ENGINEERING
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Fact sheet | iC7-Hybrid PowerHouse

Need **efficient outdoor power conversion** for **H_2 electrolyzers?**

iC7-Hybrid PowerHouse is a fully enclosed outdoor power conversion solution. It is optimized for all electrolyzer applications and has an unrivaled power density with new filter technology. This fully enclosed solution is ideal for power conversion in demanding outdoor environments in any climate condition.

iC7-Hybrid PowerHouse is a complete power conversion system comprising liquid-cooled system modules with Grid Converter application software, integrated into an outdoor enclosure with low-voltage switchgear, control equipment, and a high current electrolyzer start-up and polarization unit.

HIGHLIGHTS

- Superior power density & efficiency
- Reliable liquid cooling system
- Service corridor enables service in any weather
- Modular design allows for customer-specific requirements
- Grid code compliance
- Simulation models reduce time to market

Competitive
clean energy enabler

Feature	Benefit
Purpose-built product dedicated to electrolyzer applications	Fit-for-purpose in your industry increases competitiveness and reduces engineering effort
Superior power density	Smaller footprint on site reduces levelized cost of hydrogen
Quality in focus – world's most reliable power converter	High uptime and low operating expenses
Supported by DrivePro Lifecycle services for global service capability	High uptime and long term planning capability
Engineering support from expert staff and a range of engineering tools	Go to market faster

Learn more about iC7-Hybrid

iC7.danfoss.com

Reduces levelized cost of hydrogen

iC7-Hybrid PowerHouse optimizes the total cost of hydrogen production. In calculating levelized cost of hydrogen, it's vital to consider OPEX, CAPEX and efficiency. The iC7-Hybrid PowerHouse reduces total cost of ownership by contributing to all three of these factors.

A traditional SCR rectifier rectifies AC from the transformer and feeds the electrolyzer with DC with a high ripple factor. Unfortunately, this high ripple factor reduces electrolyzer efficiency[1].

By comparison, iC7-Hybrid PowerHouse produces an almost perfect DC with a low ripple factor for electrolyzer. This allows the electrolyzer to operate at much higher efficiency.

- Harmonic distortion of iC7-Hybrid PowerHouse towards the AC grid is typically < 3% with a unity power factor. This means no STATCOM or other compensation device is required.
- iC7-Hybrid PowerHouse supplies a clean DC current within the required DC voltage window of the electrolyzer, from beginning-of-life (BoL) to end-of-life (EoL) where the electrolyzer cell voltage typically increases.
- iC7-Hybrid power converters use the latest technology to deliver excellent power conversion efficiency

iC7-Hybrid PowerHouse is ideal for alkaline, AEM, PEM, and SOEC electrolyzers.

