NATURAL GAS POWER GENERATION

distributed energy prime power | combined heat and power plants

NATURAL GAS POWER GENERATION

Combined Heat and Power and Distributed Energy Prime Power

Since 1902, foresight and innovation have been at the heart of Stewart & Stevenson's growth as a global manufacturing, service and distribution leader. For more than 110 years, Stewart & Stevenson has provided clients with innovative, technologically superior equipment to meet changing market requirements.

With the global shift to cleaner energy alternatives, Stewart & Stevenson today offers gas engine power generation that takes advantage of the abundant natural gas supplies found in the United States. Partnering with MTU Onsite Energy, a core brand of Tognum AG, we serve power generation markets with Distributed Energy Prime Power and Combined Heat and Power (CHP) plants.

Utilizing in-house engineering, design, manufacturing and testing capabilities, Stewart & Stevenson customizes MTU Onsite Energy 400 Series and 4000 Series generators with balance of plant components to meet the exact requirements of commercial and industrial clients that include data centers, farms, office buildings, hospitals, colleges, shopping centers, remote locations, and land and offshore oilfields. With aggregates, modules and container solutions, we supply three different combinations of energy: electric power; electric power and heat; and electric power, heat and cooling.

Distributed Energy Power Plants

Distributed Energy Prime Power offered by Stewart & Stevenson features MTU Onsite Energy natural gas fueled energy modules and generator sets with power outputs ranging from 128 kWe to 2,055 kWe. Used for simple power generation, Stewart & Stevenson supplied MTU OE gensets provide 24/7 power at locations with unreliable or missing electricity networks, back-up power or continuous power applications. Stewart & Stevenson's packaged systems, also used for grid-parallel or off-grid island operation, result in cleaner, more economical energy.

Combined Heat and Power Plants

Combined Heat and Power (CHP) plants produce sustainable energy from climate-neutral, regenerative fuels. Stewart & Stevenson-supplied MTU Onsite Energy CHP generator modules, fueled by natural gas, include cogeneration (CHP) and trigeneration (CHPC) systems that can create any combination of electricity, heating and cooling for a wide variety of applications. Our CHP modules and generator sets for natural gas cover the 128 kWe-2,055 kWe power range.

Selecting the right CHP system depends on various factors. In each case, Stewart & Stevenson's engineering professionals develop solutions specifically configured to meet the client's requirements.

From start to finish, we provide:

- Support in planning your new CHP project
- Assistance in incorporating a CHP module into your project
- Explanations of the technology behind the engine, system and individual components
- Simple project proposals with budgeted pricing for the planning phase and fixed pricing for implementation
- Design and planning of peripheral systems
- Advice on service solutions as early as the project phase

SERIES 400

Output range 128–358 kWe

Components
Gas Engine — Advanced and proven Series 400 gas engine, optimized for natural gas use. Combustion chambers ensure the highest level of efficiency in its performance category.

Generator — Precisely customized to the engine and built by renowned manufacturers, the generator ensures a high level of reliability and maximum efficiency.

MTU Module Control (MMC) — Contains all functions necessary for controlling the CHP plant. Provides full access to auxiliary drive operation. Integrated power circuitry minimizes the need for cabling. The MMC is housed separately in the control cabinet and is hidden from sight.

Module Controller Features —Control system technology, one of the most important elements in the engineered system, comes factory standard for each application. If the generator set is the heart of the system, the module controller is the brain of the package. To ensure optimum operation, our industrial computer controlled electronics monitor the engine and the system for maximum reliability and cost savings. Features include:

- Control via RPS
- Operation and visual display by industrial PC, with color touch-screen panel
- Visual display of all functional processes and controls
- Numerous additional controls and functions can be integrated (CH_4, gas tank, heat production mode, heat storage, power usage)
- Networking of multi-module plants via Ethernet
- Linkable to master control systems
- Wide choice of interface protocols (Ethernet, Profibus DP, 964R, Modbus RTU)
- Logging of all fault and status messages in a database (up to six months of data can be recorded)
- Optional remote diagnosis via ISDN or DSL
- Optional integration of SMS text/e-mail alerts (notification of faults, daily reporting of all meter readings)

Ignition System — Ignition systems for individual cylinders maximize efficient operation for all cylinders, even with variable CH_4 content. The ignition voltage display also provides spark plug information.

