Supplementary Information

Super-lightweight, Low-cost and Wireless Water Quality Monitor for Remote Chlorine-rate Management in Water-circulating Cooling Facilities

Masayuki Kawakami[*ab*], Toshihiro Kasama[*a], Tomomi Sato[*a], Hidekatsu Tazawa[*a], Madoka Takai[*a], Daisaku Yano[*b], Ryo Miyake[*a]

a.Department of Bioengineering, School of Engineering, The University of Tokyo, 7-7 Shinkawasaki, Saiwai-ku, Kawasaki, Kanagawa 212-0032, Japan

b.ORGANO Corporation., 4-4-1 Nishionuma, Minami-ku, Sagamihara, Kanagawa 252-0032, Japan

* Corresponding authors:

  Email: kawakami-masayuki973@g.ecc.u-tokyo.ac.jp

• **Detailed results of the flow stability evaluations.**

These data sets provide extended evidence for the flow stability discussed in Figure 8 of the main manuscript.

Signal Profiles: The red lines represent the dye signal intensity recorded during repeated dye injections performed at 600-second (10-minute) intervals.

Velocity Calculation: The orange dots indicate the calculated flow velocity, which was derived from the time between the reagent injection and its arrival at the flow cell (refer to Equation (1) in the manuscript for the specific calculation methodology).

Individual Injection Data: Fig. S1(a) to (f) provide expanded views of the arrival profiles for each respective injection, demonstrating the high reproducibility of the flow behavior and timing.
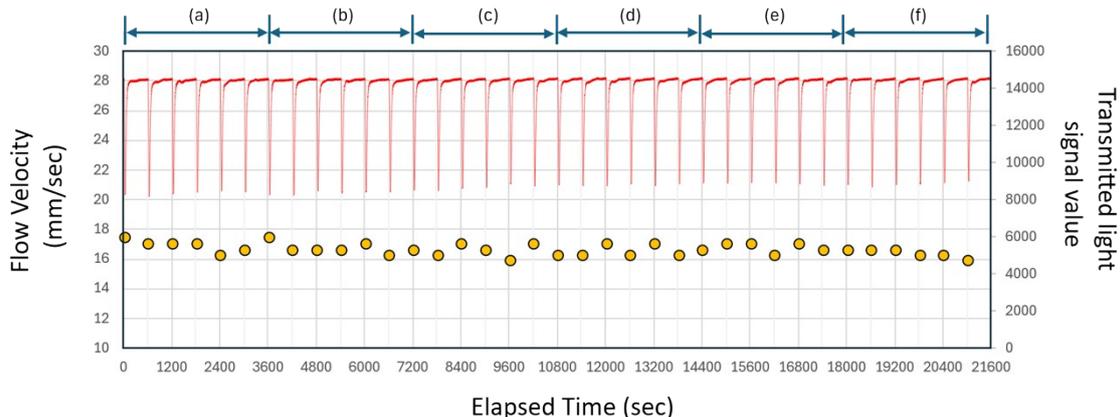

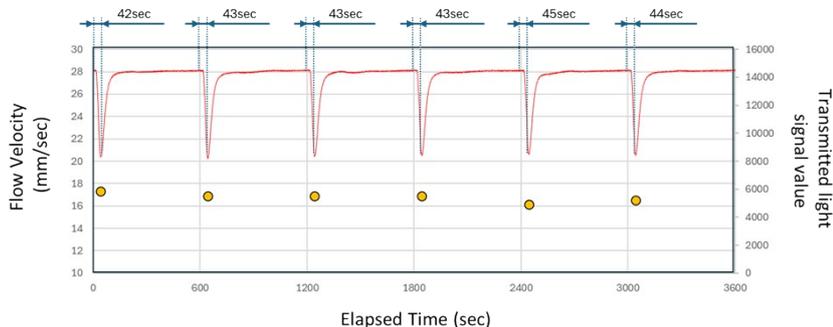Fig.S1 Detailed results of the flow stability evaluations
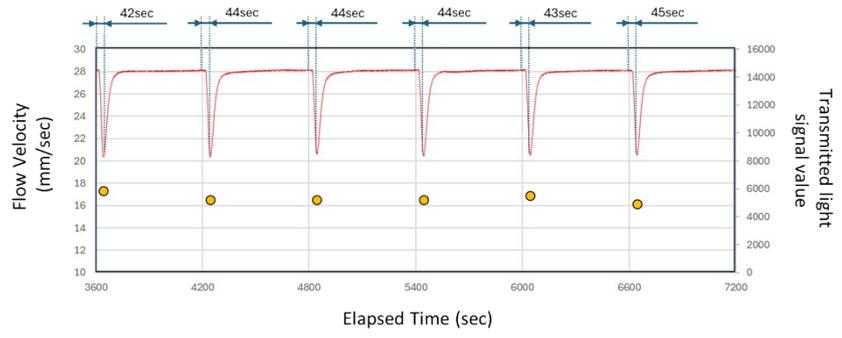

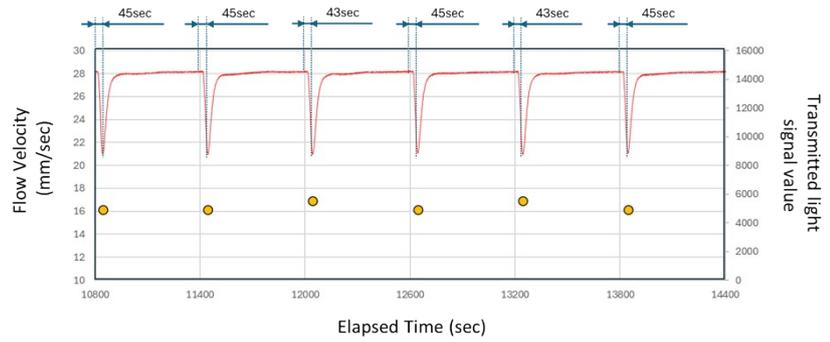Fig.S1(a)

