Static control in Ultrapure DI water application

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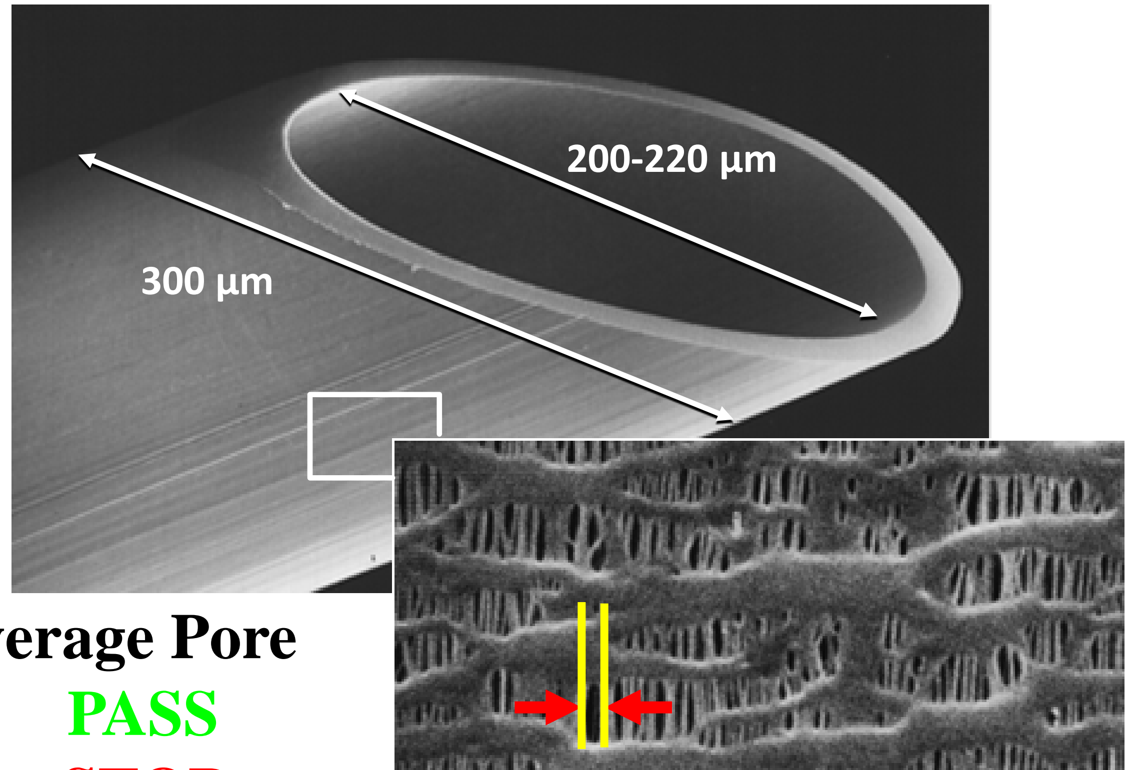
Outline

