



Profit generators. HÖGEN® on-site  
hydrogen generation systems.

Linde Gas

*Linde*



## Efficient operation, optimized performance. On-site hydrogen generation with HOGEN<sup>®</sup> HGS and STABLEFLOW<sup>™</sup> HCS.

**In today's challenging business environment, power plant operators must strive for the most efficient operations across multiple aspects of performance. In particular, they have to take into account: the fuel expense and generation capacity, safety and security, hydrogen availability, emissions reduction, and personnel productivity.**

Many power plants today are not running optimized. They operate out of OEM specifications for hydrogen purity, pressure and dewpoint, costing hundreds of thousands of dollars every year in excess fuel costs, lost generation revenue, emissions credits, and decreased winding life.

Linde Gas has introduced two advanced technology systems: the HOGEN<sup>®</sup> hydrogen generation system (HGS) and the STABLEFLOW<sup>™</sup> hydrogen control system (HCS). Together, these systems ensure automatic and continuous measurement and feedback control of hydrogen purity and pressure for optimized generator performance.

# Pure and simple – the HOGEN<sup>®</sup> HGS generates hydrogen where you need it.

The HOGEN<sup>®</sup> HGS is a proton exchange membrane (PEM) water electrolysis system that uses electricity to separate water into hydrogen and oxygen. The hydrogen is produced at 13.8 bar/200 psi pressure without a compressor and at a purity of 99.9995 % continuously and without operator intervention.

The compact HOGEN<sup>®</sup> HGS can be placed on the power plant generator deck or any other indoor non-classified plant area. Due to its unique design, the HOGEN<sup>®</sup> HGS contains virtually no hydrogen, even when generating hydrogen at up to 6 Nm<sup>3</sup>/228 SCF per hour – enough hydrogen to cool power plants as large as 1500 MW.

The HOGEN<sup>®</sup> HGS provides reliable, safe, low-cost hydrogen for generator blanketing and increases safety and security by eliminating hydrogen storage, cylinder handling, and routine hydrogen delivery.



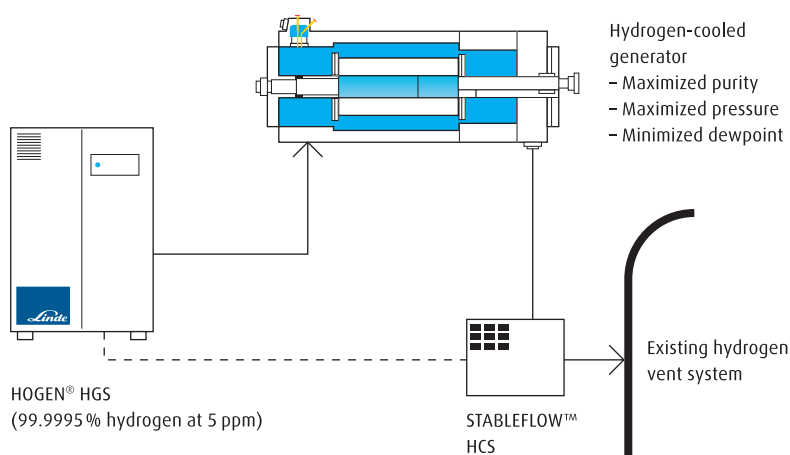
HOGEN<sup>®</sup> HGS H series



HOGEN<sup>®</sup> HGS S series

# Unlock the power – the STABLEFLOW™ hydrogen control system.

## HOGEN® HGS and STABLEFLOW™ HCS

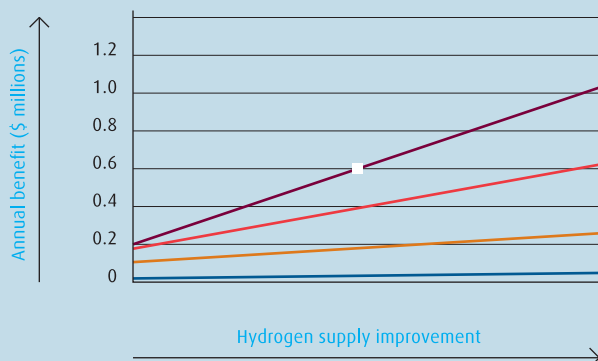


The STABLEFLOW™ hydrogen control system continuously monitors hydrogen pressure, purity and dewpoint in the generator casing on a real-time basis, controlling impure hydrogen venting and calling for pure hydrogen injection as required. The automated control of the STABLEFLOW™ HCS replaces manual periodic hydrogen refill and its resulting variability from OEM specifications for hydrogen purity, pressure and dewpoint. Compliance with OEM specifications optimizes electric production efficiency and equipment life.

By maintaining OEM specifications for hydrogen pressure, purity, and dewpoint, the STABLEFLOW™ HCS reduces windage loss and optimizes electric generating capacity. Also, it reduces air emissions and extends equipment life.

### STABLEFLOW™ HCS annual economic benefit (600 MW CCGT)

— Total benefit    — H<sub>2</sub> pressure    ■ Average total benefit  
— H<sub>2</sub> purity      — H<sub>2</sub> cost



### Bottom-line benefits

Hydrogen generation with the HOGEN® HGS and the STABLEFLOW™ HCS can save most plants up to \$ 1,000/year per megawatt of capacity. Together, these systems increase the power generating capacity while minimizing windage loss. Moreover, they ensure longer generator component life and drastically reduce handling costs.

If you are interested in our innovative hydrogen generation systems, let our application engineers configure a hydrogen generation system to meet your specific needs.

Specifications	HOGEN® HGS S series		HOGEN® HGS H series		
	S 20	S 40	H 2 m	H 4 m	H 6 m
Net hydrogen production rate					
Nm <sup>3</sup> /h at 0 °C, 1 bar	0.53 Nm <sup>3</sup> /h	1.05 Nm <sup>3</sup> /h	2 Nm <sup>3</sup> /h	4 Nm <sup>3</sup> /h	6 Nm <sup>3</sup> /h
SCF/h at 70 °F, 1 atm	20 SCF/h	40 SCF/h	76 SCF/h	152 SCF/h	228 SCF/h
SLPM at 70 °F, 1 atm	9.4 SLPM	18.8 SLPM	35.8 SLPM	71.7 SLPM	107.6 SLPM
kg per 24 hours	1.14 kg/24 h	2.27 kg/24 h	4.31 kg/24 h	8.63 kg/24 h	12.94 kg/24 h
Delivery pressure	13.8 bar g	13.8 bar g	15 bar g	15 bar g	15 bar g
	200 psi g	200 psi g	218 psi g	218 psi g	218 psi g
Purity	99.9995 %	99.9995 %	99.9995 %	99.9995 %	99.9995 %

#### DI water requirement

Consumption rate	0.47 l/h	0.94 l/h	1.83 l/h	3.66 l/h	5.50 l/h
	0.13 gal/h	0.25 gal/h	0.50 gal/h	0.96 gal/h	1.42 gal/h
Pressure	1.5 to 4 bar g	1.5 to 4 bar g	1.5 to 4 bar g	1.5 to 4 bar g	1.5 to 4 bar g
	21.8 to 58.0 psi g	21.8 to 58.0 psi g	21.8 to 58.0 psi g	21.8 to 58.0 psi g	21.8 to 58.0 psi g

#### System features

Dimensions (L x D x H)	97 cm x 79 cm x 106 cm		180 cm x 81 cm x 198 cm		
	31" x 38" x 42"		71" x 32" x 78"		
Weight	215 kg	215 kg	700 kg	747 kg	794 kg
	475 lbs	475 lbs	1500 lbs	1600 lbs	1700 lbs
Electrical specification	205 to 240 VAC, single-phase, 50 or 60 Hz		380 to 480 VAC, 3-phase, 50 or 60 Hz		
Cooling	Air-cooled		Liquid-cooled		

#### Standard features

- Fully automated, push-button start/stop
- Automatic fault detection and system depressurization
- On-board H<sub>2</sub> detection
- Emergency stop

#### Standard siting location

Indoor, level ± 1°, 0 to 90 % relative humidity non-condensing, non-hazardous/non-classified environment.

#### Ventilation

Proper ventilation must be provided from a non-hazardous area.

#### Safety and regulatory conformity

cTUVus (UL and CSA equivalent), CE (PED, ATEX, LVD, Mach. Dir., EMC)

#### Options

Linde Gas offers a wide range of options to tailor your HOGEN® HGS to your specific operational requirements. Please contact your local Linde Gas representative to discuss current options available to best fit your needs.

#### References

HOGEN® hydrogen generation systems are in place worldwide at power plants from 35 MW to 3600 MW capacity. Please contact us for a current reference list.



# Getting ahead through innovation.

With its innovative concepts, Linde Gas is playing a pioneering role in the global market. As a technology leader, it is our task to constantly raise the bar. Traditionally driven by entrepreneurship, we are working steadily on new high-quality products and innovative processes.

Linde Gas offers more. We create added value, clearly discernible competitive advantages, and greater profitability. Each concept is tailored specifically to meet our customers' requirements – offering standardized as well as customized solutions. This applies to all industries and all companies regardless of their size.

If you want to keep pace with tomorrow's competition, you need a partner by your side for whom top quality, process optimization, and enhanced productivity are part of daily business. However, we define partnership not merely as being there for you but being with you. After all, joint activities form the core of commercial success.

**Linde Gas – ideas become solutions.**

