SQF. Particle FOUP

[NFP-100]

Product Specification

(December, 2019)

PLUTOSOLUTION

Contents

1. Introduction of the product

'SQF' is designed to check the gas flow into the FOUP. Quantity measurements by dust size, flow measurements by pass among N2 GAS entering FOUP, and FOUP settling LEVEL measurements are collected and forwarded to the server.

When the NFP-100 is wirelessly charging, the sensor collection function and wireless communication function are disabled.

2. Composition of the product

Particle FOUP

ADB Cable

12.6V 13.6A Lithium-ion battery pack

12.6V 4A charger

Division		Model	Quantity (EA)	Remarks
Particle FOUP	FOUP	Particle FOUP	1	Battery pack included
	Accessory	ADB Cable	1	
		12.6V 4A Charger	1	For charging the battery pack
		12.6V 13.6A Lithium-ion battery pack	1	

3. Main Product Information

3.1. Particle FOUP

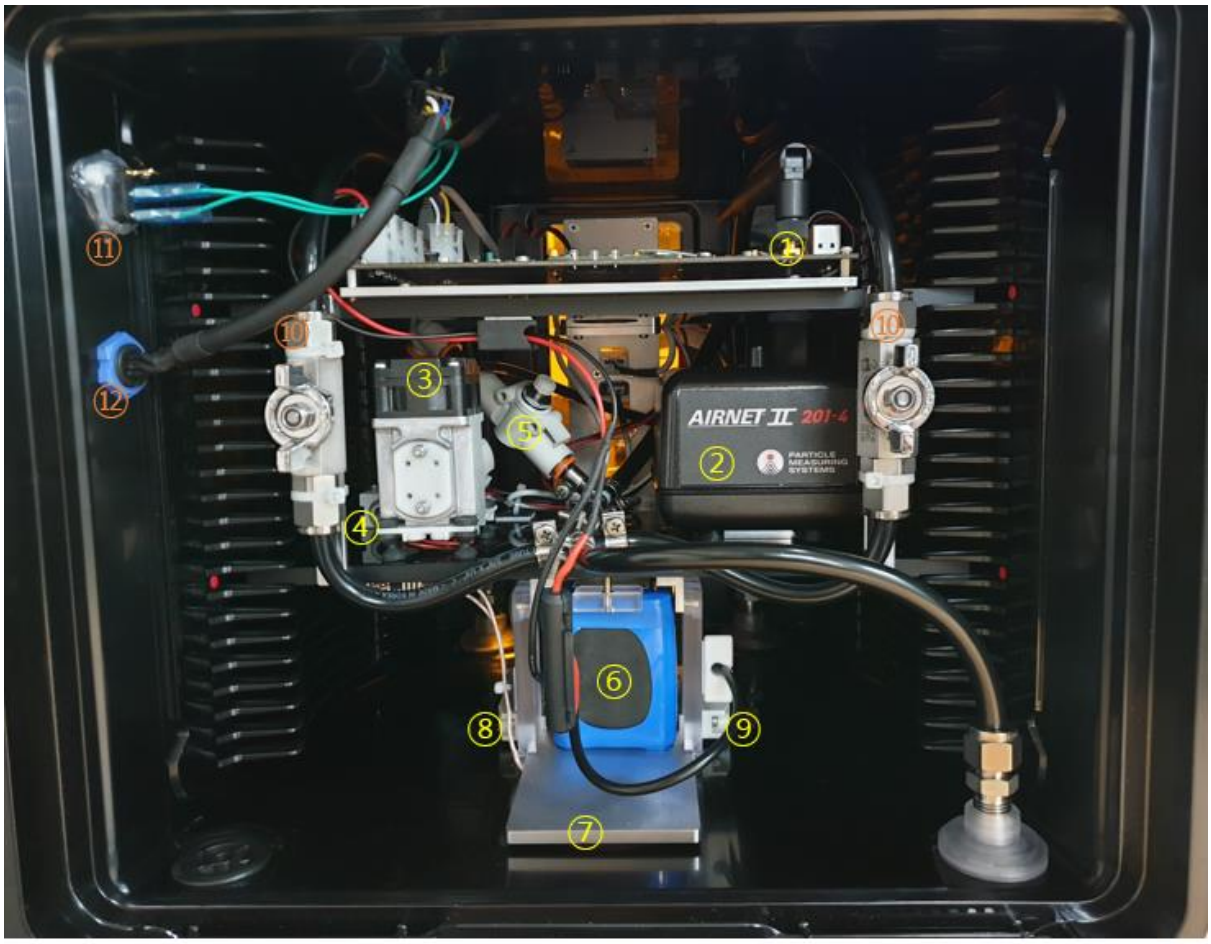
3.1.1. External Appearance

<Front View>

<Right Side View>

Location	Designation
①	Battery charge indicator
②	Status LED - Network, Power
③	Status LED - Particle detection
④	Flow sensor monitor (Bypass Flow)
⑤	Power switch
⑥	ADB connector (Wired charging port - 24V 6.25A Power adapter connection)

