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Customer:	CrossWind C.V., Rotterdam, The Netherlands

FC PowerGen 1000kW

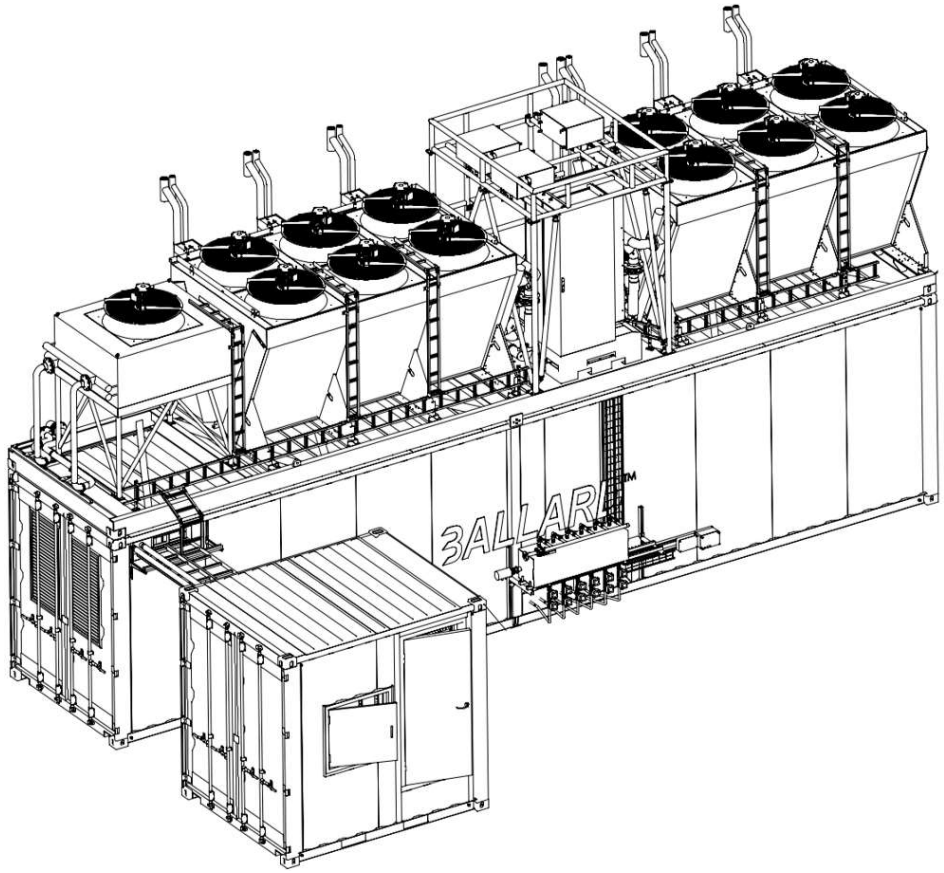
Part no.: 601456B-7002362

Configuration: 40ft Fuel Cell Container w. 6 FCwave™
10ft Converter Container, 6.6 kVAC

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Operator Manual



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1.0 Disclaimer

NOTE: READ THIS BEFORE ATTEMPTING ANY PROCEDURES DESCRIBED IN THIS MANUAL

There are inherent risks in the operation of a fuel cell module that can result in death or bodily injury or loss or damage to property. It is therefore necessary for the customer to take all prudent safety precautions in the installation, use, and maintenance of this device. Persons who install, operate, and service the device are required to be technically qualified and experienced in working with electrical equipment, compressed gases, and H2.

This manual includes certain safety guidelines and recommendations; however, this manual is not intended to cover all situations. The customer is responsible for determining the suitability of the customer's particular design or application, and for ensuring the safe operation, maintenance, and storage of the device and any systems into which it is integrated. Ballard Power Systems Europe A/S ("BPSE") cannot be responsible for the use of the device in ways, or as part of systems, that deviate from the operating recommendations in the manual. The customer is responsible for being aware of, and complying with, all applicable laws and regulations. BPSE has limited its liability for damages incurred by the customer or its personnel in the contract documents pursuant to which the device is provided to the customer. Please refer to those documents for additional information.

Procedures described in any part of the manual can only be attempted once the customer has read this entire manual. Failure to follow any instruction or recommendation could result in death or bodily injury or loss or damage to property.

BPSE intends for the device to be installed, operated, and serviced only by approved technically qualified and experienced people who understand the principles of fuel cell technology, are aware of the safe operating limits of fuel cells, and are familiar with the risks posed by operating a fuel cell module. BPSE relies on customers to use their own knowledge and experience when installing, operating, and servicing the device. BPSE also relies on the people using this manual to be familiar with common terms and abbreviations used in the manual.

