Matrix FSR 60×60 Matrix Thin-Film Pressure Sensor

Product Specification and User Manual

Model: Matrix FSR 60×60 | Version: V1.0 | Date: September 2026

1. Product Overview

The 60×60 Matrix FSR (Force Sensing Resistor) is equipped with 3600 independent piezoresistive sensing points and is designed for full-surface pressure-distribution acquisition. The sensor adopts an ultra-thin flexible film substrate and an independent row/column electrode-matrix scanning structure, enabling simultaneous acquisition of the pressure at every point on the contact surface and real-time output of a complete 2D pressure heatmap. It features fast response, ultra-thin profile, and easy integration, and is suitable for pressure-distribution mapping applications such as gait analysis, seat-cushion pressure detection, fixture fit-pressure testing, and robotic tactile sensing.

The Matrix FSR circuit consists of intersecting row and column traces: 60 row traces and 60 column traces cross orthogonally to form 3600 intersection points, each of which is one sensing point, allowing a pressure-distribution map covering all 3600 sensing points to be drawn. The row and column traces converge at the cable tail and exit to two 60-pin FPC connectors with 1.0 mm pitch. When pressure is applied to the sensing area, the force on each sensing point differs, and so does its corresponding output voltage. According to the FSR characteristic, a sensing point under greater force has lower resistance and higher output voltage, and vice versa. By acquiring and comparing the output voltage of each sensing point, the data acquisition module can compute the force location and force distribution at every point; such sensors are therefore also commonly called "pressure-distribution-map sensors."

Features & Advantages:

- Low actuation force; measurement range covers 200 g ~ 100 kg
- Ultra-thin and flexible; thickness ≤ 0.3 mm, can be mounted on curved surfaces
- Easy access to pressure-distribution regions and relative values at each point
- Simple to use and easy to integrate
- Cost-effective