3.1.2. Interior



Location	Details
①	IoT module (Main Board)
②	Particle counter
③	Vacuum pump
④	Flow sensor
⑤	Speed Controller
⑥	12.6V 13.6A Lithium-ion battery pack
⑦	Wireless Charging RX Coil Mount
⑧	Magnetic switch

⑨	Magnetic
⑩	Finger Valve (Rear1, Rear2)
⑪	Power switch
⑫	ADB connector (Wired charging port - 24V 6.25A Power adapter connection)

3.1.3. Product specification

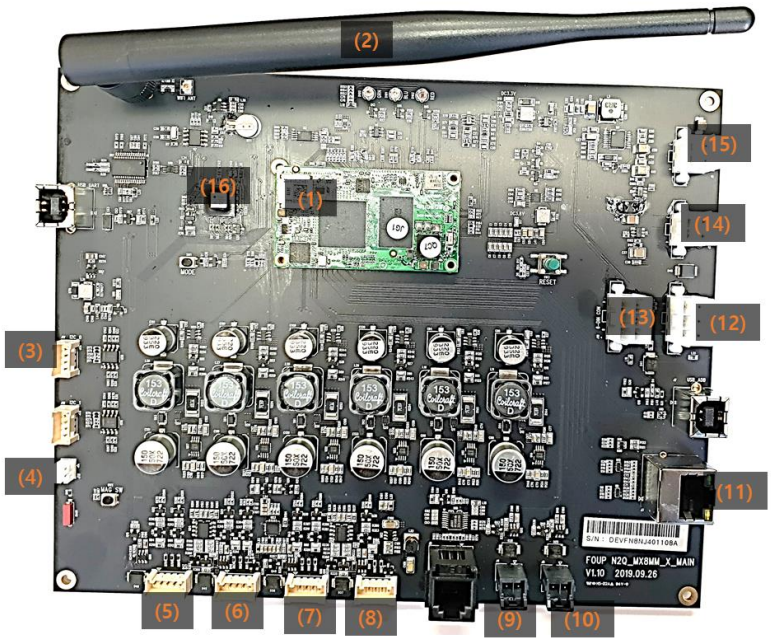
Division	Main specifications
IoT Platform	ARM® Cortex™-A53 Quad Core 1800MHz LP-DDR4 1024MB / eMMC 8GB
Wireless	Wi-Fi 802.11 ac/a/b/g/n
Power	12.6V / 13,600mAh Lithium-ion Battery Pack (Connecting connector: Molex 5557-04R)
Display	✓ Power state LED : Green ✓ Communication status LED : Green ✓ Particle Detection Status LED : Green+Red ✓ Battery charge : Red 2-digit Seven Segment LED ✓ 1 x flow sensor monitor : (model name: PFM311-MLEF)
Sensor	✓ Dual-Axis Digital Inclinometer and Accelerometer (ADIS16209) ✓ Particle counter (model name: Airnet II 201 with 24VDC) ✓ 1 x flow sensor (model name: PFM525-C6-2-R)
Vacuum pump	✓ 1 x vacuum pump (model name: DP0102S)
I/F	✓ 1 x power switch ✓ 1 x ADB connector
Operating temperature range	0 ℃ ~ 50 ℃

Weight	Entegris Particle FOUP: 8.44 Kg Miraial Particle FOUP: 8.61 Kg

3.2. **Board Specification**

3.2.1. IoT module (Main Board)

3.2.1.1. Appearance



Location	Designation
(1)	iMX8M Mini SOM (System On Module)
(2)	WiFi 5GHz Antenna
(3)	Indicator Board Connection Connector (I2C)
(4)	Magnetic Switch Connection Connector
(5)	Flow sensor Connection Connector (Power + signal)
(8)	N/A
(9)	Particle sensor power Connector
(10)	Vacuum pump power Connector

(11)	Particle Sensor Connection Connector (Ethernet for data)
(12)	Wireless / wired charging Rx Board Connection Connector
(13)	External power + ADB to USB Connection Connector
(14)	Power switch connection Connector
(15)	Connect the rechargeable battery pack Connector
(16)	2-axis digital angle and accelerometer

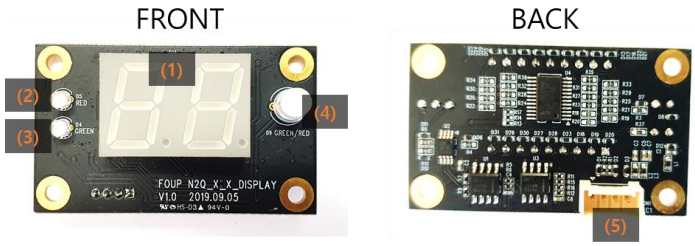
3.2.1.2. Product specification

Location	Designation
IoT Platform	ARM® Cortex™-A53 Quad Core 1800MHz LP-DDR4 1024MB / eMMC 8GB
Wireless	Wi-Fi 802.11 ac/a/b/g/n
Power	12.6V / 13,600mAh Lithium-ion Battery Pack (Connecting connector: Molex 5557-04R)
Sensor	✓ Dual-Axis Digital Inclinometer and Accelerometer (ADIS16209)
I/F	✓ 1 x Indictor Board connection port (Connection Connector: 35507-0400) ✓ 1 x Magnetic Switch connection port (Connection Connector: PHR-2) ✓ 1 x flow sensor connection ports (Connection Connector: 35507-0500) ✓ 1 x particle sensor power connection port (연결 커넥터: 172256-1002) ✓ 1 x vacuum pump power connection port (연결 커넥터: 172256-1002) ✓ 1 x connection port for particle sensor data (연결 커넥터: RJ45) ✓ 1 x wireless / wired charging Rx Board connection port (Connection Connector: 5557-6R) ✓ External power + 1 x ADB to USB connection port (Connection Connector: 5557-6R)

	✓ 1 x power switch connection port (Connection Connector: 5557-04R) ✓ 1 x rechargeable battery pack connection port (Connection Connector: 5557-04R)
Operating temperature range	0 ℃ ~ 50 ℃
Weight	265.5 g
Size	W200 x d160 x h20 mm (Antenna exclusion height)

3.2.2. Indicator Board

3.2.2.1. Appearance



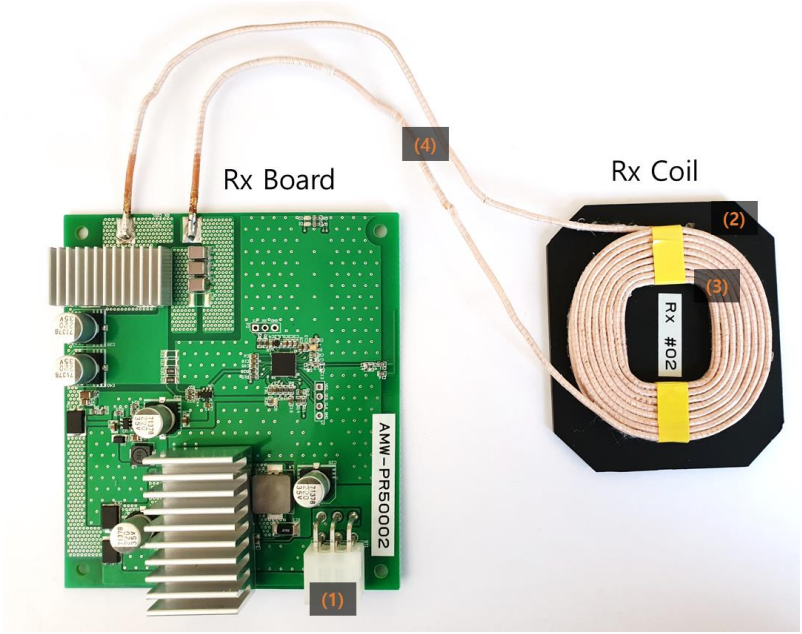
Location	Designation
(1)	Battery level indicator (2-Digit Seven Segment LED)
(2)	Communication status display LED (Green)
(3)	Power status indicator LED (Green)
(4)	Particle Status Display LED (Green+Red)
(5)	Main Board Connection Connector (I2C)

3.2.2.2. Product specification

Division	Main specifications
Battery level indicator	Red 2-Digit Seven Segment LED ✓ Battery voltage % display (10, 20, ~, 90, 99:FULL) ✓ "Voltage" and "LL" cross indications below 30%
Communication status LED	Green LED ✓ Blink when trying to connect to WiFi, On when transmitting data
Power Status Indicator LED	Green LED ✓ On when power is applied
Particle Status LED	Red-Green LED ✓ Red Blink on Particle Sensor Error ✓ Red On when detecting particles ✓ Undetected Particles Green On
POWER	3.3V (Power supply from main board)
I/F	✓ 1 x main board connection port (Connection Connector: 35507-0400)
Operating temperature range	0 ℃ ~ 50 ℃
Weight	10.5g
Size	w50 x d30 x h23 mm

3.2.3. Wireless / Wired Charge Rx Board

3.2.3.1. Appearance



Location	Designation
(1)	Main Board Connection Connector
(2)	Ferrite Plate
(3)	Coil
(4)	Lead Wire

3.2.3.2. Product specification

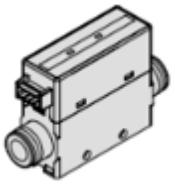
Division	Main specifications
Wired / wireless charging	✓ Input power : 24V / 6.5A (Adapter Specification) ✓ Output power : 12.6V / 4A
I/F	✓ Communicate with Wireless Charging TX Board ✓ 1 x main board connection port (Connection Connector: 5569-06A2) ✓ 1 x Magnetic Switch connection port (Connection

	Connector : 5264-02)
Operating temperature range	0 ℃ ~ 50 ℃
Weight	156g (Rx Coil Included)
Size	Rx Board : w100 x d90 x h20 mm (Heat sink Included) Rx Coil : w70 x d60 x h6.9 mm (Ferrite Plate Included)

3.3. **Sensor & Pump Specifications**

3.3.4. Flow sensor

3.3.4.1. Appearance



3.3.4.2. Product specification

Division	Main specifications
Model name	PFM525-C6-2-R
Applicable fluid	Dry air, N2, Ar, CO_2
Flow rate range	0.5 to 25 L/min
Accuracy	±3% F.S. or less
Repeatability	±5% F.S. or less (base on 0.35 MPa)
Operating pressure range	-100 kPa to 750 kPa
Rated pressure range	-70 kPa to 750 kPa
Proof pressure	1 MPa
Analog output	Response time : 1 sec Current output: 4 to 20 mA
Power supply voltage	24 VDC ±10%
Operating temperature range	0 to 50°C
Size	w64.6 x h43 x d18 (mm)
Weight	55 g

3.3.5. Flow sensor monitor

3.3.5.1. Appearance

3.3.5.2. Product specification

Division	Main specifications
Model name	PFM311-MLEF
Applicable Sensor	PFM525
Instantaneous flow	Display flow range : 0.5 to 26.3 L/min Min. setting/display unit : 0.1 L/min
Accumulated flow	Setting / display flow range : 0 to 1999999 L Min. setting /display flow unit : 1 L
Accumulated flow volume per pulse	0.1 L/Pulse
Display Unit	Instantaneous flow : L/min, CRM x 10^{-2} Accumulated flow : L, ft^3 x 10^{-1}
Analog output	Output current : 4 to 20 mA Response time : 1.5 sec Accuracy : ±1% F.S. max.
Sensor Input	Current input : 4 to 20 mA
Repeatability	±0.1% F.S. max. (Fluid : Dry air) Analogue output accuracy : ±0.3% F.S. max.
Display accuracy	±0.5% F.S. ±1digit max.

Power supply voltage	24 VDC ±10%
Operating temperature range	0 to 50°C
Size	w30 x h30 x d35.7 (mm)
Weight	30 g

3.3.6. Particle counter

3.3.6.1. Appearance

3.3.6.2. Product specification

Division	Main specifications
Model name	Airnet II with 24VDC (201-4)
Size range (μm)	0.2, 0.3, 0.5, 1.0
Flow rate	0.1 CFM (2.8 LPM)
Counting efficiency	50% ±20% for most sensitive channel 100% ±10% at 1.5 to 2.0 times channel one size
Zero count	≤ 70.7 counts/m^3
Max. concentration	5,057,310 /ft^3

Laser source	Diode / Class 1 per EN60825)
Flow system	External vacuum 1/4″ connection
Power supply voltage	24 VDC 0.5A
Operating temperature range	4 to 35°C
Size	W135 x h890 x d960 (mm)
Weight	630 g

3.3.7. Vacuum pump

3.3.7.1. Appearance

3.3.7.2. Product specification

Division	Main specifications
Model name	DP0102S
Attainable vacuum	-26.7 kPa
Free air displacement	7.0 L/min
Working pressure	-26.7 kPa to 45 kPa

range	
Rated performance	5,000 hours
Max. concentration	5,057,310 /ft^3
Rated voltage	24 VDC (Max. current: 0.5A)
Operating temperature range	4 to 35°C
Size	50 (L) x 30 (W) (mm)
Weight	250 g

4. **Set UP & Use**

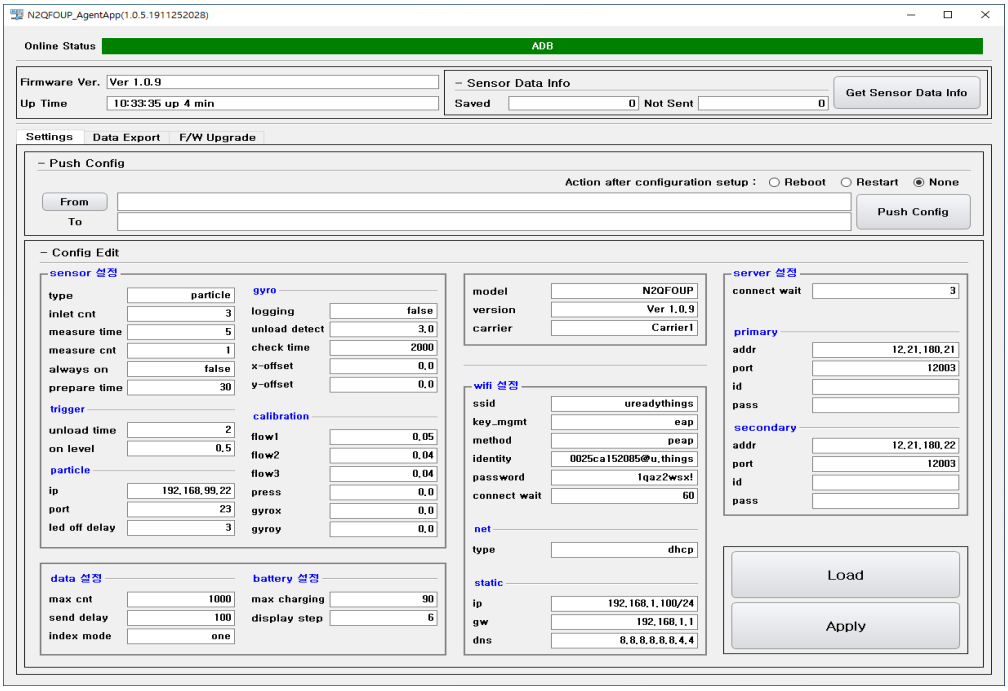
4.1 Set up

In order to use the SQF / NFP-100 product, you must use the Agent App provided with the product to perform basic settings.

The setting method is as follows.

① Turn on the product and connect it to the PC with a USB cable.

② Run the Agent APP.



< Agent App execution screen >

③ When the program is executed, the Config information set in SQF displayed.

- On the Config Edit screen, configure each setting, Sensor setting, Gyro setting, Trigger, Calibration setting, Data setting, and WiFi setting.

④ After completing the settings, click the 'Apply' button to save.

4.2 USE

Once the SQF settings are complete, turn the power switch ON to keep the product in standby mode. In standby state, the LEDs on all sensors operate.

<Power Switch>

SQF/NFP-100 automatically collects sensor data according to the factory's SOC procedures and transmits the data to the server when collection is complete.
Data from the sensors includes particle, flow, and gyro data.
The contents of the data can be checked on the server..

4.3 Error Code

When an error occurs in various sensors during operation of the SQF product, an error code is sent to the server.

Sensor	Code	Error Name
Particle	01	Flow Bad
	02	Laser Bad
	03	HW Bad
	04	IO Error
	05	No Data
Flow/Press	06	No Data
Gyro	07	No Data

5 Precautions

① Make sure to use connectors and cables that match the connection terminals. Using a connector other than the dedicated connector may cause product malfunction or failure.

② Secure the unit firmly where you want to install it.

③ Do not install in water or rainwater spatter or damp areas.

④ Be careful not to introduce moisture or other foreign substances into the product.

⑤ Be careful not to drop the product or give an external shock.

⑥ Do not disassemble, modify, or alter the product arbitrarily.

⑦ This product is designed for use in the temperature range of 0 ° C to 50 ° C. Outside this range, use at extremely low or high temperatures is undesirable.

⑧ Do not install or use the product outside of its intended purpose.

⑨ If there is a burning smell during operation, immediately turn off the power and contact the **PLUTO**SOLUTION Customer Support Center (031-337-6780)

※ **FCC**

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications (including the antennas) to this device that are not expressly approved by the manufacturer may void the user's authority to operate the equipment.

Note :
This equipment has been tested and found to comply with the limits

Note :

This equipment has been tested and found to comply with the limits for a Class A digital device , pursuant to part 15 of the FCC Rules . These limits are designed to provide reasonable protection against harmful interference in a residential installation . This equipment generates , uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions , may cause harmful interference to radio communications . However, there is no guarantee that interference will not occur in a particular installation . If this equipment does cause harmful interference to radio or television reception , which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

✓ This device is installed inside the facility.
This device is used at a distance of more than 20cm from the human body.

※ RF Exposure Statement

FCC RF Radiation Exposure Statement: This equipment complies with FCC RF Radiation exposure limits set forth for an uncontrolled environment.

This device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter..