

Generator Sizing Guide



Residential and commercial

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SIEMENS

IMPORTANT NOTICE:

This booklet is designed to familiarize estimators and installers with proper sizing guidelines for residential and commercial generators. The information is not comprehensive, nor does it replace or supercede any material contained in any of the written documents shipped with the equipment. This booklet should only be used in conjunction with the Owner's Manual, Installation Manual and other technical documents shipped with each product. Always read all accompanying documentation carefully before attempting to install any generator, transfer switch or related equipment.

HOW TO USE THIS BOOKLET:

Within this booklet, you will find electrical load information, plus an outline of generator surge capability, fuel pipe sizing, liquid propane tank sizing, and UPS / generator compatibility. The worksheet pages can be removed from the book and photocopied to create additional Onsite Estimating Sheets for use with individual jobs.

SAFETY INFORMATION:

Proper sizing of the generator is crucial to the success of any installation and requires a good working knowledge of electricity and its characteristics, as well as the varying requirements of the electrical equipment comprising the load. When analyzing the electrical load, consult the manufacturer's nameplate on each major appliance or piece of equipment to determine its starting and running requirements in terms of watts, amps and voltage. When choosing the generator output for commercial or industrial applications, select a rating that is approximately 20 to 25% higher than the peak load (for example, if the load is about 40 kilowatts, select a 50 kW genset). A higher rated generator will operate comfortably at approximately 80% of its full capacity and will provide a margin of flexibility if the load increases in the future.

For safety reasons, Siemens recommends that the backup power system be installed, serviced and repaired by a Siemens Authorized Service Dealer or a competent, qualified electrician or installation technician who is familiar with applicable codes, standards and regulations.

It is essential to comply with all regulations established by the Occupational Safety & Health Administration (OSHA) and strict adherence to all local, state and national codes is mandatory. Before selecting a generator, check for municipal ordinances that may dictate requirements regarding placement of the unit (setback from building and/or lot line), electrical wiring, gas piping, fuel storage (for liquid propane or diesel tanks), sound and exhaust emissions.

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TABLE 1 MOTOR LOAD REFERENCE

Caution:
 DO NOT size the generator based on starting kW alone.
 YOU MUST compare LR Amps to generator surge capability (table #3).
 SIZE the generator by following the sizing instructions.

AC & Heat Pumps

Running Load

Starting Load

| Description | Hp | Running kW | Amps @ 240V 1Ø | Amps @ 208V 3Ø | Amps @ 240V 3Ø | Amps @ 480V 3Ø | LR Amps @ 240V 1Ø | LR Amps @ 208V 3Ø | LR Amps @ 240V 3Ø | LR Amps @ 480V 3Ø | Starting kW |
|-----------------------|-------------|------------|----------------|----------------|----------------|----------------|-------------------|-------------------|-------------------|-------------------|-------------|
| 1 Ton (12,000 BTU) | 1 | 1 | 5 | 3 | 3 | 1 | 33 | 22 | 19 | 10 | 2.5 |
| 2 Ton (24,000 BTU) | 2 | 2 | 10 | 7 | 6 | 3 | 67 | 44 | 38 | 19 | 5 |
| 3 Ton (36,000 BTU) | 3 | 3 | 15 | 10 | 8 | 4 | 100 | 67 | 58 | 29 | 7.5 |
| 4 Ton (48,000 BTU) | 4 | 4 | 20 | 13 | 11 | 6 | 117 | 78 | 67 | 34 | 10 |
| 5 Ton (60,000 BTU) | 5 | 5 | 25 | 16 | 14 | 7 | 145 | 97 | 84 | 42 | 12.5 |
| 7.5 Ton (85,000 BTU) | 7.5 | 7.5 | 37 | 24 | 21 | 11 | 219 | 146 | 126 | 63 | 17 |
| 10 Ton* (120,000 BTU) | 5 Hp (x2) | 10 | 49 | 33 | 28 | 14 | 145 | 97 | 84 | 42 | 12.5 |
| 10 Ton (120,000 BTU) | 10 Hp | 10 | 49 | 33 | 28 | 14 | 250 | 167 | 144 | 72 | 20 |
| 15 Ton* (180,000 BTU) | 7.5 Hp (x2) | 15 | 74 | 49 | 42 | 21 | 219 | 146 | 126 | 63 | 17 |
| 15 Ton (180,000 BTU) | 15 Hp | 15 | 74 | 49 | 42 | 21 | 375 | 250 | 217 | 108 | 30 |
| 20 Ton* (240,000 BTU) | 10 Hp (x2) | 20 | 98 | 65 | 57 | 28 | 250 | 167 | 144 | 72 | 20 |
| 20 Ton (240,000 BTU) | 20 Hp | 20 | n/a | 65 | 57 | 28 | 500 | 333 | 289 | 144 | 40 |
| 25 Ton (300,000 BTU) | 25 | 25 | n/a | 82 | 71 | 35 | 625 | 416 | 361 | 180 | 50 |
| 30 Ton* (360,000 BTU) | 15 Hp (x2) | 30 | n/a | 98 | 85 | 42 | 375 | 250 | 217 | 108 | 30 |
| 30 Ton (360,000 BTU) | 30 Hp | 30 | n/a | 98 | 85 | 42 | 750 | 500 | 433 | 217 | 60 |
| 40 Ton* (480,000 BTU) | 20 Hp (x2) | 40 | n/a | 131 | 113 | 57 | 500 | 333 | 289 | 144 | 40 |
| 40 Ton (480,000 BTU) | 40 Hp | 40 | n/a | 131 | 113 | 57 | 1000 | 666 | 577 | 289 | 80 |
| 50 Ton* (480,000 BTU) | 25 Hp (x2) | 50 | n/a | 163 | 142 | 71 | 625 | 416 | 361 | 180 | 50 |
| 50 Ton (480,000 BTU) | 50 Hp | 50 | n/a | 163 | 142 | 71 | 1250 | 833 | 722 | 361 | 100 |

* For Multiple motor configurations, sequence starting is assumed.

Air Conditioning

1 hp per 1 ton

1 ton = 12,000 BTUs

General Residential

Running Load

Starting Load

| Description | Hp | Running kW | Amps @ 120V 1Ø | 4.9Amps @ 240V 1Ø | Starting kW | LR Amps @ 120V 1Ø | LR Amps @ 240V 1Ø |
|---|------|------------|----------------|-------------------|-------------|-------------------|-------------------|
| Refrigerator pump, sump, furnace, garage opener | 0.5 | 0.5 | 4.9 | 2.5 | 1.5 | 25 | 13 |
| Freezer, washer, septic grinder | 0.75 | 0.75 | 7.4 | 3.7 | 2.3 | 38 | 19 |
| General 1 Hp | 1 | 1 | 9.8 | 4.9 | 3 | 50 | 25 |
| Well & septic lift pump | 2 | 2 | 19.6 | 9.8 | 6 | 100 | 50 |

TABLE 2 NON-MOTOR LOAD REFERENCE

Residential

| Description | Running Load* | | |
|---|---------------|-----------------|-----------------|
| | kW | Amps at 120V 1Ø | Amps at 240V 1Ø |
| Electric heat per 1000 ft ² | 12 | n/a | 50 |
| Heat pump elements per 1000 ft ² | 7 | n/a | 29 |
| Dryer | 5.5 | n/a | 23 |
| Hot tub | 10 | n/a | 50 |
| Range oven/Stove top per burner | 8 | n/a | 30 |
| Hot water | 4.5 | n/a | 19 |
| General lighting and receptacles per 1000 ft ² | 3 | 24.9 | n/a |
| Blow dryer | 1.25 | 10.4 | n/a |
| Dishwasher | 1.5 | 12.5 | n/a |
| Microwave | 1 | 8.3 | n/a |
| Toasters | 1 | 8.3 | n/a |
| Home Entertainment Center | 1 | 8.3 | n/a |
| Computer | 1 | 8.3 | n/a |
| Kitchen | 1.5 | 12.5 | n/a |
| Laundry | 1.5 | 12.5 | n/a |

*Always check data plate for actual running amps.

