

TECHNICAL INFORMATION BULLETIN

Generator Set Ratings Guidelines

Generator set ratings guidelines are designed to help size the generator set to meet the load requirements of an application. The four types of generator set ratings are standby, prime power, limited running time, and base load (continuous power).

Consider building expansion and future load additions when determining generator set loads. The average power required of a generator set is a calculated value, as shown in the following paragraphs.

The life expectancy—mean time between overhauls (MTBO)—and performance of generator sets are contingent upon application of these guidelines. Generator set life depends upon engine load factors, fuel and lube oil quality, ambient conditions, operating load, installation quality, and the maintenance program.

The chart on page 3 shows a typical engine MTBO curve. Generator set performance and overhaul intervals vary with operating load. As engine operating

load decreases, the time between overhauls increases. To a point, reducing the load on an engine increases the time between overhauls. Follow the ratings guidelines to maximize MTBO for generator set engines.

The ratings shown in this technical information bulletin are common throughout the industry. Government agencies, military agencies, and other sources may publish their own definitions and ratings guidelines. Before applying other ratings to generator sets, contact a factory representative for approval.

Generator set ratings are similar among generator set manufacturers due to the industry standards as listed in each ratings sections of this bulletin. However, due to differences in manufacturing standards, each engine manufacturer may have different engine tolerances that affect engine ratings and, in turn, generator set ratings. Refer to this section for rating standards and rating tolerances.

Standby Rating

Standby rating applies to installations served by a reliable utility source. Standby power is applicable to varying loads for the duration of the utility power interruption. There is no overload capability for the standby rating; use of the generator set above the standby rating is prohibited. Ratings are in accordance with ISO 3046/1, ISO 8528/1, BS 5514, AS 2789, and DIN 6271.

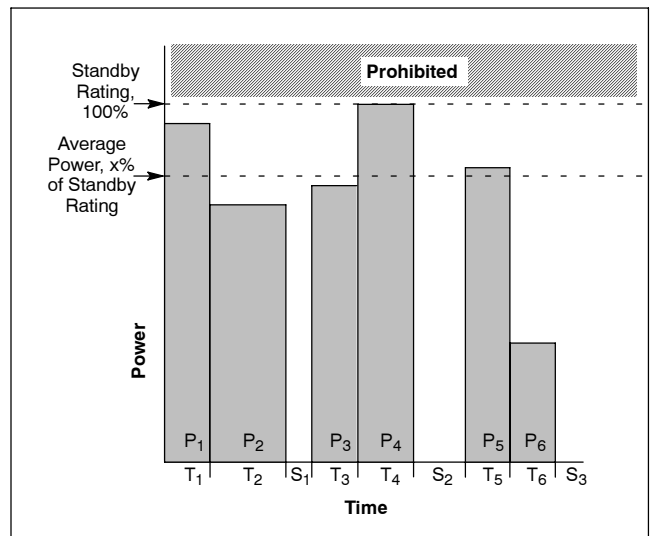
The standby rating is applicable to variable loads with an average load factor of x% of the standby rating, with 100% of rating available for the duration of the outage. See Rating Conditions following for standby rating load factor for each generator set model. Typical operating time is 200* hours per year or less. Use the prime power rating for applications exceeding 200 hours of varying load operation.

A typical standby application backs up the normal/reliable utility in the event of emergency power outages. Use the following formulas to determine the standby rating:

$$\text{Average Power} = \frac{(P_1 \times T_1) + (P_2 \times T_2) + (P_3 \times T_3) + (P_4 \times T_4) + (P_5 \times T_5) + \dots + (P_n \times T_n)}{T_1 + T_2 + T_3 + T_4 + T_5 + T_6 + \dots + T_n}$$

P = Power in kW
 T = Time in hours
 S = Shutdown or nonrunning times (not used in calculations)

Standby Rating = $\frac{\text{Average Power}}{\text{x\% Load Factor}}$



* Waukesha-powered models may run up to 3500 hours per year while maintaining a standby rating. KM-powered models are limited to 100 hours per year.

Prime Power Rating

Prime power rating applies to applications where utility power is unavailable or unreliable. At varying load, the number of generator set operating hours at prime rating is unlimited. Ratings are in accordance with ISO 8528/1 and overload power is in accordance with ISO 3046/1, BS 5514, AS 2789, and DIN 6271.

The prime power rating is applicable for variable loads with an unlimited number of operating hours per year. † The average power output shall not exceed x% of the prime power rating. See Rating Conditions following for the prime power rating load factor for each generator set model. Loads of less than 30% shall be counted as 30%.

All models except Waukesha-powered models: A 10% overload power is available for a period of one hour in every 12 hours. This overload cannot exceed 400 hours per year.

Waukesha-powered models: A 10% (rich-burn) or 5% (lean-burn) overload power is available for a period of one hour in every 12 hours. This overload cannot exceed 730 hours per year.

Typical prime power applications include emergency applications where frequent power outages occur, peak shaving and interruptible rate applications, backup for unreliable utility sources, or as a sole source when a utility is unavailable. Use the following formula to determine the prime power rating:

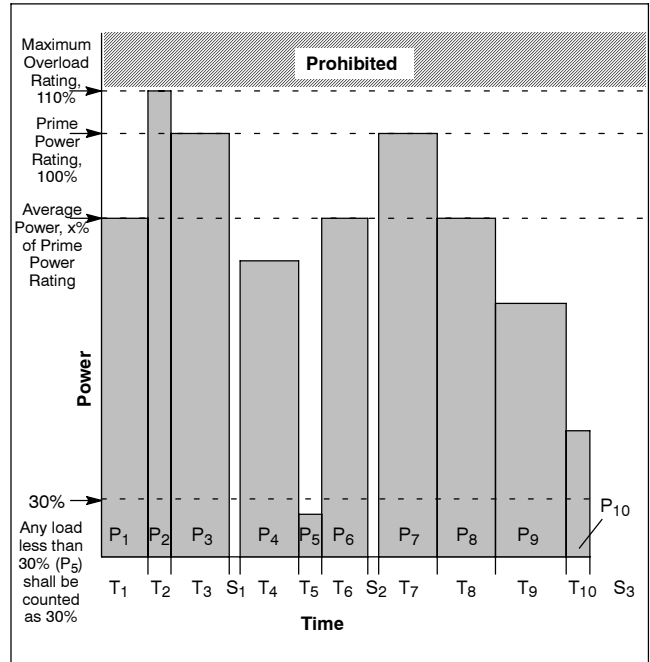
$$\text{Average Power} = \frac{(P_1 \times T_1) + (P_2 \times T_2) + (P_3 \times T_3) + (P_4 \times T_4) + (P_5 \times T_5) + \dots + (P_n \times T_n)}{T_1 + T_2 + T_3 + T_4 + T_5 + T_6 + \dots + T_n}$$

P = Power in kW

T = Time in hours

S = Shutdown or nonrunning times
(not used in calculations)

$$\text{Prime Power Rating} = \frac{\text{Average Power}}{\text{x\% Load Factor}}$$



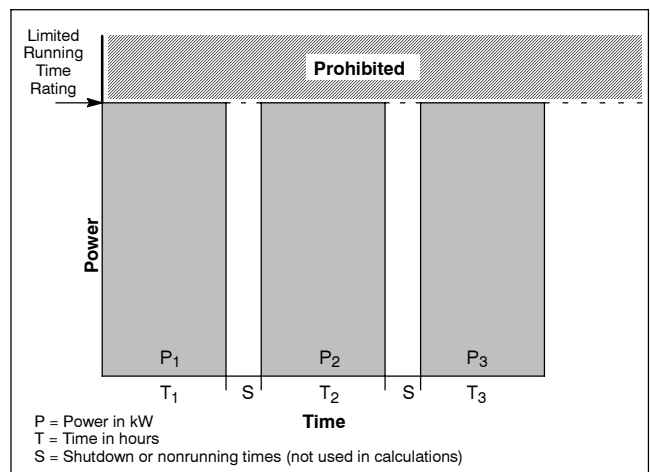
† KM-powered models are limited to 2000 hours per year.

