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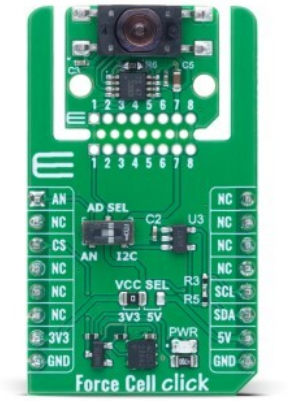
Force Cell Click



PID: MIKROE-6704

Force Cell Click is a compact add-on board that provides precise force measurement for embedded applications, enabling accurate compression load sensing up to 3000 grams (30 Newtons). It is based on the FS102A-0000-3000-G miniature compression load cell from TE Connectivity's FS10 series. Using TE's Microfused technology, the sensor ensures excellent stability, resolution, cycle life, and high over-range capability. The onboard INA333 amplifier conditions the sensor's low-level output, while the AD SEL switch allows users to select between analog output via the mikroBUS™ AN pin or digital output through the MCP3221 12-bit ADC over the I2C interface. Force Cell Click is ideal for wearable medical devices, robotics, industrial equipment, and consumer appliances where compact, accurate, and reliable force sensing is essential.

For more information about **Force Cell Click** visit the official product page.

How does it work?

Force Cell Click is based on the FS102A-0000-3000-G, a miniature compression load cell from TE Connectivity's FS10 series, designed to provide highly precise force measurement capabilities for embedded applications. The FS102A-0000-3000-G sensor features a sensitivity of 20mV/V and is capable of measuring forces up to 3000 grams, equivalent to 30 Newtons, making it suitable for a wide range of applications that require accurate force sensing. Using TE Connectivity's high-reliability Microfused technology, this sensor delivers excellent span and zero stability, superior resolution, outstanding cycle life, and high over-range capability, ensuring long-term operational consistency even under demanding conditions.

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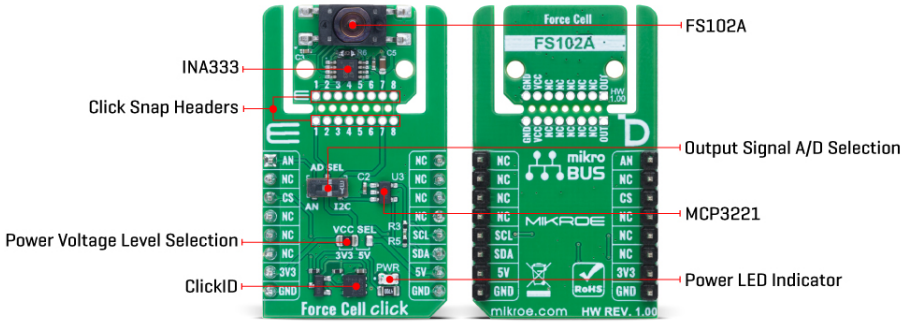

The FS102A-0000-3000-G's innovative design incorporates a high-resistance pin-molded plastic housing that connects directly with the strain gauge signal, eliminating the need for internal PCBs and providing enhanced performance stability, particularly during exposure to high-temperature processes. Optimized for integration into embedded systems, Force Cell Click is ideal for use in wearable medical devices, industrial and consumer appliances, as well as robotics applications, where space constraints, accuracy, and durability are critical factors.

This Click board™ is designed in a unique format supporting the newly introduced MIKROE feature called "Click Snap." Unlike the standardized version of Click boards, this feature allows the main sensor area to become movable by breaking the PCB, opening up many new possibilities for implementation. Thanks to the Snap feature, the FS102A-0000-3000-G can operate autonomously by accessing its signals directly on the pins marked 1-8. Additionally, the Snap part includes a specified and fixed screw hole position, enabling users to secure the Snap board in their desired location.

The signal conditioning and amplification for the FS102A-0000-3000-G sensor are handled by the INA333, a high-performance rail-to-rail operational amplifier from Texas Instruments, ensuring precise and stable amplification of the sensor's low-level output signal. After amplification, the conditioned signal is routed to the AD SEL switch, providing the user with the flexibility to choose between analog and digital output modes depending on the specific requirements of their application. When analog output is selected, the amplified signal is made available directly on the AN pin of the mikroBUS™ socket, allowing for straightforward integration with analog signal processing circuits.

For digital signal acquisition, the board incorporates the MCP3221 from Microchip, a 12-bit resolution analog-to-digital converter that enables high-accuracy digital conversion and communicates via the standard 2-wire I2C interface, ensuring compatibility with a wide range of MCUs and digital systems. The output mode selection is easily configured through the onboard surface-mount device (SMD) switch labeled AD SEL, which allows users to toggle between the analog (AN) position and the digital (I2C) position to accommodate diverse application scenarios and design preferences.

This Click board™ can operate with either 3.3V or 5V logic voltage levels selected via the VCC SEL jumper. This way, both 3.3V and 5V capable MCUs can use the communication lines properly. Also, this Click board™ comes equipped with a library containing easy-to-use functions and an example code that can be used as a reference for further development.

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Click Snap

Click Snap is an innovative feature of our standardized Click add-on boards, designed to bring greater flexibility and optimize your prototypes. By simply snapping the PCB along predefined lines, you can easily detach the main sensor/IC/module area, reducing the overall size, weight, and power consumption - ideal for the final phase of prototyping. For more details about Click Snap, visit the official page dedicated to this feature.

Specifications

Type	Pressure
Applications	Ideal for wearable medical devices, robotics, industrial equipment, and consumer appliances where compact, accurate, and reliable force sensing is essential
On-board modules	FS102A-0000-3000-G - miniature compression load cell from TE Connectivity's FS10 series
Key Features	Load cell sensor with 3000g (30N) measurement range, 20mV/V sensitivity, TE Connectivity Microfused technology for excellent span and zero stability, superior resolution, outstanding cycle life, high over-range capability, selectable analog or digital output, and more
Interface	Analog,I2C
Feature	Click Snap,ClickID
Compatibility	mikroBUS™
Click board size	M (42.9 x 25.4 mm)
Input Voltage	3.3V or 5V

Pinout diagram

This table shows how the pinout on Force Cell Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
Analog Output	**AN**	1	AN	PWM	16	NC	
	NC	2	RST	INT	15	NC	
ID COMM	**CS**	3	CS	RX	14	NC	
	NC	4	SCK	TX	13	NC	
	NC	5	MISO	SCL	12	**SCL**	I2C Clock
	NC	6	MOSI	SDA	11	**SDA**	I2C Data
Power Supply	**3.3V**	7	3.3V	5V	10	**5V**	Power Supply
Ground	**GND**	8	GND	GND	9	**GND**	Ground

Onboard settings and indicators

Label	Name	Default	Description

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LD1	PWR	-	Power LED Indicator
JP1	VCC SEL	Left	Power Voltage Level Selection 3V3/5V: Left position 3V3, Right position 5V
SW1	AD SEL	Right	Output Voltage A/D Selection AN/I2C: Left position AN, Right position I2C

Force Cell Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Force Measurement Range	-	-	3000	G
Sensitivity	-	20	-	mV/V

Software Support

Force Cell Click demo application is developed using the NECTO Studio, ensuring compatibility with mikroSDK's open-source libraries and tools. Designed for plug-and-play implementation and testing, the demo is fully compatible with all development, starter, and mikromedia boards featuring a mikroBUS™ socket.

Example Description

This example demonstrates the use of the Force Cell Click board by reading the applied force in newtons (N) from a load cell sensor. The application initializes the driver, calibrates the offset, and continuously measures and logs the force value to the USB UART terminal.

Key Functions

- forcecell_cfg_setup This function initializes Click configuration structure to initial values.
- forcecell_init This function initializes all necessary pins and peripherals used for this Click board.
- forcecell_calib_offset This function calibrates the zero force offset value.
- forcecell_read_force This function reads the applied force level [N].

Application Init

Initializes the logger and the Click driver, performs offset calibration to null the load cell.

Application Task

Continuously reads and displays the current force value in newtons every 100ms.

Application Output

This Click board can be interfaced and monitored in two ways:

- Application Output - Use the "Application Output" window in Debug mode for real-time data monitoring. Set it up properly by following this tutorial.
- UART Terminal - Monitor data via the UART Terminal using a USB to UART converter.

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For detailed instructions, check out this tutorial.

Additional Notes and Information

The complete application code and a ready-to-use project are available through the NECTO Studio Package Manager for direct installation in the NECTO Studio. The application code can also be found on the MIKROE GitHub account.

Resources

mikroBUS™

mikroSDK

Click board™ Catalog

Click boards™

ClickID

Downloads

MCP3221 datasheet

Force Cell click example package

Force Cell click 2D and 3D files v100

Force Cell click schematic v100

FS10 datasheet

INA333 datasheet