TEST LINE #6

Photo(electro)catalytic H2 production

Technical data sheet

July 2025

H2shift

Test Line 6: Photo(electro)catalytic H2 production

Operating conditions		**Notes**
Temperature	*Value*	
Maximum process temperature [°C]	150	
Minimum process temperature [°C]	20	
Pressure	*Value*	
Maximum process pressure [bar(a)]	30	
Minimum process pressure [bar(a)]	1	
Flow Rates liquids	*Value*	
Maximum process Flow Rate [g/h]	3000	
Minimum process Flow rate [bar(a)]	20	
Flow Rates gases	*Value*	
Maximum process Flow Rate [Nml/min]	150	
Minimum process Flow rate [Nml/min]	3	
Chamber layout, reactor configuration, samples, and similar		**Notes**
Heated system	*Value*	
Heat exchange for Cooling of process Streams	yes	
Chiller for service water	no	
Samples and reactors	*Value*	
Photoelectrochemical cell with 3 chambers (Anode, Cathode, Gas chamber) [cm^2]	121	Usable for water electrolysis or CO_2 co-electrolysis, as photo-electrochemical cell or as electrolyzer.
Electrochemical cells [electrodes area, cm^2]	5, 10 and 25	
Fluids		**Notes**
Gases (inlet)	*Value*	
Ar, Air, N_2, CO_2 [Nml/min]	0 - 150	Mass flow-controller, 1 - 10 bar
CO_2, N_2 [Nml/min]	0 - 150	Mass flow-controller, 1 - 30 bar
Sensors [yes/no]	yes	Gas flow rate are controlled, measured and acquired
Heating [yes/no]	no	Gas lines are not heated
Cooling Water (input)	*Value*	
Tap Water	Yes	
Service Water recirculation system	no	
Process Water/Electrolytes (input)	*Value*	
Water supply [yes/no]	yes	
Water [g/h]	<30g/h	
Liquid Electrolyte supply [yes/no]	yes	2 independent process streams
Liquid electrolyte [g/h]	20 - 1000	Liquid flow-controller, 1 - 10 bar, pH = 6-9
Liquid electrolyte [g/h]	20 - 1000	Liquid flow-controller, 1 - 10 bar, pH = 1-9
Liquid electrolyte [g/h]	20 - 3000	Liquid flow-controller, 1-30 bar, , pH = 1-14
Gas/steam output	*Value*	
Water condensation [yes/no]	yes	Flash vessels are included for G-L separation
Flow measurement [yes/no]	yes	0-150 Nml/min
Temperature measurement [yes/no]	yes	
Back Pressure controller [yes/no]	yes	
Liquid output	*Value*	
Back Pressure controller [yes/no]	yes	Flash vessels are included for G-L separation
Back Pressure controller [bar]	10	
Back Pressure controller [bar]	30	
Recirculation of electrolytes	*Value*	
Water condensation [yes/no]	yes	
Heat exchanger / Cooling system [yes/no]	yes	
Gas analysis		**Notes**
Instruments	*Value*	
Continuous gas analyze micro-GC	Yes	Not exclusive use for long tests
Other	No	
Evaporation System	*Value*	
Controlled Water-Gas Evaporation System	No	
Control and acquisition system		**Notes**
Control system	*Value*	
Programmable control system [yes/no]	No	Control system installed on local PC
Remote control [yes/no]	No	
Non programable control system	Yes	
Reactor temperature control system [yes/no]	no	The reactor temperature depends on the light irradiance and the applied cell potential. No system is present for controlling the reactor temperature to reduce fast temperature variations by heating/cooling or solar shading.
Sun Simulator	**Value**	
Xe Arc Lamp for sun simulation	Yes	Maximum illuminated area of 10 x 10 cm^2

Photo-electrodes and Electrodes Fabrication set-up

Instruments for Photo/electrode preparation		**Notes**
Automatic Catalyst Deposition Systems	**Value**	
Ultrasound Spray Coater system with vacuum-heated plate and an ultrasound nozzle	Yes	Maximum Surface coated of 40 x 40 cm^2. 2 different nozzles (patterns of 50 to 102 mm and 50 to 150 mm). Ultrasound syringe to maintain homogeneous ink dispersion. Modulable ultrasound generator operating in the range of 25 kHz a 250 kHz. Vacuum hot plate to sustain the electrode and ensure homogeneity during the coating process. Suitable to use FTO/glass substrates usually used for photocatalysts deposition.
Monitoring and control system		**Notes**
Control system	*Value*	
Remote control [yes/no]	No	
Electrode temperature control system during deposition [yes/no]	yes	A vacuum Hot plate controls the electrode T up to 150 °C during the deposition.