Knock Detection — Cylinder-specific knock detection and regulation protects the engine from abnormal operating conditions; guarantees safe operation even with natural gas that contains high levels of methane.

Mixture Cooler— Two-stage mixture cooler with large surface area improves engine performance and heat utilization.

Heat Recovery System — Complete heat recovery system is integrated into the base frame to extract maximum amount of heat from engine jacket water, oil cooler and exhaust. System comprises of a plate heat exchanger, circulating pump, expansion vessels, catalyst, exhaust cooler and muffler.

Product Portfolio S400

VERSION	GAS	ENGINE POWER (KW)	EL. OUTPUT (KWE)	TH. OUTPUT (KBTU/H)	TOTAL ENERGY INPUT (KBTU/HR)	EL. EFFICIENCY (%)	TOTAL EFFICIENCY (%)
GC 128N6	NG	135	128	758	1,298	33.7	92.1
GC 180N6	NG	190	180	1,079	1,889	32.5	89.7
GC 248N6	NG	260	248	1,455	2,501	33.6	91.5
GC 354N6	NG	370	354	2,025	3,579	33.8	90.4
GC 200B6	BG	210	200	1,455	2,501	35.8	80.0
GC 350B6	BG	366	350	2,025	3,579	34.9	90.9

At standard reference conditions (ISO 3046-1); atmospheric pressure: 14.5 psi; air temperature: 77 °F; rel. air humidity 30 %
According to ISO 3046 (+ 5 % tolerance), using reference fuel used at nominal voltage, power factor = 1 and nominal frequency

SERIES 4000

Output range 763–2,055 kWe

Components
Gas Engine — Advanced, proven Series 4000 gas engine, optimized for natural gas use. Combustion chambers ensure the highest level of efficiency in its performance category.

Generator — Precisely customized to the engine and built by globally accepted manufacturers, the generator ensures a high level of reliability with the best degree of efficiency.

MTU Module Control (MMC) — Contains all functions necessary for controlling the CHP plant. Provides full access to auxiliary drive operation. Integrated power circuitry minimizes the need for cabling. The MMC is housed separately in the control cabinet and is hidden from sight.

Module Controller Features —Control system technology, one of the most important elements in the engineered system, comes factory standard for each application. If the generator set is the heart of the system, the module controller is the brain of the package. To ensure optimum operation, our industrial computer controlled electronics monitor the engine and the system for maximum reliability and cost savings. Features include:

- Control via RPS
- Operation and visual display by industrial PC, with color touch-screen panel
- Visual display of all functional processes and controls
- Numerous additional controls and functions can be integrated (CH_4, gas tank, heat production mode, heat storage, main power usage)
- Networking of multi-module plants via Ethernet
- Linkable to master control systems
- Wide choice of interface protocols (Ethernet, Profibus DP, 964R, Modbus RTU)
- Logging of all fault and status messages in a database (up to six months of data can be recorded)
- Optional remote diagnosis via ISDN or DSL
- Optional integration of SMS text/e-mail alerts (notification of faults, daily reporting of all meter readings)

Ignition System — Ignition systems for individual cylinders maximize efficient operation for all cylinders, even with variable CH_4 content. The ignition voltage display also provides spark plug information.

Knock Detection — Cylinder-specific knock detection and regulation protects the engine from abnormal operating conditions; guarantees safe operation even with natural gas that contains high levels of methane.

Mixture Cooler — Two-stage mixture cooler with large surface area improves engine performance and heat utilization.

Additional Options Available for Advanced Applications

Exhaust Gas After Treatment — Customized to the engine, the catalyst guarantees adherence to all current emissions requirements. (Global perspective)

Auxiliary Drive Control and Electrical Connections — The integrated MMC (MTU Module Control) offers a range of connections and control options, such as hot water pumps, mixed cooling water pumps, extractor fan control, gas warning system, lubricant system, smoke detector and gas compressor.