- Introduction
- System Design
- Results

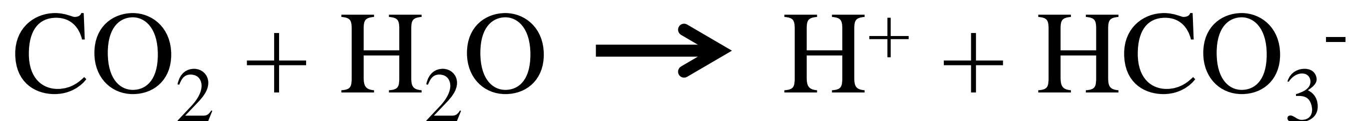
Introduction



0.03 µm Average Pore

CO_2 gas PASS

H_2O liquid STOP



Industrial Applications

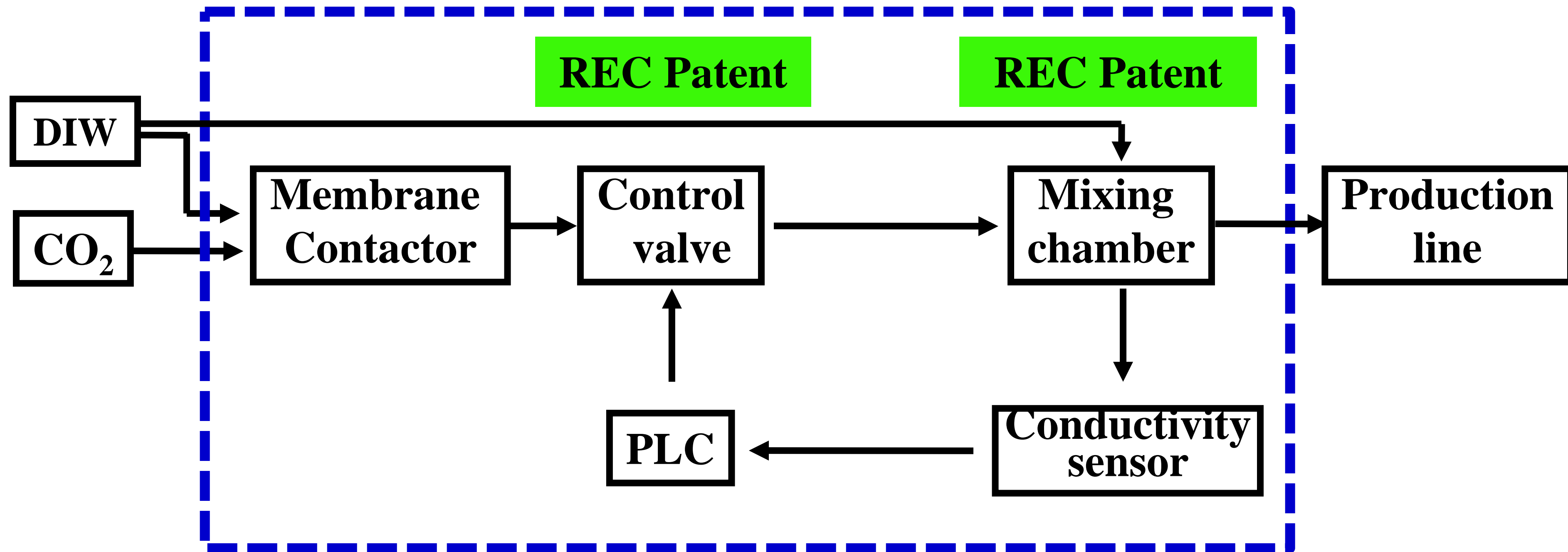
General surface cleaning
Wafer dicing process
Single substrate spin cleaning process

