composition varies between different ambient indoor environments and indoor air is always composed of different volatile organic substances3. Therefore, it is helpful to consider TVOC concentrations as statistical reference values which help to indicate indoor air quality

How many Airlabs do I need for your building? There are two main air quality standards in the industry known as WELL and RESET. The WELL standard suggests one air particle sensor per 325m2 and at least one per floor. The RESET standard suggests one air particle sensor every 500m2 of building space

Indoor air quality(IAQ)Levels and how they are related to Tvoc Concentration

Level	Hygienic Rating	Recommendation	TVOC (mg/m ³)	TVOC (ppb) ⁸		
5 Unhealty	Situation not acceptable	Intense Ventilation necessary	10-25	2200-5500		
4 Poor	Major objections	Intensified Ventilation/ airing necessary	3-10	660-5500		
3 Moderate	Some objections	Intensified Ventilation recommended	1-3	220-660		
2 Good	No relevant objections	Ventilation/airing recommended	>0.3-1	65-220		
1 Excellent	No objections	Target Value	<0.3	0-65		

Indoor air quality Levels for Europe according to WHO

Level	Recommendation	TVOC (mg/m ³)	TVOC (ppb) [®]
Outside quality classes	Greatly increased (not acceptable)	>3.0	>610
4	Significantly increased Only temporary exposure	1.0-3.0	200-610
3	Slightly increased (harmless)	0.5-1.0	100-200
2	Average(harmless)	0.25-0.5	50-100
1	Target value	>0.25	0-50

IAQ Performance Targets for ambient Tvoc Conerntration Expressed in mass concentration (ug/m³)

TVOC concentration regarding RESET target	(ug/m ³)	(ppb) ^s		
Acceptable	<500	<250		
High Performance	<400	<200		

Maximum Average TVOC Concentration according to LEED Standard for Green Buildings

Green building standard LEED	(ug/m ³)	(ppb) ⁸		
TVOC limit	<500	<250		

Wiring Diagram



Part Number Scheme



Dimensions



Mounting Installation

1.Slotted Screwdriver

2.Unfasten screw at cover

3.Install screws as shown

4.Installing the rear panel





T3000 Building System 1.Connect AirLab to PC by RS485, start T3000 software

T3000 Building Automation System May 22 2020 . 0	9		Cli	ck to San		
File Tools View Database Control Miscellaneous H	Help					
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Default_Building->Default_Building 🛛 🕈 🛛 🗙	T3000 Scar T3000 is	nning scanning, pl	ease wait.	Ar 1		
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	Ethernet Sca	Einished	12	Network scan finished		
	COM2 96	00 Detecting	0	Automatic detection, please wait!		
	COM2 19	200 Detecting	0	Automatic detecting ,please wait	-	
	COM2 38	400 Detecting	0	Automatic detecting , please wait!	=	
	COM2 57	600 Detecting	0	Automatic detecting ,please wait!		
	COM2 76	800 Detecting	0	Automatic detecting ,please wait!		
	COM2 115	200 Detecting	0	Automatic detecting ,please wait!		
	COM10 9	600 Detecting	0	Automatic detecting ,please wait!		
	COM10 19	200 Detecting	0	Automatic detecting ,please wait!		
	COM10 38	400 Detecting	0	Automatic detecting ,please wait!		
	COM10 57	600 Detecting	0	Automatic detecting ,please wait!		
	COM10 76	800 Detecting	0	Automatic detecting ,please wait!		
	COM10 11	5200 Detecting	0	Automatic detecting ,please wait!		
	Bacnet MS	TP Wait	0			

