

SC-02

8-Channel Differential Pressure Scanner



Hardware, Software and User Programming Manual

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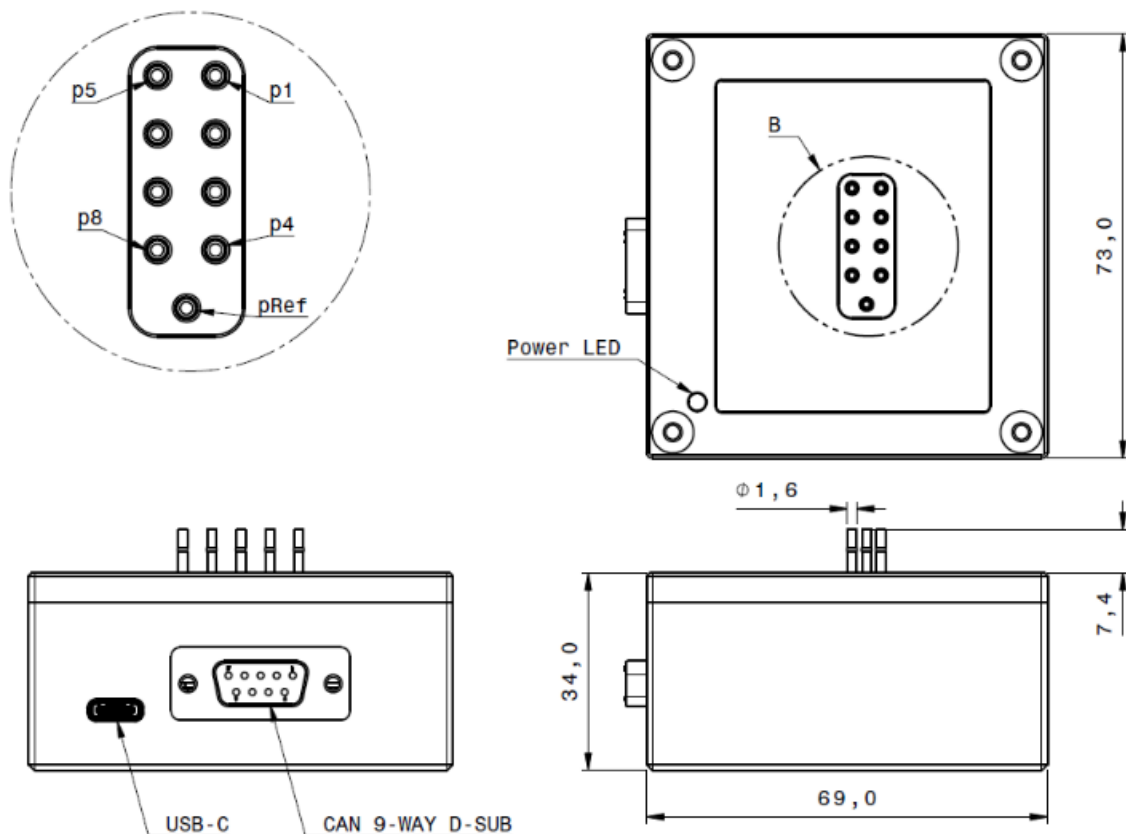
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Hardware

Overview

The SC02 is a high-speed pressure scanner measuring true differential pressure across 8 channels. The device measures the pressure difference between the common **Reference (Ref)** port and each individual channel port (**1–8**) continuously at 1000 Hz, with configurable output rate.

Device Interface



Power & Connections

Power Requirements

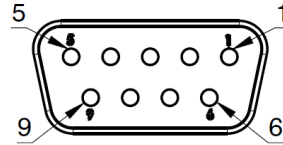
The scanner is powered via the USB-C port, the DE-9 connector or both at the same time.

- **USB Operation:** Connect directly to a PC.
- **CAN Operation:** SC02 uses a female 9-pin DE-9 connector, based on the standard CiA 106 CAN pin assignment, and can be powered via pin 9.

CAN Pin-Out

The SC02 pressure scanner has a standard female DE-9 connector. Pin-out is as shown below:

- Pin 1: NC
- Pin 2: CAN_L
- Pin 3: POWER GND / CAN GND
- Pin 4: NC
- Pin 5: CAN_SHIELD
- Pin 6: POWER GND / CAN GND (tied to pin 3)
- Pin 7: CAN_H
- Pin 8: NC
- Pin 9: POWER IN, 9–30 V DC



Status LED Codes

The multi-coloured LED indicates the current scanner status.

LED Colour	Status	Action Required
Green	Normal operation	The scanner is ready and operating normally.
Blue	Calibration unavailable	Pressure data is available but is not acceleration-corrected. Contact Aerosensor support.
Red	System Fault	Internal error. Disconnect and reconnect power to reset.
Amber	Firmware update mode	Device is waiting for firmware update. If stuck in this state, and repeated updated attempts do not work, please contact Aerosensor support.

Software

AeroDAQ is the recommended way of configuring the SC-02, viewing pressure data, recording CSV files, and updating firmware. Connect the scanner through USB-C for automatic detection and configuration.

Software Installation

1. Download the AeroDAQ Installer for your operating system from:
<https://info.aerosensor.tech/docs/start/downloads/pressure-scanner/>
2. Run the installer
3. Follow the on-screen prompts to complete installation
4. Launch the application

Connection via USB

Open AeroDAQ and connect the scanner to your PC using a USB-C data cable. The software is designed to automatically detect and connect to the scanner. The software and UI is consistent between operating systems.

When connected successfully, the **USB** indicator in the **Connections** panel will turn **Green**, and the **Device Information** panel will auto-populate with the scanner's details.

Troubleshooting

If AeroDAQ is unable to find your scanner via USB, please try the following steps:

- Disconnect and reconnect the cable
- Restart the application
- Ensure your cable supports data transfer and is not a "charge-only" cable
- Check that no other software has the USB port open
- Restart your computer

Connection via CAN

Note: A CAN connection to AeroDAQ is not required to configure CAN related settings for the SC-02. This can be done purely via USB-C, and then the device is ready to integrate into an existing CAN network.

On **Windows**, AeroDAQ supports SC-02 CAN connections through a **PEAK-System PCAN interface**, such as a PCAN-USB adapter. The **PEAK PCAN driver package version 5.x** must be installed before AeroDAQ can use the adapter. CAN functionality is not currently supported in AeroDAQ macOS version.

The CAN bitrate and message identifiers used by AeroDAQ must match the settings stored in the scanner.

With USB Connected

1. Connect the SC-02 to the computer through USB-C
2. Connect the PCAN adapter to the computer and CAN network
3. Select the scanner in AeroDAQ.
4. In the **Connections** panel, select the required PCAN adapter

5. Click **Connect**
6. Click **Start CAN**

AeroDAQ reads the CAN settings from the scanner through USB and configures the PCAN connection automatically. USB can remain connected for power and configuration while pressure data is received through CAN.

Without USB Connected

The SC-02 can also be used through CAN without a USB connection.

1. Click **Add Manual**
2. Select **SC-02 CAN via PCAN**
3. Select the required PCAN adapter
4. Enter the scanner's CAN bitrate, pressure base ID, status ID, and command ID
5. Click **Connect**
6. Click **Start CAN**

The entered values must match the settings stored in the scanner. The factory defaults are:

- Bitrate: **1000 kbit/s**
- Pressure base ID: **0x300**
- Status ID: **0x302**
- Command ID: **0x303**

Viewing Pressure Data

Select the scanner and click **Start USB**. AeroDAQ displays all eight pressure channels in the live data table and chart.

Click **Tare Scanner** to collect a one-second zero reference. Click **Reset Tare** to remove the tare.

Configuring the Scanner

AeroDAQ is the **recommended method of configuring CAN settings**. Connect the scanner through USB-C and go to **File > Configure Device**. Change the required USB or CAN setting and click the **Set** button. Each successful change is automatically saved in the scanner and remains active after a power cycle.

The USB pressure output rate can be set from 50 Hz to 1000 Hz. Lower output rates use internal averaging, usually resulting in lower measurement noise.

CAN bitrate, sample point, output rate, message identifiers, and automatic pressure output can be configured through this window. Please see the **CAN Programming** section for the complete CAN interface.

Probe Calibration Library

Aerosensor can supply a calibration CSV with a calibrated probe. This file is specific to that probe.

To use a probe calibration:

1. Open **Calibration Library**
2. Click **Import CSV** and select the file supplied with the probe
3. Select the connected scanner

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4. Open the **Calibrated Data** tab
5. Select the imported calibration

AeroDAQ stores the imported file and will remember changed settings such as changing the port mapping.

Tare the scanner before taking measurements, and AeroDAQ will use the measured pressures to calculate and display yaw, pitch and air velocity. If a calibration file is loaded these values are also included in the CSV log.

Recording Data

1. Select a folder in the **Logging** panel
2. Enter an optional description
3. Start pressure streaming and tare the scanner
4. Click **Start Logging**
5. Click **Stop Logging** when the test is complete

AeroDAQ creates a numbered CSV file containing device information, timestamps, pressure data, and calibrated probe results if a calibration file is active. When multiple scanners are logged together, they must use the same output rate.

WARNING: File Size & Excel Limits

High sample rates generate significant amounts of data, resulting in large file sizes.

- At **1000Hz**, logging generates 1000 rows of data per second.
- Microsoft Excel has a hard limit of **1,048,576 rows**.
- If logging at 1000Hz, you will reach the Excel row limit in approximately **16 minutes**.

For long-duration high-speed testing, consider using data analysis tools capable of handling large CSVs.

Firmware Updates

Connect the scanner through USB-C and open AeroDAQ. If there is a new update available, AeroDAQ will prompt you and take you to the **Firmware Update** screen. Select your scanner and follow the on-screen instructions to update.

Do not disconnect power during the update. The LED is amber while the scanner is in firmware update mode.

User Programming Guide

This section defines the interfaces used to receive pressure data and configure the SC-02. CAN is intended for embedded integration. USB is intended for AeroDAQ, complete device configuration, calibration and firmware updates.

CAN Programming

SC-002 uses Classical CAN to publish eight pressure channels and to accept a set of control commands. USB via AeroDAQ is the recommended interface for complete configuration and recovery.

Protocol Overview

Item	Value
CAN standard	Classical CAN 2.0A
Identifier	Standard 11-bit
Frame	Data frame, DLC 8
Byte order	Little endian for all multi-byte fields
Supported bit rates	125, 250, 500 and 1000 kbit/s
Factory default	1000 kbit/s, 86.7% sample point, autostart enabled
Pressure output	Two frames for one eight-channel sample

CAN Identifiers

One scanner uses five identifiers: two pressure identifiers, one status identifier, one command-request identifier and one command-response identifier.

Setting	Default	Direction	Use	Valid value
Pressure base ID	0x300	Scanner to host	Base: P1-P4; Base + 1: P5-P8	0x000-0x7FE
Status ID	0x302	Scanner to host	Two rotating status pages	0x000-0x7FF
Command base ID	0x303	Both	Base: request; Base + 1: response	0x000-0x7FE

The five identifiers used by one scanner must not overlap. Different scanners on the same bus must also use non-overlapping identifiers.

With the **default configuration**, pressure uses 0x300 and 0x301, status uses 0x302, commands use 0x303, and responses use 0x304.

Receiving Pressure Data

Pressure Data Frames

CAN ID	Bytes	Type	Field
pressure_base_id	0-1	int16	U1 pressure count
pressure_base_id	2-3	int16	U2 pressure count
pressure_base_id	4-5	int16	U3 pressure count
pressure_base_id	6-7	int16	U4 pressure count
pressure_base_id + 1	0-1	int16	U5 pressure count
pressure_base_id + 1	2-3	int16	U6 pressure count
pressure_base_id + 1	4-5	int16	U7 pressure count
pressure_base_id + 1	6-7	int16	U8 pressure count

Each pressure sample is sent in two consecutive frames. The first frame contains P1-P4, and the second contains P5-P8.

Pressure Conversion

For SC02.025.8, the positive full-scale value is 2451.6625 Pa. Use the following formula to convert the reported count to pressure (Pa).

$$\text{Pressure (Pa)} = \text{Count} * (2451.6625 / 32768)$$

Status Frames

The scanner sends one status frame each second on status_id. Pages 0 and 1 alternate. A full status cycle takes two seconds.

Page 0 bytes	Type	Field
0	uint8	Page number = 0
1-4	uint8[4]	Public short device ID
5	uint8	Pressure range index
6	uint8	Configured CAN pressure-rate ID
7	uint8	Tare-state ID

Page 1 bytes	Type	Field
0	uint8	Page number = 1
1	uint8	Firmware major version
2	uint8	Firmware minor version
3	uint8	CAN diagnostic bitfield
4	uint8	CAN data-format ID
5-7	uint8[3]	Reserved; zero

CAN diagnostic bitfield	Mask	Meaning
0	0x01	Controller is currently error-passive
1	0x02	Controller entered bus-off since startup
2-7	-	Reserved; zero

Display the four public ID bytes in transmitted order as eight uppercase hexadecimal characters.

CAN Commands

Frame	Byte 0	Byte 1	Bytes 2-7
Request: command_base_id	Opcode	First argument	Remaining arguments; unused bytes zero
Response: command_base_id + 1	Echoed opcode	Result ID	Response data; unused bytes zero

Result ID	Name	Meaning
0	ACK	Command completed or was accepted
1	UNSUPPORTED_OPCODE	Opcode is not implemented
2	INVALID_VALUE	Argument is unsupported, out of range or conflicts
3	BUSY	Device is busy
4	OPERATION_FAILED	Hardware, flash or verification failed

Opcode	Command	Request bytes 1-7
0x01	START_STREAM	All zero
0x02	STOP_STREAM	All zero
0x03	SET_RATE	Byte 1 = CAN pressure-rate ID
0x04	TARE	All zero
0x05	RESET_TARE	All zero
0x10	SET_PRESSURE_BASE_ID	Bytes 1-2 = uint16 CAN ID
0x11	SET_STATUS_ID	Bytes 1-2 = uint16 CAN ID
0x12	SET_COMMAND_BASE_ID	Bytes 1-2 = uint16 CAN ID
0x13	SET_BITRATE	Byte 1 = CAN bit-rate ID
0x14	SET_DATA_FORMAT	Byte 1 = data-format ID
0x15	SET_SAMPLE_POINT	Byte 1 = sample-point ID
0x7F	SAVE_SETTINGS_TO_FLASH	All zero

All command frames use DLC 8. Structurally malformed requests are discarded. Settings remain volatile until SAVE succeeds. For a command-ID, bit-rate or sample-point change, the scanner sends the response with the old configuration before it applies the new value.

Please note that after a device tare has been applied with the CAN TARE command, the tare will not persist between device power cycles.

CAN Enumerations

Pressure-rate ID	Rate
0	1 Hz
1	5 Hz
2	10 Hz
3	20 Hz
4	25 Hz
5	50 Hz
6	100 Hz
7	150 Hz
8	200 Hz
9-255	Reserved

Bit-rate ID	Bit rate
0	125 kbit/s
1	250 kbit/s
2	500 kbit/s
3	1000 kbit/s

Sample-point ID	Sample point
0	73.3%
1	80.0%
2	86.7% (default)
3-255	Reserved

Enum	ID	Meaning
Pressure range	0	SC02.025.8, nominal +/-2.5 kPa
Pressure range	0xFF	Invalid sensors detected, contact Aerosensor
Tare state	0	None
Tare state	1	Active and applied
CAN data format	0	Two pressure frames defined above

USB Programming

SC-002 uses USB CDC for pressure streaming and complete scanner configuration. Commands and replies use message-specific binary packets.

Protocol Overview

Item	Value
USB class	CDC Virtual Com Port
VID	0x1915
PID	0x1999
Product string	Aero Sensor SC-002
Byte order	Little endian
Floating point	IEEE-754 float32, little endian
CRC	CRC-16/CCITT-FALSE

Every packet starts with a little-endian uint16 packet identifier and ends with a little-endian uint16 CRC. A successful setting command is mirrored after the change succeeds. Invalid, unsupported or malformed commands receive no reply and do not change scanner state.

CRC-16/CCITT-FALSE

Parameter	Value
Polynomial	0x1021
Initial value	0xFFFF
Reflect input/output	No / No
Final XOR	0x0000
Coverage	All packet bytes before the CRC

Basic Commands

For basic commands, the first 2-byte identifier of the message is **0x0010**.

Basic command structure: [**packet ID 0x0010**: 2 bytes] [**sub-ID**: 2 bytes] [**CRC**: 2 bytes].

Sub-ID	Command	Action	Successful reply
0x0011	Start USB pressure	Start USB output	Mirror command
0x0002	Stop pressure	Stop the active pressure stream	Mirror command
0x0003	Report timestamp	Read milliseconds since boot	Timestamp packet 0x1003
0x0004	Report Device Info	Read fixed identity and model	Device Info packet 0x1004
0x0005	Report Device Status	Read state and all configurable settings	Device Status packet 0x1005

Example START USB packet: 10 00 11 00 25 AF.

Configuration Commands

An advanced command has the structure [**command ID**: 2 bytes] [**arguments**] [**CRC**: 2 bytes].