Limited Running Time Rating

Limited running time rating applies to generator sets operating under nonvarying load factors and/or constant dedicated loads for a limited number of hours. Power is continuously supplied to a constant or nonvarying load up to 100% of the limited running time rating for up to 700 hours a year.

No overload capability is available at this rating; therefore, use above the limited running time rating is prohibited. For operation exceeding 700 hours per year at constant load, use the base load (continuous rating).

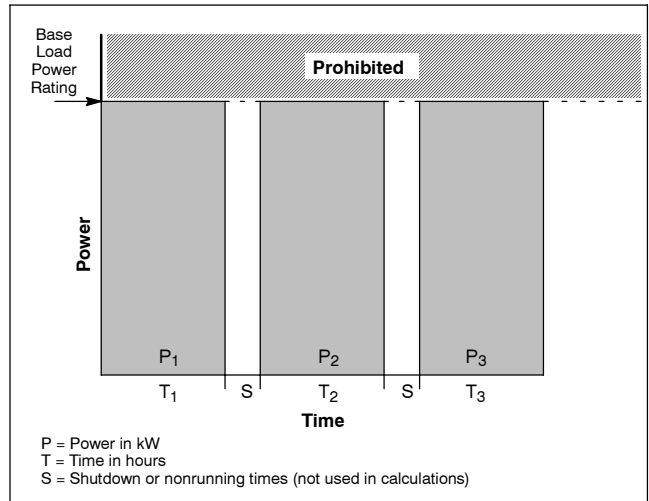
Typical limited running time applications include load management, peak shaving, interruptible rate, load curtailment, and cogeneration. Contact a factory representative for generator set limited running time ratings.