2. Click AirLab log, then you can see a tab below about AQI Region and AQI detial.

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Default_Building -> Default_Building -> P ×						
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_ab Log 🔤 🛋 AirLab	30.9	10	Г			
FANDU_BB_IP109		VOC:	Sound intensity	dBA	AQI	
FanDu_ISP_BB_108	Deg.C				AQI Value : 124	
FANDU_LB_IP101	_	Temperature Unit				1
FanduBB95		Deg.C Deg.F	CO2 PPM :	553	AQI Level : 3	
FanduT3LB_IP99						K
FanduT3NB_IP93					AQI Region USA	-
FanduTB97	Suspended Particles	5			USA	
× CO2 Node:122243					Custom Averag China	3)
CO2 Node:123150	Weight	t (ug/m3 PM Index (Par	icles / cm3 PM Se	nsor On Time (s)	Custom	
× CO2 Node:125101 =	PM1.0 :	42 288			Level 1 threshold value :	
CO2 Node:126553	1				Level 2 threshold value .	35
Humdity	PM2.5 :	3 47	PM Se	nsor Off Time (s)		
Outside weather	1				Level 3 threshold value :	55
PWMIEST_IP89	PM4.0 -	- 2	C02 S	ensor On Time (s)		
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T3 NB 91	- mio.		CO2 5	ensor Off Time (s)	Level 5 threshold value :	250
MSTP:	T-1-1	45 338				
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T3 NB IP92					AQI Detial	Done
T2-1 P-ID/2						

The PM2.5 index grade corresponding to the average daily concentration										
Ανε	erage daily concentr	ration(ug/m³)	Air quality rating							
Custom	China	USA	China	USA						
0-0	0-35	0-12	Level 1	Good						
0-35	35-75	12-35	Level 2	Medium						
35-55	75-115	35-55	Level 3	Unhealthy for Sensitive groups						
55-150	115-150	55-150	Level 4	Unhealthy						
150-250	150-250	150-250	Level 5	Very Unhealthy						
250-500	250-500	250-500	Level 6	Poisonous						

3. Click to do settings, you can see a tab below about parameter.

File Tools Yiew Database Control Miscellaneous Help Image: Specific Control Image:	Toolo building Automation System - May 22 202	0.05														
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Default_Building < 2 ×	🛔 🕗 🤄 🌑 🚍 🐨				â 🖣	۲	۹ 🛛									
Default Building Input Pa_ Full Label Auto/Man. Value Units Range Calibrail. Sign Filter Status Signal Type Label Type Imput Pa_ Full Label Auto/Man. Value Units Range Calibrail. Sign Filter Status Signal Type Label Type Imput Pa_ Full Label Humidity 5270 0.0 • 5 HUM Internal Imput Pa_ AirLab Imput Pa_ Fall Humidity 5270 0.0 • 5 CO2 Internal Imput Pa_ AirLab Imput Pa_ Fall AirCab 0.0 • 5 VOC_m Internal Insi VOC sensition 4.00 0.0 • 5 VOC_m Internal Insi VOC sensition 4.00 0.00 • 5 VOC_m Internal Insi PM25 in ug/m3 0.00 0.00 • 5 PM10_m	Default_Building->Default_Building 🛛 🔫 🖡 🗙	🕂 IN	IPUT													
Image: Construction of the second s	🖃 🛶 🔓 Default_Building	Input	Pa	Full Label	Auto/Man	Value	Units	Range	Calibrati	Sign	Filter	Status	Signal Type	Label	Туре	
No N2 1 Humidity 5270 % 0.0 + 5 HUM Internal AirLab IN3 1 CO2 586.00 9PM 0.0 + 5 CO2 Internal	🖶 🛁 Local Network	IN1	1	Temperatrue		30.20		_	0.0	+	5			TEM	Internal	
AirLab N3 1 CO2 5600 PPM 0.0 + 5 CO2 Internal	× 🖦 @E ?	IN2	1	Humidity		52.70	%		0.0	+	5			HUM	Internal	
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X AirLab IN7 1 PM10 in ug/m3 0.00 0.00 + 5 PM10_w Internal	AllLab	IN6	1	PM2.5 in ug/m3		43.00			0.0	+	5			PM2.5_w	Internal	
Image: FANDU_BB_JP109 IN8 1 PM25_particle 32800 0.0 + 5 PM25_n Internal	× 📱 AirLab	IN7	1	PM10 in ug/m3		0.00			0.0	+	5			PM10_w	Internal	
	FANDU_BB_IP109	IN8	1	PM2.5 particle		328.00			0.0	+	5			PM2.5_n	Internal	
I FANDULB JP101 IN10 1 Sound Level 0.00 0.0 + 5 SOUND Internal W11 1 Light Strength 0.00 0.0 + 5 LIGHT Internal W11 1 Light Strength 0.00 0.0 + 5 LIGHT Internal		IN9	1	PM10 particle		0.00			0.0	+	5			PM10_n	Internal	
Virtual Strength 0.00 0.0 + 5 LIGHT Internal	EANDULE BIDIO	IN10	1	Sound Level		0.00			0.0	+	5			SOUND	Internal	
X Faudrickabo Internal		IN11	1	Light Strength		0.00			0.0	+	5			LIGHT	Internal	
	FanduBB95	IN12	1			0.00					0				Internal	