Commercial

Please refer to equipment data plate and/or billing history for commercial details.

TABLE 3 SURGE CAPABILITY

Siemens Generators (Operating at less than 3600 RPM)

| Size (kW) | Rated Output (Running Amps) | | | | Commercial Surge Capability (LR Amps @ 15% Voltage Dip) | | | | Residential Surge Capability (LR Amps @ 30% Voltage Dip) | | | |
|-----------|-----------------------------|---------|---------|---------|---|---------|---------|---------|--|---------|---------|---------|
| | 240V 1Ø | 208V 3Ø | 240V 3Ø | 480V 3Ø | 240V 1Ø | 208V 3Ø | 240V 3Ø | 480V 3Ø | 240V 1Ø | 208V 3Ø | 240V 3Ø | 480V 3Ø |
| 22 | 92 | 76 | n/a | n/a | 71 | 48 | n/a | n/a | 134 | 92 | n/a | n/a |
| 27 | 113 | 94 | 81 | 41 | 100 | 67 | 58 | 33 | 153 | 137 | 118 | 64 |
| 36 | 150 | 125 | 108 | 54 | 113 | 75 | 65 | 44 | 225 | 151 | 131 | 87 |
| 48 | 200 | 167 | 144 | 72 | 163 | 109 | 94 | 57 | 321 | 214 | 185 | 112 |
| 70 | 292 | 243 | 210 | 105 | 275 | 164 | 159 | 95 | 550 | 330 | 318 | 190 |
| 100 | 417 | 347 | 300 | 150 | 369 | 222 | 214 | 128 | 738 | 441 | 426 | 255 |
| 130 | 542 | 451 | 390 | 195 | 546 | 364 | 315 | 209 | 1088 | 724 | 628 | 419 |

Siemens Generators (Operating at 3600 RPM)

| Size (kW) | Rated Output (Running Amps) | | | | Commercial Surge Capability (LR Amps @ 15% Voltage Dip) | | | | Residential Surge Capability (LR Amps @ 30% Voltage Dip) | | | |
|-----------|-----------------------------|---------|---------|---------|---|---------|---------|---------|--|---------|---------|---------|
| | 240V 1Ø | 208V 3Ø | 240V 3Ø | 480V 3Ø | 240V 1Ø | 208V 3Ø | 240V 3Ø | 480V 3Ø | 240V 1Ø | 208V 3Ø | 240V 3Ø | 480V 3Ø |
| 8 | 33 | n/a | n/a | n/a | 26 | n/a | n/a | n/a | 51 | n/a | n/a | n/a |
| 10 | 42 | n/a | n/a | n/a | 31 | n/a | n/a | n/a | 63 | n/a | n/a | n/a |
| 14 | 58 | n/a | n/a | n/a | 52 | n/a | n/a | n/a | 102 | n/a | n/a | n/a |
| 17 | 71 | n/a | n/a | n/a | 63 | n/a | n/a | n/a | 125 | n/a | n/a | n/a |
| 20 | 83 | n/a | n/a | n/a | 73 | n/a | n/a | n/a | 145 | n/a | n/a | n/a |
| 25 | 104 | 87 | 75 | 38 | 71 | 48 | 46 | 30 | 138 | 92 | 91 | 60 |
| 30 | 125 | 104 | 90 | 45 | 100 | 67 | 60 | 43 | 205 | 137 | 130 | 87 |
| 45 | 188 | 156 | 135 | 68 | 146 | 98 | 94 | 57 | 292 | 195 | 168 | 112 |
| 60 | 250 | 208 | 180 | 90 | 179 | 120 | 103 | 69 | 350 | 234 | 204 | 136 |
| 70 | 292 | 243 | 210 | 105 | 275 | 164 | 142 | 95 | 550 | 330 | 286 | 190 |
| 80 | 333 | 278 | 240 | 120 | 275 | 183 | 158 | 106 | 550 | 366 | 318 | 212 |
| 100 | 417 | 347 | 300 | 150 | 369 | 222 | 214 | 128 | 738 | 441 | 426 | 255 |
| 150 | 625 | 520 | 451 | 226 | 558 | 372 | 322 | 215 | 1121 | 747 | 647 | 431 |

Note: All nominal ratings based upon LP fuel. Refer to specification sheet for NG ratings and deration adjustments for ambient temperature and altitude.

TABLE 4 FUEL PIPE SIZING

Natural Gas (Table values are maximum pipe run in feet.)

| kW | Pipe Size (in) | | | | | | |
|-----|----------------|-----|-------|------|-----|------|------|
| | 0.75" | 1" | 1.25" | 1.5" | 2" | 2.5" | 3" |
| 8 | 55 | 200 | 820 | | | | |
| 10 | 20 | 85 | 370 | 800 | | | |
| 14 | 10 | 50 | 245 | 545 | | | |
| 17 | | 40 | 190 | 425 | | | |
| 20 | | 20 | 130 | 305 | 945 | | |
| 22 | | 15 | 115 | 260 | 799 | | |
| 25 | | 10 | 95 | 220 | 739 | | |
| 27 | | | 85 | 203 | 552 | | |
| 30 | | | 60 | 147 | 565 | | |
| 36 | | | 35 | 95 | 370 | 915 | |
| 45 | | | 15 | 60 | 260 | 650 | |
| 48 | | | | 50 | 230 | 585 | |
| 60 | | | | 25 | 145 | 390 | 1185 |
| 70 | | | | 5 | 75 | 225 | 710 |
| 80 | | | | | 65 | 195 | 630 |
| 100 | | | | | 40 | 140 | 460 |
| 130 | | | | | | 50 | 215 |
| 150 | | | | | | 30 | 150 |

LP

LPG: 8.55 ft³/lb., 4.24 lbs./gal., 2500 btu/ft³

LPG: 36.3 ft³ = 1 gal.