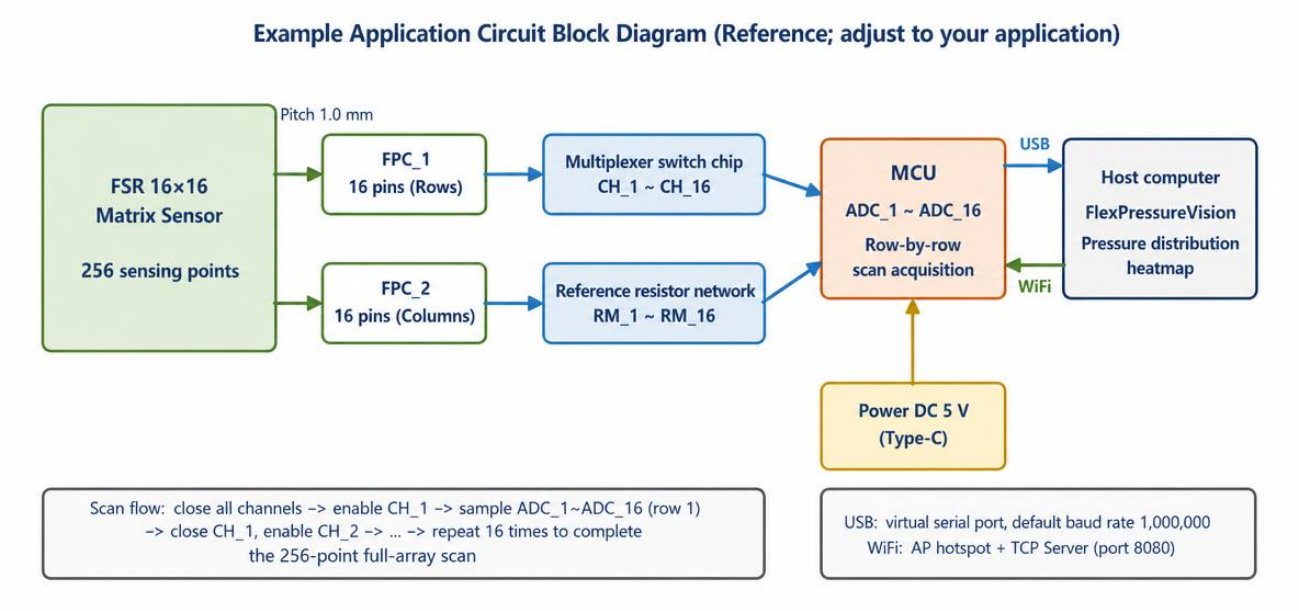


Figure 1 Crossed Row/Column Electrode Structure and Scanning Principle

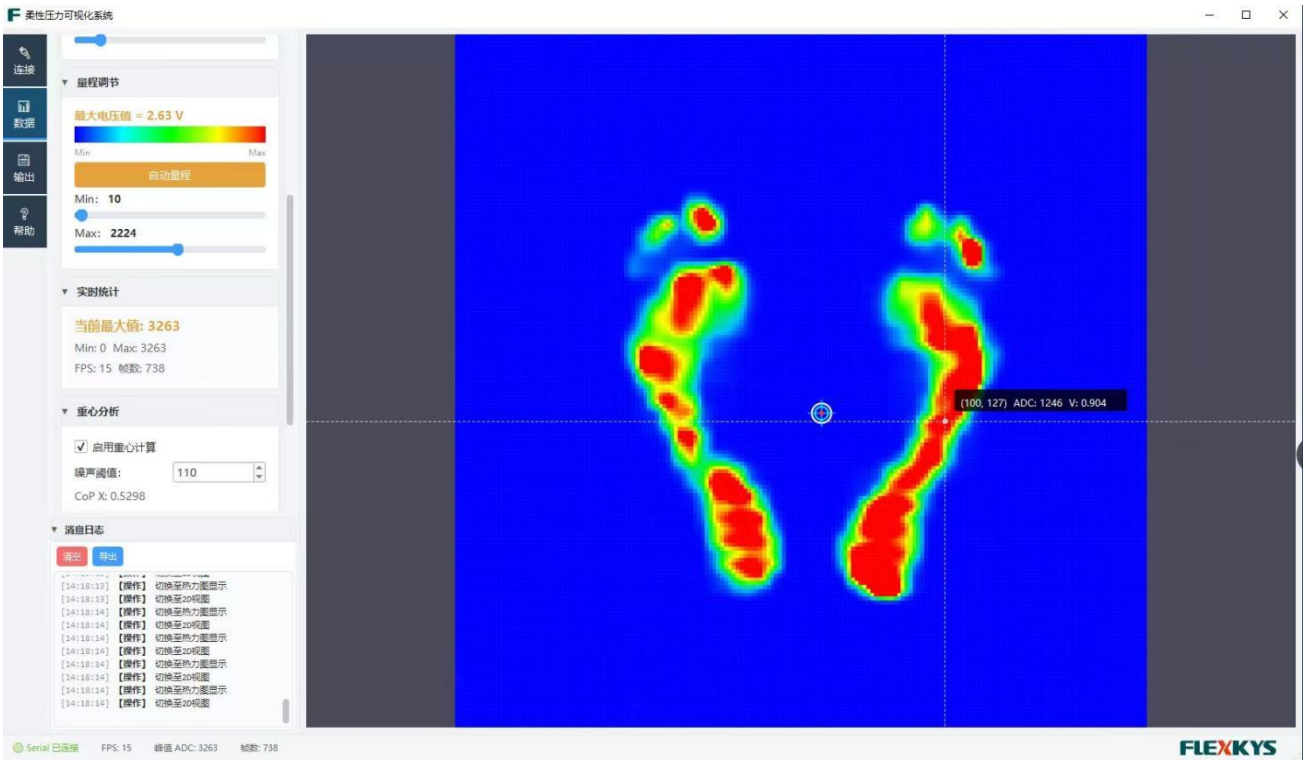


Figure 2 Real-time Pressure-Distribution Heatmap on the Host PC

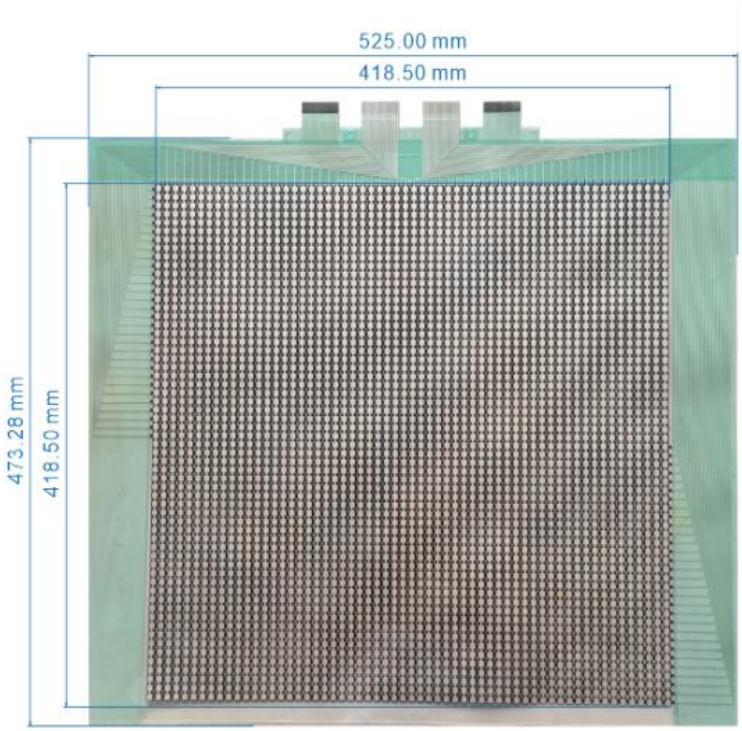
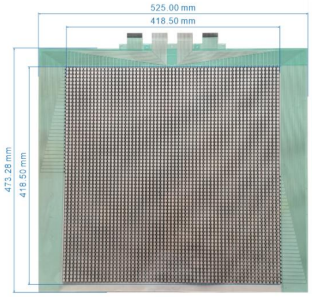


Figure 3 Product Photo

2. Product Composition

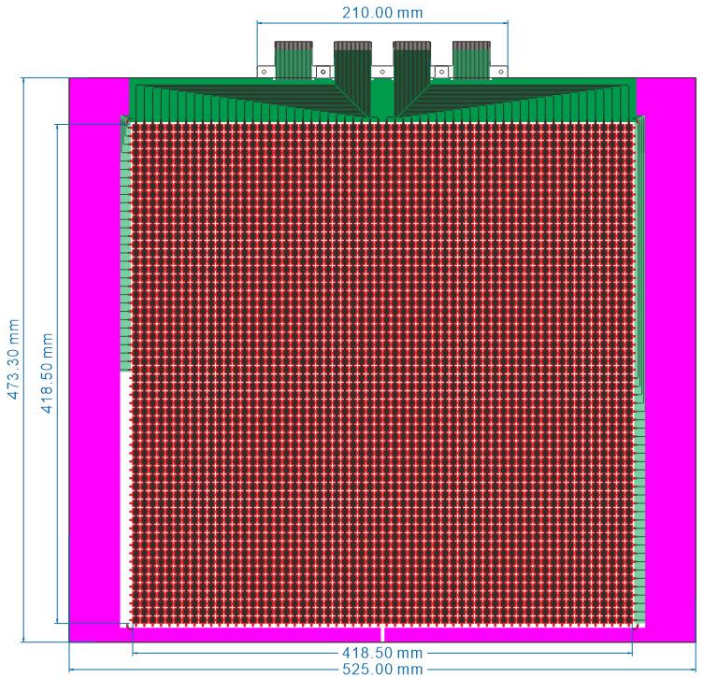
2-1. FSR Sensor

Product Photo	Performance Parameters
	Electrode array: 60 rows × 60 columns Number of sensing points: 3600; Overall dimensions: 525.00 × 473.28 mm; Sensing area: 418.5 × 418.5 mm (approx. 1751 cm²); Sensing point size: 5.0 × 5.0 mm; Row/column pitch: 7.0 mm; Connector: FPC (1.0 mm pitch, two 60-pin connectors); Sensor thickness: ≤ 0.3 mm; Force measurement range: 200 g ~ 100 kg