Wifi Set Up

Visit https://temcocontrols.com/ftp/software/24esptouch.zip, download Androidwifisetup software and install it;

First install this application on any Android phone, it is only used during setup of the Wifi credentials after which you will be able to manage the device from a PC running the T3000.exe software. First use your phone to log into your local Wi-Fi network, select your usual SSID that you would like the AirLab to also connect. Once your phone is connected to your local Wi-Fi lan, run the ESP-Touch utility and you will see this dialog below.

Enter the Wi-Fi password here and it will be sent to the Airlab device from your phone, the Airlab sensor can now log into your Wi-Fi network directly without assistance from your phone. Note: If you plan to change the Wi-Fi password you can log into the device with the T3000 software and update the Airlab password before making the network change.

If you forget to keep the Airlab password up to date you can always redo the ESPTouch procedure from the beginning.



When the connection is made and password is successfully passed to the Airlab device you will see a message like this with the IP address obtained from your Wifi Lan, assuming there is a DHCP server active to assign IP addresses.



Set Up Wifi via T3000

1.Visit https://temcocontrols.com/ftp/software/09T3000Software.zip, download T3000 software and install it; to scan

2.Start T3000 software,click

T3000 Building Automation System Jun 4 2020	. 14				
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Default_Building->Default_Building 🛛 🗢 🖪 🗙	r	100550	RS485 Information	Modbus Reply Delay 10mg	
🖃 🔤 Default_Building	ID Address 15	Change ID Serial Number 138652	Baudrate 115200 -	Toms	•
🛓 📥 Local Network	Firmware Version 12.0	Model Airlab	MAC(MSTP' 0		
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AirLab_T1 1	Luo Log		Modbus	Wifi Configuration	Click to do settings
AirLab-esp32			Bacnet Instance : 6000		chine to be stronge
Boiler Room					
		Customer De	evice ID and Key	-	
		Wifi Setting			
FANDU BB IP122					
FanDu ISP BB 108				8C-AA-B5-C2-B9-BD	
FANDU_LB_IP101		SSID: TEMCO_WIFI		MAC:	
FanduBB95			Wifi M	lodbus Port : 502	
× 🚺 FanduT3LB_IP99		Key: Travel321			
			Wifi B	acnet Port: 47808	
🖃 🔤 🖬 FanduTB97			WEE C	Wifi Normal	_
× CO2 Node:123150		Obtain an IP address automa	tically	latus Win Horman	
			Ena	ble Wifi 🔘 Disable Wifi	
CO2 Node:126553		Use the following IP address			
		IP: ¹⁹² . 168	. 0 . 123 Load	l wifi module default	
X North			· · ·		
× MSTP:		Click	to Apply	Apply Exit	
S OUTDOOR			TIV		
PWMTEST_IP89		L			
PWMTRAN					

Sensirion CO2 Sensor Re-Calibration

Locate the device in an environment with air having a stable CO2 concentration in the range of 400 ppm to 2000 ppm.

1. Setting and controlling a known CO2 concentration in a sealed environment with the set CO2concentration acting as the reference value for FRC .

2.Fresh air from the outside can be used as a reference. Outside air typically has a CO2 concentration of 400 ppm . expose the device to outside air, e.g. by placing it close to an open window or outside. Direct sun light, extreme temperatures, and strong air flow have to be prevented, After 5 minutes, apply FRC with the reference value 400 ppm .

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🖶 🔤 🔓 Local Network	C02	Refresh	Num Device ID Senal Nul	mb External PPr Prepare Alai Al	arm Setpc Calibrating C
AirLab_DEMO_WIFI	Firmware Version 6.7 CO2 Value 759	pm			
🗉 🔟 CM5	Prepare Alarm Setpoint 4028	Date: 2021/ 6/ 4 V			
MSTP:	Alarm Setpoint 4117	Time: 11:49:42			
	Baudrate 115200 V Calibration Offset 0				
FanDu T3LB_ip78		Synchronization Local PC			
FanDu-T3BB_ip122	Relative Humidity 59.0 % External Calibration Offset	Alarm On (s) 2			
🐋 Humdity		Alarm Off (c)			
LB-ASIX-2	Alarm Setting				
LB-ASIX-3	O Manual O Auto	Menu Block Time (s) 0			
LB-ASIX-5	Alarm State OFF V	Backlight			
UTDOOR	Password	LCD Always On			
T3 PT12	Enable Password	O LCD Always Off			
ТЗ-ВВ 96	1234	OLCD Delay Off 255 (s)			
T3-BB IP33				Variables	
TI TIRE WIE	TCP/IP Info		NUM Fulltabel Au	ito/Manual Value Rano	e Calibration
	Port 502 IP Address 192 . 168 . 0 . 3	Auto Background	1 Dew Point N/A	17.9 °C	N/A
	IP Model STATIC ~ Subnet Mask 255 . 255 . 255 . 0	Calbraduit	2 Partial Pressure N/A	20.5 hPa	N/A
	00.05.05.72 Gateway 102, 169, 0, 1	CO2 Sensor Type SCD30	3 Mixing Ratio N/A 4 Enthaloy N/A	12.8 g/Kg	N/A
temcopanel	MAC Address: 00-02-200-76 Gateway 192 . 108 . 0 . 1	CO2 Sensor RE-CALIERATION		i osti iojig	110
temcopanel	Apply	CO2 SEISO RE-CALIDRATION	OUTPUT		
Le temcopanel	Input Table	0 PPM Help	NUM Full Label Value R	Range Min Out Scale Max C	Out Scale Auto/Manual
Serial Port	Name Range A/M Value Calibration	Re-Calibration	1 Temperatur 2.64 v 0-	-10v 0.0 100.0	Auto
□ ▲ Com4	1 Temperature °C Auto 26.6		2 Humidity 5.90 V 0- 3 CO2 3.76 V 0-	-10v 0.0 100.0	Auto
XDUCER	3 CO2 ppm Auto 759				
Virtual Device					
			<		>

Modbus Object List

Sensor	Description					
0	Serial Number-4 byte value,Read-only					
4	Software version-2 byte value,Read-only					
6	Address,Modbus device address					
7	Product Model.This is a read-only register that is used by the microcontroller to deter- mine the product					
8	[INVALID_DATA]					
9	PIC firmware version					
10	PIC version of humidity module					
11	[INVALID_DATA]					
15						
16	Firmware update register ,used to show the status of firmware updates.Writing 143 sets the config back to out of the box except for modbus ID and baud rate. Write 159 to fix the current config as the user defaults,this is done automatically by T3000 any.					
20	Hardware options register, starting with LSB: Bit 0=Clock present or not ,Bit1=humidity present or not,Bit2=CO2 Sensor,Bit3=COsensor,Bit4=Motion Sensor.					
104	DEGC_OR_F,engineering units,Deg C=0,Deg F=1					
121	Temperature reading in Deg C or F from the sensor used in the control loop PI 1which is configured in register 111. This can be internal sensor, external, or an aver- gae of the two. writing a temperature value to this register will calibrate the curren.					
139	CO2 ppm					
140	humidity %					
142	Temperature sensor filter, Fil, weighted average of stored value to new raw value					
151	CO2 filer					
152	hum filer					
382	Sensor to be used for the PID calculations, 1=external sensor analog input 1,2=inter- nal thermistor,3=average the internal thermistor and analog input 1					
612	CO2 sensor calibration data					
628	value of light sensor,unit lux					
629	PIR sensor select 1=PIR sensor enable 0=PIR sensor disable					
630	PIR sensor real value					
631	PIR sensor ZERO value					
640	Sound sensor real value,unit dbm					
760	PM1.0 real value,unit ug/m3					
761	PM2.5 real value,unit ug/m3					
762	PM4.0 real value,unit ug/m3					
763	PM10 real value,unit ug/m3					
764	PM0.5 real value,unit number					
765	PM1.0 real value,unit number					
766	PM2.5 real value,unit number					
767	PM4.0 real value, unit number 11					

