




# Enapter

## ELECTROLYSER 2.1 NARROW BODY DC BATTERY LIMITS (PROTOTYPE)

**DOCUMENT N°: ELE21-BLI-NDC01**


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03	IFP	26/07/2021	H2O IN description	F. Bucaccio	C. Poggesi	J.J. Schmidt
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## 1 PURPOSE

The scope of this document is to define and describe the battery limits of the Electrolyser 2.1 DC-DC narrow body prototypes. 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

ELE210535D4ANV01 only

## 3 DEFINITIONS AND ABBREVIATIONS

ELE21NDC	Electrolyser Narrow Body DC
P&ID	Piping and Instrumentation Diagram
User	The integrator of the ELE21NDC in a larger system
Warranty	A written guarantee, issued to the purchaser of an ELE21 narrow body DC by Enapter, promising to repair or replace it as outlined in “Enapter’s Factory Warranty”

## 4 REFERENCE DOCUMENTS

Code	Name
ELE21-PID-000RA	Electrolyser 2.1 P&ID
ELE21-DRW-INT03	Electrolyser 2.1 Interfaces
ELE21-DTS-TEC04	Electrolyser 2.1 NDC technical datasheet

## 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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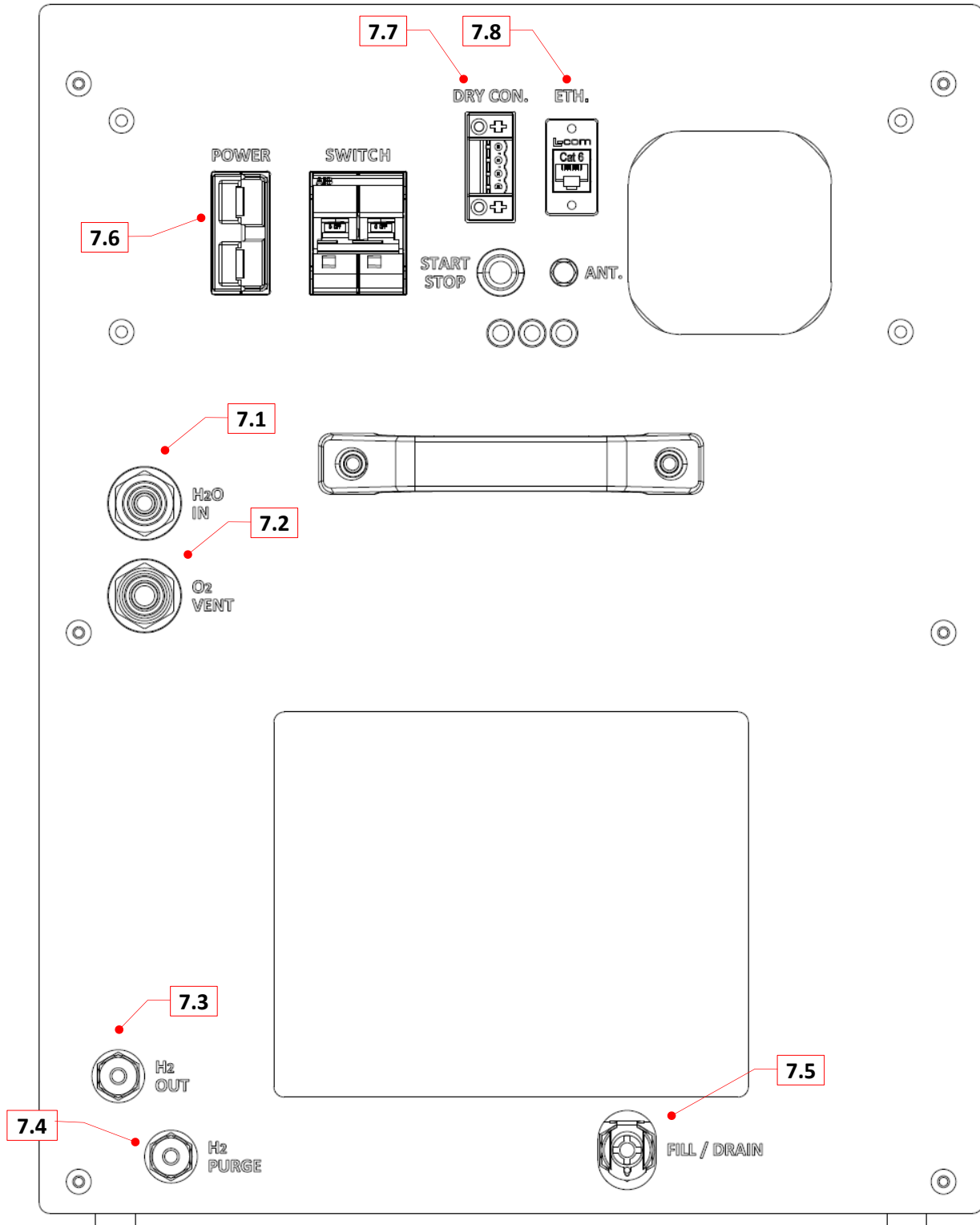
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## 6 ELECTROLYSER 2.1 NARROW BODY DC INTERFACES