Item	Parameter
Electrode Array	60 rows × 60 columns
Number of Sensing Points	3600
Overall Dimensions (including tail lead area)	525.00 × 473.28 mm
Sensing Area	418.5 × 418.5 mm (approx. 1751 cm²)
Sensing Point Size	5.0 × 5.0 mm
Row/Column Center Distance	7.0 mm

Substrate	PET
Sensor Thickness	≤ 0.3 mm
Force Measurement Range	200 g ~ 100 kg
Force Repeatability (single unit)	< ±5% (at 80% of max force)
Off-state Resistance (Off)	> 1 MΩ
Response Time	< 1 ms
Force Resolution	Continuous
Operating Temperature	-20 ℃ ~ 80 ℃
Operating Voltage	3 ~ 5 V DC
Rated Current	10 mA ~ 100 mA
Storage Temperature	0 ~ 35 ℃
Storage Humidity	< 70% RH
Service Life	> 2,000,000 cycles
Connector	FPC, Pitch 1.00 mm (two 60-pin connectors)

Table 2-1 FSR Sensor Specifications



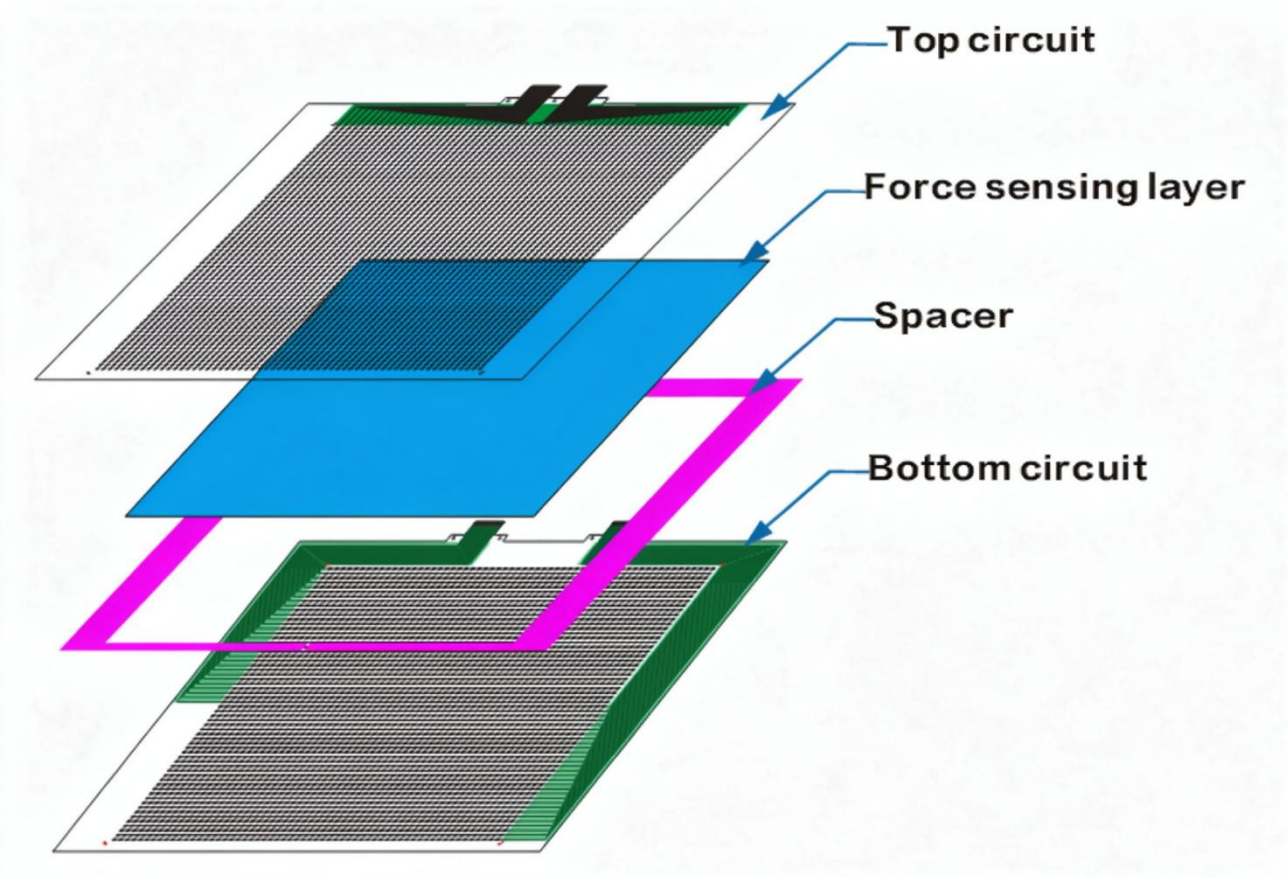
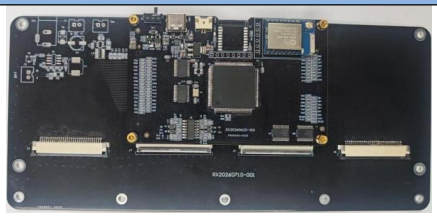


Figure 5 Product Structure (Layer Stack-up)

Note: The sensing area is a 60×60 dot matrix. The Matrix FSR 60×60 is currently the largest standard matrix product by size. It shares the same data-acquisition platform and software with other matrix products in this series; therefore, the acquisition module, product software, and communication protocol described below all follow the same configuration of this platform.

