Industrial H2 Gas Generator

iH08 / iH10

Engineering Data Sheet

Technical Specification

Product Selection

Model	H_2 Flow Rate		O_2 Flow Rate		H_2 & O_2 Pressure		H_2 Purity *(at Full Flow)*	O_2 Purity *(at Full Flow)*	H_2 Dewpoint		O_2 Dewpoint	
	m^3/hr	scfm	m^3/hr	scfm	Bar g	psi g	%	%	°C	°F	°C	°F
iH2-08-05-0	8.6	5.1	4.3	2.5	5	70	99.5	99	-10	14	-20	-4
iH2-08-05-P	8.6	5.1	4.3	2.5	5	70	99.9995	99	-70	-94	-20	-4
iH2-08-12-0	8.6	5.1	4.3	2.5	12	175	99.5	99	-20	-4	-20	-4
iH2-08-12-P	8.6	5.1	4.3	2.5	12	175	99.9995	99	-70	-94	-20	-4
iH2-10-05-0	10.6	6.2	5.3	3.1	5	70	99.5	99	-10	14	-20	-4
iH2-10-05-P	10.6	6.2	5.3	3.1	5	70	99.9995	99	-70	-94	-20	-4
iH2-10-12-0	10.6	6.2	5.3	3.1	12	175	99.5	99	-20	-4	-20	-4
iH2-10-12-P	10.6	6.2	5.3	3.1	12	175	99.9995	99	-70	-94	-20	-4

m^3 reference standard = 20°C / 68°F, 1013millibar(a), 0% relative water vapour pressure.

Inlet Parameters

De-ionised water:	
Quality	Maximum Conductivity 5 µS/cm
Consumption	iH2-08: 7.4 L/hr iH2-10: 9 L/hr
Cooling Water:	
Maximum Temperature	35°C / 95°F
Minimum Flow	iH2-08: 3.5 m^3/hr (2.1 scfm) iH2-10: 4.5 m^3/hr (2.6 scfm)
Pressure	2 - 5 bar g (29 - 72.5 psi g)
Nitrogen:	
Maximum Flow	3.0 m^3/hr (1.8 scfm)
Pressure	2 - 5 bar g (29 - 72.5 psi g)
Purity	0.5% O_2

Electrical Parameters

Supply Voltage	400V 3 Phase + N
Frequency	50Hz
Rated Current	iH2-08: 76 A iH2-10: 90 A
Maximum Power Consumption	iH2-08: 47 KW iH2-10: 58 KW
Fuse	iH2-08: 100 A iH2-10: 125 A

Environmental Parameters

Ambient Temperature	5 - 35°C (41 - 95°F)
Humidity	20 - 80%
IP Rating	IP20 / NEMA 1
Altitude	<1000m
Noise	<78dB (A)

Fluids

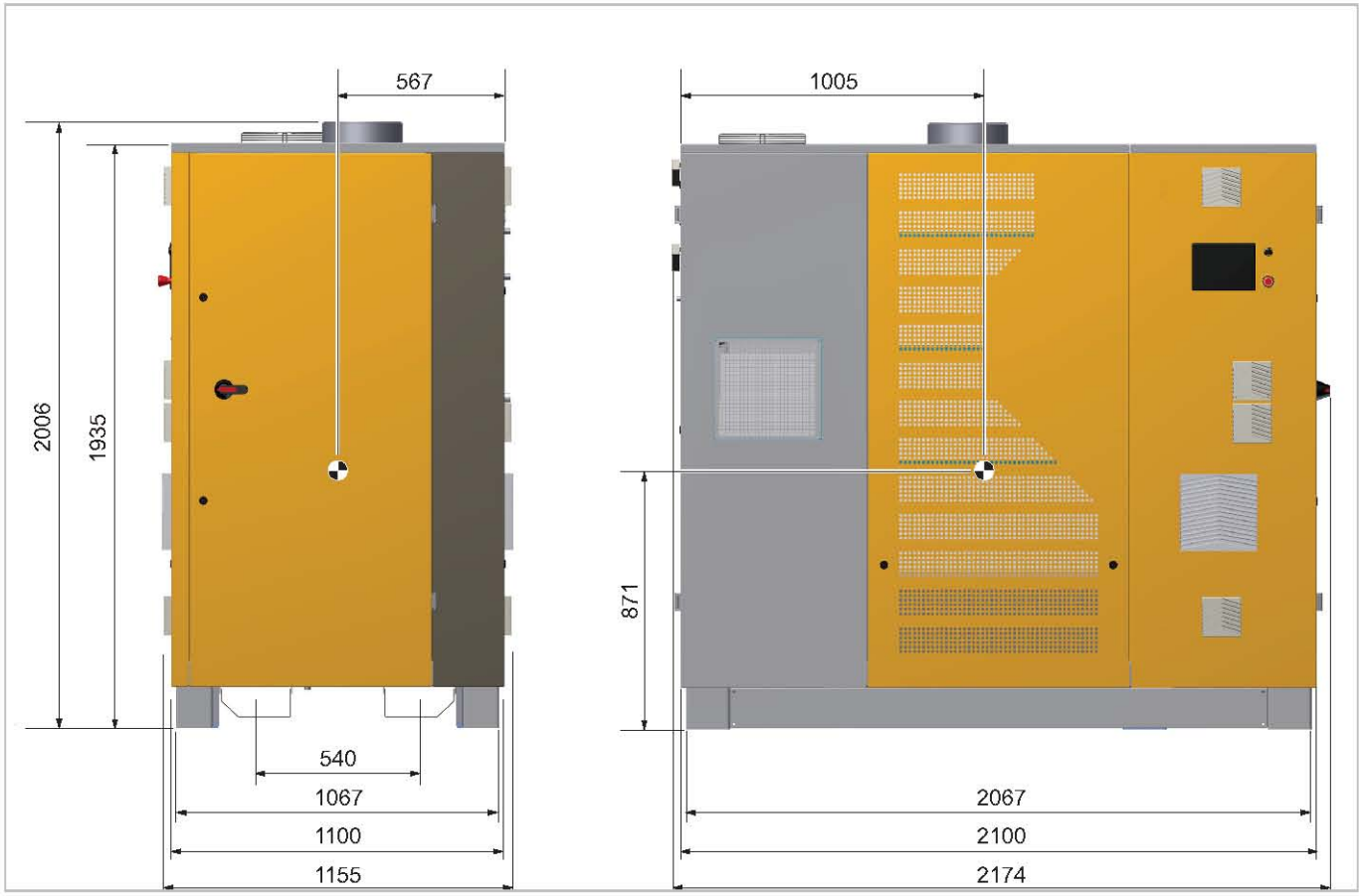
Electrolytic Solution Caustic Soda (NaOH)	
Density a 25°C	1.2 g/ml (24 Bè)
Quantity	iH2-08: 100 L iH2-10: 115 L
Freon R404A	
Quantity	2.2 Kg (4.9 lbs)
High Pressure	16 bar (232.1 psi)
Low Pressure	3 bar (43.5 psi)
Cooling Liquid, Water-Glycol at 50%	
Quantity	10 L

Port Connections

H2 Outlet	G3/8" (F)	**Air Inlet**	G 3/8" (F)
H2 Vent	G3/4" (F)	**N2 Inlet**	G3/8"(F)
H2 Safety Valve	G3/8" (F)	**Cooling Inlet**	G3/4" (F)
O2 Outlet	G3/8" (F)	**Cooling Outlet**	G3/4" (F)
O2 Vent	G3/4" (F)	**H2 Condensate Drain**	G3/8" (M)
O2 Safety Valve	G3/8" (F)	**O2 Condensate Drain**	G3/8" (M)

Weights and Dimensions

Overall Dimensions



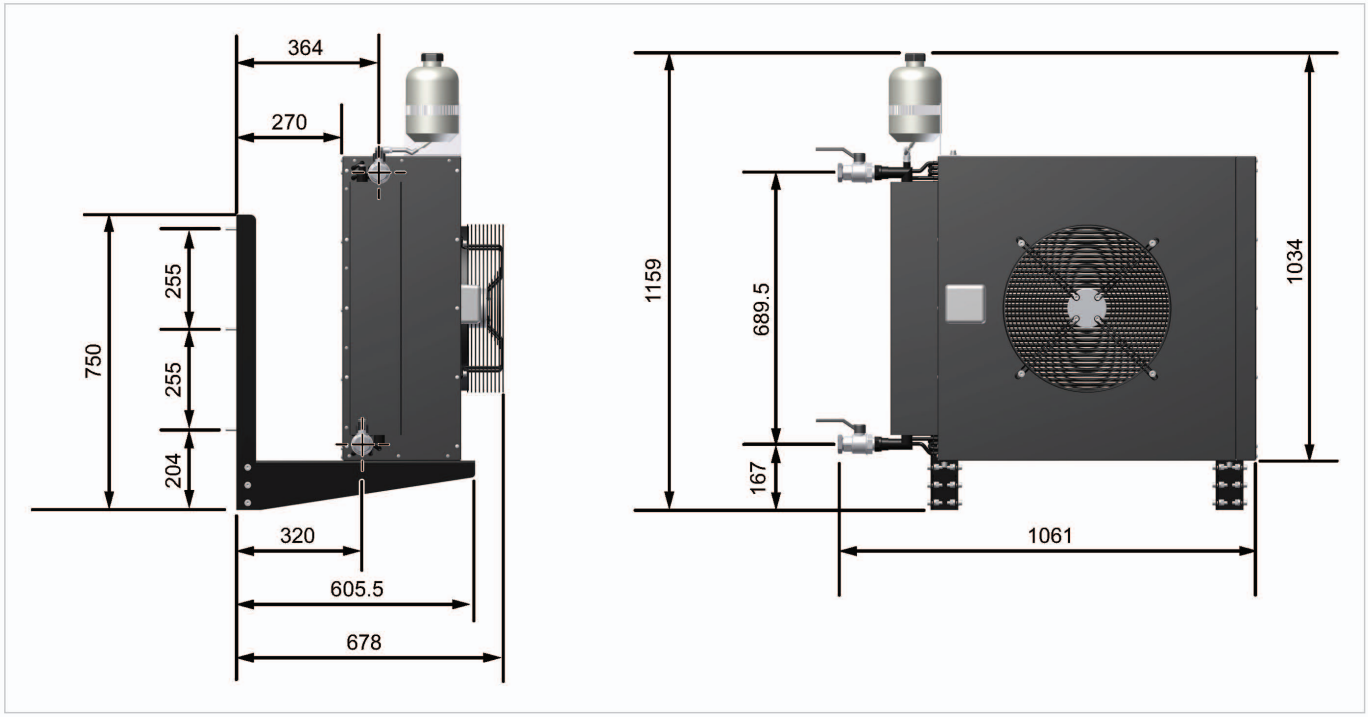
Generator Weights

Model	Weight	
	Kg	lbs
iH2-08-0	**1410**	**3108.5**
iH2-08-P	**1640**	**3615.6**
iH2-10-0	**1700**	**3747.9**
iH2-010-P	**1935**	**4265.9**

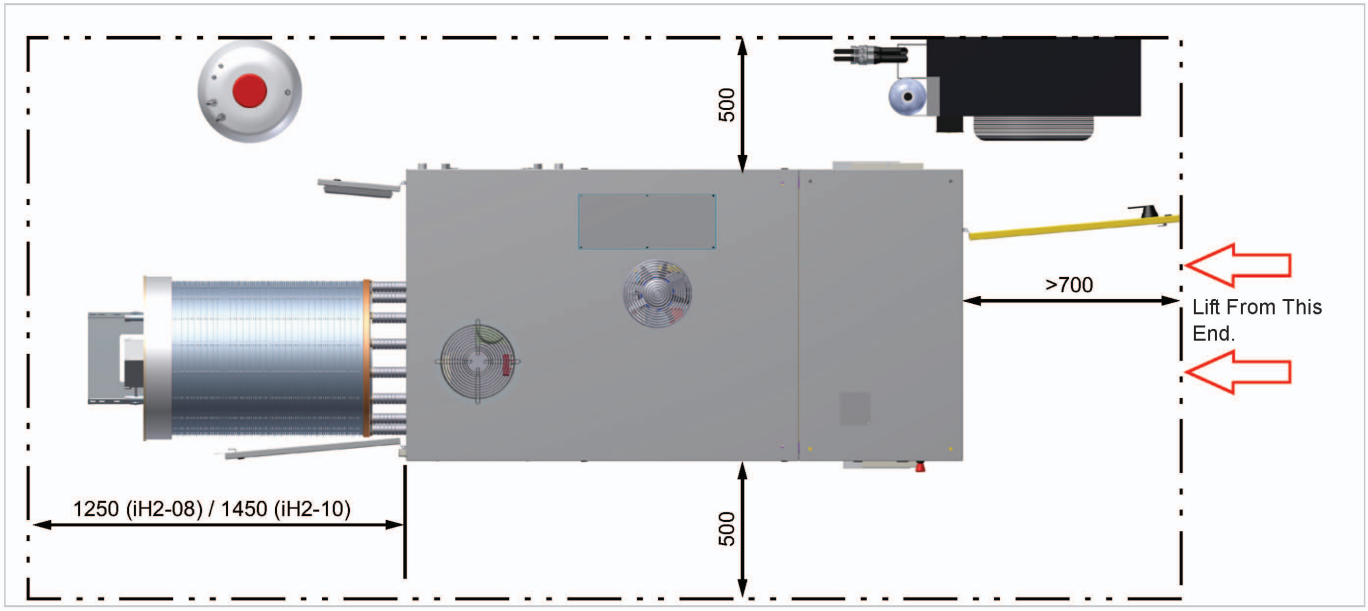
Packed Weights and Dimensions

Model	Height		Width		Depth		Weight	
	mm	ins	mm	ins	mm	ins	kg	lb
iH2-08-0	2250	88.6	1450	57.1	2350	92.5	1860	4100
iH2-08-P	2250	88.6	1450	57.1	2350	92.5	2190	4828
iH2-10-0	2250	88.6	1450	57.1	2350	92.5	2005	4420
iH2-010-P	2250	88.6	1450	57.1	2350	92.5	2235	4927

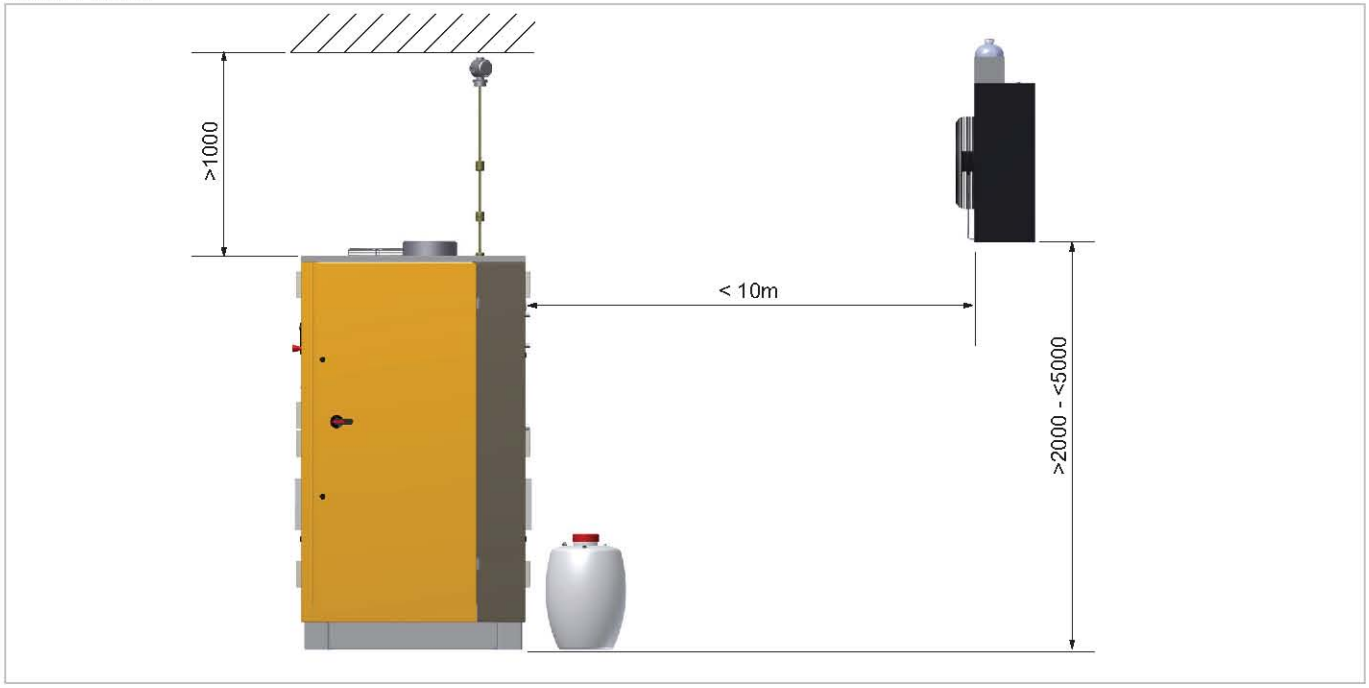
External Heat Exchanger



Floor Plan



Head Room



Lifting and handling

Handling the Crate

The generator is supplied in a sturdy wooden crate designed to be moved using a forklift truck.

Refer to the technical specification for packed weights and dimensions.