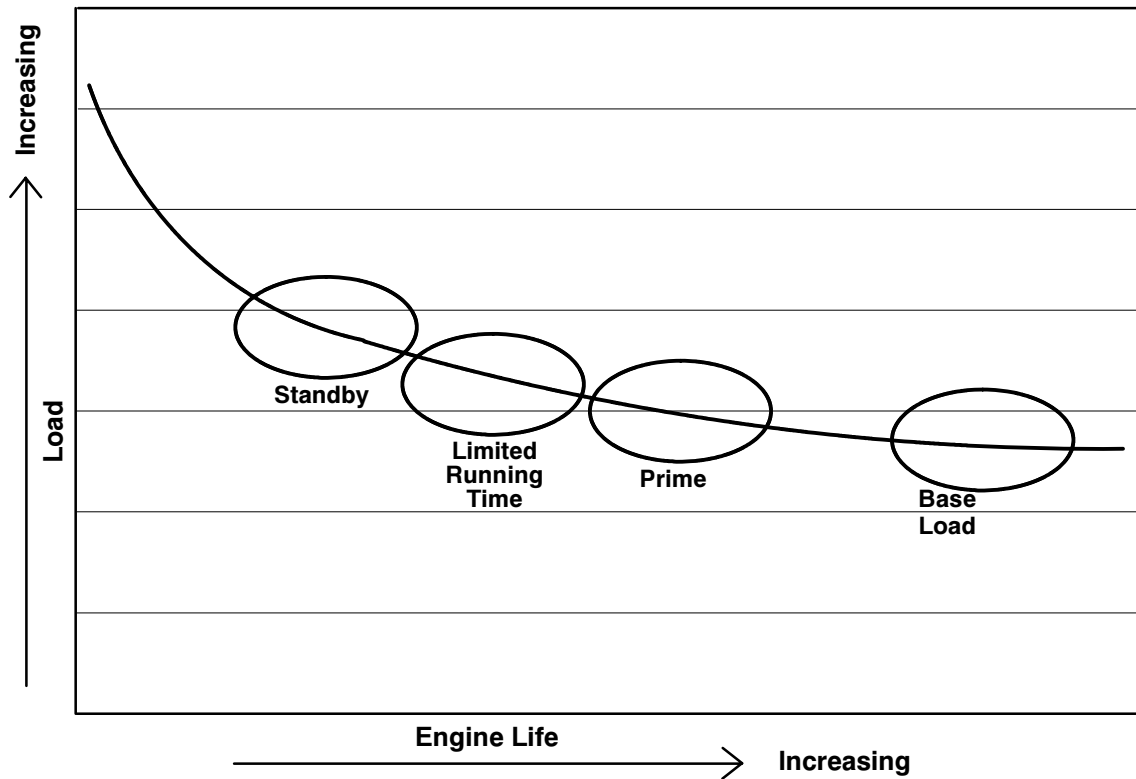
Base Load (Continuous) Rating

Base load rating (also referred to as continuous rating) applies to generator sets operating as utility-type power sources where there are nonvarying load factors and/or constant dedicated loads. Power is continuously supplied to a constant or nonvarying load up to 100% of the base load rating for an unlimited number of hours. No overload capability is available at this rating; therefore, use above the base load rating is prohibited. Ratings are in accordance with ISO 8528/1, ISO 3046/1, BS 5514, AS 2789, and DIN 6271.

Typical base load applications include utility, base load, main source of electrical power, and cogeneration. Contact a factory representative for generator set base load ratings.



Typical Engine MTBO Curve



Engine life will vary with the following:

- Engine Load Factors
- Quality of Fuel and Lube Oil
- Ambient Conditions
- Quality of Installation
- Quality of Maintenance Program

Engine Rating Tolerances and Load Factors

The following table lists engine rating tolerances and the standby and prime rating load factor percentages by

generator set model family and the industry standards on which the engine ratings are based.

Generator Set Model	Ratings Tolerance	Standby Rating Load Factor	Prime Rating Load Factor
John Deere-Powered Models 20/30/50/100/180/200REOZJB 40/60/80/125/150/230REOZJB 80-200REOZJC and 250REOZJC (50 Hz) 125-275REOZJD Engine ratings are based on SAE J1995 and ISO 3046.	None ±5% ±5% ±5%	70% 70% 70% 70%	70% 70% 70% 70%
DDC/MTU-Powered Models 230-300REOZD and 230-450REOZDD 230-300REOZDB and 450REOZDB 350/400REOZD and 350/400REOZDC 450REOZD-4 and 500ROZD-4 650-1000REOZDB and 650-1000REOZDC 1350-2000REOZDB 2500/2800REOZD Engine ratings are based on SAE J1995 and ISO 3046.	±5% ±5% ±5% ±2% ±2% ±2% ±2%	85% 85% 85% 85% 85% 85% 85%	75% 75% 75% 75% 75% 75% 75%
Kohler-Branded D600-D2000 Models 600-2000REOZM Engine ratings are based on ISO 3046.	±2%	60%	60%
Kohler-Branded D300-D500 Models 275-500REOZV 350/400REOZVC 450/500REOZVB Engine ratings are based on ISO 3046.	±2% ±2% ±2%	70% 70% 70%	70% 70% 70%
Ford-Branded Models 20RZ Engine ratings are based on SAE 1349.	None	70%	70%
General Motors-Powered Models 30-125RZG and 30/50RZGB Engine ratings are based on ISO 3046.	±5%	82%	65%
DDC Gas-Powered Models 200-275RZDB Engine ratings are based on SAE J1995.	None	70%	70%
Waukesha-Powered Models 400-800RZW (Lean Burn Ratings and Rich Burn Prime Rating) 400-800RZW (Rich Burn Standby Rating) Engine ratings are based on ISO 3046.	None ±5%	100% 100%	100% 100%
KM/KD/KV Models KM5.5-KM33 and KM11U-KM30U KD24-KD300 and KD30U-KD250U KV220-KV630 and KV300U-KV550U Engine ratings are based on ISO 3046	±5% ±5% ±2%	60% 70% 70%	50% 70% 70%
All Mobile and Marine Models* All Gasoline- and Diesel-Powered Models Engine ratings are based on ISO 3046 and ISO 8528-1. * Marine continuous rating applies to: <ul style="list-style-type: none"> • Sole power supply with varying load. • Load factor less than 75%. • Pleasure craft with less than 400 hours per year. • Commercial craft with less than 2000 hours per year. • No overload capability. 	±5%	Not Applicable	Not Applicable