Packet ID	Command	Arguments	Total length
0x0020	SET_USB_PRESSURE_RATE	uint8 rate_id	5
0x0032	SET_CAN_PRESSURE_RATE	uint8 rate_id	5
0x0033	SET_CAN_BITRATE	uint8 bitrate_id	5

Packet ID	Command	Arguments	Total length
0x0034	SET_CAN_PRESSURE_BASE_ID	uint16 identifier	6
0x0035	SET_CAN_AUTOSTART	uint8 enabled	5
0x0039	SET_CAN_STATUS_ID	uint16 identifier	6
0x003A	SET_CAN_COMMAND_BASE_ID	uint16 identifier	6
0x003B	SET_CAN_DATA_FORMAT	uint8 format_id	5
0x003C	SET_CAN_SAMPLE_POINT	uint8 sample_point_id	5
0x0099	SAVE_SETTINGS	None	4

USB can configure all CAN settings. It cannot start CAN streaming.

Saving Settings

SAVE_SETTINGS (0x0099) stores the current USB and CAN settings. The scanner mirrors the command only after the flash record is committed and verified. It restores the previous pressure stream after a successful save.

USB Enumerations

USB pressure-rate ID	Rate
0	50 Hz
1	100 Hz
2	250 Hz
3	500 Hz
4	1000 Hz

CAN pressure-rate ID	Rate
0	1 Hz
1	5 Hz
2	10 Hz
3	20 Hz
4	25 Hz
5	50 Hz
6	100 Hz
7	150 Hz
8	200 Hz

Enum	ID	Value
CAN bit rate	0 / 1 / 2 / 3	125 / 250 / 500 / 1000 kbit/s
CAN sample point	0 / 1 / 2	73.3% / 80.0% / 86.7%
CAN data format	0	Two pressure frames defined in CAN Programming
Scanner model	0	SC02.025.8, +/-2.5 kPa
Scanner model	0xFF	Unknown or invalid model. Contact Aerosensor.

Timestamp Packet 0x1003

Bytes	Type	Field
0-1	uint16	Packet identifier 0x1003
2-5	uint32	Milliseconds since boot
6-7	uint16	CRC

Device Info Packet 0x1004

Bytes	Type	Field
0-1	uint16	Packet identifier 0x1004
2-13	uint8[12]	Full device UID
14	uint8	Firmware major version
15	uint8	Firmware minor version
16	uint8	Scanner-model ID
17-18	uint16	CRC

The shorter eight-character device ID displayed in AeroDAQ and sent in CAN, is the last four **Full device UID** bytes displayed in byte order as uppercase hexadecimal characters.

Device Status Packet 0x1005

Bytes	Type	Field
0-1	uint16	Packet identifier 0x1005
2	uint8	Pressure streaming active
3	uint8	Calibration mode active
4	uint8	Valid board calibration loaded
5	uint8	USB pressure-rate ID
6	uint8	CAN pressure-rate ID
7	uint8	CAN bit-rate ID
8	uint8	CAN autostart enabled
9	uint8	CAN data-format ID
10	uint8	CAN sample-point ID
11-12	uint16	CAN pressure base ID
13-14	uint16	CAN status ID
15-16	uint16	CAN command request ID
17-18	uint16	CRC

Pressure Data Packet 0xAABB

Structure: [ID: 2 bytes] [record count: 1 byte] [36-byte **pressure record bytes**] [CRC: 2 bytes].

Record bytes	Type	Field
0-3	uint32	Acquisition timestamp in ms
4-7	float32	P1 pressure in Pa
8-11	float32	P2 pressure in Pa
12-15	float32	P3 pressure in Pa
16-19	float32	P4 pressure in Pa
20-23	float32	P5 pressure in Pa
24-27	float32	P6 pressure in Pa
28-31	float32	P7 pressure in Pa
32-35	float32	P8 pressure in Pa

Appendix A: Specification

Power and electrical

Power supply	5V (USB)
Current	200mA

Environmental

Compensated range	0 to 50°C
Operational range	-20 to +85°C
Humidity	0 to 95%
Vibration	15g

Pressure measurement performance

Pressure ranges	+/-2.5kPa, +/-12.5kPa
Proof pressure	10kPa, 100kPa
Resolution	24-bit (16-bit CAN)
Accuracy	+/-0.05% FS
Total error band	+/-0.15% FS
Total error band after zero	+/-0.05% FS
Output rate (per channel)	50–1000Hz over USB 1 - 200Hz over CAN

Mechanical

Pneumatic connectors	1.59mm tubulations x 9
Dimensions	69 x 73 x 34mm
Weight	100g