



**GENERATING INNOVATIVE**  
**ENERGY SOLUTIONS**  
**THAT POWER GLOBAL INDUSTRY**



**TELEDYNE**  
**ENERGY SYSTEMS**  
Everywhereyoulook™

# ABOUT US



Teledyne Energy Systems, a division of Teledyne Technologies, is a leading global provider of on-site hydrogen and oxygen gas generation systems.

## Our Commitment

We build decades of engineering excellence into every hydrogen generator system, ensuring the most reliable and durable on-site hydrogen generation solutions available.

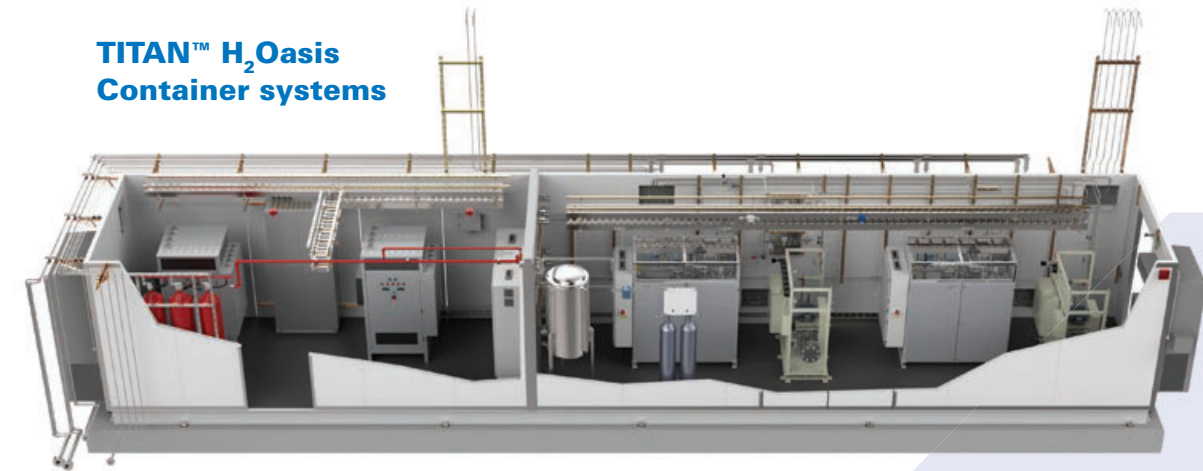
We continuously strive to exceed expectations by listening to a customer's needs and offering industry best solutions, based on a 50+ year history of material and production excellence. Many of our clients have been customers for over 30 years, and use our products and services to maintain leadership in their respective markets.



# OUR PRODUCTS

Designed for easy installation and for safe, reliable, unattended operation, Teledyne Energy Systems offers on-site, on demand industrial gas generators to supply ultrapure hydrogen and oxygen for a variety of applications including: power plant cooling, metal processing, float glass manufacturing, wholesale gas, chemical, and semiconductor production. Multiple generators can be used to meet specific gas requirements and redundancy needs. Teledyne's engineering team routinely designs and provides necessary support equipment, piping, and conduit systems for turn-key hydrogen plants.

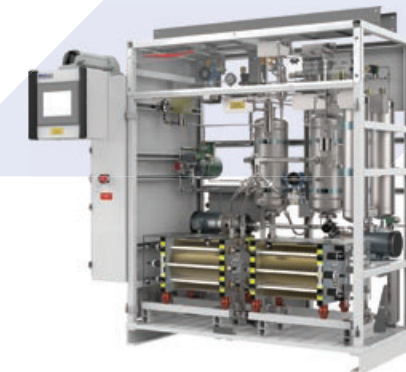
## TITAN™ H<sub>2</sub>Oasis Container systems



## Highest Quality Construction and Design

Custom designed and built by our talented engineers and technicians in our facilities, shipped and ready to connect—anywhere in the world.