Natural Gas

1 cubic foot = 1,000 BTU

1 therm = 100,000 BTU

Gas consumption = 13,000-16,000 BTU per kW/hr

Pressure

1 inch mercury = 13.61 inches water column

1 inch Water Column = 0.036 psi

5-14 inches water column = 0.18 psi to 0.50 psi

LP Vapor (LPV) (Table values are maximum pipe run in feet.)

| kW | Pipe Size (in) | | | | | | |
|-----|----------------|-----|-------|------|------|------|------|
| | 0.75" | 1" | 1.25" | 1.5" | 2" | 2.5" | 3" |
| 8 | 165 | 570 | | | | | |
| 10 | 70 | 255 | 1000 | | | | |
| 14 | 45 | 170 | 690 | | | | |
| 17 | 25 | 130 | 540 | | | | |
| 20 | 15 | 115 | 480 | | | | |
| 22 | | 85 | 365 | | | | |
| 25 | | 60 | 275 | 605 | | | |
| 27 | | 55 | 260 | 575 | | | |
| 30 | | 40 | 195 | 435 | | | |
| 36 | | 20 | 125 | 290 | 1030 | | |
| 45 | | | 82 | 195 | 725 | | |
| 48 | | | 70 | 165 | 620 | | |
| 60 | | | 45 | 115 | 445 | 1095 | |
| 70 | | | 20 | 60 | 260 | 660 | |
| 80 | | | 15 | 50 | 230 | 590 | |
| 100 | | | | 30 | 165 | 430 | 1305 |
| 130 | | | | | 70 | 205 | 660 |
| 150 | | | | | 45 | 150 | 490 |

Note:

- Pipe sizing is based on 0.5" H₂O pressure drop.
- Sizing includes a nominal number of elbows and tees.
- Please verify adequate service and meter sizing.

TABLE 5 LP VAPOR (LPV) TANK SIZING

Vapor Withdrawal

| Tank Capacity Total (Gal.) | Tank Capacity Useable (Gal.) | Minimum Temp (°F) | Tank Capacity (btu/hr.) | Length (Inches) | Diameter (Inches) | Overall Ht. (Inches) |
|----------------------------|------------------------------|-------------------|---------------------------------|-----------------|-------------------|----------------------|
| 120 | 72 | 40 20 0 | 246,240 164,160 82,080 | 57 | 24 | 33 |
| 150 | 90 | 40 20 0 | 293,760 195,840 97,920 | 68 | 24 | 33 |
| 250 | 150 | 40 20 0 | 507,600 338,400 169,200 | 94 | 30 | 39 |
| 325 | 195 | 40 20 0 | 642,600 428,400 214,200 | 119 | 30 | 39 |
| 500 | 300 | 40 20 0 | 792,540 528,360 264,180 | 119 | 37 | 46 |
| 850 | 510 | 40 20 0 | 1,217,700 811,800 405,900 | 165 | 41 | 50 |
| 1000 | 600 | 40 20 0 | 1,416,960 944,640 472,320 | 192 | 41 | 50 |

| Load (kW) | BTU / Hr | LP Gal / Hr | NG Ft ³ / Hr | NG Therms/ HR |
|-----------|-----------|-------------|-------------------------|---------------|
| 5 | 110,000 | 1.2 | 110 | 1.1 |
| 10 | 156,000 | 2 | 156 | 1.6 |
| 15 | 231,800 | 2.5 | 220 | 2.2 |
| 20 | 294,000 | 2.9 | 294 | 2.6 |
| 25 | 345,000 | 3.8 | 345 | 3.2 |
| 30 | 418,300 | 4.5 | 417 | 4.2 |
| 35 | 485,000 | 5.1 | 485 | 4.8 |
| 40 | 550,000 | 6.1 | 550 | 5.5 |
| 50 | 655,000 | 7.5 | 655 | 6.7 |
| 60 | 836,600 | 9 | 862 | 8.6 |
| 70 | 1,035,700 | 11 | 1,020 | 10.2 |
| 80 | 1,170,000 | 12.7 | 1,154 | 11.5 |
| 90 | 1,200,000 | 13 | 1,200 | 12 |
| 100 | 1,280,000 | 13.8 | 1,260 | 12.6 |
| 110 | 1,550,000 | 17.1 | 1,550 | 15.5 |
| 120 | 1,675,000 | 18.5 | 1,675 | 16.7 |
| 130 | 1,800,000 | 19.5 | 1,786 | 17.8 |
| 140 | 1,925,000 | 21.3 | 1,925 | 19.2 |
| 150 | 2,050,000 | 22.7 | 2,050 | 20.5 |
| 200 | 2,800,000 | 30.9 | 2,800 | 28.0 |
| 300 | 4,100,000 | 45.3 | 4,100 | 49.0 |

| |
|---------------------------------|
| Operating Cost Per Hour |
| = |
| NG Therms/HR x Cost of NG Therm |

| Gas Required For Common Appliances | |
|--|--|
| Appliance | Approximate Input BTU / Hr |
| Warm Air Furnace Single Family Multifamily, per unit | 100,000 60,000 |
| Hydronic Boiler, Space Heating Single Family Multifamily, per unit | 100,000 60,000 |
| Hydronic Boiler, Space and Water Heating Single Family Multifamily, per unit | 120,000 75,000 |
| Range, Free Standing, Domestic Built-In Oven or Broiler Unit, Domestic Built-In Top Unit, Domestic | 65,000 25,000 40,000 |
| Water Heater, Automatic Storage, 30 to 40 gal. Tank Water Heater, Automatic Storage, 50 gal. Tank Water Heater, Automatic Storage, Instantaneous 2 GPM 4 GPM 6 GPM Water Heater, Domestic, Circulating or Side-Arm | 35,000 50,000 142,800 285,000 428,000 35,000 |
| Refrigerator Clothes Dryer, Type 1 (Domestic) Gas Fireplace Direct Vent Gas log Barbecue Gas light Incinerator, Domestic | 3,000 35,000 40,000 80,000 40,000 2,500 35,000 |

Table Reprinted From Table 5.4.2.1, NFPA 54, 2002 ed.

Note: Tank BTU capacity and generator run times based upon maintaining a minimum tank fuel level of 20%. Tanks are typically filled to 80% full.
Note: Typical fuel consumption based on a generator 100% loaded.

UPS - GENERATOR COMPATIBILITY

Passive (also referenced as standby or off-line) and Line-Interactive

These technologies are most common for personal workstations and point of sale applications. They are typically single phase equipment with size ranges of 350 VA - 2000 VA for passive and 500 VA to 5000 VA for line-interactive.

Passive UPS’s are the simplest type. Under normal conditions AC power passes straight through to the UPS load. When the input power supply goes outside of specifications, the UPS transfers the load from input power to the internal DC to AC power inverter. Passive UPS’s do not correct for voltage or frequency deviations under “normal” operation.

Line-interactive is similar to the passive technology except it has circuitry that attempts to correct for standard voltage deviations. Frequency deviations under “normal” power operation are not corrected.

Equipment Notes:

These devices tend to be electrically / harmonically very noisy. A single small UPS is not a significant concern, but applications with multiple UPS’s can be problematic.