Biggest issue for DICO_2 process

How to keep the conductivity set point with wide flowrate span

System Design

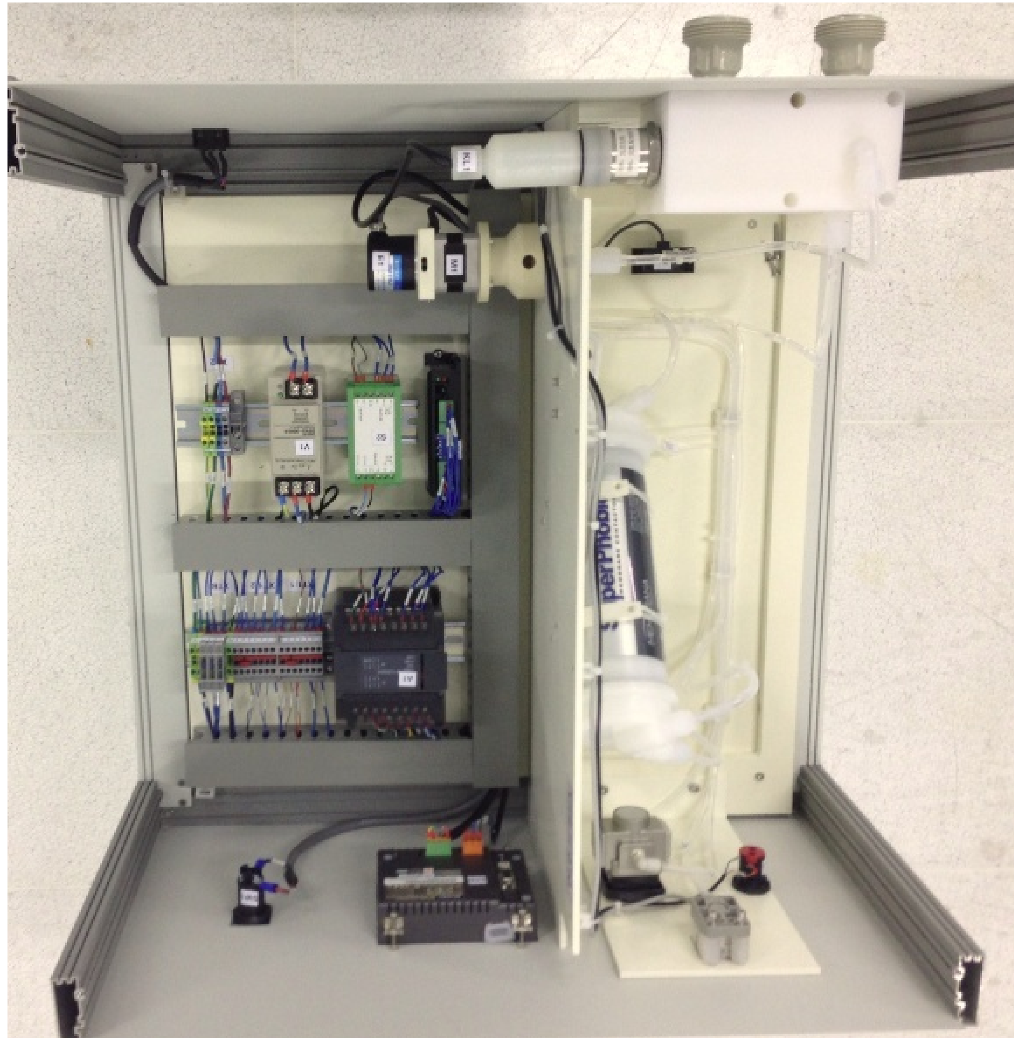
CO_2 & DI mixing



Control Mechanism:

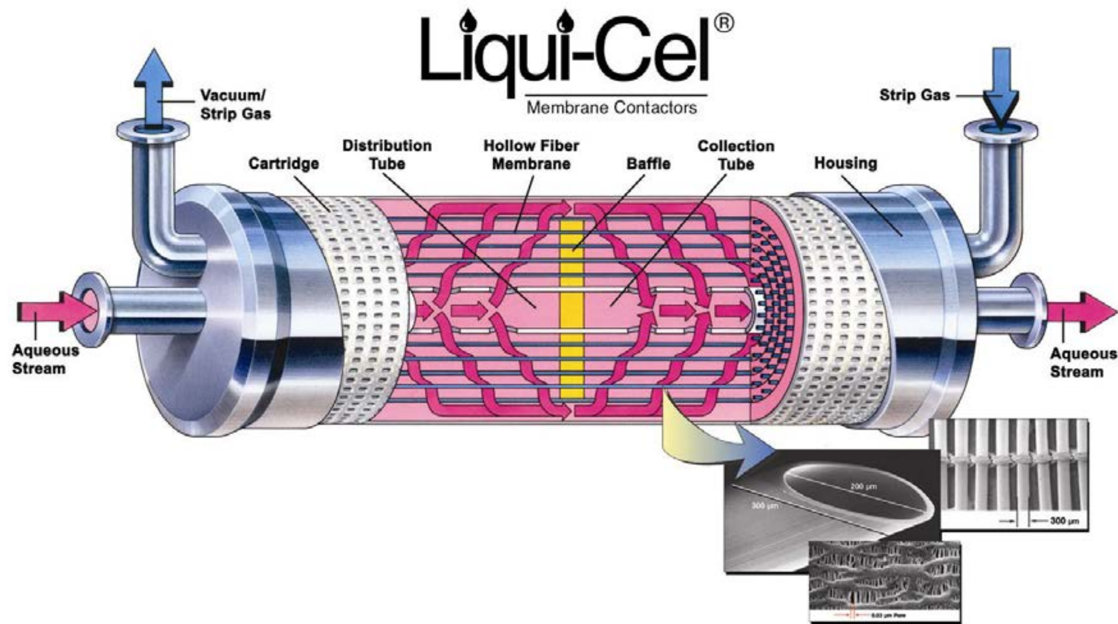
Step motor driven needle valve in the control valve modulates the flow rate of highly concentrated CO_2 water entering the 2nd mixing chamber based on the signal from conductivity sensor