Storage

Caution

Do not store the generator or any ancillary equipment outdoors.

The equipment should be stored upright, within the packing crate, in a clean dry environment. If the crate is stored in an area where the environmental conditions fall outside of those specified in the technical specification, it should be moved to its final location (installation site) and left to stabilise prior to unpacking. Failure to do this could cause condensing humidity and potential failure of the equipment.

Handling the Generator

It is recommended that the generator is moved into position, using a forklift truck, prior to removing it from the crate.

Lifting pockets have been provided on the generator to facilitate lifting with a fork lift truck. Once positioned in its final location fit the lower access panel to the generator.

Refer to the technical specification for details of centre of gravity and weights and dimensions.

Hydrogen Generator Site Layout and Design

Classification of Hazardous Area

Warning

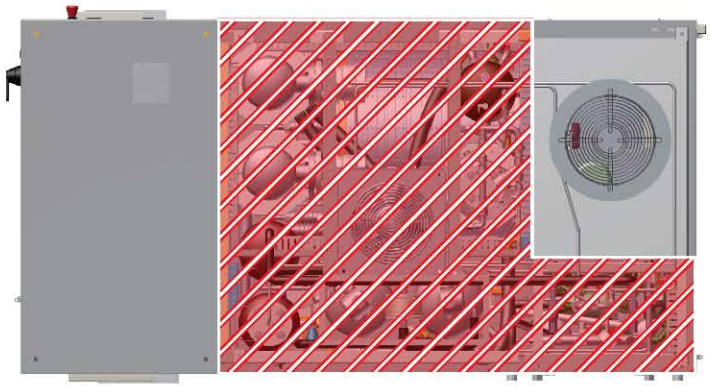
This equipment is not suitable for use in a hazardous area.

The generator is designed to maintain pressure. Under normal operating conditions hydrogen should not be present outside of its intended pipelines and associated fittings.

When installed correctly, in accordance with the recommendations within this manual, this generator is suitable for use in a non-hazardous area.

Internally the hydrogen section of the enclosure is classified as Zone 2, with a secondary grade of release, in accordance with BS EN 60079-10-1:2009 Explosive atmospheres - Part 10-1: Classification of areas - Explosive gas atmospheres.

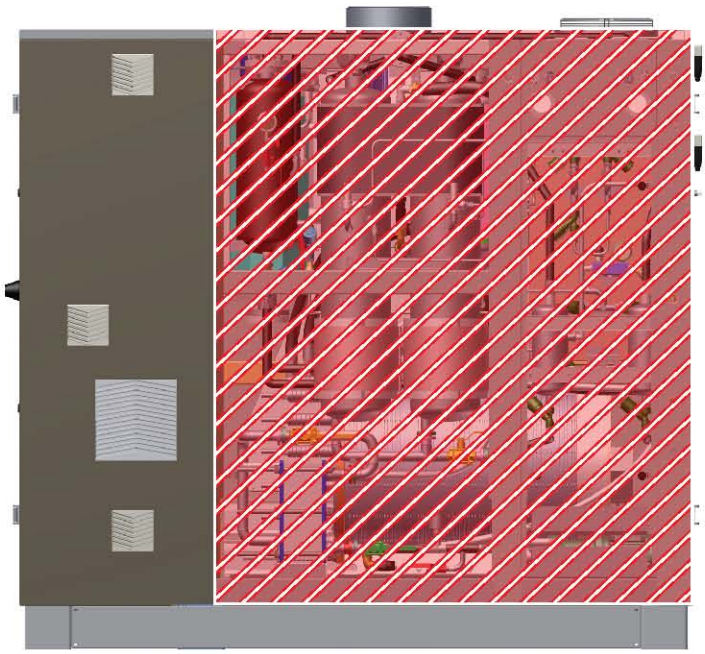
The Zone system makes extensive use of the Lower Flammability Limit (LFL) concept. That is, if the amount of flammable gas in the atmosphere mixture is below the LFL for hydrogen (4%), then the mixture will be too lean and won't burn.



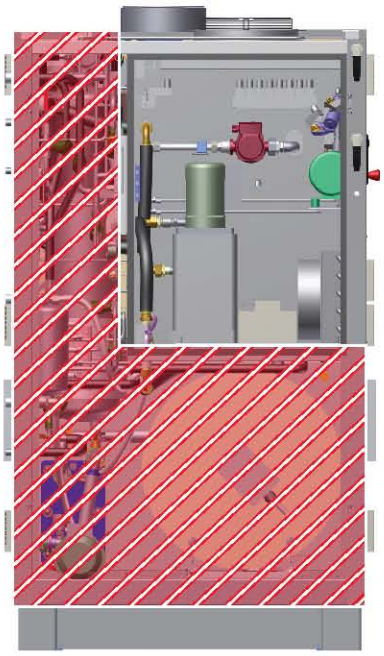
Top View

Key:

Zone 2 Area



Review View



Left View

H2 Enclosure: Zone 2 Classification BS EN (IEC) 60079-10: 2009

Environment

Although it is suitable for open air installations, the generator must be protected against direct exposure to the elements. Exposure to direct sunlight, rain and extreme temperatures will affect the environment in which the equipment is operating and consequently may impair the safety and operation.

It is the customers' responsibility to ensure that the environmental conditions specified within the “Technical Specification” on page 3 are maintained.

It is recommended that a powder fire extinguisher is located near to the generator and ancillary equipment.

Pay particular attention to the shape of the roof to avoid the potential build up of hazardous pockets of hydrogen gas.

In the event of hydrogen escaping from the generator, a hydrogen gas sensor should be installed within its locality, and mounted at the highest level possible.

Ventilation

Always ensure that the generator is operated in a well ventilated area and all of the vent ports are kept clear and free from blockages.

With the exception of oxygen, any gas can cause asphyxiation in high enough concentrations. In most scenarios, however, because hydrogen rises and disperses so rapidly, it is unlikely to be confined where asphyxiation might otherwise occur.

Due to the nature of operation there is a possibility of oxygen enrichment surrounding the generator. Where the risk of oxygen enrichment is high, such as a confined space or poorly ventilated room, the use of oxygen monitoring equipment is advisable. Oxygen levels must be maintained below a volume of 23.5% in air.

Clearances

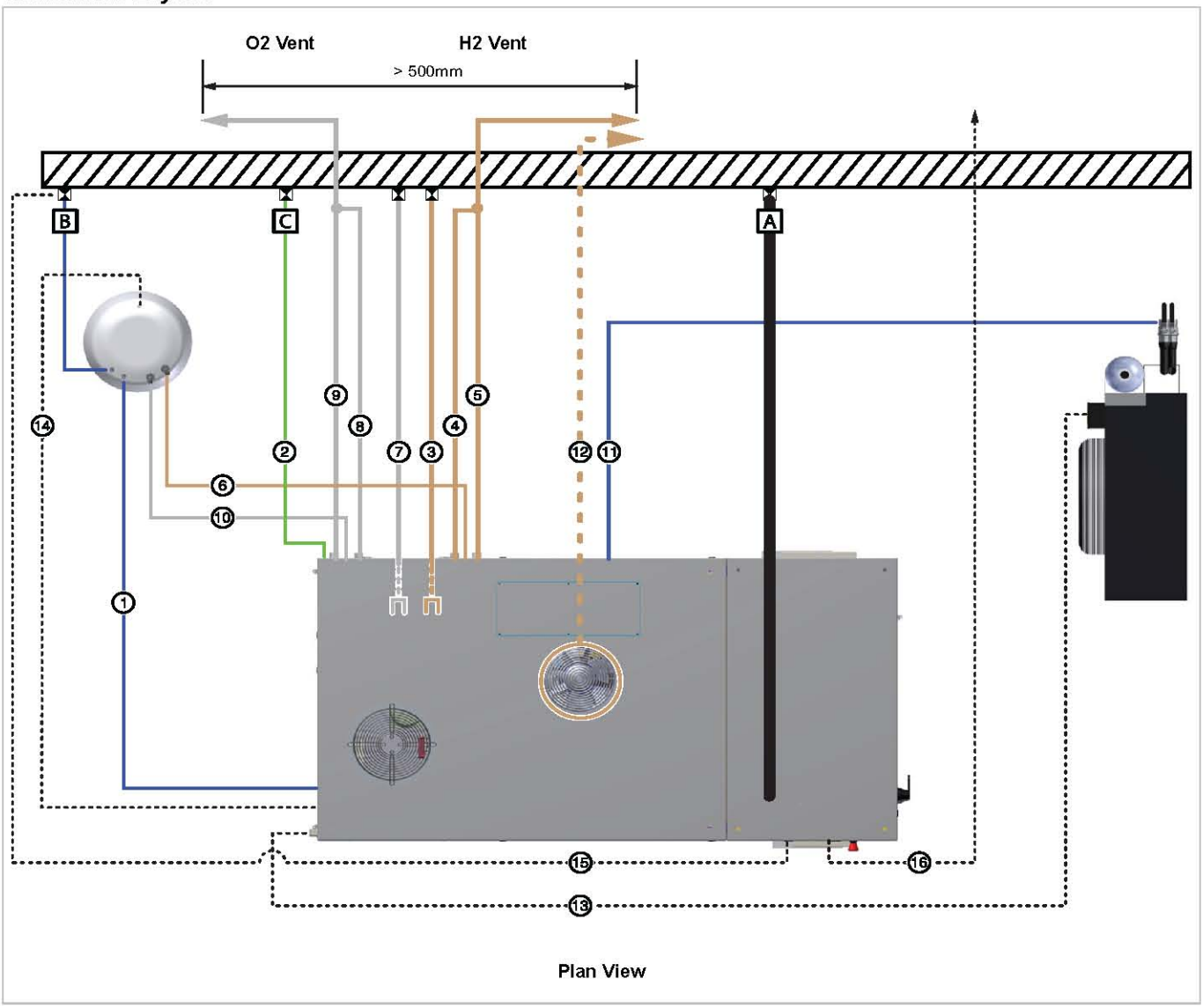
The equipment should be mounted on a flat surface capable of supporting its own weight plus the weight of all ancillary parts.

There must be adequate space around the equipment to allow airflow and access for maintenance purposes and lifting equipment. The following images illustrate the minimum clearances.

The external heat exchanger should be mounted at a height of 2 - 5m above the base level of the generator, and at a distance up to 10m away from the generator.

Do not obstruct or block the ventilation vents on the enclosure.

Installation Layout



Plan View

Utilities (1)					
A	Electrical Supply	B	De-ionised water	C	Nitrogen

(1) Refer to the technical specification for for detailed utility requirements

Piping Connections

Ref #	Description	Port Size	Ref #	Description	Port Size
1	De-ionised water inlet	1/4" BSPP	7	O2 Outlet	3/8" BSPP
2	N2 Inlet	3/8" BSPP	8	O2 Safety Valve	3/8" BSPP
3	H2 Outlet	3/8" BSPP	9	O2 Vent	3/4" BSPP
4	H2 Safety Valve	3/8" BSPP	10	O2 Condensate Drain	3/8" BSPP
5	H2 Vent	3/4" BSPP	11	Cooling Glycol	3/4" BSPP
6	H2 Condensate Drain	3/8" BSPP	12	H2 Enclosure ventilation	Ø 266mm

Electrical Connections

Ref #	Description	Ref #	Description
13	Heat Exchanger electrical supply	14	External de-ionised water tank level sensor
15	Automatic Water Fill	16	Auxilliary Equipment connection (controls, alarms and detectors)

Maintenance Schedule

The following service schedule highlights the service operations that should be performed on the module. The intervals are expressed in terms of months and hours run (whichever occurs first).

Description Of Service Required		Recommended Service Interval (Hours)						
Equipment	**Operation**	**Daily**	**Weekly**	**2000**	**4000**	**8 000**	**16 0000**	**32 0000**
Generator	Check for water leaks	✓						
Generator	Check that enclosure vents and ducts are not obstructed	✓						
Generator	Check that there are no combustible materials within the location	✓						
Generator	Status and Alarm Indicators	✓						
Generator	Check pipes for damage and / or leaks		✓					
Generator	Check fans are operating		✓					
Generator	Check operation of Emergency devices		✓					
Generator	Check electrical supply cable for damage			✓				
Generator	Clean radiators and fan intake / outlet			✓				
Generator	Replace Balancing Valve Membrane			🔧				
Generator	Clean Level Sensors			🔧				
Generator	Check and / or replace Electrolytic Solution			🔧				
Generator	Clean Hydrogen Discharge Solenoid Valve			🔧				
Generator	Check and adjust electrolyser cell packing disc springs			🔧				
Generator	Check the Carbon Tower and Deoxy Sintered Filters				🔧			
Generator	Check the Activated Carbon					🔧		
Generator	Replace Oxygen Discharge Solenoid Valves					🔧		
Generator	Replace the Electrolyte Pump Gaskets					🔧		
Generator	Check and Calibrate the Load Water Pump					○		
Generator	Replace the Load Water Pump						🔧	
Generator	Dryer Tower Sintered Filters						🔧	
Generator	Replace the Activated Carbon						🔧	
Generator	Activated carbon						🔧	
Generator	Replace the Electrolyser Stack							🔧

Key:

✓	Check and clean	🔧	Essential Procedure	○	Recommended Process

Scheduled Maintenance Kits

The following spares are available to cover service operations detailed in the service schedule. Should an unforeseen breakdown occur please contact dhFNS for spare parts and advice on fitting.

2000 Hour Service Kits

Description	Catalogue Number	Contents
2000Hr Service Kit (iH2-08-05 / iH2-10-05 and iH2-08-05-P and iH2-10-05-P)	M03SK.IH2.001	Balancer membrane Balancer O-ring (x8) Balancer orifice (x2) O-ring level switch (x2)
2000Hr Service Kit (iH2-08-12 / iH2-10-12 and iH2-08-12-P and iH2-10-12-P)	M03SK.IH2.002	Balancer membrane H.P. Balancer orifice (x2) O-ring level switch (x2)

4000 Hour Service Kits

Description	Catalogue Number	Contents
4000Hr Service Kit (iH2-08-05-P / iH2-08-12-P and iH2-10-05-P / iH2-10-12-P)	M06SK.IH2.001	PTFE Flange gasket (x2)

8000 Hour Service Kits

Description	Catalogue Number	Contents
8000Hr Service Kit (iH2-08-05-P / iH2-08-12-P and iH2-10-05-P / iH2-10-12-P)	M12SK.IH2.001	Large sintered filter (x2) Small sintered filter PTFE Flange gasket (x5) 1/2" Atex Electro-pneumatic valve (N/O) Electrolyte pump maintenance kit
8000Hr Service Kit (iH2-08-05 / iH2-08-12 and iH2-10-05 / iH2-10-12)	M12SK.IH2.002	1/2" Atex Electro-pneumatic valve (N/O) Electrolyte pump maintenance kit

16000 Hour Service Kits

Description	Catalogue Number	Contents
16000Hr Service Kit (iH2-08-05-P / iH2-08-12-P and iH2-10-05-P / iH2-10-12-P)	M24SK.IH2.001	Activated Carbon (2.5Kg) Large sintered filter (x4) Small Sintered filter (x4) Water load pump head
16000Hr Service Kit (iH2-08-05 / iH2-08-12 and iH2-10-05 / iH2-10-12)	M24SK.IH2.002	Water load pump head

32000 Hour Service Kits

Description	Catalogue Number	Contents
32000Hr Service Kit (iH2-08-05)	M48SK.IH2.001	iH2-08-05 Electrolyte Cell Cell plate o-ring (x3) Electrolytic solution (100L)
32000Hr Service Kit (iH2-08-12)	M48SK.IH2.002	iH2-08-12 Electrolyte Cell Cell plate o-ring (x3) Electrolytic solution (100L)
32000Hr Service Kit (iH2-10-05)	M48SK.IH2.003	iH2-10-05 Electrolyte Cell Cell plate o-ring (x3) Electrolytic solution (120L)
32000Hr Service Kit (iH2-10-12)	M48SK.IH2.004	iH2-10-12 Electrolyte Cell Cell plate o-ring (x3) Electrolytic solution (120L)

Approvals

This equipment complies with the following Directives:

Machinery Directive 2006/42/EC

Electromagnetic Compatibility (EMC) Directive 2004/108/EC

Pressure Equipment Directive (PED) 97/23/EC

Standards Referenced:

BS EN 60204-1:2006 + Amendment1:2009
Safety of machinery. Electrical equipment of machines. General requirements

ISO 13857:2008
Safety of machinery -- Safety distances to prevent hazard zones being reached by upper and lower limbs

BS EN 626-1:1994+A1:2008
Safety of machinery. Reduction of risks to health from Hazardous substances emitted by machinery. Principles and specifications for machinery manufacturers

BS EN ISO 12100:2010
Safety of machinery. General principles for design. Risk assessment and risk reduction

EN 61000-6-4:2007 +/A1:2012
Electromagnetic compatibility (EMC). Generic standards. Emission standard for industrial environments

EN 61000-6-2:2006
Electromagnetic compatibility (EMC). Generic standards. Immunity for industrial environments

BS ISO 22734-1:2008
Hydrogen generators using water electrolysis process. Industrial and commercial applications (Pending)

UNE EN 60079-10-1:2010
Explosive Atmospheres - Part 10-1: Classification Of Areas - Explosive Gas Atmospheres