## TITAN™ HMXT H<sub>2</sub> Generator



## TITAN™ EL H<sub>2</sub> Generator



# PRODUCT PORTFOLIO

## Hydrogen Generators

### MODEL

### APPLICATIONS

	H <sub>2</sub> Gas Delivery (NM <sup>3</sup> /hr)	Float Glass	Fats and Oils	Small Chemical	Metals Processing	Semiconductor	Power Plants
<b>HMXT</b>	2.8-11.2	■	■	■	■	■	■
<b>EL</b>	56-80	■	■	■	■	■	■
<b>H<sub>2</sub>Oasis</b>	2.8-80	■	■	■	■	■	■

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## FREQUENTLY ASKED QUESTIONS

What are the benefits of using a Teledyne Hydrogen generator?

**Gas Purity:**

Our systems produce up to 99.9998% purity hydrogen.

**Safety:**

Minimal on-board gases and no sparking components, in addition to an uninterruptible power supply, which ensures system control in the event of a power outage.

**Simple Installation:**

Each system is fully assembled and skid-mounted for trouble-free shipping and simple installation.

**Easy Operation:**

Fully automatic operation with on-board diagnostics, remote monitoring, and operation options.

**Longevity:**

Many generators are still in use in the field, 30 years after installation.

**Customer Service:**

We strive to exceed customer expectations by listening to your needs and by offering industry best service and solutions.

Is it easy to get a generator serviced?

**Yes!** You can contact one of our internationally located customer service reps, or use our customer service portal to create a new service case.

What utility inputs does my site need to install a Teledyne hydrogen generator?

We can custom engineer solutions to allow for optimum integration with your existing infrastructure. However, depending on your needs and selected generator model, your site might need electrical power, cooling water, feedwater and a properly constructed foundation.

Where can Teledyne generators be used?

Our generators can be used in a variety of industries and are designed to meet Class 1 Div 2 Group B requirements.

## INDUSTRY SECTORS



### Power Plants

Hydrogen generators are used at power plants to cool the windings because of hydrogen's unique properties of low density, high heat capacity and thermal conductivity. Power plant hydrogen generators must be cased for efficiency, safety and reliability.



### Semiconductor

The semiconductor industry requires hydrogen that exceeds 99.999 percent purity for its operations. The hydrogen is used to control the production atmosphere, and is also used as a carrier gas.



### Metals Processing

Hydrogen is used in the metals processing industry to form and shape metals, and to also prevent oxidation.



### Chemical

The chemical processing industry uses hydrogen processing to assist in the manufacture of ammonia and methanol.



### Float Glass

Hydrogen is used in float glass production to prevent oxidation in tin baths during the manufacturing process. The resulting glass formed in the hydrogen atmosphere is made without defects.



### Fats and Oils

The food industry uses hydrogen to hydrogenate liquid oils to make edible substances like, shortening, margarine and peanut butter, in addition to non-edible substances like soap, insulation and plastics.

# TITAN™ HMXT SERIES

## On-site Hydrogen Generation System

Teledyne Energy Systems builds decades of engineering excellence into every hydrogen generator system, ensuring the most reliable and durable on-site hydrogen solutions available.

### TITAN™ HMXT Advantages

#### Ultra Pure Gas

Ultra pure (99.9998%) gas generation increases equipment life, saving considerable maintenance and replacement costs.

#### Proven Reliability

Durable stainless steel process components maximize system life. Demonstrated life span of 25+ years.

#### Comprehensive Installation

Every TITAN™ hydrogen generator system is fully assembled and skid-mounted for trouble-free shipping and simple installation.