【Top view】



【Product key technique I】

Gas adding membrane

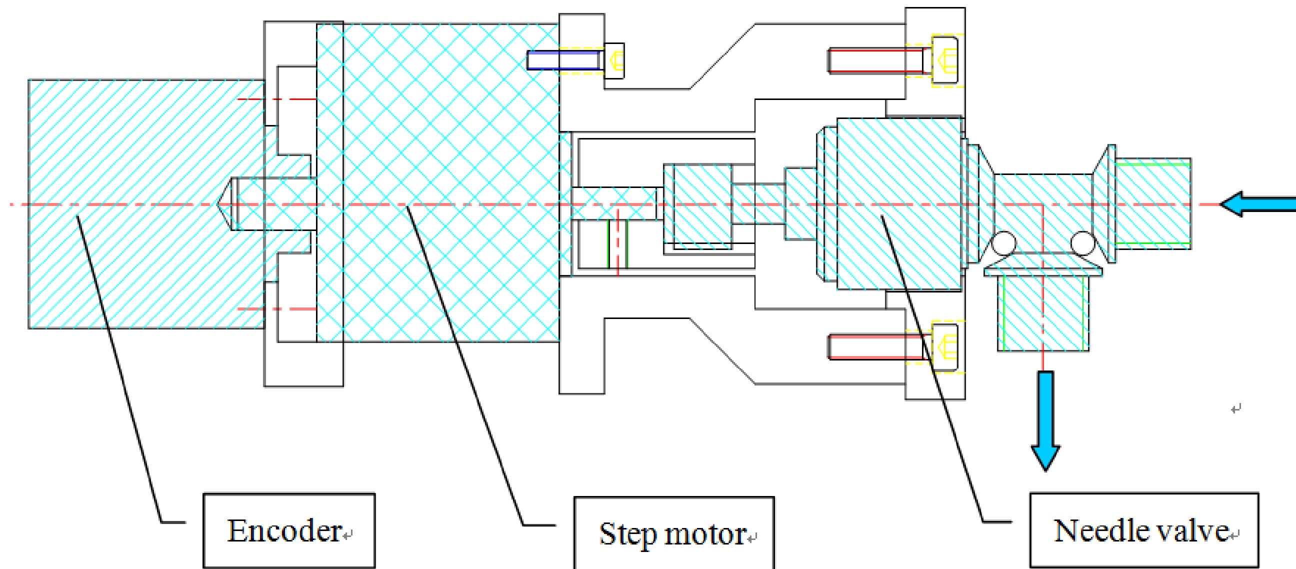


Large surface area membrane produces highly concentrated CO_2 re-ionized water

SMIC REC

【Product key technique II】

Control valve



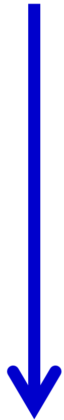
Step motor driven mechanism precisely control the volume of concentrated CO_2 re-ionized water for 2nd tier mixing

【Product key technique III】

2nd tie mixing chamber

Internal check valve design to prevent down stream water backflow causing contamination on membrane and DI water supply

