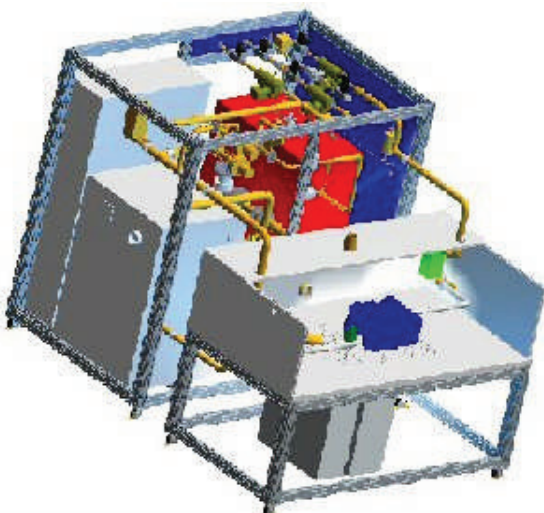


QMS-FC - Test Benches For Fuel Cells

Test benches for fuel cells are available in the power ranges from 0.5 KW to 250 KW

Our test benches for fuel cells offer the following:

- flexible adaptation regarding your requirements (flow rates, pressure losses...)
- automated, unsupervised operation of the test bench by a control system with flexible setting of cycle and parameter
- storage and conditioning of measuring data according your request
- a completely validated safety and alarm processing concept
- large temperature ranges of the fuel cells media supply (e.g. cooling water from -40°C to 130°C)
- low-temperature cooling of the fuel cell and the cooling circuit to -40 °C for cold start tests
- cooling medium DI water or DI water/ethyl glycol - mixture
- high dynamics
- accurate pressure controls, gas flow without pulsation
- accurate temperature controls
- high-dynamic, exactly adjustable humidification regulated by direct-steam-proportioning
- different fuel cell operation modes on one test bench (e.g. Dead-end, recirculation...)
- reliable and verified safety engineering with:
 - 3 stages - alarm processing and notification of emergency by software
 - safety-relevant alarms are designed redundant by hard-wired emergency
 - shutdown relays
 - inertization with nitrogen during activation of – emergency shutdown
 - packaging of the fuel cell in transparent and ventilated compartment
- H2 detection, loss of ventilation sensor





Description	FC 5	FC 12	FC 100
power of fuel cell	up to 5 kW	up to 12 kW	up to 100 kW
gas supply			
flow rate - cathode	250 NI/min	600 NI/min	4500 NI/min
flow rate - anode	100 NI/min	200 NI/min	1500 NI/min
humidification	direct-steam-proportioning	direct-steam-proportioning	direct-steam-proportioning
humidity (dependent on pressure and flow)	from dry to 100% r.H. @ 90 °C	from dry to 100% r.H. @ 90 °C	from dry to 100% r.H. @ 90 °C
gas temperature	up to 130 °C	up to 130 °C	up to 130 °C
back pressure control	1,05 – 5 bara	1,1 – 5 bara	1,1 – 5 bara
stack cooling			
max. temperature	130 °C	130 °C	130 °C
max. pressure	6 bara	6 bara	6 bara
max. flow	25 l/min	40 l/min	250 l/min
load bank			
max. power/ current/voltage	5 kW 600 A/100V	10 kW 800 A/160 V	100 kW 600 A/600 V
water cooled	standard	standard	optional
regenerative	optional	optional	standard
cell voltage monitoring	20 channels	60 channels	360 channels
dimensions (LxBxH) [m]	1,5 x 1,2 x 2,2	1,6 x 1,4 x 2,2	2,5 x 1,8 x 2,2

Optionally the test benches for fuel cells can be extended with:

- CAN - BUS interface
- measurement of anode and cathode humidity
- online - gas analytics for exhaust gas and recirculation loop (H₂ -, CO -, CO₂ -, N₂ -, O₂ -concentration)
- impedance spectroscopy
- anode gas admixture (up to 5 gases)
- regenerative load bank
- connection box for additional sensors arbitrary by the operator
- DMFC - configuration (up to 5 kW fuel cell power)
- connection of the test bench to your data base
- interface for HIL simulation with MATLAB / SIMULINK