2-2. Data Acquisition Module

Product Photo	Electrical Performance Parameters
	Power supply: DC 5 V (Type-C interface) Operating current: standby ≤ 80 mA, full load ≤ 150 mA; ADC sampling resolution: 16 bit; Reference voltage: 3.3 V; Communication: USB virtual serial port / WiFi wireless; Refresh rate: USB 20 Hz; WiFi 5–12 Hz

3. Product Software

3-1. Software Runtime Environment

Operating system: Windows 10 / 11 (64-bit);

Driver: The serial-port driver must be installed first; otherwise the serial port cannot be recognized.

3-2. Running the Software

The software is a portable, installation-free version. Simply double-click FlexPressureVision_boxed.exe to run it.

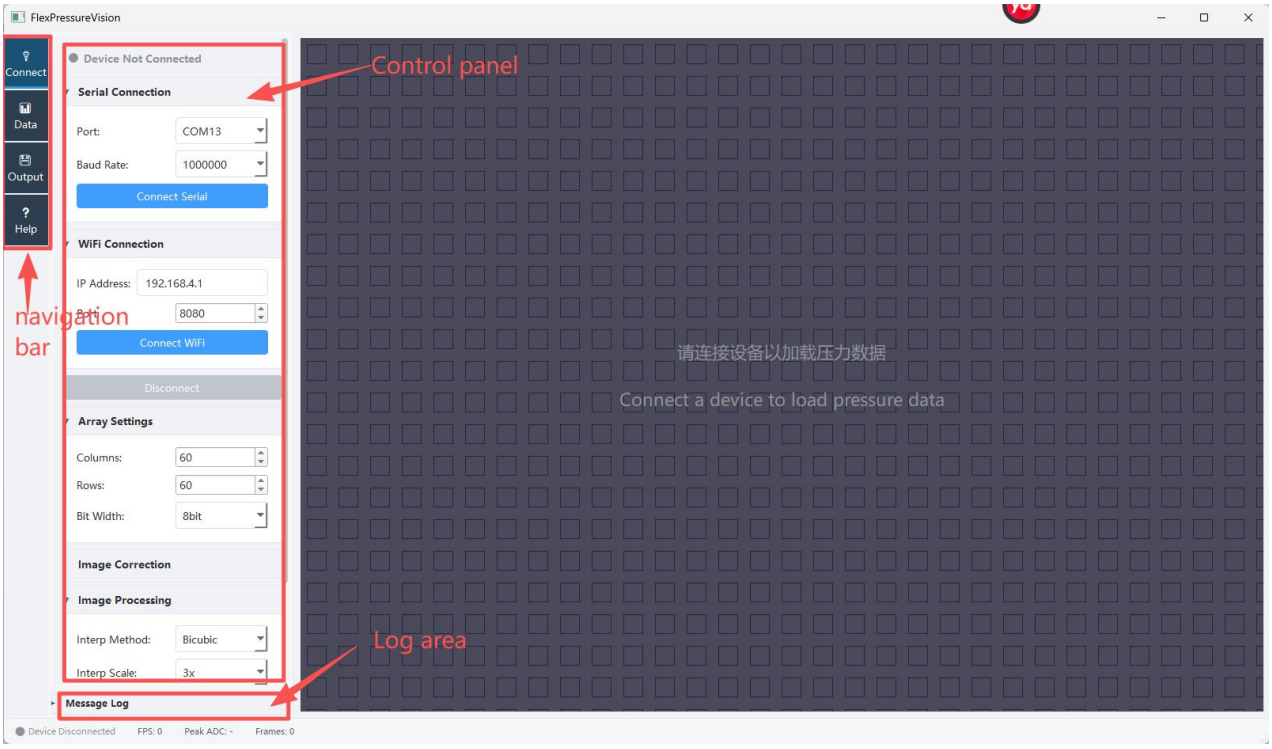


Figure 6 Software Interface Function Areas

3-3. Software User Guide

The main interface is divided into a left panel (navigation + control + log) and a right rendering area (2D/3D pressure map).

3-3-1. Connecting the Device

Connect the device power (Type-C, 5 V) and select the communication method:

1) Select USB serial communication — connect the data cable to the computer and make sure the WiFi switch is OFF (after pressing the power button, the WiFi indicator goes out).

2) Select WiFi communication — connect the data cable directly to a power adapter or phone charger (5 V 1 A / 2 A), and turn on the red WiFi switch (then turn on the power switch; the WiFi indicator lights up). For first-time use, first connect the computer to the device WiFi hotspot "Matrix FSR" (password: 123456789) and check "Auto-connect".

Figure 7 Device Buttons and Interfaces

Figure 8 Connecting to the Device WiFi Hotspot

Open the software and click "Connect" to enter the connection page.

Note: Be sure to power on the device before opening the software; otherwise the software cannot detect the COM port. The communication method must be selected before powering on, then press the power switch. To switch the communication method, turn off the device power, toggle the WiFi switch on or off, then press the device power switch to complete the switch. The serial port and WiFi cannot work simultaneously; only one communication method can be selected.

1. Connect the device in the software:

- Serial port: Select the COM port and baud rate (default 1000000), then click "Connect Serial".
- WiFi: After confirming the computer is connected to the device WiFi, click "Connect WiFi".