#### Fully Tested

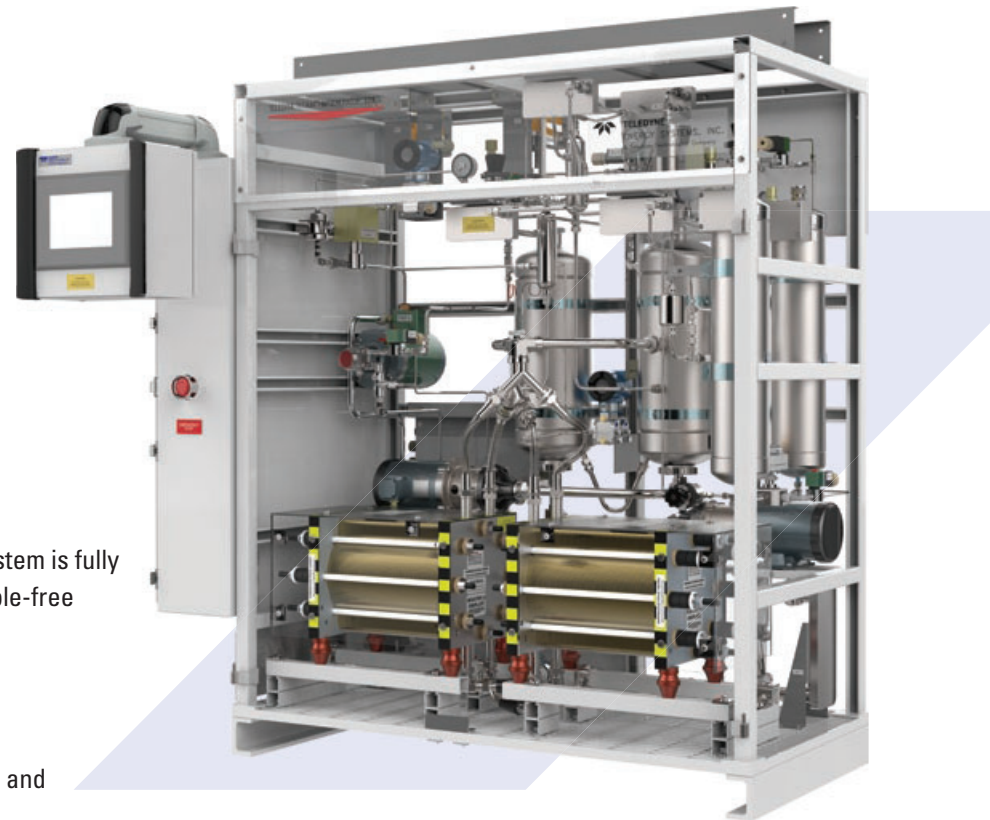
Each unit is thoroughly factory-tested to meet Teledyne's exacting standards and exceed industry codes.

#### On Demand Gas Delivery

- Pressure up to 150 psig (10 barg)
- Maximum flow delivery ranges of 50, 100 and 200 SLM
- Higher flow delivery ranges available to meet your specific hydrogen requirements

#### Custom Engineered Design

Custom-engineered hydrogen generating solutions available for optimum integration with existing plant infrastructure.



#### Safe, Unattended Operation

- PLC controlled with 10" HMI touch-screen interface
- Fully automatic operation with on-board diagnostics
- Minimal on-board gases and no sparking components
- Uninterruptible Power Supply (UPS) ensures system control in the event of power outage
- Remote monitoring and operation option
- O<sub>2</sub> byproduct is safely vented outside your facility or can be optionally configured for use in your process

# TITAN™ HMXT SERIES

MODEL		HMXT-50	HMXT-100	HMXT-200
<b>Hydrogen Gas Production</b>				
Max Flow Rate	SLM	50	100	200
	Nm <sup>3</sup> /hr	2.8	5.6	11.2
	scfh	106	212	424
	kg/day	6.0	12.0	24
Hydrogen Delivery Pressure	Bar gauge	10.6		
	psig	150		
Hydrogen Purity		99.9998%*		
<b>Oxygen Gas Production</b>				
Max Flow Rate	SLM	25	50	100
	Nm <sup>3</sup> /hr	1.4	2.8	5.6
	scfh	53	106	212
Oxygen Delivery Pressure	Bar gauge	9.6		
	psig	140		
Oxygen Purity		99.999%*,**		
* Subject to ambient and cooling water temperatures, as well as dissolved gas contained in Feed Water. A separate supply of cold (11°C) cooling water is required.				
** With use of Oxygen Purification Package supplied separately. A separate supply of cold (11°C) cooling water is required.				
<b>Feed Water Consumption</b>				
	l/hr	2.55	5.11	10.2
	g/hr	0.7	1.4	2.7
<b>Power Supply</b>				
Voltage		Factory Configured, 380-480 vac, 3 Phase		
Frequency		50 or 60 Hz		
<b>Cooling Water</b>				
Max Inlet Temp.	°C	40		
	°F	104		
Max Flow	lpm	40		
	gpm	11		
Pressure Drop	Bar gauge	1.75		
Main Heat Load	watts/slm H <sub>2</sub>	127.5		
<b>Condenser Cooling Water</b>				
Max Temperature	°C	up to 10		
Max Allowable Pressure	Bar gauge	7		
	Required Flow	lpm	4	
	gpm	1.1		
Pressure Drop	Bar gauge	0.35		
Main Heat Load	kW	1.5 to 2.25		
<b>Purge Gas</b>				
	Bar gauge	5.3 to 17.5		
	psig	75 to 250		
<b>Feed Water Specification</b>				
Min. Resistivity	MegOhm-cm	0.2		
Min Supply Pressure	Bar gauge	0.4		
Pressure Drop	psig	0.5		

# TITAN™ EL SERIES - SINGLE MODULE

## On-site Hydrogen Generation System

Teledyne Energy Systems builds decades of engineering excellence into every hydrogen generator system, ensuring the most reliable and durable on-site hydrogen solutions available.

### TITAN™ EL Advantages

#### Ultra Pure Gas

Ultra pure (99.9998%) gas generation increases equipment life, saving considerable maintenance and replacement costs.

#### Modular Design

The TITAN™ EL Series features a modular design engineered for ease of site integration and maintenance, and comes skid-mounted for trouble-free shipping and installation.

#### Safe, Unattended Operation

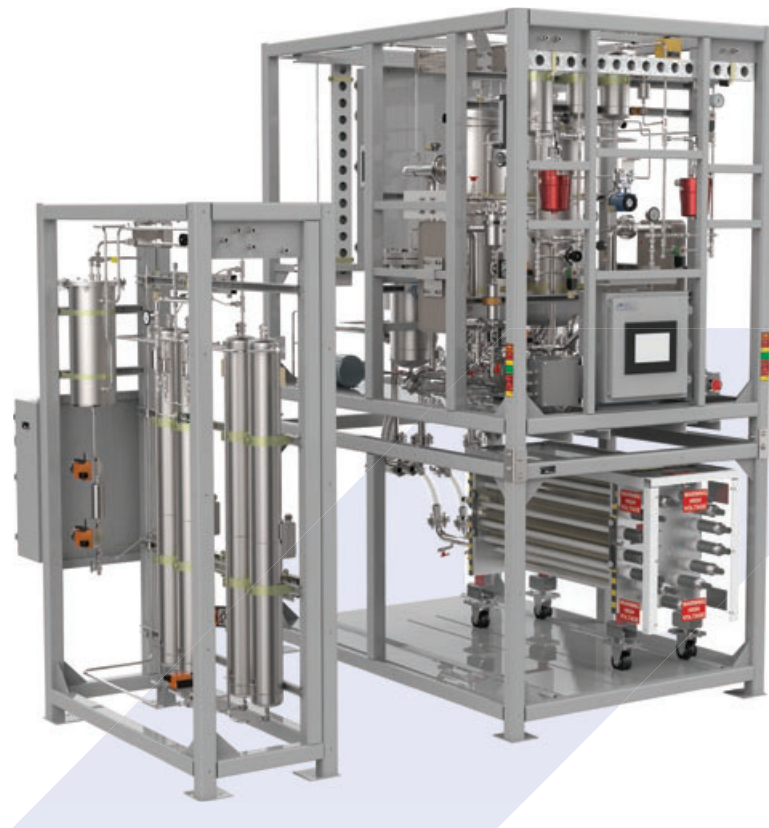
- PLC controlled with 10" HMI touch-screen interface
- Minimal on-board gases and no sparking components
- Uninterruptible Power Supply (UPS) ensures system control in the event of power outage
- Remote monitoring and operation option
- O<sub>2</sub> byproduct is safely vented outside your facility or can be optionally configured for use in your process

#### On Demand Gas Delivery

- Pressure up to 150 psig (10 bars)
- Maximum flow delivery of 1400 SLM

#### Fully Tested

Each unit is thoroughly factory-tested to meet Teledyne's exacting standards and exceed industry codes for quality and safety.