Information in this manual is subject to change without notice. BPSE makes no commitment to update or keep current the information in this manual and reserves the right to make updates or other changes to this manual and/or to the products described in this manual, at any time without notice. Updates and other changes to the manual may be posted on the BPSE website and may be accessed through the customer portal; it is the customer's responsibility to check for any such updates or changes.

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2.0 General Information

This manual is mandatory reading for personnel working in or near the system, and persons instructing visitors prior to access to the system.

2.1 System introduction

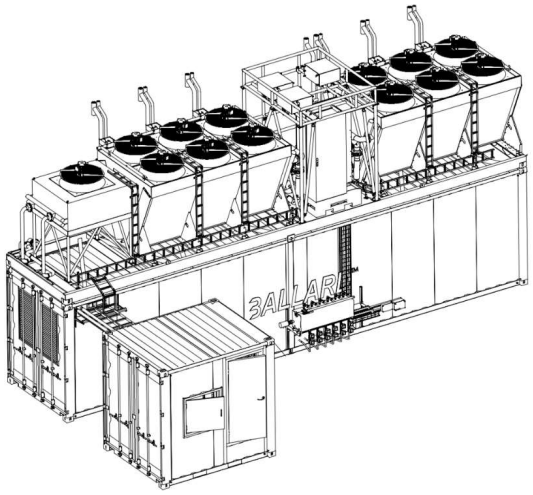
The Ballard FC PowerGen is a modularized power generator, comparable to a diesel-generator. It is a stationary, megawatt-scale hydrogen PEM fuel cell solution, utilizing the Ballard FCwave™.

The solution contains all needed elements to produce 1MW AC, when supplied with an auxiliary power supply, a local hydrogen supply, and an electrical grid that is controlled by a Power Management System (PMS), communicating with the use of Modbus.

Integration between the FC PowerGen and the local PMS enables the integrator to create a coherent and automatic system that reacts on the power-demand on the grid, within the given dynamic and capability limits of the solution.

The FCwave and the internals of the containers are designed in such a way that no explosive hazard zones are created in or around the system.

Figure 1: System overview



Indicative illustration of entire system

2.2 Manual purpose and scope

This operator Manual offers instructions for operating the system, instructions for operator-based maintenance, safety rules and recommendations.

It does not cover the operating instructions through the Modbus connection, refer to the Integration manual.

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2.3 Intended audience

The intended user of this Operator Manual is Operators, integrators, Installers, Service and Maintenance personnel, customer personnel working in or near the system, and persons instructing visitors prior to access to the system.



Before interacting directly or indirectly with the system, personnel must read and apply this manual.

2.4 Manual series

The Manual Series provides manuals covering different life-phases of the plant, as defined in Table 2-1:

Table 2-1: Manual series contents

Document no.	Title	Brief purpose description	Intended user(s)
Ballard: 7003672 CW: K559-2254-CWIWP4202202-R01-002	Transportation and Handling Manual	Enables safe, land-based, transport and handling from manufacturer to designated site.	Personnel qualified in preparation of, handling, and transport of freight.
Ballard: 7003718 CW: K559-2254-CWIWP4202202-N01-001	Integration Manual	Enables integrators to design designated site and subsystems required within the intended use and limits of the system.	Integrators partaking in designing the designated site and subsystems, and commissioning.
Ballard: 7003717 CW: K559-2254-CWIWP4202202-N01-002	Operator Manual	As described in section 2.2	As described in section 2.3
Ballard: 7003719 CW: K559-2254-CWIWP4202202-N01-003	Service and Maintenance Manual	Provide information regarding Service and Maintenance schedules and related safety.	Service and Maintenance personnel.

Ballard Power Systems Europe (BPSE) may update the provided manuals on an ongoing basis.

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2.5 Hazards Symbols

Hazard symbols throughout the manual indicate objectives or potentially dangerous situations.

Table 2-2: Hazard symbols	
	**MANDATORY ACTIONS**: are marked with blue action-points. This indicates actions that must be performed. Ignoring may result in an accident, which could cause damage to equipment or other property, and could cause bodily injury if not promptly detected and remedied.
	**PROHIBITIONS**: are marked with red prohibition-signs. This indicates a forbidden action. Ignoring may result in immediate bodily injury or loss of life or could cause damage to equipment or other property
	**WARNINGS**: are marked with yellow triangles and/or square warning. Indicates hazards that may result in an accident, which could cause immediate bodily injury or loss of life or could cause damage to equipment or other property.
	**CAUTION** in this manual indicates actions that may result in an accident, which could cause damage to equipment or other property, and which could cause bodily injury if not promptly detected and remedied.
	**ELECRICAL HAZARD** Obey ALL warnings, cautions, and safety instruction related to electricity. Failure to do so may result in electrical shock leading to personal injury or death.