Key techniques

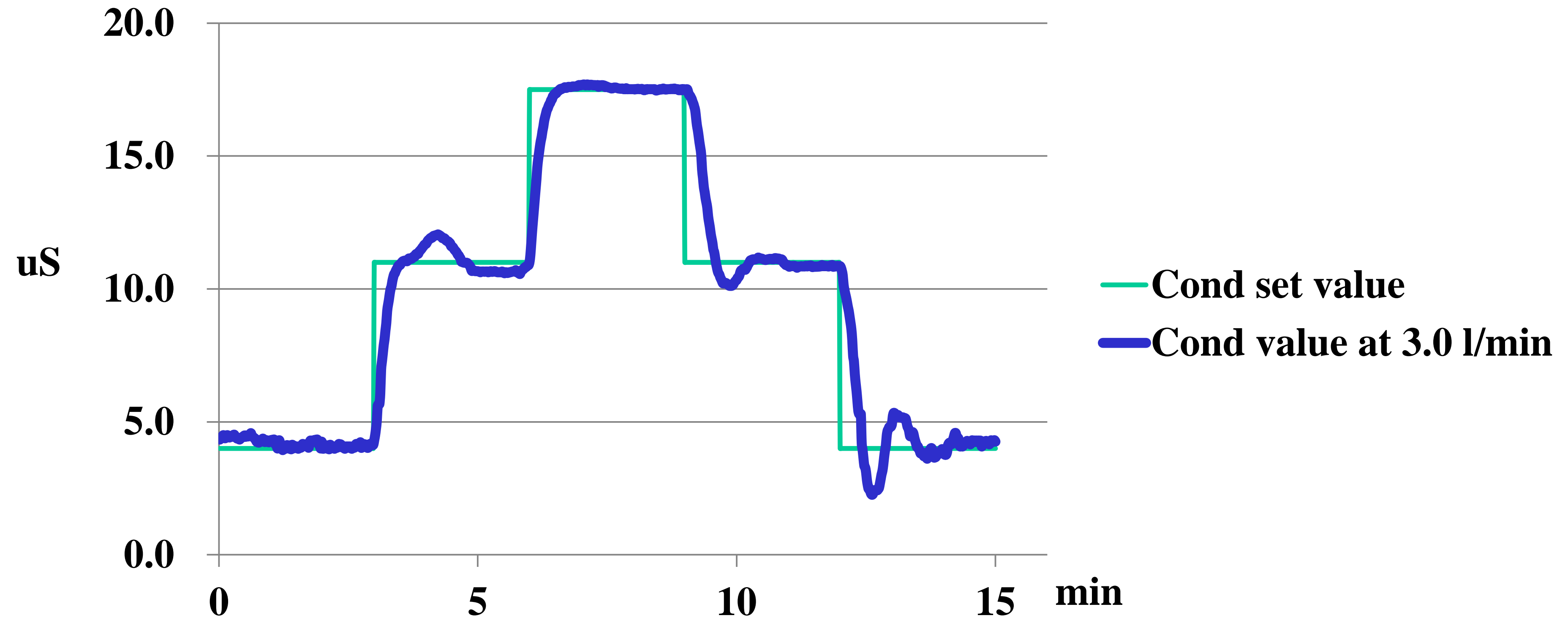


Major advantages

① *Large surface area membrane*
② *REC patent feedback loop control mechanism*
③ *REC patent 2nd tier mixing chamber design*

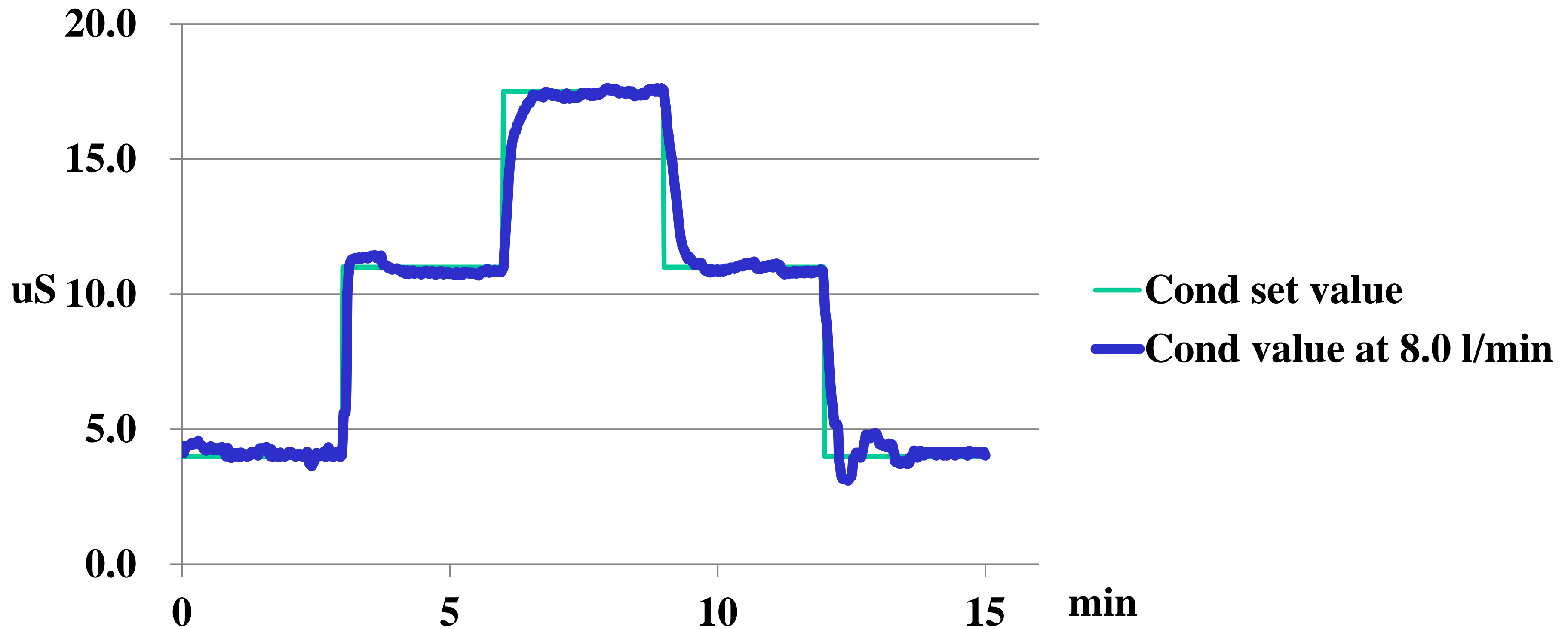
① *Wide range for $DICO_2$ flow rate*
② *Precise control for resistivity set point with wide flow rate span*
③ *Fast response for resistivity set point change*