Fig.S1(b)

Fig.S1(c)
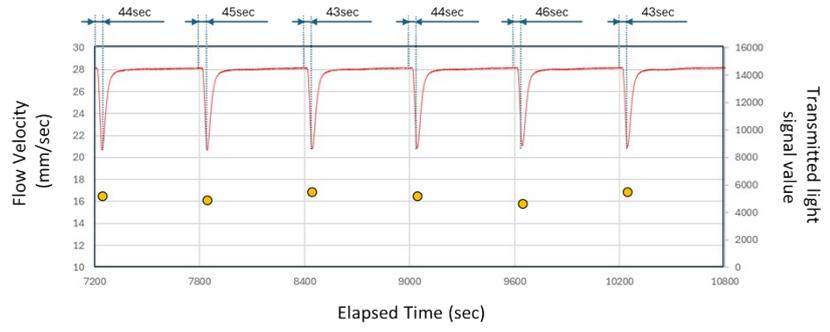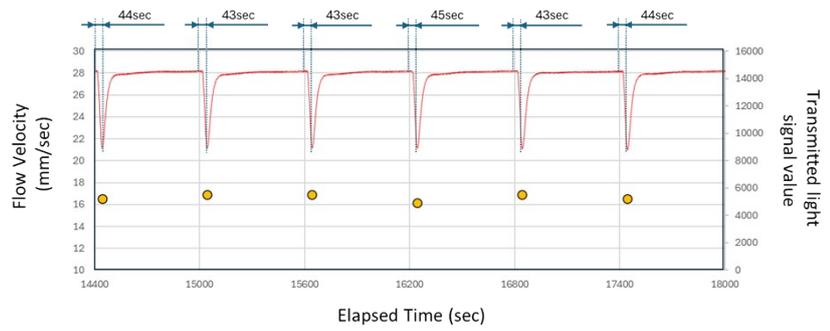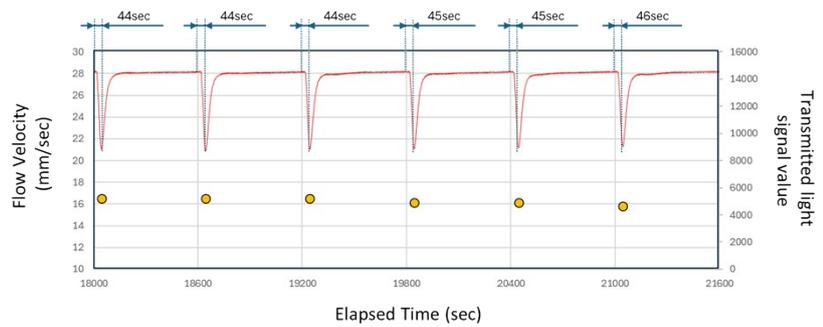

Fig.S1(d)

Fig.S1(e)

Fig.S1(f)

- **Numerical data for the calibration plot of chlorine concentration.**

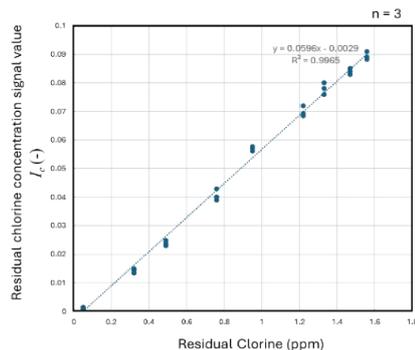These tables correspond to Fig.9 in the manuscript.

Table S1. Numerical data for the calibration curves of residual chlorine (n = 3).

Chlorine Concentration (ppm)	Average Signal Response (A.U.)	Standard Deviation (SD)
0.05	0.0014	0.0001
0.32	0.0143	0.0008
0.49	0.0238	0.0009
0.76	0.0407	0.0021
0.95	0.0570	0.0008
1.22	0.0699	0.0018
1.33	0.0780	0.0020
1.47	0.0840	0.0010
1.56	0.0878	0.0040

Table S2. Raw experimental data for the residual chlorine calibration curves.

Chlorine Concentration (ppm)	Trial 1 (Ic-N1) [A.U.]	Trial 2 (Ic-N2) [A.U.]	Trial 3 (Ic-N3) [A.U.]
0.05	0.0014	0.0013	0.0014
0.32	0.0150	0.0134	0.0145
0.49	0.0237	0.0248	0.0230
0.76	0.0430	0.0390	0.0400
0.95	0.0562	0.0577	0.0570
1.22	0.0693	0.0720	0.0685
1.33	0.0800	0.0760	0.0780
1.47	0.0850	0.0830	0.0840
1.56	0.0910	0.0890	0.0833

Note: Ic-N1, Ic-N2, and Ic-N3 represent three independent measurements performed under the same experimental conditions.

· **Dimensions of the glass-made mixing and reaction device**

This figure shows the dimensions of the glass-made mixing and reaction device.

All dimensions are in mm.

Fig.S2 Dimensions of the glass-made mixing and reaction device