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2.6 References

Throughout the manual are referrals to separate documents. These references documents are available on the BSPE after sales Service Portal.

Should a document not be available, contact BSPE.

Table 2-3: Reference documents

Document no.:	Document name:
K559-2254-CWIWP4202202-B01-001Rev009	General Arrangement
K559-2254-CWIWP4202202-D05-001Rev001	Material Safety Data Sheets
K559-2254-CWIWP4202202-C08-001Rev004	Control philosophy and Logic block diagrams
K559-2254-CWIWP4202202-C99-001Rev002	Hydrogen Safety Concept

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Commented [CJ5]: Rev008 is issued - see if it affects documnt

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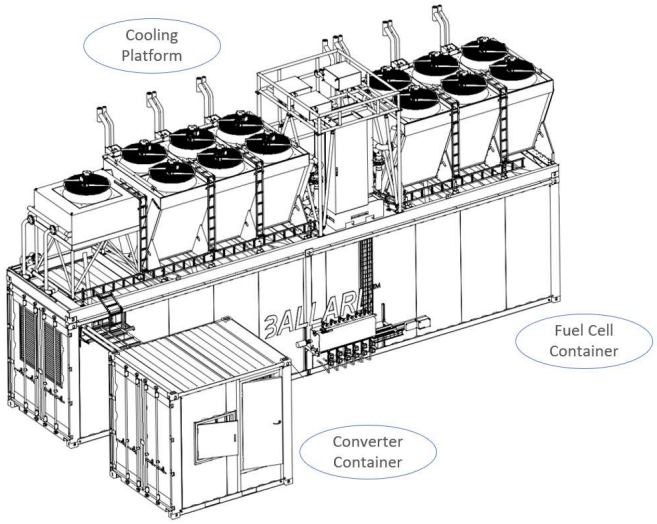
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3.0 FC PowerGen Description

3.1 Major components

The system is a modularized power generator based on a number of FCwave™ Fuel cell units.
The FC PowerGen consists of the following main components:

Figure 2: Major components overview



Short descriptions of major components can be found in Table 3-1

Table 3-1: Major components of the machine (See Figure 2)

Component	Short Description
Fuel Cell Container	Based on a 40ft HC container, modified to a machine housing with access, ventilation, light safety etc. The container holds 6 FCwave modules with installation, internal 400VAC power supply for complete Balance of Plant components, main controller, LT pump system and DC/DC converters.
Cooling Platform	40ft Cooling Platform with service platform. 2 individual HT radiators dimensioned to the specific solution 2 individual HT pump-systems 1 LT radiator
Converter Container	Based on a 10ft HC container, modified to a machine housing with access, ventilation, light, safety etc. Holds DC to AC grid-forming power electronics, Isolation transformer, and Grid Main Breaker.

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3.2 General Functional Description

The FC PowerGen is designed for fully autonomous and remote operation with no operator interface, except for service purposes. It is activated and operated remotely by the PMS of the integrators designated microgrid, for the solution to deliver power to.

While there is no fault internally on the fuel cell system or externally signaled, the solution will start and stop fuel cells as needed, to maintain delivery of requested power and keep operational health.

The solution accepts a power-request of zero. In this case it will be running in a stand-by mode, powered by either the auxiliary power supply, the power produced by itself, or a combination.

If any single input to the safety controller is outside acceptable parameters, e.g. hydrogen detection, E-stop activation, or external trip, the safety-system will trip and activate emergency shutdown. Depending on the severity of a potential fault, it will either:

- Initiate controlled shutdown on affected system(s) or the entire solution, or
- Instantaneously shutdown and isolate energy on affected system(s) or the entire solution.

Loss of hydrogen supply will stop operation and be handled as a failure.

3.3 Local HMI

Inside the Fuel Cell Container is located an HMI in the form of a touchscreen. This is available for service purposes of the machine. An overview of the system can be seen, and parameter changes can be made when unlocked with the use of a password (for authorized personnel only).

Instructions of use and/or creation of an HMI/SCADA for the PMS of local grid is not within the scope of the FC PowerGen, but a responsibility of the local integrator with the use of the Integration Manual.

3.4 Alarms

The following alarms are externally to the FC PowerGen triggered and should be handled by the site operator. For other alarms than mentioned, contact Ballard.

3.4.1 No hydrogen

The solution provides a signal to show that hydrogen is not available at the proper requirements. In case of "no hydrogen" alarm, please investigate hydrogen-supply upstream.

