EQUILOG

GYROTURN EQUILOG

Technical documentation
Precise adjustment of lockshield valves and manual valves

Prototype EQUILOG module with integrated display

The EQUILOG gyroscopic sensor converts the rotation of the handle or adjustment tool into a number of turns that can be used on site. It helps document an opening position, check intermediate turns and secure the repeatability of hydraulic balancing.

Main use
Measure and record the number of turns when adjusting lockshield valves, valve bodies or manual balancing devices requiring a precise angular position.

Local interface
Connection from a tablet or smartphone via browser, with the measurement interface accessible locally.

1. Purpose and measurement functions

The gyroscopic sensor is designed for precise adjustment of manual devices such as lockshield valves. It counts rotations during handling, displays the sensor orientation and can store intermediate positions in order to document the final setting in EQUILOG.

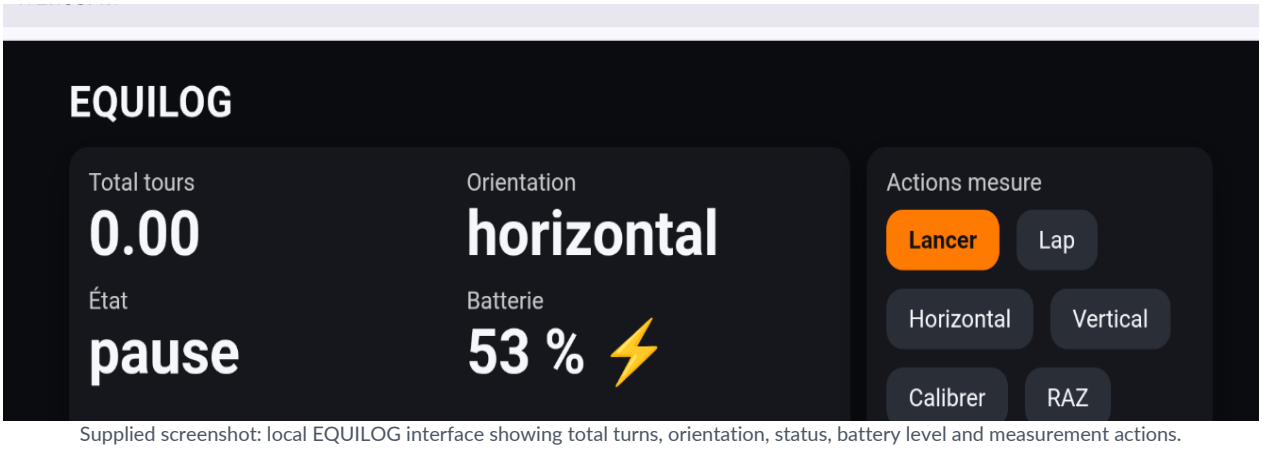
Turn counting
Displays the cumulative number of turns with decimals. The cumulative value makes it possible to return to an identical position or record a precise opening.

Orientation
Detects horizontal or vertical mode to adapt the useful measurement axis to the way the sensor is mounted on the lockshield valve.

Calibration / zero
Resets the angular reference before adjustment or after the sensor has been repositioned.

Intermediate turns
Lap function used to store intermediate steps during adjustment or to compare several positions.

EQUILOG measurement interface



Supplied screenshot: local EQUILOG interface showing total turns, orientation, status, battery level and measurement actions.

Total turns	Cumulative number of turns since start or since the last reset.
Status	Paused / measurement running: indicates whether angular acquisition is active.
Battery	Battery level used to check autonomy before the site intervention.
Start	Starts or resumes the measurement.
Lap	Records an intermediate point without resetting the measurement.
Horizontal / Vertical	Selects the reference orientation according to the actual mounting on the adjusted device.
Calibrate	Sets the sensor reference and reduces drift related to the initial position.
Reset	Resets the total turns to zero to restart a clean measurement.

2. Measurement principle and site procedure

The sensor uses a six-axis inertial measurement unit: a gyroscope measures angular velocity and an accelerometer helps determine orientation and mounting stability. EQUILOG logic converts rotation around the useful axis into a number of turns to facilitate documented lockshield valve adjustment.

