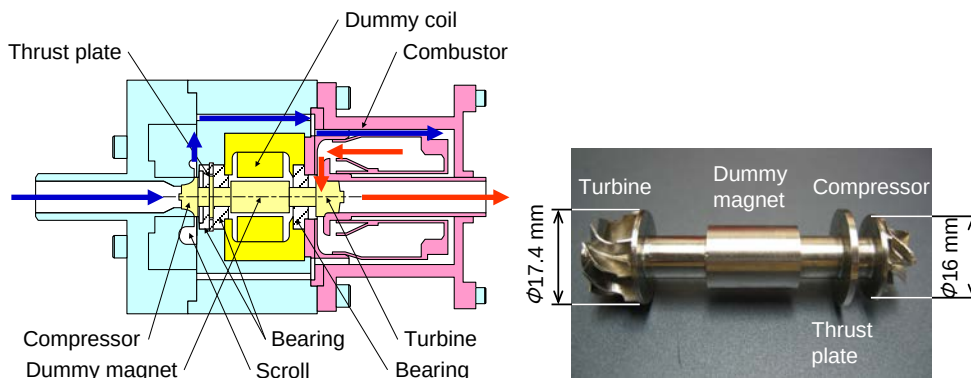


## 14 Power MEMS

### Ultra-small Gas Turbine Generator

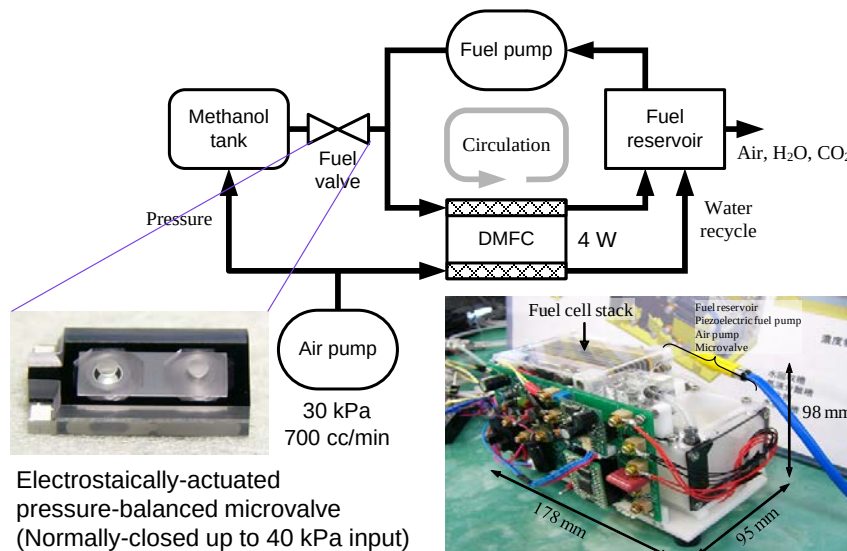


World's smallest gas turbine (2007)  
(Collaboration with IHI, Tohoku Gakuin Univ. etc.) (Inconel one-piece structure)  
(Tanaka *et al.*, PowerMEMS 2007, pp. 359–362)



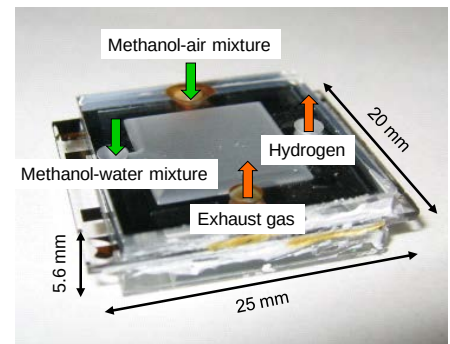
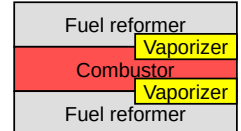
Portable gas turbine generator  
prototyped by IHI (2012)  
(Based on achievement in 2007)

### Portable Fuel Cell



Electrostatically-actuated  
pressure-balanced microvalve  
(Normally-closed up to 40 kPa input)

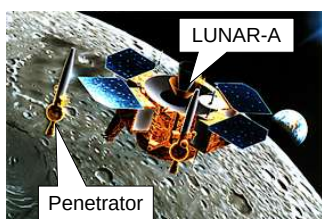
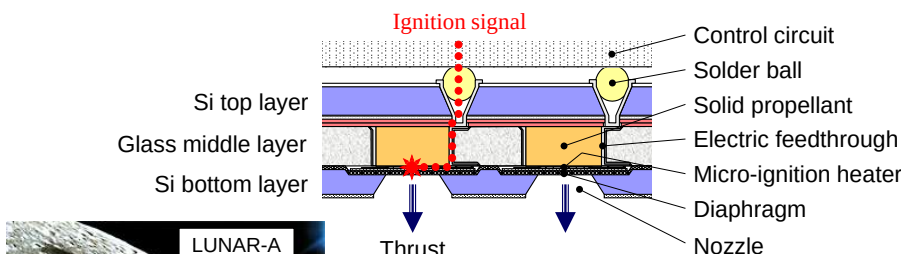
### Reactor configuration



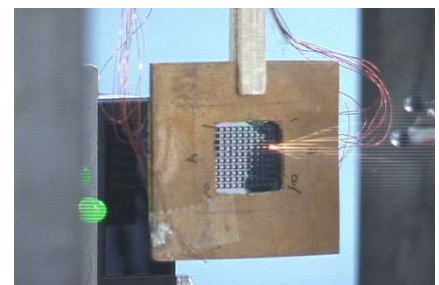
Electrostatic MEMS valve and direct methanol fuel cell system using the valve  
(Collaboration with Panasonic Electric Works)  
(K. Yoshida *et al.*, Sensors and Actuators A, 157 (2010)  
p pp. 290–298, p. 299–306)

Integrated micro fuel reformer  
(Collaboration with Panasonic Electric Works)  
(K. Yoshida *et al.*, J. Micromech. Microeng.,  
16 (2006) pp. S191–S197)

### Micro Rocket Array Thruster



Structure of micro rocket array thruster  
(Collaboration with ISAS/JAXA and Nichiyu Giken Kogyo)  
(S. Tanaka *et al.*, Trans. Jpn. Soc. Aeronautical Space Sci., 46, 151 (2003) pp. 47–51)



Micro rocket array thruster under test

The micro-thruster was developed for Penetrator injected to lunar surface.