Passive UPS technology typically has normal tolerances of 10-25% on voltage and 3 hertz on frequency. Minuteman UPS input tolerance is closer to 10-36%. If the input source goes outside of these tolerances, the UPS will switch onto the UPS battery source. Some line-interactive units may have frequency tolerances factory set to 0.5 hertz. These units will need to have their frequency tolerance increased to a minimum of 2 hertz. Minuteman UPS products are close to 5 hertz and not 0.5 hertz.

Generator Sizing Recommendation:

Limit the total UPS loading to 15% - 20% of the generator capacity.

Double-Conversion

This technology is most common for critical load applications. Double-conversion UPS’s constantly rectify AC to DC and then invert the DC back into AC. This configuration results in an output that corrects for voltage and frequency deviations.

There are single and three phase models covering small through large applications. Most UPS applications larger than 5000 VA use double conversion technology. This approach is also the preferred technology for generator applications.

Equipment Notes:

Double-conversion UPS’s that are single phase or unfiltered three phase models tend to create a significant level of electrical/ harmonic noise. This is illustrated by harmonic current distortions that are greater than 35%. Minuteman UPS products could have current distortion of 8%. When three phase models are supplied with harmonic filters (current distortion less than 10%), this concern is no longer an issue.

Generator Sizing Recommendation:

Single phase models: limit the total UPS loading to 25% of the generator capacity.

Single phase Minuteman UPS models: limit the total UPS loading to 50% of the generator capacity.

Three phase models without filters (current distortion > 30%): limit the UPS loading to 35% of the generator capacity.

Three phase models with filters (current distortion < 10%): limit the UPS loading to 80% of the generator capacity.

| Supplier(s) | Passive (Standby) | Line-Interactive | Double-Conversion |
|---------------|---------------------|---------------------|---------------------|
| Minuteman UPS | Enspire | Enterprise Plus | Endeavor |
| APC | Back-UPS Series | Smart-UPS Series | Symmetra Series |
| Liebert | PowerSure PST & PSP | PowerSure PSA & PSI | UPStation & Nfinity |
| Powerware | 3000 series | 5000 series | 9000 series |

Note: Ferrups and Delta-Conversion UPS technologies not included in discussion

TYPICAL GENERATOR/TRANSFER SWITCH COMBINATIONS

| Current Model - NEXUS | Current Switch model # | Description |
|--|----------------------------------|---|
| Nexus models / transfer switches and prior models / transfer switches listed CAN be used together. See notes below for details | | |
| ASGN008RBS | | 8 kW Air-Cooled Generator - Steel |
| | ST100R10C | 10 Circuit Load Distribution Panel |
| | SL100R | 100 amp Normal Nexus Smart Switch |
| | SL100RCSA | 100 amp CSA Service Rated Switch |
| ASGN010RBS | | 10 kW Air-Cooled Generator - Steel |
| | ST100R10C | 10 Circuit Load Distribution Panel |
| | SL100R | 100 amp Normal Nexus Smart Switch |
| | SL100RD | 100 amp Service Entrance Rated Nexus Smart Switch |
| | SL150RD | 150 amp Service Entrance Rated Nexus Smart Switch |
| | SL200R | 200 amp Normal Nexus Smart Switch |
| | SL200RD | 200 amp Service Entrance Rated Nexus Smart Switch |
| | SL200J | LTS Load Shedding 200 amp Nexus Smart Switch |
| | | GenReady Load Center NEMA 1 |
| | | GenReady Load Center NEMA 3R |
| | SL100RCSA | 100 amp CSA Service Rated Switch |
| SL200RCSA | 200 amp CSA Service Rated Switch | |
| AGSN014RBS | | 14 kW Air-Cooled Generator - Steel |
| | ST100R12C | 12 Circuit Load Distribution Panel |
| | ST100R14C | 14 Circuit Load Distribution Panel |
| | SL100R | 100 amp Normal Nexus Smart Switch |
| | SL100RD | 100 amp Service Entrance Rated Nexus Smart Switch |
| | SL150RD | 150 amp Service Entrance Rated Nexus Smart Switch |
| | SL200R | 200 amp Normal Nexus Smart Switch |
| | SL200RD | 200 amp Service Entrance Rated Nexus Smart Switch |
| | SL200J | LTS Load Shedding 200 amp Nexus Smart Switch |
| | | GenReady Load Center NEMA 1 |
| | | GenReady Load Center NEMA 3R |
| SL100RCSA | 100 amp CSA Service Rated Switch | |
| SL200RCSA | 200 amp CSA Service Rated Switch | |
| ASGN017RBS ASGN017RBA | | 17 kW Air-Cooled Generator - Steel 17 kW Air-Cooled Generator - Aluminum |
| | ST100R16C | 16 Circuit Load Distribution Panel |
| | SL100R | 100 amp Normal Nexus Smart Switch |
| | SL100RD | 100 amp Service Entrance Rated Nexus Smart Switch |
| | SL150RD | 150 amp Service Entrance Rated Nexus Smart Switch |
| | SL200R | 200 amp Normal Nexus Smart Switch |
| | SL200RD | 200 amp Service Entrance Rated Nexus Smart Switch |
| | SL200J | LTS Load Shedding 200 amp Nexus Smart Switch |
| | | GenReady Load Center NEMA 1 |
| | | GenReady Load Center NEMA 3R |
| | SL100RCSA | 100 amp CSA Service Rated Switch |
| SL200RCSA | 200 amp CSA Service Rated Switch | |
| ASGN020RBA | | 20 kW Air-Cooled Generator - Aluminum |
| | SL100R | 100 amp Normal |
| | SL100RD | 100 amp Service Entrance Rated |
| | SL150RD | 150 amp Service Entrance Rated Nexus Smart Switch |
| | SL200R | 200 amp Normal Nexus Smart Switch |
| | SL200RD | 200 amp Service Entrance Rated Nexus Smart Switch |
| | | GenReady Load Center NEMA 1 |
| | | GenReady Load Center NEMA 3R |
| | SL200J | LTS Load Shedding 200 amp Nexus Smart Switch |
| | SL100RCSA | 100 amp CSA Service Rated Switch |
| SL200RCSA | 200 amp CSA Service Rated Switch | |

*NOTE 1: Combining a previous model transfer switch with a current Nexus model generator requires kit #0H930305RV to be installed to complete the battery charging circuit.
NOTE 2: Installing a previous model series generator with any of the listed transfer switch will require the installation of the battery charger included with the generator
Centurion generator models are not displayed.

TYPICAL GENERATOR/TRANSFER SWITCH COMBINATIONS

| Current Model - NEXUS | Current Switch model # | Description |
|-----------------------|------------------------|-------------|
|-----------------------|------------------------|-------------|

Nexus models / transfer switches and prior models / transfer switches listed CAN be used together. See notes below for details

| | | |
|--|----------------------------------|---|
| SGN022RBAL SGN025RBS SGN027RBAL SGN030RBS | | 22 kW Liquid-Cooled Generator, 1phase - Aluminum |
| | | 25 kW Liquid-Cooled Generator, 1phase - Steel |
| | | 27 kW Liquid-Cooled Generator, 1phase - Steel |
| | | 30 kW Liquid-Cooled Generator, 1phase - Steel |
| | SL100R | 100 amp Normal Nexus Smart Switch |
| | SL100RD | 100 amp Service Entrance Rated Nexus Smart Switch |
| | SL150RD | 150 amp Service Entrance Rated Nexus Smart Switch |
| | SL200R | 200 amp Normal Nexus Smart Switch |
| | SL200RD | 200 amp Service Entrance Rated Nexus Smart Switch |
| | SL200J | LTS Load Shedding 200 amp switch |
| | | GenReady Load Center NEMA 1 |
| | GenReady Load Center NEMA 3R | |
| SL100RCSA | 100 amp CSA Service Rated Switch | |
| SL200RCSA | 200 amp CSA Service Rated Switch | |

| | | |
|------------|----------------------------------|---|
| SGN036RBAL | | 36 kW Liquid-Cooled Generator - Aluminum |
| | SL100R | 100 amp Normal Nexus Smart Switch |
| | SL100RD | 100 amp Service Entrance Rated Nexus Smart Switch |
| | SL150RD | 150 amp Service Entrance Rated Nexus Smart Switch |
| | SL200R | 200 amp Normal Nexus Smart Switch |
| | SL200RD | 200 amp Service Entrance Rated Nexus Smart Switch |
| | SL200J | LTS Load Shedding 200 amp switch |
| | SL100RCSA | 100 amp CSA Service Rated Switch |
| SL200RCSA | 200 amp CSA Service Rated Switch | |

| | | |
|-----------|----------------------------------|---|
| SGN045RBS | | 45 kW Liquid-Cooled Generator - Steel |
| | SL100R | 100 amp Normal Nexus Smart Switch |
| | SL100RD | 100 amp Service Entrance Rated Nexus Smart Switch |
| | SL200R | 200 amp Normal Nexus Smart Switch |
| | SL200RD | 200 amp Service Entrance Rated Nexus Smart Switch |
| | SL200J | LTS Load Shedding 200 amp switch |
| | SL100RCSA | 100 amp CSA Service Rated Switch |
| SL200RCSA | 200 amp CSA Service Rated Switch | |

| | | |
|------------|-----------------------------------|---|
| SGN048RBAL | | 48 kW Liquid-Cooled Generator - Aluminum |
| | SL100R | 100 amp Normal Nexus Smart Switch |
| | SL100RD | 100 amp Service Entrance Rated Nexus Smart Switch |
| | SL200R | 200 amp Normal Nexus Smart Switch |
| | SL200RD | 200 amp Service Entrance Rated Nexus Smart Switch |
| | SL200J | LTS Load Shedding 200 amp switch |
| | SL100RCSA | 100 amp CSA Service Rated Switch |
| | SL200RCSA | 200 amp CSA Service Rated Switch |
| SL400R | 400 amp Normal Nexus Smart Switch | |

| | | |
|-------------------|--|----------------|
| SL 100 - 400 amp* | 22-60 kW Liquid-Cooled Generator - 3Ø options | 100 - 400 amp* |
| SL 100 - 800 amp* | 70-150 kW Liquid-Cooled Generator - 1 & 3Ø options | 100 - 800 amp* |

*(all NON service entrance rated)

NOTE: Combining a previous model transfer switch with a current Nexus model generator requires a kit #0H93030SRV to be installed to complete the battery charging circuit.

NEC (700, 701, 702) Comparison

NEC Comparison Table to be used as a general guideline in determining the proper generator for specific applications. Refer to architectural documents for final selection.

| | | Article 700 - Emergency | Article 701 - Standby | Article 702 - Optional Standby |
|----------------------------|------------------------------|------------------------------------|--|---|
| Testing | Scope | Legally required life safety | Legally required critical support (fire fighting, health hazards, etc) | Protect property & facilities |
| | Equipment Approval | For Emergency / (UL2200) | For Intended Use / (UL2200) | For Intended Use / (UL2200) / Not in 2008 |
| | Witness Testing (on-sight) | At install & periodically | At install | None |
| | Periodic Testing | Yes | Yes | None |
| | Battery Maintenance | Yes | Yes | None |
| | Maintenance Records | Yes | Yes | None |
| Transfer Switch | Load Testing | Yes | Yes | None |
| | Capacity | All Loads | All loads intended to operate at one time | All loads intended to operate at one time / Not in 2008 |
| | Other Standby Loads Allowed | Yes with load shedding | Yes with load shedding | 2008 – Yes with load shedding |
| | Peak Shaving Allowed | Yes ?? | Yes | Yes |
| | Automatic | Yes | Yes | No |
| | Equipment Approval | For Emergency / (UL1008) | For Standby / (UL1008) | For Intended Use / (UL1008) |
| Signals (Audible & Visual) | Means to Permitt Bypass | Yes | No | No |
| | Elect. Operated - Mech. Held | Yes | No | No |
| | Other loads | No | Yes with load shedding | N/A |
| | Max. Fault Current Capable | Yes | Yes | Yes |
| | Derangement | Yes / Standard common alarm | Yes / Standard common alarm | Yes / Standard common alarm |
| | Carrying Load | Yes / Displayed at ATS | Yes / Displayed at ATS | Yes / Displayed at ATS |
| Signs | Battery Charger Failed | Yes | Yes | No |
| | Ground Fault Indication | Yes (480V & 1000A) | No | No |
| | NFPA 110 Signaling | Yes / Optional annunciator | Yes / Optional annunciator | No |
| | At service | Yes / Type & location | Yes / Type & location | Yes / Type & location |
| | At neutral to ground bonding | Yes (if remote) | Yes (if remote) | Yes (if remote) |
| | Wiring kept independent | Yes | No | No |
| | Fire protection (ref 700-9d) | Yes (1000 persons or 75' building) | No | No |
| | Maximum power outage | 10 sec | 60 sec | N/A |
| | Retransfer delay | 15 min setting | 15 min setting | No |
| | Automatic starting | Yes | Yes | No |
| | On-site fuel requirements | 2 hours (see NFPA 110) | 2 hours | None |
| | Battery charger | Yes | Yes | No |
| Ground Fault | Indication Only | No | No | |

Electrical Formulas

| TO FIND | KNOWN VALUES | 1-PHASE | 3-PHASE |
|-------------------------|-------------------------------|--|--|
| KILOWATTS (kW) | Volts, Current, Power Factor | $\frac{E \times I}{1000}$ | $\frac{E \times I \times 1.73 \times PF}{1000}$ |
| KVA | Volts, Current | $\frac{E \times I}{1000}$ | $\frac{E \times I \times 1.73}{1000}$ |
| AMPERES | kW, Volts, Power Factor | $\frac{kW \times 1000}{E}$ | $\frac{kW \times 1000}{E \times 1.73 \times PF}$ |
| WATTS | Volts, Amps, Power Factor | Volts x Amps | $E \times I \times 1.73 \times PF$ |
| NO. OF ROTOR POLES | Frequency, RPM | $\frac{2 \times 60 \times \text{Frequency}}{\text{RPM}}$ | $\frac{2 \times 60 \times \text{frequency}}{\text{RPM}}$ |
| FREQUENCY | RPM, No. of Rotor Poles | $\frac{\text{RPM} \times \text{Poles}}{2 \times 60}$ | $\frac{\text{RPM} \times \text{Poles}}{2 \times 60}$ |
| RPM | Frequency, No. of Rotor Poles | $\frac{2 \times 60 \times \text{Frequency}}{\text{Rotor Poles}}$ | $\frac{2 \times 60 \times \text{Frequency}}{\text{Rotor Poles}}$ |
| kW (required for Motor) | Motor Horsepower, Efficiency | $\frac{HP \times 0.746}{\text{Efficiency}}$ | $\frac{HP \times 0.746}{\text{Efficiency}}$ |
| RESISTANCE | Volts, Amperes | $\frac{E}{I}$ | $\frac{E}{I}$ |
| VOLTS | Ohms, Amperes | $I \times R$ | $I \times R$ |
| AMPERES | Ohms, Volts | $\frac{E}{R}$ | $\frac{E}{R}$ |

E = VOLTS I = AMPERES R = RESISTANCE (OHMS) PF = POWER FACTOR

U.S. WEIGHTS AND MEASURES

LINEAR MEASURE

| | | |
|------------|-------------|---------------------|
| 12 INCHES | = 1 FOOT | = 2.540 CENTIMETERS |
| 3 FEET | = 1 YARD | = 3.048 DECIMETERS |
| 5.5 YARDS | = 1 ROD | = 9.144 DECIMETERS |
| 40 RODS | = 1 FURLONG | = 5.029 METERS |
| 8 FURLONGS | = 1 MILE | = 2.018 HECTOMETERS |
| | | = 1.609 KILOMETERS |

MILE MEASUREMENTS

| | |
|-----------------|---------------|
| 1 STATUTE MILE | = 5,280 FEET |
| 1 SCOTS MILE | = 5,952 FEET |
| 1 IRISH MILE | = 6,720 FEET |
| 1 RUSSIAN VERST | = 3,504 FEET |
| 1 ITALIAN MILE | = 4,401 FEET |
| 1 SPANISH MILE | = 15,084 FEET |

OTHER LINEAR MEASUREMENTS

| | | | |
|---------|------------|-----------|---------------|
| 1 HAND | = 4 INCHES | 1 LINK | = 7.92 INCHES |
| 1 SPAN | = 9 INCHES | 1 FATHOM | = 6 FEET |
| 1 CHAIN | = 22 YARDS | 1 FURLONG | = 10 CHAINS |
| | | 1 CABLE | = 608 FEET |

SQUARE MEASURE

| | |
|---------------------|-----------------|
| 144 SQUARE INCHES | = 1 SQUARE FOOT |
| 9 SQUARE FEET | = 1 SQUARE YARD |
| 30 3/4 SQUARE YARDS | = 1 SQUARE ROD |
| 40 RODS | = 1 ROOD |
| 4 ROODS | = 1 ACRE |
| 640 ACRES | = 1 SQUARE MILE |
| 1 SQUARE MILE | = 1 SECTION |
| 36 SECTIONS | = 1 TOWNSHIP |

CUBIC OR SOLID MEASURE

| | |
|---------------------|-------------------------------|
| 1 CU. FOOT | = 1728 CU. INCHES |
| 1 CU. YARD | = 27 CU. FEET |
| 1 CU. FOOT | = 7.48 GALLONS |
| 1 GALLON (WATER) | = 8.34 LBS. |
| 1 GALLON (U.S.) | = 231 CU. INCHES OF WATER |
| 1 GALLON (IMPERIAL) | = 277 1/4 CU. INCHES OF WATER |

METRIC SYSTEM

PREFIXES:

| | | | |
|----------|-------------|----------|-----------|
| A. MEGA | = 1,000,000 | E. DECI | = 0.1 |
| B. KILO | = 1,000 | F. CENTI | = 0.01 |
| C. HECTO | = 100 | G. MILLI | = 0.001 |
| D. DEKA | = 10 | H. MICRO | = 0.00001 |

LINEAR MEASURE:

(THE UNIT IS THE METER = 39.37 INCHES)

| | | |
|--------------|------------------|------------------|
| 1 CENTIMETER | = 10 MILLIMETERS | = 0.3937011 IN. |
| 1 DECIMETER | = 10 CENTIMETERS | = 3.9370113 INS. |
| 1 METER | = 10 DECIMETERS | = 1.0936143 YDS. |
| | | = 3.2808429 FT. |
| 1 DEKAMETER | = 10 METERS | = 10.936143 YDS. |
| 1 HECTOMETER | = 10 DEKAMETERS | = 109.36143 YDS. |
| 1 KILOMETER | = 10 HECTOMETERS | = 0.62137 MILE |
| 1 MYRIAMETER | = 10,000 METERS | |

SQUARE MEASURE:

(THE UNIT IS THE SQUARE METER = 1549.9969 SQ. INCHES)

| | | |
|------------------|-----------------------|-------------------|
| 1 SQ. CENTIMETER | = 100 SQ. MILLIMETERS | = 0.1550 SQ. IN. |
| 1 SQ. DECIMETER | = 100 SQ. CENTIMETERS | = 15.550 SQ. INS. |
| 1 SQ. METER | = 100 SQ. DECIMETERS | = 10.7639 SQ. FT. |
| 1 SQ. DEKAMETER | = 100 SQ. METERS | = 119.60 SQ. YDS. |
| 1 SQ. HECTOMETER | = 100 SQ. DEKAMETERS | |
| 1 SQ. KILOMETER | = 100 SQ. HECTOMETERS | |

(THE UNIT IS THE "ARE" = 100 SQ. METERS)

| | | |
|-----------------|----------------|---------------------|
| 1 CENTIARE | = 10 MILLIARES | = 10.7643 SQ. FT. |
| 1 DECIARE | = 10 CENTIARES | = 11.96033 SQ. YDS. |
| 1 ARE | = 10 DECIARES | = 119.6033 SQ. YDS. |
| 1 DEKARE | = 10 ARES | = 0.247110 ACRES |
| 1 HEKTARE | = 10 DEKARES | = 2.471098 ACRES |
| 1 SQ. KILOMETER | = 100 HEKTARES | = 0.38611 SQ. MILE |

CUBIC MEASURE:

(THE UNIT IS THE "STERE" = 61,025.38659 CU. INS.)

| | | |
|-------------|------------------|---------------------|
| 1 DECISTERE | = 10 CENTISTERES | = 3.531562 CU. FT. |
| 1 STERE | = 10 DECISTERES | = 1.307986 CU. YDS. |
| 1 DEKASTERE | = 10 STERES | = 13.07986 CU. YDS. |

METRIC SYSTEM

CUBIC MEASURE:

(THE UNIT IS THE METER = 39.37 INCHES)

| | | |
|------------------------------|------------------------|--------------------|
| 1 CU. CENTIMETER | = 1000 CU. MILLIMETERS | = 0.06102 CU. IN. |
| 1 CU. DECIMETER | = 1000 CU. CENTIMETERS | = 61.02374 CU. IN. |
| 1 CU. METER | = 1000 CU. DECIMETERS | = 35.31467 CU. FT. |
| | = 1 STERE | = 1.30795 CU. YDS. |
| 1 CU. CENTIMETER (WATER) | | = 1 GRAM |
| 1000 CU. CENTIMETERS (WATER) | = 1 LITER | = 1 KILOGRAM |
| 1 CU. METER (1000 LITERS) | | = 1 METRIC TON |

MEASURES OF WEIGHT:

(THE UNIT IS THE GRAM = 0.035274 OUNCES)

| | | |
|--------------|---------------------|---------------------|
| 1 MILLIGRAM | = | 0.015432 GRAINS |
| 1 CENTIGRAM | = 10 MILLIGRAMS | = 0.15432 GRAINS |
| 1 DECIGRAM | = 10 CENTIGRAMS | = 1.5432 GRAINS |
| 1 GRAM | = 10 DECIGRAMS | = 15.4323 GRAINS |
| 1 DEKAGRAM | = 10 GRAMS | = 5.6438 DRAMS |
| 1 HECTOGRAM | = 10 DEKAGRAMS | = 3.5274 OUNCES |
| 1 KILOGRAM | = 10 HECTOGRAMS | = 2.2046223 POUNDS |
| 1 MYRIAGRAM | = 10 KILOGRAMS | = 22.046223 POUNDS |
| 1 QUINTAL | = 10 MYRIAGRAMS | = 1.986412 CWT. |
| 1 METRIC TON | = 10 QUINTAL | = 2,2045.622 POUNDS |
| 1 GRAM | = 0.56438 DRAMS | |
| 1 DRAM | = 1.77186 GRAMS | |
| | = 27.3438 GRAINS | |
| 1 METRIC TON | = 2,204.6223 POUNDS | |

MEASURES OF CAPACITY:

(THE UNIT IS THE LITER = 1.0567 LIQUID QUARTS)

| | | |
|--------------|------------------|----------------------|
| 1 CENTILITER | = 10 MILLILITERS | = 0.338 FLUID OUNCES |
| 1 DECILITER | = 10 CENTILITERS | = 3.38 FLUID OUNCES |
| 1 LITER | = 10 DECILITERS | = 33.8 FLUID OUNCES |
| 1 DEKALITER | = 10 LITERS | = 0.284 BUSHEL |
| 1 HECTOLITER | = 10 DEKALITERS | = 2.84 BUSHELS |
| 1 KILOLITER | = 10 HECTOLITERS | = 264.2 GALLONS |

NOTE: $\frac{\text{KILOMETERS}}{8} \times 5 = \text{MILES}$ or $\frac{\text{MILES}}{5} \times 8 = \text{KILOMETERS}$

METRIC DESIGNATOR AND TRADE SIZES

| METRIC DESIGNATOR | | | | | | | | | | | | |
|-------------------|-----|-----|----|-------|-------|----|-------|----|-------|-----|-----|-----|
| 12 | 16 | 21 | 27 | 35 | 41 | 53 | 63 | 78 | 91 | 103 | 129 | 155 |
| 3/8 | 1/2 | 3/4 | 1 | 1 1/4 | 1 1/2 | 2 | 2 1/2 | 3 | 3 1/2 | 4 | 5 | 6 |
| TRADE SIZE | | | | | | | | | | | | |

U.S. WEIGHTS & MEASURES / METRIC EQUIVALENT CHART

| | In. | Ft. | Yd. | Mile | Mm | Cm | M | Km |
|----------|--------|----------|-------------------------|--------------------------|-----------|-----------|-----------|------------------------|
| 1 Inch = | 1 | .0833 | .0278 | 1.578x10 ⁻⁵ | 25.4 | 2.54 | .0254 | 2.54x10 ⁻³ |
| 1 Foot = | 12 | 1 | .333 | 1.894x10 ⁻⁴ | 304.8 | 30.48 | .3048 | 3.048x10 ⁻¹ |
| 1 Yard = | 36 | 3 | 1 | 5.6818 x10 ⁻⁴ | 914.4 | 91.44 | .9144 | 9.144x10 ⁻¹ |
| 1 Mile = | 63,360 | 5,280 | 1,760 | 1 | 1,609,344 | 160,934.4 | 1,609.344 | 1.609344 |
| 1 mm = | .03937 | .0032808 | 1.0936x10 ⁻³ | 6.2137x10 ⁻⁷ | 1 | 0.1 | 0.001 | 0.000001 |
| 1 cm = | .3937 | .0328084 | .0109361 | 6.2137x10 ⁻⁴ | 10 | 1 | 0.01 | 0.00001 |
| 1 m = | 39.37 | 3.28084 | 1.09361 | 6.2137x10 ⁻¹ | 1000 | 100 | 1 | 0.001 |
| 1 km = | 39,370 | 3,280.84 | 1,093.61 | 0.62137 | 1,000,000 | 100,000 | 1,000 | 1 |

In. = Inches Ft. = Foot Yd. = Yard Mi. = Mile Mm = Millimeter Cm = Centimeter M = Meter Km = Kilometer

EXPLANATION OF SCIENTIFIC NOTATION:

Scientific Notation is simply a way of expressing very large or very small numbers in a more compact format. Any number can be expressed as a number between 1 & 10, multiplied by a power of 10 (which indicates the correct position of the decimal point in the original number). Numbers greater than 10 have positive powers of 10, and numbers less than 1 have negative powers of 10.

Example: 186,000 = 1.86 x 10⁵ 0.000524 = 5.24 x 10⁻⁴

USEFUL CONVERSIONS / EQUIVALENTS

| | | |
|----------------|-------|----------------------------|
| 1 BTU | | Raises 1 LB. of water 1°F |
| 1 GRAM CALORIE | | Raises 1 Gram of water 1°C |
| 1 CIRCULAR MIL | | Equals 0.7854 sq. mil |
| 1 SQ. MIL | | Equals 1.27 cir. mils |
| 1 MIL | | Equals 0.001 in. |

To determine circular mil of a conductor:

ROUND CONDUCTORCM = (Diameter in mils)²

BUS BARCM = $\frac{\text{Width (mils)} \times \text{Thickness (mils)}}{0.7854}$

NOTES: 1 Millimeter = 39.37 Mils 1 Cir. Millimeter = 1550 Cir. Mils
1 Sq. Millimeter = 1974 Cir. Mils

ONSITE ESTIMATING SHEET

Contractor _____ Email _____

Phone _____ Fax _____

Job Name _____

Date _____ Location _____

VOLTAGE 120/240 1Ø 120/208 3Ø 120/240 3Ø 277/480 3Ø

TYPE Natural Gas LP Vapor (LPV)

ELEC. SERVICE 100 Amp 200 Amp 400 Amp 600 Amp Other _____

Before installation contact local jurisdiction to confirm all requirements are met. Jurisdictions may vary. Siemens recommends contacting local authorities prior to installation.

LOADS: Look for heavy building loads such as refrigeration, air conditioning, pumps or UPS systems.

Use the following for sizing and determining generator kW.

| TABLE 6 | Motor Load Table (refer to Table 1) | | | | |
|---------|-------------------------------------|----|-----|-------------------|--------------------------|
| Device | HP | RA | LRA | kW Running (= HP) | Starting kW ¹ |
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¹ Starting kW for HP < 7.5 starting kW = HP x 3
 Starting kW for HP > 7.5 starting kW = HP x 2
 Starting kW for loading with no listed HP, calculate HP based on running amps in the chart on the right

Applications

The QT Series does not meet the necessary requirements for the following applications:

- NEC 695 Fire Pumps
- NEC 700 Emergency Systems
- NFPA 20 Fire Pumps
- NFPA 99 Healthcare
- NFPA 110 Emergency Systems

Reference Codes

Related Codes and Standards:

- NEC 225 Branch Circuits and Feeders
- NEC 240 Overcurrent Protection
- NEC 250 Grounding
- NEC 445 Generators
- NEC 700 Emergency Systems
- NEC 701 Legally Required Standby
- NEC 702 Optional Standby
- NFPA 37 Installation & Use of Stationary Engines
- NFPA 54 National Fuel Gas Code
- NFPA 58 LP Gas Code

| To Calculate kW | |
|-----------------|---------------------------------------|
| 120 V 1Ø | Amps x 120/1000 = kW |
| 240 V 1Ø | Amps x 240/1000 = kW |
| 208 V 3Ø | (Amps x 208 x 1.732 x PF) / 1000 = kW |
| 240 V 3Ø | (Amps x 240 x 1.732 x PF) / 1000 = kW |
| 480 V 3Ø | (Amps x 480 x 1.732 x PF) / 1000 = kW |

PF is application power factor (worst case 1.0)
 Typical application power factor is 0.95.

| TABLE 7 | Non-Motor Load Table (refer to Table 2) | |
|---------|---|----|
| Device | Amps | kW |
| | | |
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UPS Information
 1.5 x kVA rating for a filtered system
 3 – 5 x kVA rating for an unfiltered system
 Siemens recommends you refer to the Siemens UPS Generator Compatibility sheet and contact the manufacturer of the UPS system to assist in your installation.

Transfer Switch Availability
SLD Type – 100, 150, 200 and 400 Amp service rated
SL Type – 100-800 3Ø and 600-800 1Ø Amp
SL Type – 100, 200, 400 Amp
PowerManager – 200 Amp service rated load shed switch
GenReady – 200 Amp service panel

Recommended Generator Size _____ Refer to Generator Sizing Instructions on other side of this sheet.

INSTALL NOTES:

1. Suggested concrete pad minimum thickness of 4" with 6" overhang on all sides. Composite pad included with air-cooled products.
2. Consult manual for installation recommendations.
3. Consult local authority having jurisdiction for local requirements.

SYSTEM CAPACITY – LOAD CALCULATOR

| DIRECTIONS FOR NEC 2008, ARTICLE 220, PART IV DIRECTIONS FOR NEC 2011, ARTICLE 220, PART IV | | NEC REFERENCE |
|--|--|---------------|
| 220.80 Optional Feeder and Service Load Calculations (RESIDENTIAL) | | |
| SECTION CAN BE USED FOR DWELLING UNITS | | 220.82 (A) |
| <ul style="list-style-type: none"> • Served by a single feeder conductor (generator) • 120/240 volt or 208Y/120 volt service • Ampacity of 100 amps or greater The calculated load will be the result of adding <ul style="list-style-type: none"> • 220.82 (B) General Loads, and 220.82 (B) • 220.82 (C) Heating and Air-Conditioning Load 220.82 (C) • Calculated neutral load determined by 220.61. (Additional 70% demand factor can be taken for cooking appliances and dryers when tables 220.54 and/or 220.55 are used) | | |
| GENERAL LOADS | | 220.82 (B) |
| General Lighting and General-Use Receptacles <ul style="list-style-type: none"> • Calculate at 3 VA per square foot 220.82 (B) (1) • Use exterior dimensions of the home to calculate square footage – do not include open porches, garages, or unused or unfinished spaces not adaptable for future use. • Add 20-amp small appliance & laundry circuits @ 1500 VA each 220.82 (B) (2) Calculate the following loads at 100% of nameplate rating 220.82 (B) (3) <ul style="list-style-type: none"> • Appliances fastened in place, permanently connected or located on a specific circuit 220.82 (B) (3) a • Ranges, wall-mounted ovens, counter-mounted cooking units (Tables 220.54 & 220.55) 220.82 (B) (3) b • Clothes dryers not connected to the laundry branch circuit 220.82 (B) (3) c • Water heaters 220.82 (B) (3) d • Permanently connected motors not included in Heat & Air-Conditioning Load section 220.82 (B) (4) | | |
| HEATING & AIR-CONDITIONING LOADS | | 220.82 (C) |
| Include the largest of the following six selections (kVA load) in calculation <ul style="list-style-type: none"> Air Conditioning and Cooling 220.82 (C) (1) <ul style="list-style-type: none"> • 100% of nameplate rating Heat Pumps Without Supplemental Electric Heating 220.82 (C) (2) <ul style="list-style-type: none"> • 100% of nameplate rating Heat Pumps With Supplemental Electric Heating 220.82 (C) (3) <ul style="list-style-type: none"> • 100% of nameplate rating of the heat pump compressor* • 65% of nameplate rating of supplemental electric heating equipment <ul style="list-style-type: none"> – If compressor & supplemental heat cannot run at the same time do not include the compressor Electric Space Heating <ul style="list-style-type: none"> • Less than 4 separately controlled units @ 65% of nameplate rating 220.82 (C) (4) • 4 or more separately controlled units @ 40% of nameplate rating 220.82 (C) (5) • 40% of nameplate rating if 4 or more separately controlled units Electric Thermal Storage (or system where the load is expected to be continuous at nameplate rating) 220.82 (C) (6) <ul style="list-style-type: none"> • 100% of nameplate rating • Systems of this type cannot be calculated under any other section of 220.82 (C). | | |
| LOAD CALCULATIONS | | |
| General Lighting Load | 3 VA x ft ² | |
| • Small Appliance & Laundry Circuits | + 1500 VA per circuit | |
| • General Appliances & Motors (100% rated load) | + <u>Total general appliances</u> | |
| • Sum of all General Loads | = Total General Load (VA) | |
| APPLY DEMAND FACTORS | | |
| – First 10 kVA @ 100% | = 10,000 VA | |
| – Remainder of General Loads @ 40% | = <u>(Total VA - 10,000) x .40</u> | |
| • HEAT / A-C LOAD @ 100% | = <u>Largest Heat or A-C Load (VA)</u> | |
| | = TOTAL CALCULATED LOAD | |

Converting VA TO kW (Single-phase applications with 1.0 power factor only) 1 kVA = 1 kW

220.54

Worksheet — NEC 2011, 220 Part IV

| | | | | | |
|--|----------|---------------------|---------|--------------------|----------------------------|
| Contractor | | Email | | | |
| