

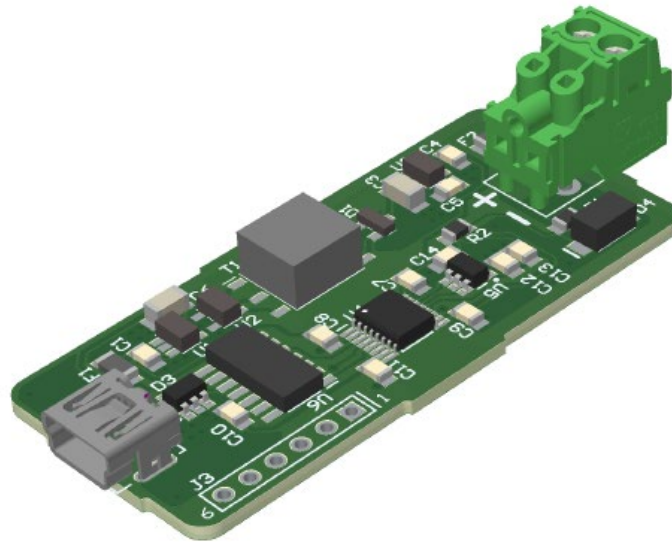


**TOKYO DEVICES**

# TDFA60220

4-20mA to USB, Analog Current Signal A/D Converter, Galvanic Isolation

Revision 1.0.2



The TDFA60220 is a USB current meter compatible with the 4-20mA current signal of industrial sensors. It can capture the current loop value in real-time at a rate of up to 1,000 Ksps with a 12-bit resolution (4,096 levels).

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## 1. Specification

項目	値	説明
Measurement Range	0-30mA	
Resolution	12 bit	0-4,095
Maximum Rating	50mA	Protected by a polyfuse
Input Impedance	100 Ω	
Sampling Rate	1,000 SPS	
Isolation Performance	1KV	*Not tested
Contact Size	0.2 – 2.5 mm <sup>2</sup> 26 – 14 AWG	
USB Interface	USB 2.0 Full speed	
USB Connector Type	USB Type B Mini	
Power Consumption	12mA typ.	
Power Supply	Bus powered	
Operating Temperature	0 – 55 °C	
Board Dimensions	W: 60mm D: 25mm H: 18mm	

## 2. Board Layout

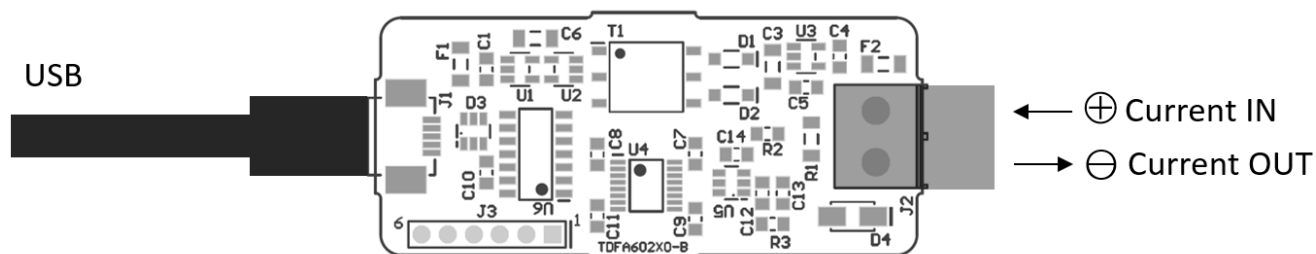


Figure1 Board Layout

名前	説明
⊕	Connect to the positive side of the current loop. It draws current.
⊖	Connect to the negative side of the current loop. It releases current.
J1	Connect the USB cable.

Table 1 Connector assignments

### 3. Quick Start

1. Search for "TDFA60220" in the search box of the Tokyo Devices website and download and install "TD-AppKit" from the product page.
2. Connect the USB port of the computer to the USB connector on the board.
3. Prepare an external power source and connect the 4-20mA current output sensor to the TDFA60220.
4. Launch TD-AppKit and select "Device" and "Open" from the main menu. Choose "TDFA60220" from the "Product Model" list, select the serial number from the "Detected devices" list, and press the "Open" button.
5. The current value will be displayed in real-time on the graph.

### 4. Connecting with sensors

Figures 2 and 3 illustrate examples of connections with 2-wire sensors and 4-wire sensors, respectively. The input impedance of the TDFA60220 is  $100\Omega$ . For the 2-wire system, please incorporate it into the current loop that runs through both the power supply and the sensor. For the 4-wire system, please connect the TDFA60220 directly to the current source/sink terminals of the sensor.

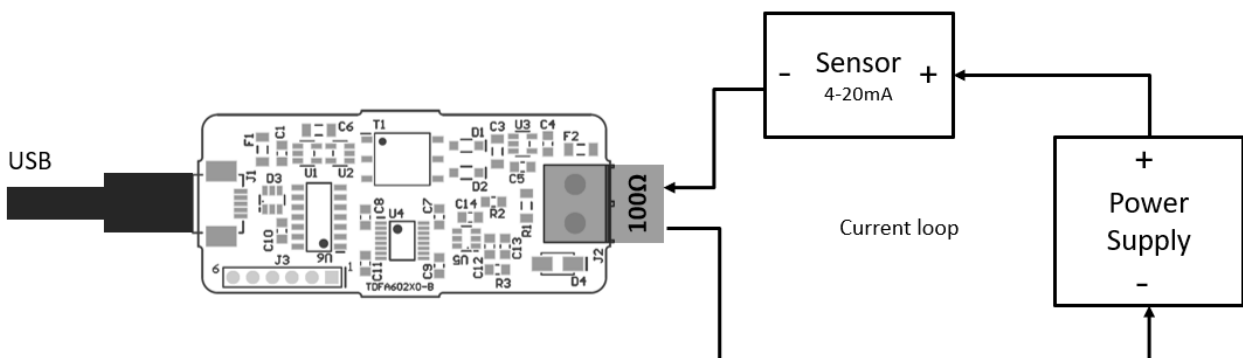


Figure 2 2-wire system

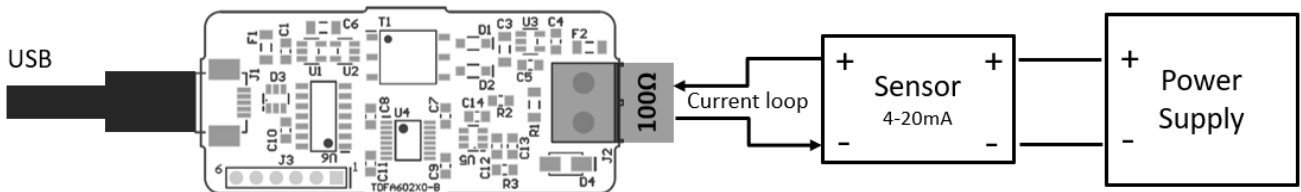


Figure 3 4-wire system

## 5. Controlling TDFA60220

TDFA60220 is controlled by the command "TD-USB." TD-USB is a command-line program that runs from either Windows or Linux. To obtain TD-USB, please search for the keyword "TDFA60220" on the Tokyo Devices website or acquire it from the GitHub repository.

Tokyo Devices Website (in Japanese): <https://tokyodevices.com/>

TD-USB GitHub Repository: <https://github.com/tokyodevices/td-usb/>

### 5.1. Measuring Current Value

```
> td-usb tdfa60220 get
3.14159
```

Where `get` is an operation to read values from the device. When the value retrieval is successful, a number will be returned on the standard output in a single line. This number represents the current value, with the unit being mA.

By specifying the "`--loop=N`" option, you can repeatedly retrieve values. For `N`, specify the retrieval interval as a number in milliseconds. The following example outputs the current value to the standard output every 3 seconds.

```
> td-usb tdfa60220 get --loop=3000
3.14159
3.14159
3.64822
```

The `get` operation may experience delays due to the communication status of the USB bus (from several tens of milliseconds to several seconds in the case of Windows). If you need the fastest data, please use the following `listen` operation.

### 5.2. Measuring Current Values in Real-Time

By specifying the `listen` operation, data is written to the standard output at the fastest speed (1,000 samples/second). One `listen` operation retrieves 30 data points. To retrieve repeatedly, specify the "`--loop`" option. The following example will display data indefinitely. To stop, press the Ctrl key and the "C" key on the command line.

```
> td-usb tdfa60220 listen --loop
3.14159
3.14159
3.14159
...
```

The following command writes all the data to a text file. You can load it into applications like Excel.

```
> td-usb tdfa60220 listen --loop > output.txt
```

### 5.3. Identifying Multiple TDFA60220 Devices

Multiple TDFA60220 devices can be connected to a single PC. Each TDFA60220 is assigned a unique serial number at the time of shipment. By specifying the serial number in TD-USB, you can designate which specific device to operate.

```
> td-usb tdfa60220 list
XXXXXXXXXXXXXXXX,YYYYYYYYYYYYYYY
> td-usb tdfa60220:XXXXXXXXXXXX get
3.14159
```

Using the "list" operation of the TD-USB command, you can retrieve serial numbers of multiple devices connected to a single computer. The serial numbers are output by delimited with comma ',' character. By concatenating the fixed string "tdfa60220" with a colon character and the serial number, you can designate the target device for operation.

### 5.4. Calibration

TDFA60220 can be calibrated (single-point calibration). The process is as follows:

1. Prepare a constant current source that outputs an accurate 25mA and connect it to TDFA60220. Alternatively, prepare a DC power supply and a DC ammeter, and connect them in a current loop to ensure an accurate 25mA flow.
2. Use the "get" operation with the `--format=raw` option to retrieve the calibration value.
3. Use the "set" operation to configure the calibration value.
4. Write to the device's non-volatile memory using the "save" operation.

Here's an example of the commands used in the calibration process:

```
> td-usb tdfa60220 get --format=raw
3114
> td-usb tdfa60220 set CALIBRATION=3114
> td-usb tdfa60220 save
```

The `--format=raw` option is a fixed string used to obtain the calibration value(Case sensitive). In the above example, the calibration value of 3114 has been retrieved. The "set" operation's option "CALIBRATION=3114" is a string used to set the calibration value(Case sensitive) Note that if the "save" operation is not executed, the calibration value will not be reflected the next time the power is turned on.

You can integrate the TDFA60220 into custom applications by calling each of the TD-USB commands as an external process or external program. For methods of collaboration with external processes, please refer to the samples in the TD-USB

README, as well as reference manuals and developer guides for each programming language.

## 6. Product Customization Services

Tokyo Devices offers customization of circuit board exteriors, functionalities, and performance based on customer needs. For more details, please check the "Customization" on the Tokyo Devices website.

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