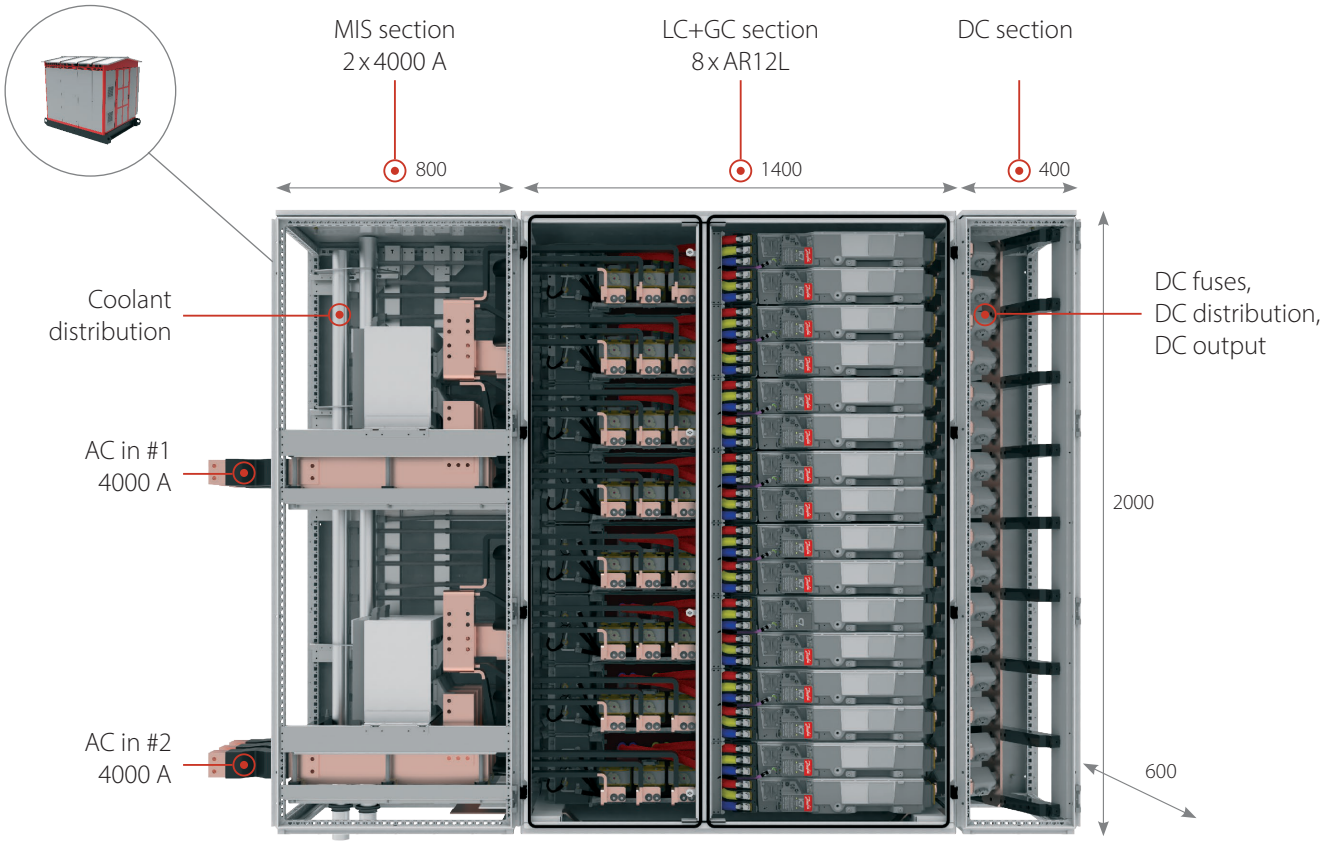
[1] PEM and alkaline electrolyzers

MyDrive® Virtual simulation models reduce time to market

Remove constraints of the physical environment.
FMU models of Grid Converter are available for system simulation.
In addition, models for tools like PSCAD and PowerFactory are available for grid simulation.

MyDrive® Virtual

fmi Functional Mock-Up Interface



Grid Converter application software key features

Control references		Fit for purpose application features
Grid following	– DC voltage control (AFE) – DC power and DC current – Active and reactive AC power limit controllers	– Online transition between control modes during run state – Independent converter paralleling in same common AC and DC bus – Fall back to open loop in case feedback is lost – Filter & transformer pre-magnetization – Main circuit breaker and pre-charge control – I/O, fieldbus, PC and control panel control place changeover during run state – Dedicated fieldbus control and status words & fieldbus customizer
Fieldbus protocols	– Modbus TCP – PROFINET RT	

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Key specifications

Characteristics	
Converter principle	– Modular AC to DC Grid Converter – SiC MOSFET-based up to 1500 V DC – IGBT based up to 830 V DC
DC power rating	Up to 2 x 4.5 MW or 1x 9 MW at 690 V AC input voltage
DC operating voltage range	640-1500 V DC
DC output current	Up to 8500 A or 2 x 4250 A
Nominal AC input voltage	525-690 V 50/60 Hz 380-500 V 50/60 Hz
Nominal input AC current	2 x 3850 A or 1 x 7600 A
Power conversion	AC-to-DC configuration. 1 or 2 individual converters enable 1 or 2 electrolyzer stacks per iC7-Hybrid PowerHouse
Scalability	Modular design which can be extended for customer-specific sections
Protection rating	IP54 outdoor rated enclosure for coastal areas Power electronics (PCBA, IGBT) installed in IP67 converter enclosures
Corrosion class	C5
Cooling system	Integrated HVAC system for sensitive electronics and losses to air: Liquid-cooled: Built-in liquid-to-liquid heat exchanger.
CEC and Euro efficiency at 1250 V DC	> 99%
Harmonic grid distortion	< 3% THDi
Power factor	Adjustable
Additional features	Built-in high-current electrolyzer start-up and polarization unit up to 500 A DC
Protective devices	Low-voltage air circuit breakers AC and DC fuses on every converter module
Environment	Ambient temperature -30 to +40 °C Sound pressure <80 dB(A) (standard)
Compliance	CE, SIL2 compliant converter. Planned: UL1741, CSA C22.2 No 107.1
Dimensions of power converter **Length [mm]** **Width [mm]** **Height [mm]** **Weight [kg]**	 3300 (depending on output options) 2360 2740 < 8000
Transport and service access	Fits inside open type 20 ft shipping platform Forklift/moving platform pockets Padlock-lockable entrance doors Two entrances to avoid confined space Integrated lifting aid for heavy converter part maintenance/repair Middle maintenance area under roof is large enough to fit in an EU pallet (800 mm+)
Mains and DC connections	AC connection: Busbar trunking system at the end of the converter DC connection: Busbar or cable connection at the side of the converter
Heat management	Integrated HVAC unit for handling heat losses to air Customer coolant inlet temperature up to +35 °C Customer coolant liquid outlet temperature up to +40 °C Customer coolant flow rate 370 l/min Heat losses to liquid up to 105 kW

Some functionalities listed in this fact sheet are for future implementation