3.4.2 Remote Emergency Hydrogen Supply

The system has received a remote stop signal from upstream hydrogen supply, please investigate upstream.

3.4.3 Remote Emergency Site

The system has received a remote stop signal from PMS, please investigate downstream.

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3.5 General Operating States

The solution is designed for the Integrators local PMS to control the system through a wired Ethernet Modbus TCP/IP Connection.

The solution operates in the modes described in Table 3-2.

Table 3-2: General Operating mode descriptions

Operating Mode	Brief description	Preconditions
Off	Container fully depowered.	No power supplied to container; UPS batteries depleted
Initialization	Functions to establish baseline container status, with connections to external power and communications.	After bootup. 400Vac Supplied to Container.
Sleep	Container minimum operational level. Control and safety system are operating, but no high-power systems (>20kW) are operating. Hydrogen supply and fuel cells are inactive.	400Vac Supplied to Container. Communications heartbeat from PMS
Wakeup	Container enables 24V supply to fuel cell modules and starts container ventilation system.	400Vac Supplied to Container. Signal from PMS (Standby).
Standby	Waiting state for "Run" command from high level control system. Hydrogen supply and MV link disabled.	400Vac Supplied to Container Signal from PMS (Standby)
Startup	Transitional phase when PMS signals container to initiate operation. The significant part of this phase is that the container will draw a significant amount of power during startup, to energize fuel cell modules and cooling fans/pumps. After startup is complete on the fuel cells, the container transitions to "Running". All systems operational. Hydrogen system active.	400Vac from internal microgrid. Signal from PMS (Run). MV link active (10-150kW power draw, depending on # of FCwave starts concurrent). Hydrogen-supply active.
Running	Operational state for the container, where the fuel cell modules are consuming hydrogen to produce electrical energy. Cooling and ventilation systems are operating to support fuel cell modules.	Signal from PMS (Run). Signal from PMS (Power request). MV link active (up to 1050kW power produced) Hydrogen-supply active.
Rampdown	When signaled from PMS that operation is done, the container stops power production and performs fuel cell module shutdown procedures. Fuel cell modules shutting down. Hydrogen system transitions from active to inactive. After shutdown is complete, container proceeds to aftercooling.	Signal from PMS (Standby) MV link active (~10kW power draw) Hydrogen-supply active.

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Table 3-2: General Operating mode descriptions		
Aftercooling	After fuel cell system has shut down, container performs aftercooling from the cooling system and ventilation from the container ventilation	400Vac Supplied to Container MV link active (~5kW power draw)
Shutdown	The cooling and ventilation systems shuts down. Container returns to standby.	400Vac Supplied to Container. MV link transitions from active to Inactive.
Fault	Internal fault state. Hydrogen supply and fuel cells are inactive.	400Vac Supplied to Container. Fault indication to PMS.

For more details, refer to Control philosophy and Logic block diagrams.

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4.0 General Safety

⚠ CAUTION	
	**The FC PowerGen is intended to be remotely controlled. Automated start up may occur at any time if not prevented with applicable procedures.**

4.1 Machine access

At no time is access permitted inside the machine containers for unauthorized personnel, especially the Converter Container.

The exterior container doors must always remain locked except during active installation, integration, service, or maintenance.

⚠ WARNING	
	**Access to the internals of Converter Container is strictly prohibited except when applicable procedures are done by trained personnel, approved by the manufacturer.**

4.2 Hazardous materials

4.2.1 Coolant



The solution utilizes two types of coolant. The LT and HT cooling circuit uses the Glycol-based coolant Proviflow®, and the internal closed coolant loop of the FCwave™ uses GLYSANTIN® FC G20.

For more details, refer to the document "Material Safety Data Sheets".

During normal operation there should be no leakage of coolant. If a leakage is noted, Manufacturer must be informed.

General rules are:

- Avoid contact with eyes and skin.
- Use protective gloves and tightly sealed googles.
- Avoid ingestion and inhalation of vapors.
- Spillage – do not allow to enter sewers/surface or ground water, absorb with a liquid–binding material, dilute with water.
- Disposal must be made according to official regulations.

4.2.2 Lubricant

General for container solution: Ceramic Grease PV.20.01, used as assembly paste and high temperature lubricant grease without metal particles for lubrication of bolts.

Fuel Cell Modules: Krytox™ GPL 205 & 206: Grease safe for use around hazardous chemicals, non-flammable. For extreme temperatures.

General rules are:

- Avoid contact with eyes and skin
- Avoid ingestion and inhalation of vapors.
- Use protective gloves, safety glasses, and suitable protective clothing.
- Spillage – do not allow to enter sewers/surface or ground water, absorb with a liquid-binding material, dilute with water.
- Disposal must be made according to official regulations.

