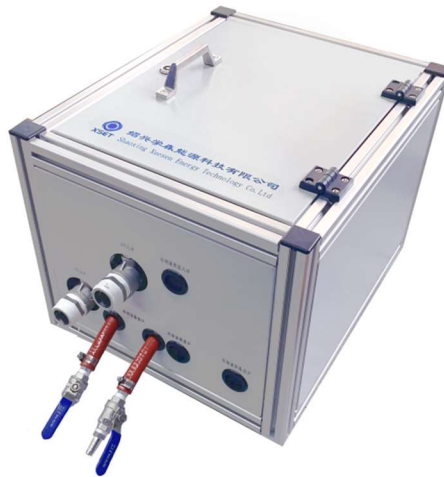


# PEMFC thermal management module



**Fig. 5 Appearance of PEMFC thermal management module**

Based on forward design technique and the fast and high dynamic robust tracking control of stack temperature, the module has the following features:

- 1) Stack inlet temperature regulation, temperature difference between stack inlet and outlet regulation;
- 2) Stack outlet temperature regulation, temperature difference between stack inlet and outlet regulation;
- 3) Stack inlet pressure regulation;
- 4) High dynamic response:  $\geq 1^\circ\text{C}/\text{s}$  (rated operating point);
- 5) Steady error:  $\leq 1^\circ\text{C}$ ;
- 6) Support CAN communication;

**Table 5 PEMFC thermal management module**

Item	Specification
<b>Power range</b>	0-150KW
<b>Test medium</b>	Ethylene glycol solution(50%) or deionized water;
<b>Liquid temperature control</b>	Model predict control technique;
<b>Accuracy of temperature</b>	≤1 °C, high dynamic response (≥1°C/s, rated operating point);
<b>Control mode</b>	Mode 1: stack inlet temperature setting, temperature difference setting;
	Mode 2: stack outlet temperature setting, temperature difference setting;
<b>Controller module</b>	Automotive ECU module;
<b>Communication mode</b>	CAN2.0, baud rate=250Kbps/500Kbps (According to customer requirements);
<b>Test host computer</b>	Customization according to requirements;
<b>Structural design</b>	Integrated heat management module(Including:sensors , cooling water pump, three-way valve, plate heat exchanger, and so on.
<b>Size (L*W*H)</b>	480*580*400 mm (20KW) ,different power levels have different sizes;

## 5. Integrated ejector module for fuel cells



**Fig.6 Appearance of integrated ejector module**

Using forward design technology, integrated ejector module realizes ejection in the full range working conditions, and the module has the following functions:

- 1) Automatic adjustment of anode pressure;
- 2) Automatic control of anode hydrogen discharge and drainage;
- 3) Real-time estimation of anode hydrogen concentration;
- 4) Anode steam-water separation and hydrogen circulation;

**Table 6 General technical data of integrated ejector module**

Item	Specification
<b>Types of allowed gases</b>	H2, N2, H2O, He
<b>Range of inlet pressure</b>	15 ± 2 bar (A)
<b>Range of outlet pressure</b>	100-300 kPa (A)
<b>Range of anode pressure drop</b>	0.9 ~ 42.5 kPa
<b>Maximum flow rate (H2)</b>	2500S LPM
<b>Power of applicable stack</b>	0-200kW
<b>Range of medium gas temperature</b>	-30~95 °C
<b>Material of body</b>	Aluminum alloy
<b>Parameters of interfaces</b>	Inlet: NPT 3/8Suction: Φ20Hose Fittings Outlet: Φ20Hose Fittings
<b>Integrated ejector module</b>	Including: Proportional valve, Pressure sensor, Pressure relief valve, Steam-water separator, Hydrogen discharge solenoid valve;
<b>Range of ambient temperature</b>	-30°C ~ +55°C
<b>Integration of ejector module with steam-water separator</b>	Ejector module and steam-water separator can be arranged separately or integrated to meet the various needs of different customers;
<b>Dimensions (L*W*H)</b>	220*130*144 mm