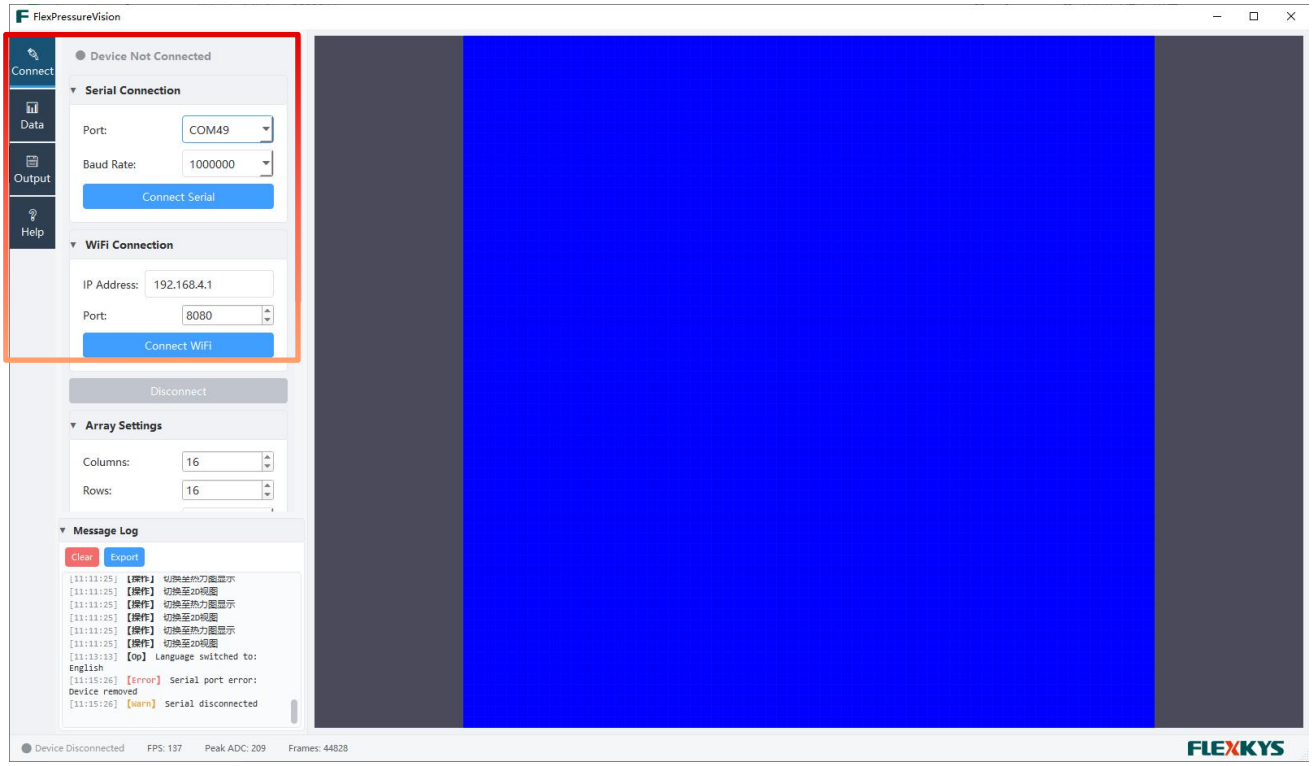


Figure 9 Software Connection Page

• In the whole-row / whole-column settings, enter 60 rows and 60 columns. If connected via USB, select 16 bit; if WiFi is selected, set the bit width to 8 bit.

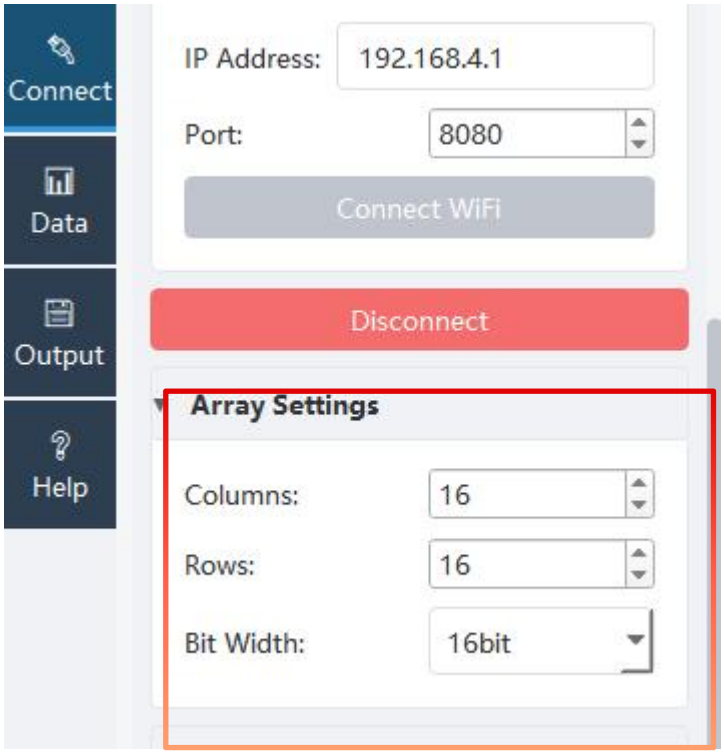


Figure 10 Software Connection Page — Array Setting

2. After a successful connection, the status bar shows an indication and synchronously outputs logs.

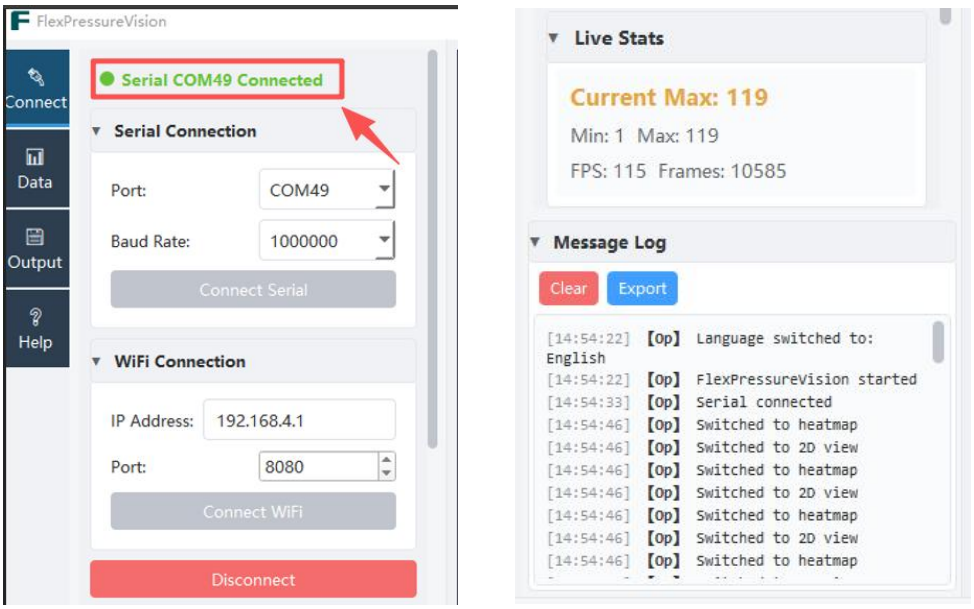


Figure 11 Connection Success Status

3-3-2. Configuration Parameters

Set at the bottom of the connection page:

Parameter	Description	Default
Rows/Columns (Columns / Rows)	Row and column count of the sensor array	60 × 60
Bit Width	ADC sampling bit depth; must match the slave device	16 bit
Horizontal / Vertical Mirror	Flip the image direction	Off
Interpolation Algorithm	Nearest-neighbor / Bilinear / Bicubic	Bilinear
Interpolation Factor	Interpolation magnification	3x
Smoothing Mode	Gaussian filter: Off / Denoise before interpolation / Soft focus after interpolation	Off
Gaussian σ	Filter strength (0.5 ~ 3.0)	1.0

Table 3-1 Configuration Parameters

3-3-3. Language Switching

Switch between the Chinese / English interfaces at the bottom of the connection page.

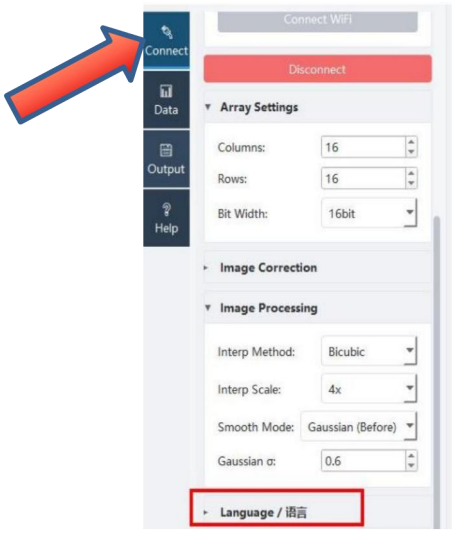


Figure 12 Language Switching Interface

3-3-4. Data Display and Adjustment

Switch to the "Data" page:

- Display Style: Grayscale / Heatmap. Grayscale shows pressure intensity in black and white; the heatmap uses a blue–red gradient.
- View Mode: 2D is a top-down plan view; 3D stretches the pressure into a 3D surface that can be dragged and rotated with the mouse.
- Reference Voltage: The ADC reference voltage (default 3.30 V), used to convert the ADC count into an actual voltage value.
- Gain: 1.0 ~ 10.0×; increase the gain when the signal is too weak to see clearly, so that faint pressure is also colored.
- Range Adjustment: The Min / Max sliders set the upper and lower bounds of the color mapping; values below Min are not colored, and values above Max are clipped. "Auto Range" automatically adapts the range to the current data with one click.
- Real-time Statistics: Current maximum, Min/Max, FPS, and frame count.
- COP Analysis: Shows the position of the center of pressure within the working area. By setting a noise threshold, pressure noise below that threshold (e.g., initial background noise) can be filtered out.

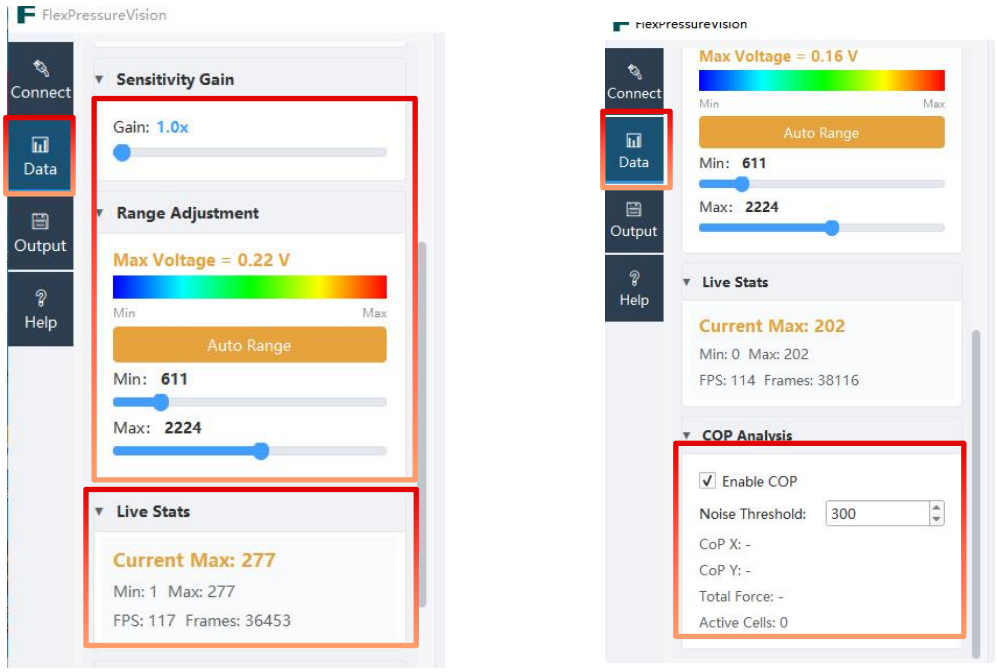


Figure 13 Range Adjustment, Real-time Statistics, and COP Analysis

Switch to the "Connect" page:

In the image processing mode, you can set the difference mode, interpolation factor (interp scale), smoothing mode, and Gaussian value.