Results

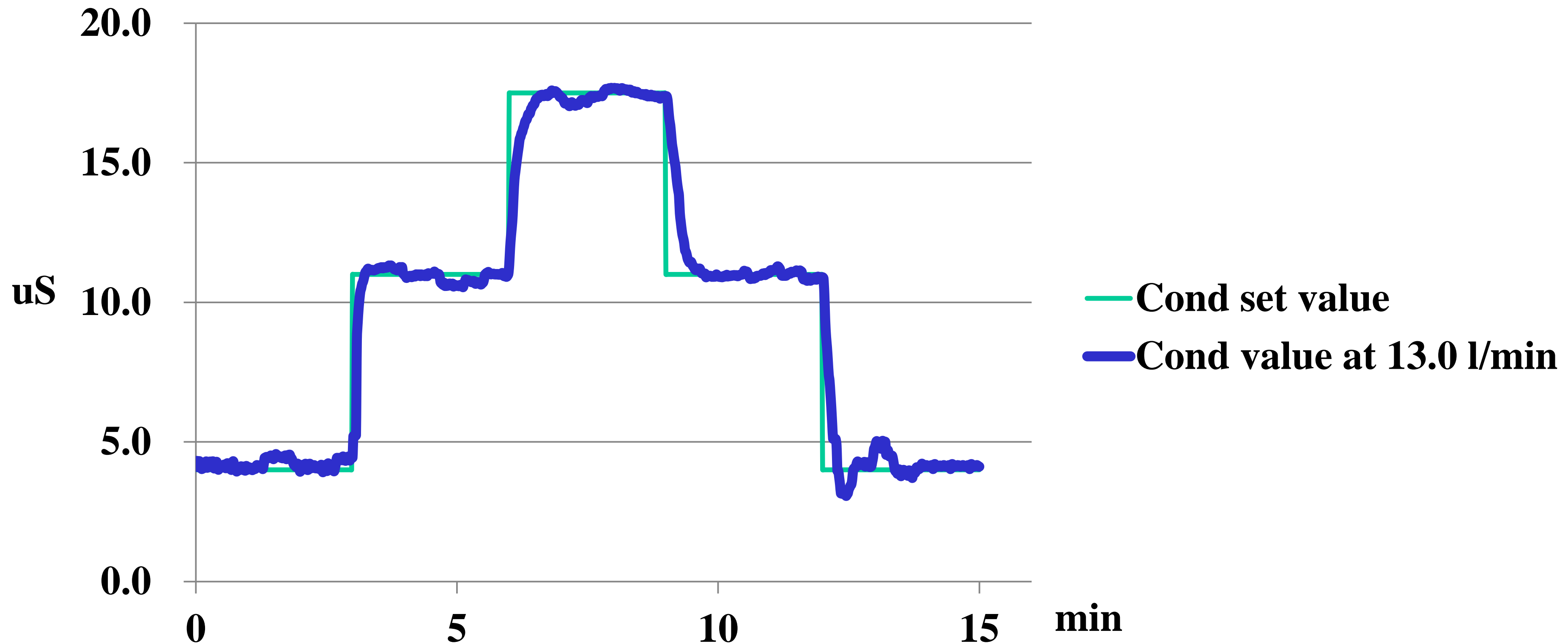


Time to Set Value (+/- 1uS): 15sec~30sec

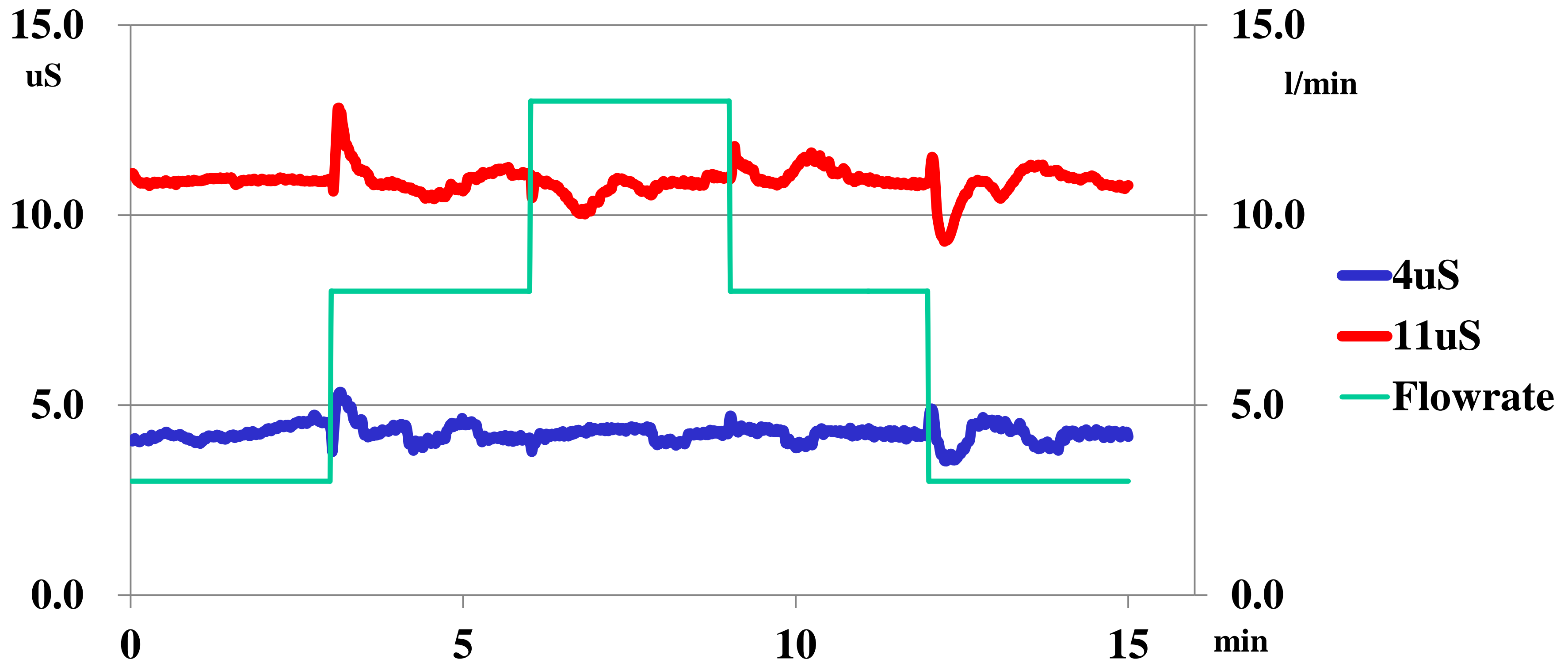
SMIC REC



Time to Set Value (+/- 1uS): 6sec~18sec



Time to Set Value (+/- 1uS): 8sec~21sec



Time to Set Value (+/- 1uS): 13sec~15sec
Total range: Set value +/- 1.5uS

Acknowledgements

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Thank You!