**Electrolysis Module**



# TITAN™ EL SERIES - SINGLE MODULE

MODEL		EL-500	EL-600	EL-750
<b>Hydrogen Gas Production</b>				
Max Flow Rate	SLM	500	600	750
	Nm <sup>3</sup> /hr	28	33	42
	scfh	1060	1270	1590
	kg/day	60	72	90
Hydrogen Delivery Pressure	Bar gauge	6.89 to 10.3		
	psig	100 to 150		
Hydrogen Purity	%	99.9998% *		
<b>Oxygen Gas Production</b>				
Max Flow Rate	SLM	250	300	375
	Nm <sup>3</sup> /hr	14	16	21
	scfh	530	635	794
	kg/day	477	572	716
Oxygen Delivery Pressure	Bar gauge	5.5 to 8.9		
	psig	80 to 130		
Oxygen Purity	%	99.998% *, **		
* Subject to ambient and cooling water temperatures, as well as dissolved gas contained in Feed Water A separate supply of cold (11°C) cooling water is required				
** With use of Oxygen Purification Package supplied separately. A separate supply of cold (11°C) cooling water is required.				
<b>Pressurizing Gas</b>				
Pressure	Bar gauge	4.2 to 7		
	psig	6 to 100		
Average Consumption for Start-Up & Shut-Down	Nm <sup>3</sup>	.63		
	scf	24.3		
<b>Feed Water</b>				
ASTM D1193-06 (2011) Type II				
Consumption	l/hr	28.1	33.7	42.1
	gph	7.42	8.9	11.13
Minimum Pressure	Bar gauge	.4		
	psig	6		
Max Conductivity	µS/cm	1		
<b>Power Supply</b>				
Voltage		Factory Configured, 380 – 480 vac 3 phase		
Frequency		50 or 60 Hz		
<b>Generator Main Cooling Water</b>				
Max Temperature	°C	40		
	°F	104		
Max Flow	lpm	83.4	97.6	118.8
	gpm	22	25.7	31.35
Max Pressure	Bar gauge	10		
	psig	150		
Pressure Drop	Bar gauge	2		
	psig	30		
Main Heat Load	kW	70	86	105
<b>Condenser Cooling Water</b>				
Max Temperature	°C	10		
	°F	50		
Max Flow	lpm	12.5		
	gpm	3.3	3.3	3.3
Max Pressure	Bar gauge	10		
	psig	150		
Pressure Drop	Bar gauge	.5		
	psig	8		
Condenser Heat Load	kW	4.5	6	7.5
<b>Hydrogen Dryer Cooling Water</b>				
Max Temperature	°C	20		
	°F	68		
Max Flow	lpm	9.1		
	gpm	2.4		
Max Pressure	Bar gauge	10		
	psig	150		
Pressure Drop	Bar gauge	2		
	psig	30		
Hydrogen Dryer Heat Load	kW	1.25	1.5	1.85

Normal Conditions: 0°C and 1 atm (32°F and 14.7 psia). Standard Conditions: 20°C and 1 atm (68°F and 14.7 psia). System to be installed indoors in a protected environmental between 5°C and 50 °C. Specifications subject to change.

# TITAN™ EL SERIES - DUAL MODULE

## On-site Hydrogen Generation System

Teledyne Energy Systems builds decades of engineering excellence into every hydrogen generator system, ensuring the most reliable and durable on-site hydrogen solutions available.

### TITAN™ EL Advantages

#### Ultra Pure Gas

Ultra pure (99.9998%) gas generation increases equipment life, saving considerable maintenance and replacement costs.

#### Modular Design

The TITAN™ EL Series features a modular design engineered for ease of site integration and maintenance, and comes skid-mounted for trouble-free shipping and installation.

#### Safe, Unattended Operation

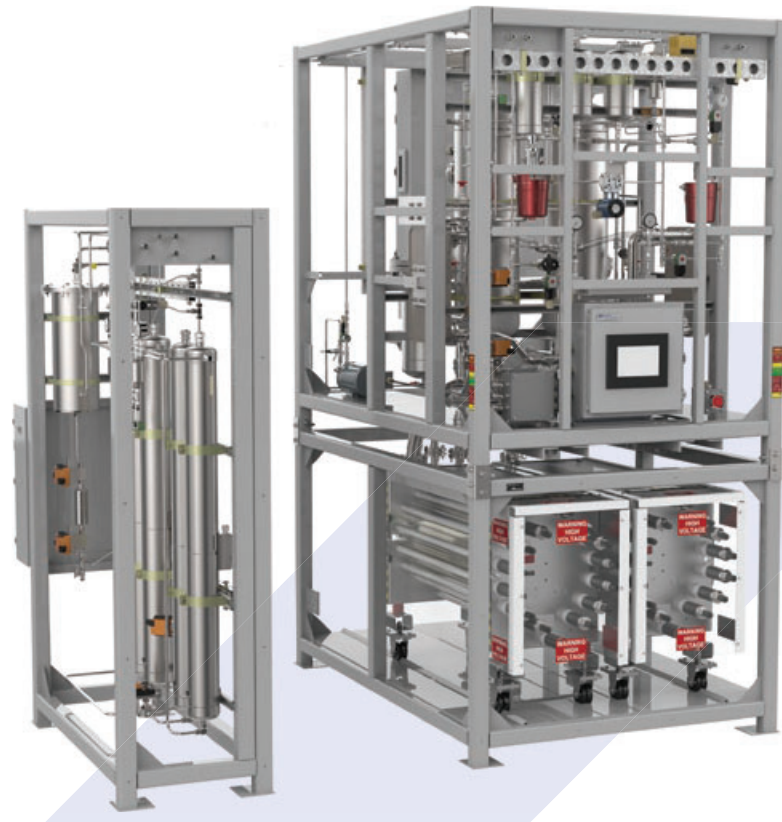
- PLC controlled with 10" HMI touch-screen interface
- Minimal on-board gases and no sparking components
- Uninterruptible Power Supply (UPS) ensures system control in the event of power outage
- Remote monitoring and operation option
- O<sub>2</sub> byproduct is safely vented outside your facility or can be optionally configured for use in your process

#### On Demand Gas Delivery

- Pressure up to 150 psig (10 barg)
- Maximum flow delivery of 1400 SLM

#### Fully Tested

Each unit is thoroughly factory-tested to meet Teledyne's exacting standards and exceed industry codes for quality and safety.



Electrolysis module.

Stainless steel process piping maximizes generator's lifetime.



# TITAN™ EL SERIES - DUAL MODULE

MODEL		EL-1000	EL-1200	EL-1400
<b>Hydrogen Gas Production</b>				
Max Flow Rate	SLM	1000	1200	1400
	Nm <sup>3</sup> /hr	56	66	78
	scfh	2119	2542	2966
	kg/day	120	144	168
Hydrogen Delivery Pressure	Bar gauge	6.89 to 10.3		
	psig	100 to 150		
Hydrogen Purity	%	99.9998 % *		
<b>Oxygen Gas Production</b>				
Max Flow Rate	SLM	500	600	700
	Nm <sup>3</sup> /hr	28	33	39
	scfh	1059	1271	1483
	kg/day	954	1145	1336
Oxygen Delivery Pressure	Bar gauge	3.4 to 5.5		
	psig	50 to 80		
Oxygen Purity	%	99.998 % *, **		
* Subject to ambient and cooling water temperatures, as well as dissolved gas contained in Feed Water A separate supply of cold (11°C) cooling water is required				
** With use of Oxygen Purification Package supplied separately. A separate supply of cold (11°C) cooling water is required.				
<b>Pressurizing Gas</b>				
Pressure	Bar gauge	4.2 to 7		
	psig	6 to 100		
Average Consumption for Start-Up & Shut-Down	Nm <sup>3</sup>	.63		
	scf	24.3		
<b>Feed Water</b>				
ASTM D1193-06 (2011) Type II				
Consumption	l/hr	56.18	67.42	78.66
	gph	14.48	17.81	29.77
Minimum Pressure	Bar gauge	.4		
	psig	6		
Max Conductivity	µS/cm	1		
<b>Power Supply</b>				
Voltage		Factory Configured, 380 – 480 vac 3 phase		
Frequency		50 or 60 Hz		
<b>Generator Main Cooling Water</b>				
Max Temperature	°C	40		
	°F	104		
Max Flow	lpm	160.5	191.4	222.2
	gpm	42.4	50.5	58.6
Max Pressure	Bar gauge	10		
	psig	150		
Pressure Drop	Bar gauge	2		
	psig	30		
Main Heat Load	kW	140	165	195
<b>Condenser Cooling Water</b>				
Max Temperature	°C	10		
	°F	50		
Max Flow	lpm	18.8	21.3	23.8
	gpm	4.95	5.61	6.27
Max Pressure	Bar gauge	10		
	psig	150		
Pressure Drop	Bar gauge	1		
	psig	15		
Condenser Heat Load	kW	9	10.5	12
<b>Hydrogen Dryer Cooling Water</b>				
Max Temperature	°C	10		
	°F	50		
Max Flow	lpm	9.1		
	gpm	2.4		
Max Pressure	Bar gauge	10		
	psig	150		
Pressure Drop	Bar gauge	2		
	psig	30		
Hydrogen Dryer Heat Load	kW	2.5	2.8	3.3

Normal Conditions: 0°C and 1 atm (32°F and 14.7 psia). Standard Conditions: 20°C and 1 atm (68°F and 14.7 psia). System to be installed indoors in a protected environmental between 5°C and 50 °C. Specifications subject to change.

# THE H<sub>2</sub>Oasis™

## A COMPLETE HYDROGEN GENERATION PLANT

Self-Contained, Easily Integrated and Ready For Hookup

H<sub>2</sub>Oasis™ Hydrogen Gas Station is a self-contained hydrogen plant in prefabricated shelters that can be situated anywhere that hydrogen production is required. Hydrogen gas can be produced at purities of 99.9998%\*, and flow rates from 50 standard liters per minute to 1400 standard liters per minute at 10 Bar. Higher delivery pressures are available with an optional compressor. This range of operation allows the containerized systems to be used in a wide variety of industrial applications such as power plants, semiconductor, float glass, and metals fabrication.

\* Subject to ambient and condenser water temperatures, as well as dissolved gas content in feedwater.

### Versatile, Safe and Tested

The H<sub>2</sub>Oasis™ provides customers the flexibility to redeploy the unit to other locations if required. The system is designed for elimination of separate building design and construction, ease of installation, operation,

reliability, and safety. The H<sub>2</sub>Oasis™ is factory assembled and tested so that the entire system is integrated by engineers and skilled technicians with many years of equipment experience.

### Site-Ready

The H<sub>2</sub>Oasis™ generating station is completely self-contained requiring only utility inputs such as electrical power, cooling water, feedwater, and a properly constructed foundation. The H<sub>2</sub>Oasis™ consists of two rooms, one for the gas generation (which can be classified as Class I, Division 2, Group B) and one for electrical equipment and other ancillary equipment.



Approximate Overall Dimensions: Length: 1097.28 cm | 36 ft · Height: 294.84 | 9 ft · Width: 274.32 cm | 8 ft



Hydrogen Generator Power Supply



Hydrogen Compressor

**STRUCTURAL SAVINGS:** Systems are delivered fully populated and completely serviceable. Requires no civil or capital expenditures. Only sound structural surface preparation and appropriate facility hook-ups are required.

**SAFETY:** Systems are integrated to meet Class 1 Div 2 Group B requirements. May include ancillary equipment such as power distribution panel to all internal equipment, explosion proof lighting and switches, proper heating and ventilation, and N<sub>2</sub> or FM-200 fire suppression to maintain good safety practices.

**EASE OF MAINTENANCE:** Periodic maintenance or repairs can be executed without dismantling equipment. Service access doors provide free access to all equipment allowing for better serviceability.

**VERSATILE DESIGN:** Along with our standard self-contained electrolysis

## Standard Features

- Interior Lighting
- Ventilation Fans
- N<sub>2</sub> Purge Panel
- Interface Panel: H<sub>2</sub> Delivery/H<sub>2</sub> Vent
- Service Access Doors
- H<sub>2</sub> Generator
- Interface Panel: Feedwater/O<sub>2</sub> Vent
- Hydrogen Generator Power Supply
- Power Distribution Panel
- Cable Trays
- Engineered Deck, Walls, and Ceiling Load Design to Resist Wind Shear and Snow Loading
- Exterior Wall Insulation: R-13 Rating
- Roof Insulation: R-20 Rating
- Floor Insulation: R-19 Rating
- Interior Ceiling Height: 8 ft
- Interior Deck Loading Design: 250 lb./ft<sup>2</sup>
- Interior Decking: 3/16" Carbon Steel Primed and Coated with Gray Non-skid Epoxy

shelters, our custom engineering capabilities allow for specific shelter layouts to meet your particular needs.

**RELIABILITY:** Systems arrive with the superb quality customers expect from Teledyne—equipment is pretested and ready for commissioning and final testing onsite.

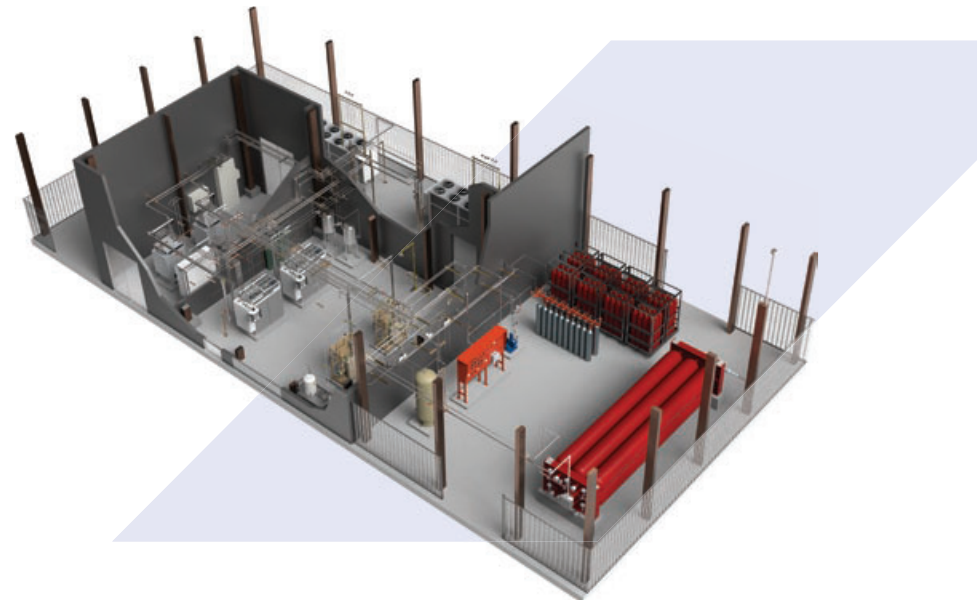
**TRANSPORTATION EASE:** Teledyne's modular systems are designed to ship on normal carriage flat racks while also allowing for simplicity of handling. This design will ease the movement of the H<sub>2</sub> system from the manufacturing site to its final location and may reduce site preparation costs.

# COMPLETE HYDROGEN PLANT ENGINEERING

Teledyne Energy Systems' advanced engineering has been providing trusted on-site hydrogen generation turnkey systems around the world for over 40 years.

## Comprehensive Installation

Teledyne's turnkey systems are shipped fully tested for trouble free installation. Every installation is provided with the option of getting preliminary site evaluation, 2D/3D architectural renderings, on-site engineering support during commissioning and operator training, along with customer support.



## Proven Equipment Reliability

Durable, stainless steel process components provide maximum systems longevity with a demonstrated system life of 25+ years.

## Safe, Unattended Operation

Teledyne's power generating solutions are fully automatic for reliable, unattended operation. Full-function remote controls allow continuous data and system monitoring. And, with minimal on-board gases and no sparking components, Teledyne's power generators meet and exceed the most stringent global safety regulations, including NFPA Class 1 Division 2 Group B.

## Optional Oxygen Purifiers

The optional oxygen purifier is separately mounted in a self contained skid. The oxygen purification system receives oxygen from the generator, removes trace impurities, recombines any hydrogen in the oxygen to water and dries the oxygen to a very low moisture content. The oxygen purifiers have been designed for operation in NEC Class I, Division 2 locations. The purifier system's cabinet contains all the mechanical components and plumbing necessary for carrying out the process. The control logic of the oxygen purifier is controlled by the

generator's PLC. Purified oxygen parameters (purity, production rates and pressure) can be found on the generators' specification pages of this catalog.



# GLOBAL COVERAGE



For more information on our representatives please visit our customer support page at:  
[www.teledynees.com/contact-us/spare-parts-orders-customer-support](http://www.teledynees.com/contact-us/spare-parts-orders-customer-support)

While visiting the website, there are many ways to find out more information on our various product lines. If you would like to request additional information or contact a sales representative, please fill out and submit a request on the respective product page.



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