TOPICS

An Ultra-small Sized Data-logger System for High-speed Rotational Measurement

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高速回転信号取得技術　ー超小型データロガーー

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1. Introduction

The extraction of signals from a sensor on a rotating object is the key to the success in experiments that aim to measure phenomena related to mechanisms operating at high rotational speeds, such as belts, engines, motors and brakes. We have developed an ultra-small data-logger system - a compact, high-precision measuring instrument that can supersede conventional methods such as telemetry.

2. Method

The data-logger system is configured as shown in **Fig. 1**. It has been designed to be mounted on a device under test. The system obtains data at a high SN ratio by digitizing the analog signals from the sensor(s) and storing the resulting digital data directly into its memory. The data-logger system can thus collect data without being connected to a PC or interface, even while the device under test is rotating. Once the device under test comes to rest, the data-logger system is connected to a PC via a cable and the stored data is then transferred to the PC. The main body of the data-logger system is separated from its power source (rechargeable battery) to minimize its weight and thus reduce the influence on the device being tested.

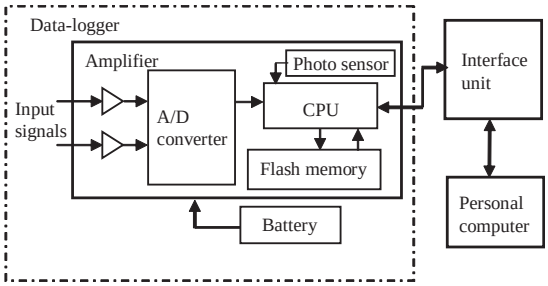

Fig. 1 'Data-logger system' block diagram.

Table 1 Specifications of data-logger.

Maximum revolution	2000rpm
Input	2 channels
A/D Resolution	10bit
Memory capacity	32MB (16M data points)
Sampling rate	100k sampling/sec.
Power supply	Lithium-polymer battery 3.7V
Dimensions	22mm x 22mm x 7mm
Weight	5 g

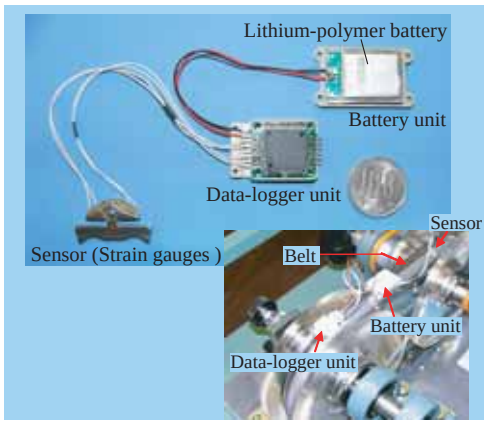

Fig. 2 Data-logger system mounted on a belt.

3. Results

Table 1 lists the technical data of the prototype data-logger system. The total weight of the body and the battery unit is 5 g, and the maximum weight that preliminary tests showed can be used at a target rotational speed of 2,000 rpm.

Fig. 2 shows the appearance of the data-logger system and how it can be mounted on a belt to measure strain in that belt. **Fig. 3** shows an example of the results obtained by measuring the bending strain in a device under test. The data obtained with the data-logger system does not contain any of the noise that tends to occur with telemetry-type measurement. It features a high SN ratio over the entire measurement range.

4. Conclusion

Our newly developed ultra-small data-logger system can be applied to the measurement of moving and rotating objects for which the extraction of signals would be difficult using other types of measuring instruments. The ultra-small data-logger system has already been used successfully for measuring engine piston temperatures and brake strain.

We will continue our development with the goal of producing lighter and more advanced data-logger systems that can be used for measurements at a rotational speed up to 6,000 rpm.

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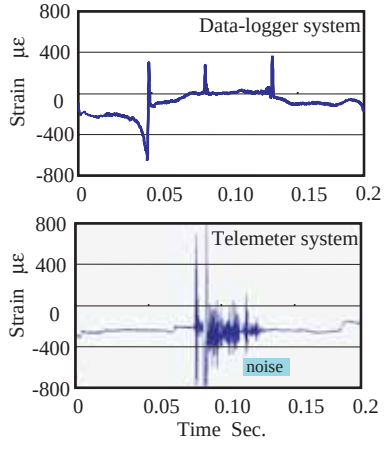

Fig. 3 Comparison of belt bending strain.