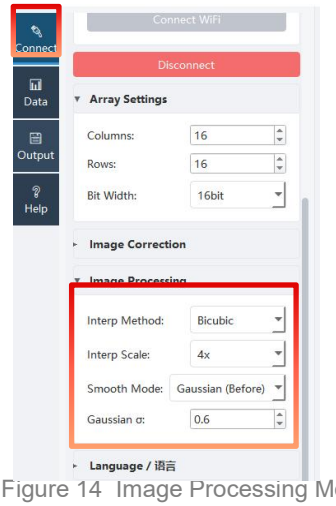


Figure 14 Image Processing Mode

3-3-5. Data Export

Switch to the "Output" page:

Method	Description
TXT Export	Raw ADC-value text file
CSV Export	Spreadsheet format, can be opened with Excel
Screenshot	Save the current screen as a PNG
Display-area Screenshot	Capture only the data rendering area
Full-screen Screenshot	The entire main window
Batch Images	Continuously save multiple frames of images

Table 3-2 Data Export Methods

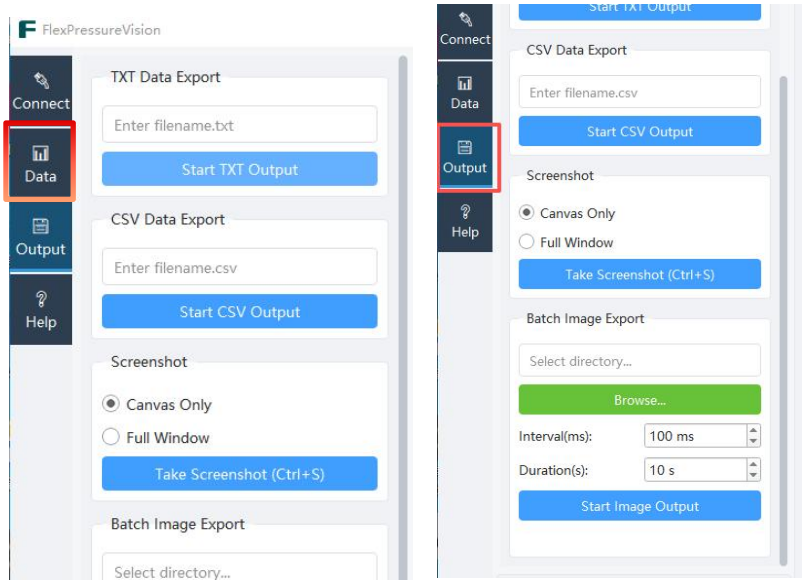


Figure 15 Data Export Interface

4. Interface Information

4-1. Serial Communication Protocol

4-1-1. Physical Link

The basic serial communication parameters are shown in the table below.

Item	Detailed Description
Communication Interface	USB CDC virtual serial port (Type-C hardware interface; the device has a built-in USB-to-serial controller)
Hardware Flow Control	None (no RTS/CTS hardware handshake; only two data lines are used for transmission)
Serial Data Format	8 data bits, 1 stop bit, no parity (standard 8N1 serial mode)
Baud Rate Note	The USB virtual serial port is based on a high-speed USB bus; the baud-rate parameter is only a software placeholder and does not limit the actual transmission speed. The host serial tool can use any baud rate (default 1000000 recommended) for normal data transmission
Communication Logic	After power-on and sensor initialization, the device actively and continuously reports complete pressure-array data packets in a loop. The host does not need to send any query or start command — data is received as soon as the connection is established

The device connects to the PC via USB. After the driver is installed, the system recognizes it as a COM port (Windows). The baud-rate setting does not affect the actual transmission speed; simply use the default value (e.g., 1000000). Once the device is connected, the host software can receive the data packets returned by the acquisition device without sending any command.

4-1-2. Data Format

The overall frame structure is fixed. The total length of a single frame is fixed at 7207 bytes (16-bit ADC sampling; this device outputs 16 bits by default). The data acquisition device reports the complete pressure-sensor array data frame in the following format:

Frame Header (3 bytes)	Reserved Bytes (2 bytes)	Data Payload	Frame Tail (2 bytes)
Fixed 55 AA F1	00 00, reserved unused	60×60 ADC values	Fixed 00 5A

Table 4-1 Data Frame Structure

Frame Length Formula Breakdown:

Formula: Total length = 3 + 2 + columns × rows × (bit width / 8) + 2.

This device defaults to 16 bits (2 bytes per point) → 3 + 2 + 60×60×2 + 2 = 7207 bytes

8-bit data packet length → 3 + 2 + 60×60×1 + 2 = 3607 bytes

Data Packet Example Analysis:

55 AA F1 00 00 02 00 02 00 02 00 03 00 06 00 04 00 07 00 05 00 22 00 09 00

08 00 20 00 08 00 04 00 ... 00 04 00 05 00 04 00 03 00 03 00 02 00 02 00 5A

- 55 AA F1: Frame header, marks the start of a frame
- 00 00: Reserved padding bytes
- 00 02: 1st sampling-point ADC value = 0x0002 = 2; 02 00: 2nd sampling-point ADC value = 2; parse all 3600 groups of double-byte data in sequence
- Frame tail 00 5A: frame-end marker, indicating that the current 60×60 dot-matrix data transmission is complete, and the next frame follows immediately

Host Parsing Logic:

- Continuously buffer the data stream received over USB;
- Cyclically search the byte stream for the synchronization frame header 0x55 0xAA 0xF1;
- After finding the frame header, read 7202 bytes backward (2 B reserved + 7200 B payload); the following 2 bytes should be 0x00 0x5A;
- After verification passes, extract the middle 7200-byte payload and split it by 2 bytes to reconstruct the 60×60 2D pressure matrix; if verification fails, discard the current buffer and re-search for the frame header to re-synchronize.

4-2. WiFi Communication

4-2-1. Basic Communication Parameters

The basic WiFi communication parameters are shown in the table below.