Gas Safety Plan — MTU Onsite Energy has developed a comprehensive gas safety plan for entire systems. The plan guarantees protection against internal and external hazardous environments.

Product Portfolio S4000

VERSION	ENGINE POWER (KW)	EFFICIENCY GEARBOX (%)	POWERA AT GEARBOX (KW)	EFFICIENCY GENERATOR (PF1, 480V) (%)	EL. OUTPUT (KW)	TH. OUTPUT (KBTU/H)	TOTAL ENERGY INPUT (KBTU/HR)	EL. EFFICIENCY (%)
GR20V4000L63	2,129	99.44	2,117	97.30	2,055	4,132	17,551	41.40
GR20V4000L62	1,973	99.42	1,961	97.60	1,914	3,708	16,123	41.10
GR16V4000L62	1,579	99.35	1,589	97.40	1,527	2,978	12,858	41.10
GR12V4000L62	1,184	99.09	1,173	96.60	1,133	2,288	9,709	40.40
GR8V4000L62	790	98.88	781.15	96.40	753	1,482	6,431	40.50

At standard reference conditions (ISO 3046-1); atmospheric pressure: 14.5 psi; air temperature: 77 °F; rel. air humidity 30 %
According to ISO 3046 (+ 5 % tolerance), using reference fuel used at nominal voltage, power factor = 1 and nominal frequency

POWER GENERATION FOR A CLEANER ENVIRONMENT

Stewart & Stevenson/MTU Onsite Energy gas power generation systems are technologically advanced, extremely efficient and globally proven with hundreds of thousands of operating hours.

- Lean-burn engines prevent harmful emissions from being produced during the combustion process. Emission levels below the limits required by clean air regulations are achieved without the use of a catalytic converter.
- The MTU Onsite Energy oxygen-content control system guarantees optimum combustion even with variable gas qualities, preventing engine damage.
- The arrangement of the power generation packaged cooling system enables straightforward integration into existing heating systems.
- The exhaust heat exchanger is integrated into the engine coolant circulation system, minimizing the risk of heat exchanger damage.
- Largely standardized and carefully selected subassemblies maximize operational safety and reliability. Availability figures of well over 90% are common.
- Low fuel and lubricant consumption, combined with long component life, reduced operating costs.
- A separate development department constantly analyzes usage data and optimizes the technology for many natural gas application requirements.

The heart of the Stewart & Stevenson/MTU Onsite Energy package is the reliable gas engine. We design most CHP plants as multi-module systems. Electrical or thermal load profiles can be adjusted by switching in or shutting down individual modules. Another advantage of multi-module systems is their high level of availability.

Compact modules not only offer high levels of electrical and thermal efficiency with a fuel efficiency level of up to 90%, but also conserve space, are easily connected, factory tested, easy to maintain and are available as uncovered or enclosed units.

Distributed Generation energy plants using CHP modules can also be used as a grid backup or emergency power generator. With a synchronous generator and starter battery, our modules are ideal for emergency power generation. After clarifying all technical details and meeting with your operator, we'll adapt the module's control and monitoring hardware and software to your unique needs.

Added Value From Stewart & Stevenson

- Field-experienced personnel work with clients to develop the best concept and implementation for their application.
- In-house engineers and drafting team design individualized client solution with consideration to environmental impact, noise control, personnel safety and risk mitigation.
- Manufacturing facilities incorporate globally recognized production and assembly standards.
- Fabrication and assembly capabilities include in-house machine shop, electrical research and development, advanced welding and inspection technologies, and on-site metal preparation and painting.
- Work-in-progress inspections are conducted in compliance with API and ISO quality control standards.
- Extensive testing and inspection ensures the product delivered is in accordance with the client's operational specifications, code and classification requirements.

Stewart & Stevenson has the capability to custom design systems in conformance with most national and international standards, including: ANSI, IEC, NEC and NFPA.

www.stewartandstevenson.com

CONTACT US TODAY

For assistance with your clean energy solution.

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