

# CODES AND STANDARDS FOR ONSITE POWER SYSTEMS

## CRITERIA APPLY TO GENERATOR SETS AND THEIR MANUFACTURERS

Generator sets and the companies that make them can be judged by how they measure up to codes and standards established by private industry and governmental groups. This ensures that all compliant generator set manufacturers measure performance the same way.



Some of these guidelines define how to measure horsepower, electrical output or hundreds of other parameters. In addition, a number of these codes set minimum levels of equipment performance and establish criteria meant to increase safety for manufacturing workers, power-system operators and the general public.

Codes and standards also help ensure uniformity and quality of onsite power systems, although manufacturers such as MTU Onsite Energy often exceed minimum requirements. Some codes and standards apply to all onsite power generation systems, while others apply only when required by a particular application or customer. Here is a closer look at the standards for both design and manufacturing standards and for safety and performance, plus code-compliance information specific to generator sets from MTU Onsite Energy:

### DESIGN AND MANUFACTURING STANDARDS

Standards that apply to all generator sets are those established by the International Organization for Standardization. ISO defines how to measure and rate many quality and performance parameters.

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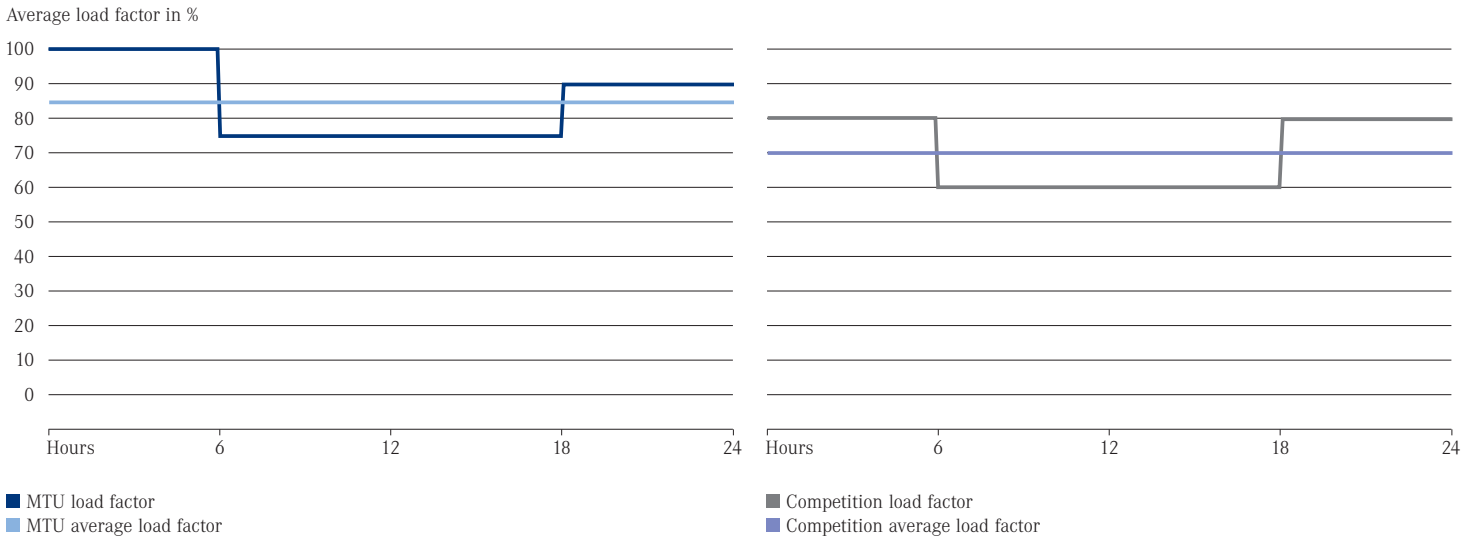
*Some industry codes set minimum levels of equipment performance and establish criteria meant to increase safety for manufacturing workers, power-system operators and the general public.*

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ISO standards that are relevant to onsite power generation systems are:

- // *ISO 8528* – describes how to establish ratings, measure performance and evaluate engines, alternators, controls and switchgear. This standard also defines test methods for measuring vibration and sound.
- // *ISO 3046* – deals with important engine-related matters such as power ratings, fuel consumption, vibration and test methods. Compliance with ISO 3046 is usually noted on a generator set's specification sheet.
- // *ISO 9001* – describes processes manufacturers must use to manage quality in their facilities. All of MTU Onsite Energy's manufacturing facilities are ISO 9001 certified.
- // *ISO 14001* – defines environmental management practices in manufacturing facilities. All MTU facilities are ISO 14001 certified.
- // *ISO 17025* – deals with testing and calibration of instruments used to measure performance and quality. All MTU test instruments are calibrated in accordance with this standard.

FIGURE 1. MTU LOAD-FACTOR ADVANTAGE

**ISO 8528: The 85% load-factor advantage from MTU Onsite Energy**

One of the provisions of ISO 8528 sets a minimum 24-hour average load factor of 70% for both standby- and prime-rated generator sets. This means that a 1,000 kW generator set meeting this standard must be able to provide an average of 700 kW per hour over a 24-hour period. In emergency standby applications, this means that *the average load factor that can be sustained by most generator sets over an extended outage of 24 hours is only 70% of the nameplate rating*, a factor that affects generator set sizing considerations. However, *emergency standby generator sets from MTU Onsite Energy are certified at a load factor of 85%, so a 1,000 kW generator can provide an average of 850 kW per hour over a 24-hour period*. All other generator set manufacturers meet the 70% load-factor minimum, but only MTU Onsite Energy exceeds it.