Item	Detailed Description
Communication Protocol	TCP Socket (TCP server mode; the device builds its own TCP server after power-on)
Default Parameters	AP hotspot mode; device IP: 192.168.4.1; listening port: 8080
Data Format	Binary stream, using the same 55 AA F1 frame structure as the serial port
Connection Method	After the PC / host device connects to the device WiFi hotspot, it acts as a TCP client and actively connects to 192.168.4.1:8080
Transport Carrier	TCP streaming binary data stream, with no additional TCP encapsulation layer; it transparently transmits the same raw pressure frames as the serial port

For the binary data packets transmitted over WiFi TCP, the frame header, reserved bytes, ADC payload, frame tail, total length, data byte order, and dot-matrix arrangement order are completely consistent with the USB virtual serial port, so the host parsing code can be shared without distinguishing between the serial-port and WiFi links.

Complete frame: 55 AA F1 + 00 00 + 3600 16-bit ADC values + 00 5A, 7207 bytes per frame.

TCP Streaming Characteristics: TCP is a byte stream without boundaries and does not automatically split packets. The host must follow the same logic as the serial port, relying on the frame header 55 AA F1 and frame tail 00 5A for frame synchronization and splitting, and cannot rely on TCP packet boundaries to parse the data.

4-2-2. WiFi Communication Workflow

1. After the device is powered on, the WiFi module automatically creates an AP wireless hotspot (WiFi name: Matrix FSR / password: 123456789);

2. The internal firmware starts the TCP Server and continuously listens on port 8080 for incoming clients;

3. After the PC / tablet connects to this WiFi hotspot, use a network debugging tool or the host software to initiate a TCP client connection to 192.168.4.1:8080;

4. After the connection is successfully established, the device automatically and continuously reports complete pressure-array data packets; the client does not need to send any start or query command;

5. After the client disconnects, the device continues to wait for a new client; once connected, it resumes data reporting;

6. A single client connection is supported; when multiple clients connect simultaneously, only the first valid connection can receive data.

Appendix A Reference Application Circuit

The sensor consists of a 60-row, 60-column array with a total of 3600 pressure-acquisition points. The reserved interface is two 60-pin FPC connectors with 1.0 mm pitch (FPC_1 and FPC_2). The block diagram below is an example reference circuit; users may adjust the circuit according to their actual application scenario.

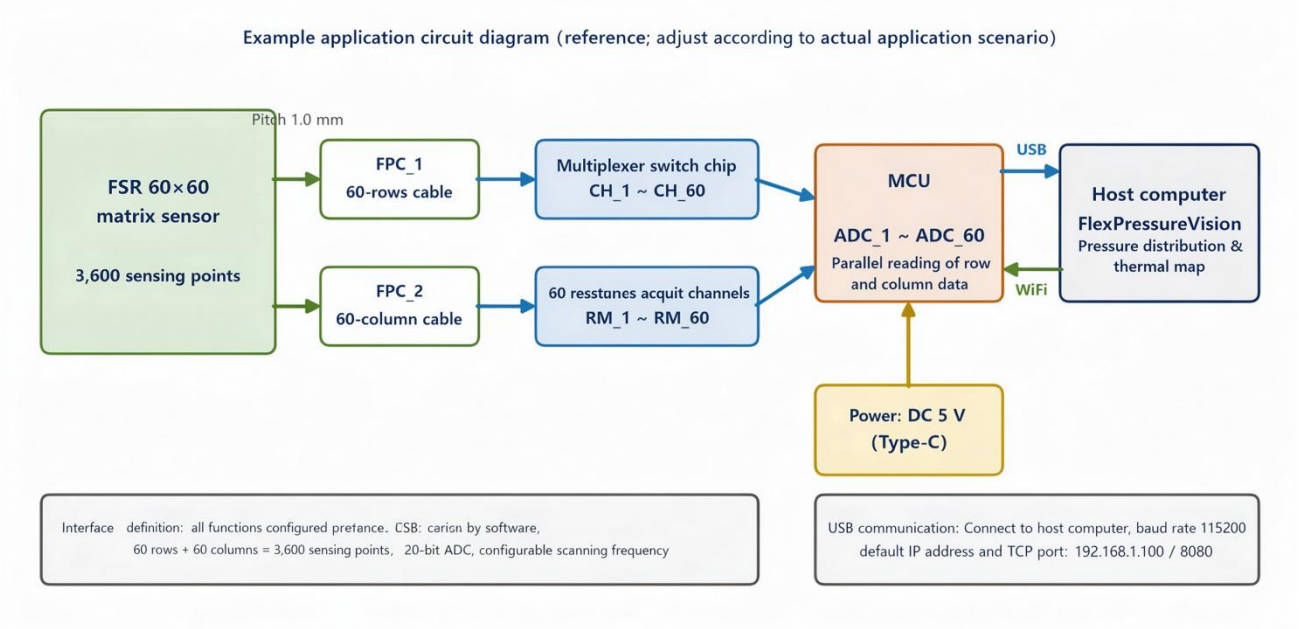


Figure A-1 Example Application Circuit Block Diagram

Example description: FSR connector "FPC_1" connects to channels CH_1 ~ CH_60 of the channel-switch chip; FSR connector "FPC_2" connects to ports RM_1 ~ RM_60 (the resistance value of the reference resistor RM can be determined according to the customer's actual usage requirements). The MCU measures the voltage at the reference-resistor (RM) end through its 60 ADC channels: when all channel switches are closed, open channel 1 (CH_1), and the MCU acquires the voltages of ADC_1 ~ ADC_60 to calculate the force value of row 1 R_FSR via the formula; then close CH_1 and open CH_2, and the MCU acquires the voltages of ADC_1 ~ ADC_60 again to obtain the force value of row 2 R_FSR. By analogy, the channel-switch chip works with the MCU's ADC channel

switches to complete a full-range scan of all 3600 pressure-acquisition points, and finally the force-distribution on the pressure-sensor surface is obtained through data analysis.

The host can simultaneously display which areas of the sensor are under force and which are not, and can distinguish among heavily, moderately, and lightly loaded parts within the loaded areas. The sensor is highly sensitive to changes in motion and force.