768	PM10 real value,unit number
769	Humidity sensor calibration data
805	Tvoc sensor real value,unit ppb
988	Tvoc sensor real value,unit ppb

Bacnet Object List

AI	Description
Al1	TEM
Al2	HUM
AI3	CO2
Al4	VOC_m
AI5	VOC_s
Al6	PM2.5 ug/m3
AI7	PM10 ug/m3
AI8	PM2.5 number
AI9	PM10 number
AI10	Sound level
AI11	Light strength

AV	Description
1	baud rate
2	station number
3	protocol select 0:MODBUS 1:BACKED
4	Instance
5	Temperature unit 0:C 1: F

AirLab Calibration Sheet

NO	Calibration	Reference	Reference	Calibration	Before	After Cali-
	items	Instrument	value	Method	Calibration	bration
NO.1					33.2	33.8
NO.2	_				33.5	33.9
NO.3					34	33.8
NO.4		TESTO 435-2	33.7	Single Point Calibration	32.6	33.9
NO.5	Tempera-				33.3	33.9
NO.6	ture				32.4	33.7
NO.7					36.9	33.9
NO.8					34.4	33.9
NO.9					37.0	33.9
NO.10					37.9	33.9
NO.1					61.3	57.3
NO.2					58.6	57.5
NO.3					58.2	57.4
NO.4	Humidity	TESTO 435-2	57 7	Single Point	62.8	57.3
NO.5				Calibration	60.4	57.4
NO.6					59.2	57.7
NO.7					49.1	57.1
NO.8					55.9	57.3
NO.9					48.7	57.2
NO.10					46.3	57.1
NO.1					400	411
NO.2					394	400
NO.3					421	394
NO.4					395	414
NO.5	CO2	TESTO 435-2	400	Sensirion	436	421
NO.6				field Cali- bration	400	407
NO.7					482	415
NO.8					405	407
NO.9					475	408
NO.10					238	415
NO.1					30	30
NO.2					26	29
NO.3					43	32
NO.4	liaht	TESTO 435-2	30	Single Point Calibration	23	28
NO.5					37	33
NO.6					30	30
NO.7					36	31
NO.8					24	30 13

NO	Calibration	Reference	Reference	Calibration	Before	After Cali-
	items	Instrument	value	Method	Calibration	bration
NO.9	Light	TESTO 435-2	30	Single Point	24	29
NO.10				Calibration	25	32
NO.1					61	60
NO.2					61	61
NO.3					61	61
NO.4	Sound	CENTER321	61	Single Point	60	60
NO.5				Calibration	61	61
NO.6					61	60
NO.7					60	60
NO.8					60	61
NO.9					61	60
NO.10					60	60
NO.1					4	5
NO.2					5	4
NO.3					5	4
NO.4		The average			4	5
NO.5	PM2.5	value of 10	4	Sinale Point	4	5
NO.6		sensirion		Calibration	5	4
NO.7		particulate			5	5
NO.8		matter sensor			5	4
NO.9					4	4
NO.10					5	4
NO.1					31	32
NO.2					36	35
NO.3					33	33
NO.4	PM10	value of 10	33	Single Point	31	32
NO.5		sensirion		Calibration	31	34
NO.6		particulate			34	33
NO.7		matter sensor			37	34
NO.8					32	32
NO.9					30	33
NO.10					34	33
NO.1					22	25
NO.2		The average			6	22
NO.3		value of 10	25	Single Doint	42	28
NO.4	TVOC	TVOC sensor	20	Calibration	12	20
NO.5					7	22
NO.6					42	28
NO.7	ļ				7	22 14
NO.8					23	25

NO	Calibration items	Reference Instrument	Reference value	Calibration Method	Before Calibration	After Cali- bration
NO.9 NO.10	TVOC	The average value of 10 sensirion	25	Single Point	41 21	28 24
		TVOC sensor		Calibration		