By virtue of their higher cylinder displacement in relation to horsepower, the MTU engines used on MTU Onsite Energy generator sets have significantly more reserve capacity than competitive engines used on generator sets meeting the minimum 70% load-factor threshold. As a result, MTU Onsite Energy generator sets with MTU engines are certified to deliver an 85% average load factor over a 24-hour period. This means that in extended outages, a 1,000 kW MTU Onsite Energy generator set can deliver an average 850 kW per hour versus an average 700 kW per hour for a competitive generator set. That is a 150 kW sizing advantage for MTU Onsite Energy and a potential cost savings for standby power buyers. (See Figure 1.)

**SAFETY AND PERFORMANCE STANDARDS**

Many codes and standards are applicable only in certain applications, geographic locations or as requested by the customer. Well-known standards of this type are those from Underwriters Laboratories (UL), the National Fire Protection Association (NFPA), the International Building

Code (IBC), the Canadian Standards Association (CSA) and those found in the National Electrical Code. These organizations have established safety and performance-based criteria for onsite power generation systems throughout North America.

**Underwriters Laboratories (UL)**

When a product complies with a specific UL standard and the manufacturer pays the required fee to UL, that product can be labeled as “UL listed.” Some manufacturers put phrases such as “meets UL 2200” on their products when they haven’t gone through the proper UL listing process – and, therefore, can’t use the “UL listed” label. MTU generator sets, however, comply with relevant UL standards and MTU has paid the appropriate fees to earn the “UL listed” designation. Popular UL listings available from MTU include:

- // **UL 2200** – Addresses the entire generator set and is primarily concerned with reducing the risk of shock, fire and machinery-related injuries. This standard also addresses matters such as the routing of fuel lines and safety measures for rotating parts. UL 2200 also requires manufacturers to load-test their generator sets to verify that they can produce nameplate-rated power levels.
- // **UL 142** – Covers steel fuel tanks intended for aboveground storage of diesel fuel. Tanks covered by these requirements are fabricated, inspected and tested for leakage by MTU Onsite Energy before shipment from the factory as completely assembled vessels.
- // **UL 891** – Provides safety criteria for electrical switchboards up to 600 volts.
- // **UL 1008** – Sets standards for safety and performance of automatic and manual transfer switches as required by the National Electrical Code.

// *UL 1558* – Addresses metal-enclosed low-voltage power circuit breaker switchgear assemblies containing such devices as low-voltage power circuit breakers, other interrupting devices, switches, control, instrumentation and metering, protective and regulating equipment.

#### **National Fire Protection Association (NFPA)**

This national industry organization sets fire-prevention standards. In addition, NFPA establishes safety and performance standards for transfer switches and addresses the performance of emergency standby generator sets in critical applications such as those in healthcare facilities. Equipment from MTU Onsite Energy meets a number of NFPA standards, the most critical being NFPA 110:

// *NFPA 110* – Specifies how long it should take a generator set to start and assume full-rated load in emergency standby power applications. The regulation can be met at several levels depending on how quickly the generator set can assume full-rated load. The top rating, Type 10, goes to systems that can start and assume full-rated load in 10 seconds or less. All MTU Onsite Energy diesel generator sets are capable of meeting this critical top rating.

// *NFPA 70* – Details comprehensive requirements for electrical design, installation and inspection in a set of standards known as the National Electrical Code®. The NEC is not a legally binding standard, but it has been adopted by all 50 states in order to codify the requirements for safe electrical installations into a single standard.

For more information:

[www.csa.ca](http://www.csa.ca)  
[www.iccsafe.org](http://www.iccsafe.org)  
[www.iso.org](http://www.iso.org)  
[www.nfpa.org](http://www.nfpa.org)  
[www.ul.com](http://www.ul.com)

#### **International Building Code (IBC) seismic certification**

To obtain IBC seismic certification, generator sets must go through rigorous design and testing procedures to ensure their survivability in the event of an earthquake or equivalent natural disaster. In mission-critical applications, IBC-certified systems must be able to start and accept full-rated load immediately after an earthquake. IBC also states that structures housing emergency standby generator sets must resist overturning and withstand wind loads up to 150 mph.

MTU Onsite Energy is currently completing the necessary IBC seismic certification steps for its entire line of generator sets. Beginning in 2010, IBC seismic certification became available for many of the company's generator sets.

#### **OTHER STANDARDS**

Additional sources of standards for onsite power generation equipment include the Canadian Electrical Code, the Canadian Standards Association and CE mark. MTU products meet the relevant requirements from all of these sources.

#### **CONCLUSION**

The performance, quality and safety of onsite power generation systems are covered by a number of recognized industry codes and standards. Generator sets from MTU Onsite Energy not only meet these nationally recognized standards, but in several cases exceed them. Work with your MTU distributor to determine what codes and standards apply to your onsite power application.

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*MTU Onsite Energy is the brand name under which the Tognum Group markets distributed power generation systems. The product range encompasses standardized and customized diesel generator sets for emergency standby, base and peak load applications based on diesel engines rated up to 3,250 kW, as well as compact cogeneration modules powered by gas engines with up to 2,150 kW or gas turbines up to 45,000 kW for the generation of both heat and power.*