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4.2.3 Process water

The fuel cell process produces De-Ionized Water, which is routed from each FCwave™ to a H2 separator. The trace amount of H2 is led to the process-drain exhaust, and the process water is led to a drainpipe, connected to the outside drain system.

De-Ionized Water is not suitable for drinking water.

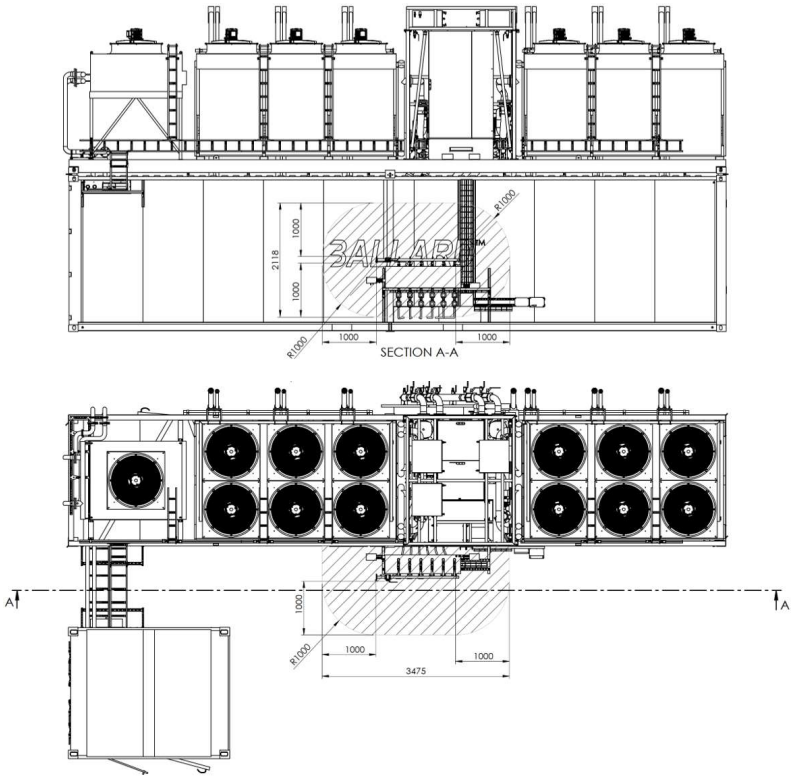
4.2.4 Hydrogen

Risks of hydrogen leakages is highly unlikely.

Areas within the solution are classified as non-hazardous since areas with the slightest risk of leakage are monitored by the safety system and excessively ventilated to dilute and remove the hydrogen, thereby removing any explosion hazard inside the system.

The area around the External hydrogen handling unit is classified as an EX-Zone 2 with a max 1 meter extend. Here, an explosive gas atmosphere is not likely to occur in normal operation, but, if it does occur, will exist for a short period only.

Figure 3: EX Zone – External hydrogen handling unit



EX-zone marked around the External hydrogen handling unit.

Refer to Hydrogen Safety Concept for more details about the EX-zone.

Commented [CJ8]: Add details regarding the ATEX zone and the dangers hereof

Commented [CJ9]: This can't be true when we have defined an ATEX zone outside - Having that zone means we haven't removed all explosion hazards

Commented [CJ10R9]: Maybe rephrase: "Thereby removing any explosion hazard inside the system" and show the applicable zone, warning that no source of ignition are allowed etc.

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Minimize all activities in the EX-zone
Activities must be done by trained personnel
Do not introduce any ignition source into the EX-zone



4.3 Site safety for Personnel

4.3.1 Personal Protection Equipment (PPE)

Appropriate PPE should always be worn while interacting with the system directly and/or indirectly. Wear a safety helmet, protective glasses, gloves, and other protective equipment, as required by the designated site.

4.3.2 Noise

During normal operation the noise-level emitted varies depending on the operating conditions. The noise-level in the surrounding area may reach up to 80dB, the highest being in front of the air-intakes.



Hearing protection should be available and used when in the surrounding area.

4.3.3 Emergency doors

The fuel cell container is equipped with two emergency exit doors, see Figure 4.

Do not store material or in other way block the emergency doors.

4.3.4 Freezing conditions

The process exhaust contains water. This water will freeze and turn into snow and ice. Care must be taken when outside temperatures are at or below 0 °C.

- It is possible that icicles are formed on the exterior of the containers, creating a risk of falling objects.
- It is possible that surrounding surfaces have icing, creating a risk of slipping.
- Avoid or restrict access to the area if needed

Commented [CJ11]: Safexpert risk assessment Fuel cell container -> Mechanical hazard -> Slipping, tripping and falling

4.3.5 Medical devices

During some operating modes, the system will create a magnetic field which may influence medical devices. Such devices shall not enter the system.

4.3.6 Fire

The Fuel Cell Modules have internal fire detection in the form of smoke detectors and linear heat detectors. If a Fuel Cell module detects fire, it will automatically perform a safe shutdown of itself and indicate an alarm.

If Smoke is detected inside the general space of the Fuel Cell Container, the entire system will perform a safe shutdown and indicate an alarm.

Commented [CJ12]: See integration manual and write something similar here

Commented [CJ13]: CRS Comment 3

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Should a fire occur, exit through the provided emergency exits.

4.3.7 Explosion Safety

The solution introduces an area with explosion hazard around the hydrogen interface. This zone is classified as a Zone 2, meaning that a hazardous mixture of hydrogen in the area will not likely be present under normal operating conditions, and if so, only for a short period at a time. Detailed drawing of the hazard zone can be found in the General Arrangement.

Commented [CJ14]: Short version of the description in integration manual

Commented [CJ15R14]: Show area

	**Respect the zone indicated, do not introduce any source of ignition.**

4.3.8 Hot surfaces

	**During operation, hot surfaces are present. Respect the nature of the machine and avoid touching surfaces marked.**

4.3.9 Service and maintenance

	**When service and maintenance are conducted, personnel in the area must follow the instructions from the responsible service technician.**

4.4 Cleaning

The area around the system should be kept clean and with unrestricted access, e.g. during winter snow.

Cleaning of the major components of the system must be done according to the service instruction. Do not wash down exterior without consulting the service manual.

4.5 Settings

No settings for the FC PowerGen are available for the general operator. Settings are restricted to Integrators and Service and Maintenance Personnel through the use of Modbus communication and the HMI inside the Fuel Cell Container.

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4.6 Safety labels on the machine

Table 4-1: Safety labels on the machine

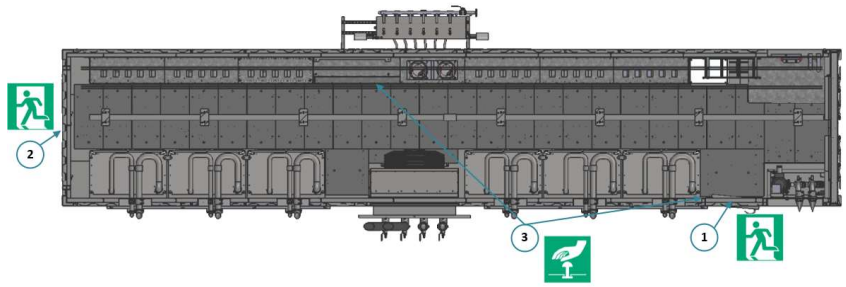
	Emergency exit		Use hearing protection
	Authorized personnel only		Wear safety footwear
	No smoking		Read manual
	No open flame		Risk of electric shock
	No access for active implanted cardiac devices or others alike		Hot surface
	Not lifting point		Automatic startup
	Lifting point		Crush of hands

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5.0 Safety inside Fuel Cell Container

When the entirety of this manual has been consulted, it is safe to enter the Fuel Cell Container during operation. The Fuel Cell Container is designed to meet minimum IP20 for all equipment installed.

Figure 4: Safety equipment in Fuel Cell container



Emergency doors, emergency buttons

Commented [CJ16]: New picture

5.1 General rules

The interior of the Fuel Cell Container is to be kept as clean as possible:

- Remove any litter or debris.
- Keep the doors closed to allow for ventilation air to be filtered.
- The Fuel Cell Container is a machine, respect the rules and signs. Do NOT open equipment without proper instruction and safety measures as described in relevant service work instruction.
- It is recommended to keep a communications device on your person when being inside.

The interior light can be switched on and off next to the main entrance door.

If any abnormal condition is noted on entry, avoid entering and contact Ballard service.

5.2 Emergency exit

The main entry door (Figure 4, 1) is on the side of the container. The door is equipped with an emergency Push bar on the inside.

There is an additional service access door (Figure 4, 2) at the end of the container. This door is intended for use only during specific service activities and emergency exit.

5.3 Emergency Stop button

The Emergency Stop buttons (Figure 4, 3) are placed next to the main access door, and on the MCU panel. Activating one will immediately shut down the entire system and disengage the main output connection to the grid.

The emergency stop button may not be used as a general stop button of the machine.

It is important to note that not all energy sources are disconnected from the machine when the emergency button is activated. Systems such as UPS batteries for the control-systems and the Auxiliary power supply etc., supplies energy to the system during emergency stop.

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5.4 Emergency lighting

Part of the internal lighting of the container is supplied with power from the UPS during an emergency.

5.5 Fire safety

The Fuel Cell Container is equipped with a fire detection system using multiple detectors. The activating of a detector may lead to partial shutdown of the affected unit or a complete shutdown of the system.

- Smoke detectors are mounted in the ceiling of the container, monitoring the inlet and outlet of the ventilation air.
- Each FCwave module contains an internal smoke detector and linear heat detector.

5.6 Hydrogen safety

The Fuel Cell Container is designed to prevent leakages of hydrogen inside the container, and there are no hydrogen-flammable or -explosive conditions inside the system.

As an additional precaution, in case of hydrogen entering the container, the container is equipped with three hydrogen sensors in the general space of the container. One at the ventilation intake and one at each of the ventilation exhausts, which will detect incoming and exiting hydrogen.

If one of these hydrogen detector is triggered, the safety system shuts off all the hydrogen supply valves and trigger emergency shutdown of the fuel cell modules and power converters.

Refer to Hydrogen Safety Concept for more details.

5.7 Electrical safety

The electrical cabinets are only to be opened by instructed electricians and require a tool.

⚠ ELECTRICAL HAZARD	
	**Special attention is required to the DC cabinets.** **The voltage on the DC busbars is 750V, and special procedures must be followed to disconnect and discharge the system prior to opening.** **Refer to Service and Maintenance Manual.**

5.8 Auxiliary power supply

The system requires a permanently mounted auxiliary power supply. Auxiliary power supply is used during operating modes where power from the fuel cells is not available.

The auxiliary power is present at all times, also when the main grid breaker is open, unless disconnected remotely.

5.9 Noise

During operation the sound level may reach up to 94dB inside the container. Hearing protection must be used when inside the container.

If the fuel cell system is shut down for service and starting are prevented by applicable lock-out, hearing protection is not mandatory.

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	**Hearing protection must be worn during operation.**

5.10 Hot surfaces

The components and piping of the LT cooling rack may reach a temperature of 45°C.

The components and piping of the HT cooling that are placed below the raised technical floor may reach a temperature of 65°C. The floor should only be opened in consultation with the instructions in the service manual.

The Process exhaust piping above the fuel cells may reach a temperature of 70°C during fuel cell operation. Avoid touching.

	**The HT Coolant pipes reach temperatures up to 65°C during normal operation.**
	The process exhausts reach temperatures above 70°C during operation.

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6.0 Cooling Platform

Commented [CJ17]: CRS Comment 5

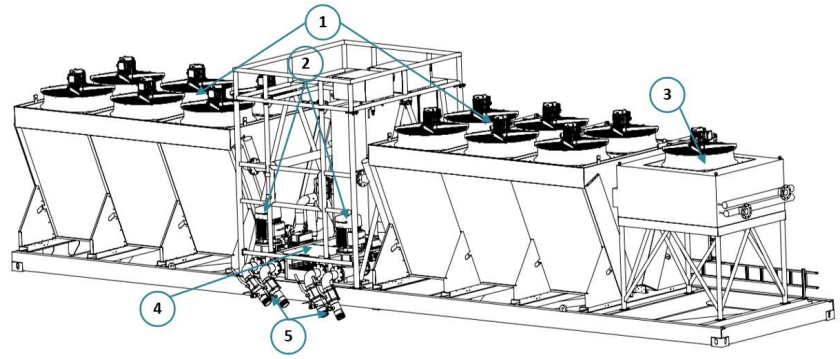
The Cooling platform is a steel structure with the footprint of a 40ft container. The purpose of the cooling platform is to dissipate the excess heat generated. The cooling systems are open unpressurized systems with open header tanks to accommodate for volume changes due to temperature. The cooling media is Ethylene glycol, and the highest temperature is approximately 65 °C.

The exhausts from each FCwave™ is fastened to the HT cooling platform.

- Process air, oxygen reduced air from the electrochemical process saturated with water.
- Hydrogen ventilation air

Figure 5: Cooling platform [illegible]

Commented [CJ18]: New picture



Indicative overview of HT Cooling Platform with numbered ballons (see Table 6-1)

Table 6-1: HT Cooling platform overview descriptions (See Figure 5)	
1	HT Coolers with fans
2	HT Coolant pumps
3	LT Cooler with fan
4	Platform Service area
5	HT Coolant in- and outlet

6.1 Platform Service area

The Service Area of the Cooling Platform is located between the HT coolers. The Cooling Platform is placed on top of the Fuel Cell Container, approximately 3 meters above ground level. This makes the Service Area inaccessible for unauthorized personnel.

Access for authorized personnel is with a designated ladder which is hooked on to the service area extension, or from a scaffold or similar, if service work requires.

The Service Area has a surrounding fencing. This prevents service engineers from falling from height. Special care must be taken in extreme weather conditions, consider using PPE equipment (harness).

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Prior to accessing the Service Area of the Cooling Platform, the Service and Maintenance Manual must be consulted.

6.2 Hydrogen safety

There is no Hydrogen present at the service area.

6.3 Electrical safety

The electrical cabinets are only to be opened by instructed electricians and require a tool.

6.4 Noise

During operation the sound level may reach up to 80dB in the Service Area, main source being the cooling fans on top of the coolers.

Use hearing protection when in operation.

6.5 Hot surfaces

The components and piping of the HT cooling may reach a temperature of 65°C during operation.

Mounted to the HT Cooling Platform are the Process exhaust from the Fuel Cell Modules that resides inside the Fuel Cell Container. These may reach temperatures up to 70°C.

Avoid touching.

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7.0 Converter Container

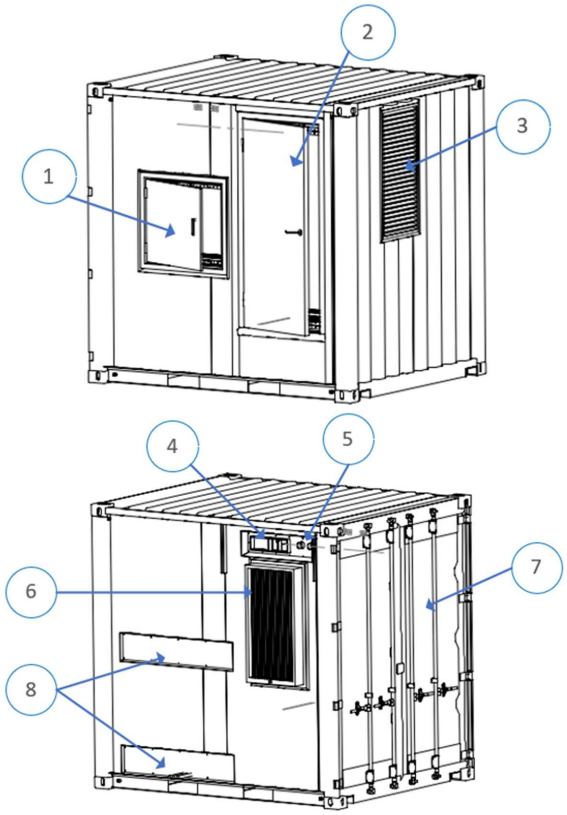
The Converter Container is structurally a 10ft high-cube double-door container, modified to the specific need. It is designed as an electrical cabinet, housing DC/AC converters and a transformer that converts the energy to the desired voltage (6.6 kV).

Access to the inside is through the normal container doors which are, because of electrical safety, mechanically prevented from opening during operation. These are also equipped with safety sensors, which will immediately bring the entire solution to "Failure state" if opened.

Access is restricted to instructed and trained personnel, and only after a safety procedure is followed, which will deenergize the container to a safe mode.

The control panel and grid breaker front of the Converter Container is accessible from the outside, behind an additional locked door which will not shut down the solution if opened.

Figure 6: Converter Container overview



Indicative overview of 10ft Converter Container with numbered ballons (see Table 7-1)

Commented [CJ19]: Need to mention the 6,6 kV!

Commented [CJ20]: Get the updated version from Integration Manual

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Table 7-1: Converter Container overview descriptions (See Figure 6)	
1	Control panel access door
2	Main output breaker access door
3	Ventilation exhaust
4	Wall passthrough for Control Signals and DC power cables from Fuel Cell Container
5	LT Cooling interface
6	Ventilation air intake
7	Service doors
8	Converter (1MW AC output)

7.1 Electrical safety

⚠ ELECTRICAL HAZARD	
	**HIGH VOLTAGE – 6.6 kV** **Danger of electrocution** **Authorized personnel only** **Keep clear and follow safety protocols** **Proper PPE required** **Failure to comply may result in serious injury or death**

7.2 Access

There is no access to the insides of the Converter Container for unauthorized personnel, as some aspects inside are IP00.

Access is only granted with proper de-energization procedures found in the Service and Maintenance Manual.

Commented [CJ21]: CRS Comment 6

Opening any of the access doors triggers a safeguard, immediately de-energizing the entire FC PowerGen and requires a resetting procedure.

It is recommended to keep a communications device on your person when being inside.

⚠ WARNING	
	**Access to the internals of Converter Container is strictly prohibited except when applicable procedures are done by trained personnel, approved by the manufacturer.**

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