




Enapter

ELECTROLYSER 2.1 LC BATTERY LIMITS

DOCUMENT N°: ELE21-BLI-INTW2


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1 PURPOSE

The scope of this document is to define and describe the battery limits of the Electrolyser 2.1 Liquid Cooled. It illustrates the physical interface ports of the Electrolyser, to allow its user to integrate it with the other equipment that composes his system.

2 FIELD OF APPLICATION

ELE210535A2LSVXX

3 DEFINITIONS AND ABBREVIATIONS

ELE21 LC	Electrolyser 2.1 Liquid Cooled
P&ID	Piping and Instrumentation Diagram
User	The integrator of the ELE21 LC in a larger system
Warranty	A written guarantee, issued to the purchaser of an ELE21 LC by Enapter, promising to repair or replace it as outlined in "Enapter's Factory Warranty"

4 REFERENCE DOCUMENTS

Code	Name
ELE21-PID-W0001	Electrolyser 2.1 LC P&ID
ELE21-DRW-INTW1	Electrolyser 2.1 LC Interfaces
ELE21-MAN-W0001	Electrolyser 2.1 LC User Manual

5 RESPONSIBILITIES

User: It is the User's responsibility to adhere to the ranges and constraints set henceforth. Failure to do so may cause the system to behave in an unpredictable/unsafe behaviour and render void the product Warranty.



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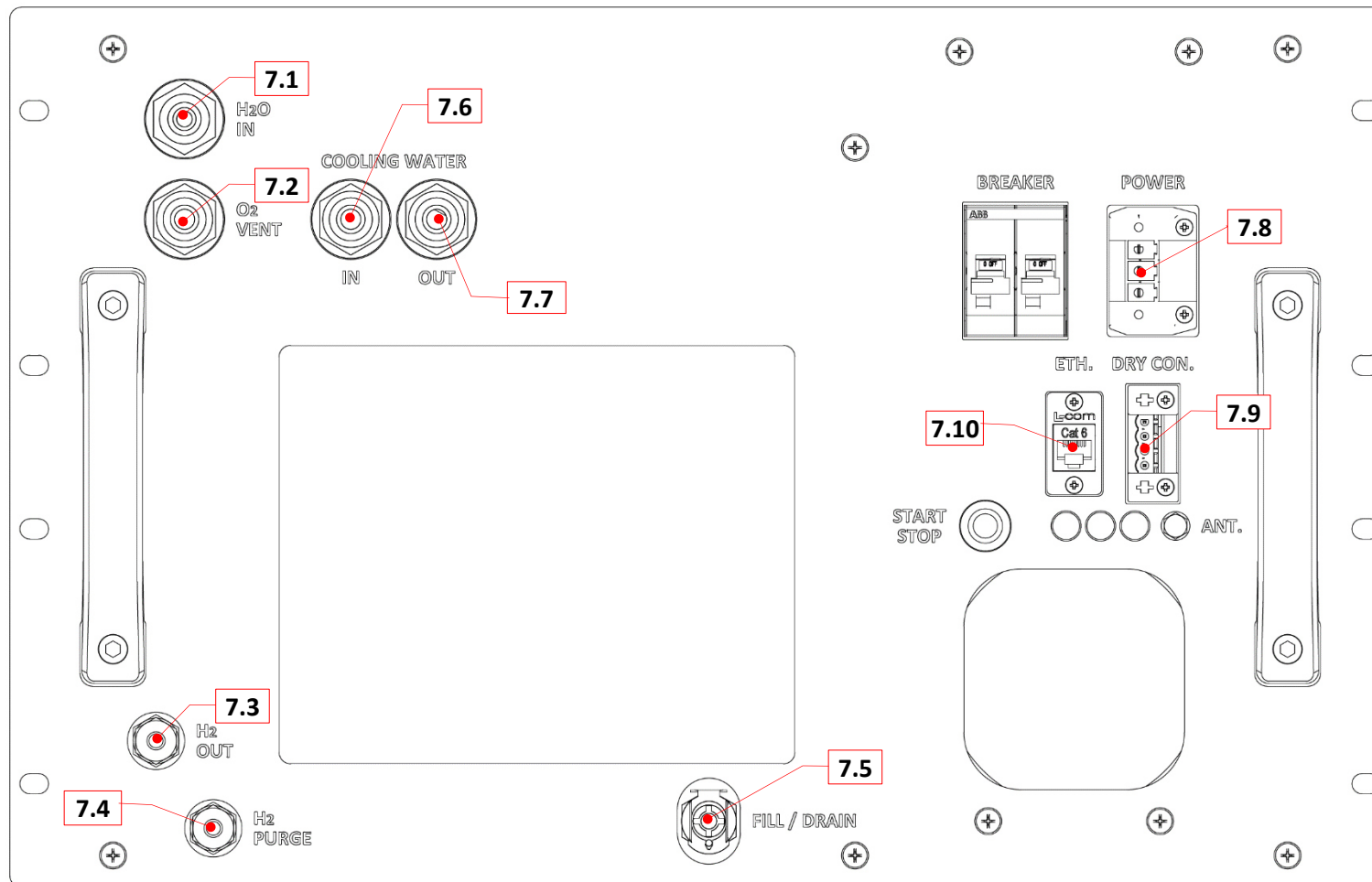
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6 ELECTROLYSER 2.1 INTERFACES

The following figure shows the positions of the ELE21 LC physical interfaces. All interfaces are located on the front panel.



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7 INTERFACE SPECIFICATIONS

The values set in the following tables are maximum operative values to be taken into account in the User system interface with ELE21 LC.

7.1 H₂O IN

This inlet port is used for the automatic refilling of de-ionized water. At the back of this port is a solenoid valve that opens when refilling is needed.


Name	H ₂ O IN
Fitting Type	8 mm OD Pushfit female fitting
Fitting Material	LLDPE
Fluid	De-ionised water (<20 µS/cm)
Flowrate	0-4 L/min
Pressure	0.5-4 barg
Temperature	6-55°C

- Water is required to be supplied to the device from a pressurised source. If the pressure is higher than 4 bar, a warning appears on the ELE21 LC. If the pressure is too low, refilling does not start. If pressure drops below 0.5 barg during refilling, the ELE21 LC issues a warning message.
- When water with a temperature lower than 6°C is detected, an error on the ELE21 LC is triggered. Water with a temperature higher than 58°C also triggers an error on the ELE21 LC and can damage the ELE21 LC.
- The input water must, at all times, have a conductivity lower than 20 µS/cm. Failure to do this results in accelerated degradation of the stack and damages the system.
- Any plastic piping with an outside diameter of 8 mm is compatible with the interface fitting. Particular care should be taken in selecting material resistant to KOH corrosion.

7.2 O₂ VENT

This outlet port is directly connected to the electrolyte tank, and its primary function is to evacuate the produced O₂. Apart from O₂, a small quantity of H₂ (<2% concentration) and up to 25 mL/h of H₂O vapour is part of the effluent. It also serves as an overflow port if the ELE21 LC electrolyte tank is topped up with too much water due to a refilling malfunction.

Name	O ₂ VENT
Fitting Type	10 mm OD Pushfit female fitting
Fitting Material	LLDPE
Fluid	O ₂ + H ₂ O vapour+ H ₂ (<2%)
Flowrate	0-250 NL/h
Pressure	0-0.5 barg
Temperature	20-55°C

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- No blockage or valves should be present on the User side of the interface. The port should be connected to a safe location open to atmosphere.
- The system is designed to withstand no more than 0,5 barg. An error on the ELE21 LC triggers if any overpressure is found on the line. Pressures exceeding 0,5 barg can damage the ELE21 LC.
- The flow rate is proportional to the ELE21 LC H₂ production rate – i.e., at 60% of production capacity, 60% of the nominal oxygen flowrate exits the vent line.
- Any plastic piping with an outside diameter of 10 mm is compatible with the interface fitting. Particular care should be taken in selecting material resistant to KOH corrosion.

7.3 H₂ OUT

This outlet port is from which the Electrolyser produces Hydrogen. It is internally protected by a pressure control device and check valve to eliminate the possibility of gas backflow.

Name	H ₂ OUT
Fitting Type	¼" double ferrule female compression fitting (Swagelok)
Fitting Material	316L Stainless Steel
Fluid	H ₂
Flowrate	0-500 NL/h
Pressure	0-35 barg
Temperature	20-55°C


- Particular care should be taken not to attach any pressurised system with a pressure higher than 40 barg to the system.
- The outlet pressure is regulated by the User's downstream equipment. Operative pressure range should stay between 0 and 35 barg.
- The User should connect piping with compatible material – i.e. 316L Stainless Steel.

7.4 H₂ PURGE

This outlet port is from which the Electrolyser purges all internal hydrogen and accumulated water on the cathode side. A solenoid valve is used to release pressure.

Name	H ₂ PURGE
Fitting Type	¼" double ferrule female compression fitting (Swagelok)
Fitting Material	316L Stainless Steel
Fluid	H ₂ + LIQUID H ₂ O
Flowrate	0-35 NL/sec (transient)
Pressure	0-35 barg (transient)
Temperature	20-55°C

- No blockage or valves should be present on the User side of the interface as critical ELE21 LC safety measures are dependent on it. The port should be connected to a safe location open to atmosphere.
- The ELE21 LC purges twice during ramp-up, each of the purges occurring at 5 barg internal pressure. The ELE21 LC additionally purges every 24 hours, when User ramps the system down, or when – for any given

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reason – the electrolyser needs to go into a safe state. The output from this port is not constant; it only occurs during production when any of the conditions above are met. During the purge, all the pressurised H₂ and water accumulated in the ELE21 LC internal water trap are expelled suddenly. A transient high-pressure flow is expected, whose characteristics are dependent on the User piping side of this interface.

- The User should connect piping with compatible material – i.e. 316L Stainless Steel.

7.5 FILL/DRAIN

This port is used only during the first refilling of electrolyte solution or during maintenance. This port is also used during draining of the ELE21 LC during maintenance. The connector needed to plug into this interface is provided by Enapter.

Name	FILL/DRAIN
Fitting Type	10 mm CPC female coupling
Fitting Material	POM (Polyoxymethylene)
Fluid	Aqueous KOH solution (1-2% concentration)
Flowrate	0-1.6 L/min.
Pressure	Atmospheric
Temperature	6-55°C


- Enapter provides the male coupling and piping to connect to this port with the Electrolyte for first refilling and for draining. Any plastic piping with an outside diameter of 10 mm is compatible with the interface fitting. Particular care should be taken in selecting material resistant to KOH.

7.6 Cooling IN

This inlet port is used for the cooling of the electrolyte. At the back of this port is a solenoid valve that opens when cooling is needed.

Name	Cooling IN
Fitting Type	10 mm OD Pushfit female fitting
Fitting Material	LLDPE
Fluid	Water or another cooling agent
Flowrate	0-7 L/min (intermittent)
Pressure	0.5-7 barg
Temperature	6-46°C

- Cold water or another cooling agent is required to be supplied to the device from a pressurised source or by a booster pump. The cooling agent needs to be compatible with 1.4404 and 1.4301 stainless steel and LLDPE.
- Ensure the pressure of the cooling agent does not exceed 7 bar, this will damage the electrolyser.
- The needed instantaneous flow rate of the cooling agent depends on the inlet temperature and varies between 0.5 L/min at 30 °C max. inlet temperature and 7 L/min at 46 °C max. inlet temperature. Lower inlet temperatures are acceptable. Overall allowable inlet temperature for the cooling agent is 6-46 °C.
- If not enough cooling water is supplied, the electrolyser will go into error mode.

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7.7 Cooling OUT

This outlet port is used for the cooling of the electrolyte.

Name	Cooling OUT
Fitting Type	10 mm OD Pushfit female fitting
Fitting Material	LLDPE
Fluid	Water or another cooling agent
Flowrate	0-7 L/min (intermittent)
Pressure	0.5-7 barg
Temperature	6-55°C (during operation)

- Depending on the cooling loop design, the cooling water can either be drained from this outlet or the cooling agent be piped to a heat exchanger to cool it down before circulating back to the Cooling In port.

7.8 POWER

This inlet port is needed to provide power to the ELE21 LC. The connector needed to plug into this interface is provided by Enapter.

Name	POWER
Fitting Type	PCB 3-pin 7,62 mm pitch female connector
Fitting Material	PA (polyamide)
Fluid	Electric current
Current	0-13 A
Voltage	220-240 V _{AC}
Frequency	50/60 Hz


- Enapter provides the male coupling to connect to this port. Conductors with a cross-section up to 4 mm² are compatible with the Enapter provided male coupling.

7.9 DRY CON.

This plug is used for operating the integrated dry contact function. The main contact is on the bottom and the repeater is on top. The connectors needed to plug into this interface are provided by Enapter.

Name	DRY CON.
Fitting Type	PCB 4-pin 5,08 mm pitch female connector
Fitting Material	PA (polyamide)
Fluid	Electricity
Voltage	0-5 V _{DC}


- Enapter provides the male couplings to connect to this port. Conductors with a cross-section up to 2,5 mm² are compatible with the Enapter provided male couplings.

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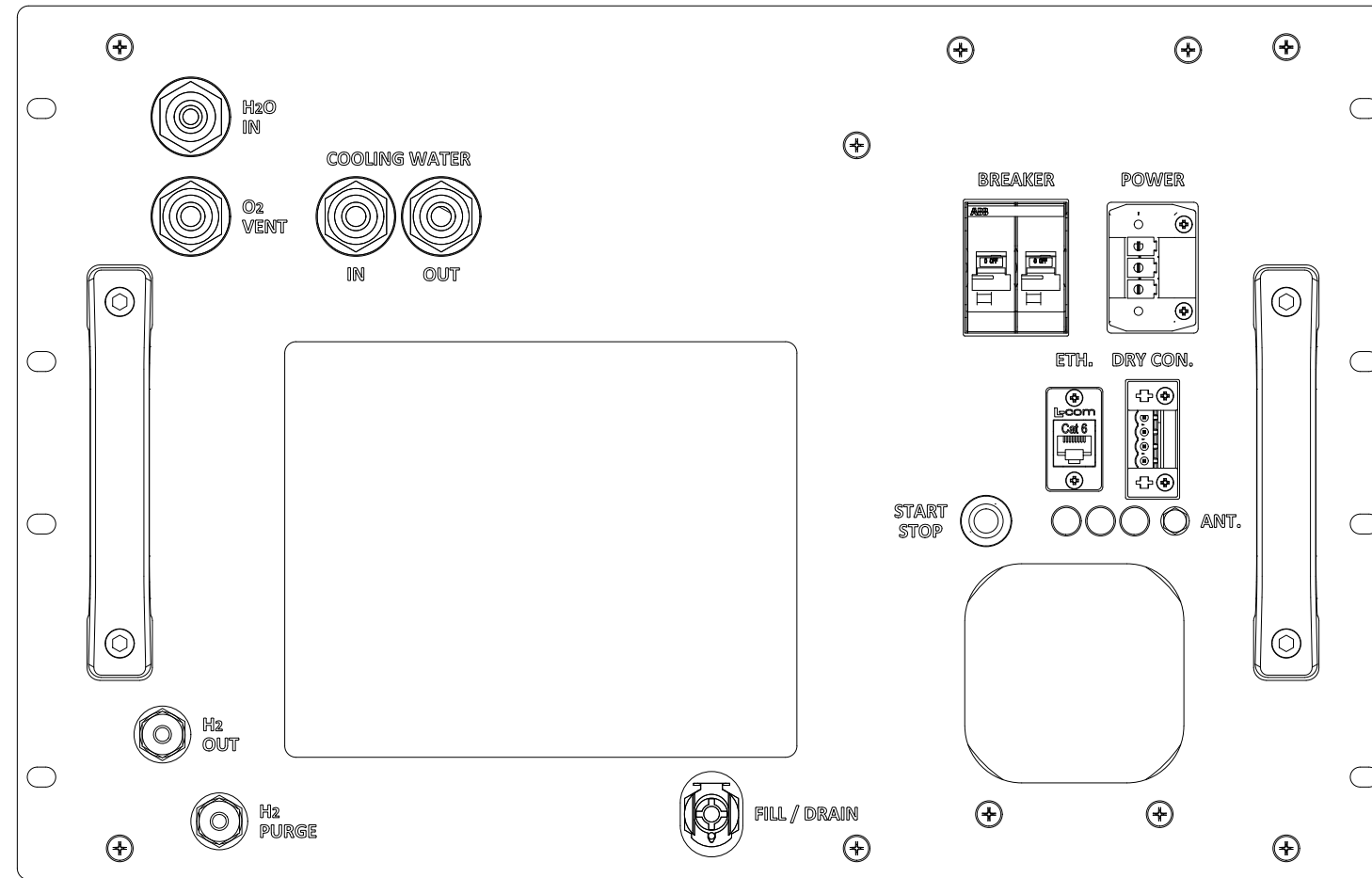
7.10 ETH

This inlet port allows the User access to the ELE21 LC Modbus control and monitoring.

Name	ETH
Fitting Type	Female Ethernet port

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8 APPENDIX: INTERFACE DRAWING ELE21-DRW-INT02-REV00



ELECTROLYSER LC 2.1 INTERFACE LIST

#	NAME	TYPE	MATERIAL	FLUID	FLOWRATE	PRESSURE	TEMPERATURE	CURRENT and VOLTAGE
A	H2O IN	8 mm OD John Guest Speedfit female fitting	LLDPE	De-ionised water	0-4 L/min	0.5-4 barg	6-55 °C	/
B	O2 VENT	10 mm OD John Guest Speedfit female fitting	LLDPE	O2 + H2O vapour + H2 (<2%)	0-250 NL/h	0-0.5 barg	20-55 °C	/
C	H2 OUT	1/4" double ferrule female compression fitting	316L Stainless Steel	H2	0-500 NL/h	0-35 barg	20-55 °C	/
D	H2 PURGE	1/4" double ferrule female compression fitting	316L Stainless Steel	H2 + liquid H2O	0-35 L/s (transient)	0-35 barg (transient)	20-55 °C	/
E	FILL/DRAIN	10 mm CPC female coupling	POM (Polyoxymethylene)	Aqueous KOH solution (1-2%)	0-1.62 L/min	Atmospheric	6-55 °C	/
F	COOLING IN	10 mm OD John Guest Speedfit female fitting	LLDPE	Water or other cooling agent	0-7 L/min (intermittent)	0.5-7 barg (intermittent)	6-46 °C	/
G	COOLING OUT	10 mm OD John Guest Speedfit female fitting	LLDPE	Water or other cooling agent	0-7 L/min (intermittent)	0.5-7 barg (intermittent)	6-55 °C (during operation)	/
H	POWER	PCB 3-pin 7.62mm pitch female connector	PA (Polyamide)	Current	/	/	/	0-13 A / 200-240 VAC / 50-60 Hz
I	DRY CON.	PCB 4-pin 5.08mm pitch female connector	PA (Polyamide)	Electricity	/	/	/	0-5 VDC
J	ETH.	Ethernet port	/	/	/	/	/	/

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			CHECKED	E. van der Put
REV	DATE	ALTERATION	APPROVED	J. Schmidt
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			DISCIPLINE:	PJM
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