The following figure shows the positions of the ELE21 narrow body DC 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 operative values to be taken into account in the User system interface with ELE21 narrow body DC.

### 7.1 H<sub>2</sub>O IN

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

<b>Name</b>	H <sub>2</sub> O IN
<b>Fitting Type</b>	8 mm OD Pushfit female fitting
<b>Fitting Material</b>	LLDPE
<b>Fluid</b>	Demineralised water (<20 µS/cm)
<b>Flowrate</b>	0-4 L/min
<b>Pressure</b>	0,5-4 barg
<b>Temperature</b>	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 ELE21NDC. If the pressure is too low, refilling does not start. If pressure drops below 0.5 barg during refilling, the ELE21NDC issues a warning message.
- When water with a temperature lower than 6°C is detected, an error on the ELE21NDC is triggered. Water with a temperature higher than 58°C also triggers an error on the ELE21NDC and can damage it.
- 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 O<sub>2</sub> VENT

This outlet port is directly connected to the electrolyte tank, and its primary function is to evacuate the produced O<sub>2</sub>. Apart from O<sub>2</sub>, a small quantity of H<sub>2</sub> (<2% concentration) and up to 25 mL/h of H<sub>2</sub>O vapour is part of the effluent. It is also serves as an overflow port if the ELE21NDC electrolyte tank is topped up with too much water due to a refilling malfunction.

<b>Name</b>	O <sub>2</sub> VENT
<b>Fitting Type</b>	10 mm OD Pushfit female fitting
<b>Fitting Material</b>	LLDPE
<b>Fluid</b>	O <sub>2</sub> + H <sub>2</sub> O vapour+ H <sub>2</sub> (<2%)
<b>Flowrate</b>	0-235 NL/h
<b>Pressure</b>	0-0,5 barg
<b>Temperature</b>	20-55°C



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- No blockage should be present on the User side of the interface. If multiple electrolysers are connected together, then Enapter supplied check valves should be installed between the Electrolyser and the main vent line. The line 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 ELE21NDC triggers if any overpressure is found on the line. Pressures exceeding 0,5 barg can damage the ELE21NDC.
- The flow rate is proportional to the ELE21NDC H<sub>2</sub> production rate – i.e., at 50% of production capacity, 50% 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 H<sub>2</sub> 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.

<b>Name</b>	H <sub>2</sub> OUT
<b>Fitting Type</b>	¼" double ferrule female compression fitting (Swagelok)
<b>Fitting Material</b>	316L Stainless Steel
<b>Fluid</b>	H <sub>2</sub>
<b>Flowrate</b>	0-470 NL/h
<b>Pressure</b>	0-35 barg
<b>Temperature</b>	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 H<sub>2</sub> 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.

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

- No blockage or valves should be present on the User side of the interface as critical ELE21NDC safety measures are dependent on it. The port should be connected to a safe location open to atmosphere.



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- The ELE21NDC purges twice during ramp-up, each of the purges occurring at 5 barg internal pressure. The ELE21NDC additionally purges every 12 hours, when User ramps the system down, or when – for any given 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 H<sub>2</sub> and water accumulated in the ELE21NDC 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 ELE21NDC during maintenance. The connector needed to plug into this interface is provided by Enapter.

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

- Enapter provides the male coupling and piping to connect to this port with the Electrolyte for first refilling. 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 POWER

This inlet port is needed to provide power to the ELE21NDC. The connector needed to plug into this interface is provided by Enapter.

<b>Name</b>	POWER
<b>Fitting Type</b>	APP 2 poles 120A 600V connector
<b>Fitting Material</b>	Plastic
<b>Fluid</b>	Electric current
<b>Input Current</b>	0-60A
<b>Voltage</b>	48 - 60 V <sub>DC</sub>

- Enapter provides the coupling to connect to this port. Conductors with a cross-section from 16 mm<sup>2</sup> to 33.3mm<sup>2</sup> are compatible with the Enapter provided male coupling.

**Nota Bene:** This prototype is not equipped with overcurrent or short-circuit protection. The customer should take all precautions necessary to for these hazards.

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## 7.7 DRY CON.

This plug is used for operating the integrated dry contact function. The connectors needed to plug into this interface are provided by Enapter.

<b>Name</b>	SAFETY
<b>Fitting Type</b>	PCB 4-pin 5,08 mm pitch female connector
<b>Fitting Material</b>	PA (polyamide)
<b>Fluid</b>	Electricity
<b>Voltage</b>	0-5 V <sub>DC</sub>

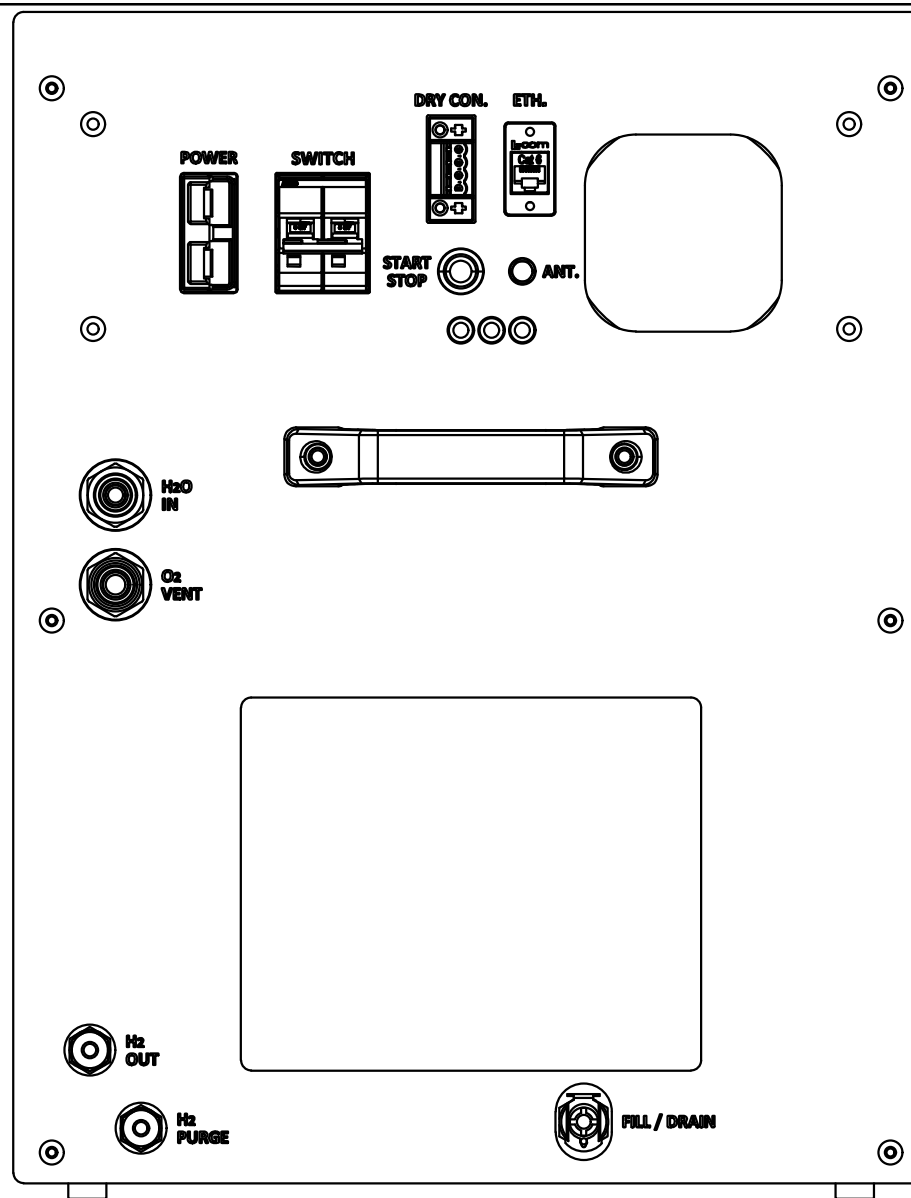
## 7.8 ETH

This inlet port allows the User access to the ELE21NDC Modbus control and monitoring.

<b>Name</b>	ETH
<b>Fitting Type</b>	Female Ethernet port

## 8 APPENDIX: INTERFACE DRAWING ELE21-DRW-INT03





### ELECTROLYSER 2.1 NARROW BODY DC INTERFACE LIST

#	NAME	TYPE	MATERIAL	FLUID	FLOWRATE	PRESSURE	TEMPERATURE
A	H <sub>2</sub> O IN	8 mm OD Pushfit female fitting	LLDPE	Demineralised water	0-4 L/min	0,5-4 barg	6-55°C
B	O <sub>2</sub> Vent	10 mm OD Pushfit female fitting	LLDPE	O <sub>2</sub> + H <sub>2</sub> O vapour + H <sub>2</sub> (<2%)	0-235 NL/h	0-0,5 barg	20-55°C
C	H <sub>2</sub> OUT	¼" double ferrule female compression fitting	316L Stainless Steel	H <sub>2</sub>	0-470 NL/h	0-35 barg	20-55°C
D	H <sub>2</sub> PURGE	¼" double ferrule female compression fitting	316L Stainless Steel	H <sub>2</sub> + liquid H <sub>2</sub> O	0-35 L/s (transient)	0-35 bar (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	POWER	APP 2poles 120A 600V connector	Plastic	Electric current	0-60 A / 48 V <sub>DC</sub>		
G	DRY CON.	PCB 4-pin 5.08mm pitch female connector	PA (Polyamide)	/	/	/	/
H	ETH	Ethernet port	/	/	/	/	/

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REV	DATE	ALTERATION
00	03/02/2021	FIRST RELEASE
01	11/05/2021	MAX CURRENT
02	26/07/2021	H2O IN - DESCRIPTION

DESIGN BY	F. Bucaccio
CHECKED	C. Poggese
APPROVED	J. J. Schmidt
DISCIPLINE:	PJM
DATE:	26/07/2021
DRAWING STATUS:	IFI
SHEET:	1 of 1
SCALE:	N/A



DRAWING TITLE:	ELE 2.1 INTERFACES
DRAWING N°	ELE21-DRW-INT03_rev02