1. Attach the sensor	Install the sensor or its bracket on the adjustment key/handle while avoiding any mechanical play.
2. Choose orientation	Select Horizontal or Vertical according to the working position so the useful rotation axis is correctly taken into account.
3. Calibrate	Perform calibration with the sensor stationary. This step defines the reference and limits starting errors.
4. Start measurement	Press Start, then turn the adjustment device smoothly, without impact or abrupt change of axis.
5. Store steps	Use Lap to record an intermediate position: starting position, pre-setting, final position or check point.
6. Validate the setting	Record the final position in the valve sheet or in EQUILOG, with the device identifier and circuit status.

Precision recommendations

- Use a rigid adapter centered on the rotation axis.
- Recalibrate after each removal or repositioning of the sensor.
- Adjust at moderate speed to avoid jerks.
- Record the initial mechanical position if the device has an end stop.
- Check consistency against the manufacturer scale when available.

Limitations to document

- Final accuracy depends on the mechanical play between the key, adapter and lockshield valve.
- The sensor measures rotation; it does not replace a hydraulic flow or temperature measurement.
- Drift may appear during long operations if the sensor is poorly calibrated or moved.

3. Technical characteristics - hardware platform

The visible hardware platform corresponds to a compact M5Stack StickC-Plus2 type module. The characteristics below are based on official data for this hardware platform and for the MPU6886 inertial sensor. To be confirmed against the exact module reference purchased if it differs.

Microcontroller	ESP32-PICO-V3-02, dual-core processor up to 240 MHz
Memory	8 MB Flash + 2 MB Quad PSRAM
Communication	2.4 GHz Wi-Fi; local interface possible via access point and browser
Display	1.14-inch color TFT screen, 135 x 240 px, ST7789v2 controller
Interface	USB Type-C; HY2.0-4P connector compatible with I2C / I/O / UART
Buttons	3 customizable buttons
Integrated IMU	MPU6886: 3-axis accelerometer + 3-axis gyroscope
Battery	Integrated 200 mAh, 3.7 V battery
Operating temperature	0 to 40 °C
Enclosure	PC plastic
Dimensions / weight	48.0 x 24.0 x 13.5 mm; 16.7 g

Integrated inertial sensor

Sensor type	MPU6886 6-axis MotionTracking: 3-axis gyroscope + 3-axis accelerometer
Programmable gyroscope ranges	±250, ±500, ±1000 and ±2000 degrees/s
Programmable accelerometer ranges	±2 g, ±4 g, ±8 g and ±16 g
Conversion / filtering	16-bit ADC, programmable digital filters, 1 kB FIFO
Sensor interfaces	I2C 400 kHz or SPI 10 MHz
Benefit for EQUILOG	Rotation tracking, orientation, motion detection and field measurement stabilization.

4. EQUILOG functional specification

This section formalizes the expected behavior of the turn-counting application for hydraulic balancing. It can be used as a basis for a software specification or a user guide.

Measurement mode	Start / pause from the interface. The total counter is frozen while paused.
Displayed calculation	Total in turns: conversion of the accumulated angle around the useful axis, with decimal display.
Orientation	Horizontal or vertical mode to adapt the reference frame according to the mounting.
Calibration	Stationary measurement to define the reference and reduce starting biases.
Lap / intermediate	Saves an intermediate turn value, with possible timestamping.
Reset	Resets the cumulative total after validation or when changing device.
Local interface	Readout on smartphone/tablet via local browser. The example supplied shows address 192.168.4.1.
Operating safety	Battery indication; recalibration recommended in case of impact, movement or change of support.

Technical sources used

- Official M5Stack StickC-Plus2 documentation: functions, SoC, Wi-Fi, screen, battery, IMU, dimensions and interfaces.
- MPU-6886 datasheet: 6-axis MotionTracking sensor, gyroscope ranges, accelerometer ranges, ADC, filters and interfaces.
- Screenshots supplied by EQUILOG: module visual and local measurement interface.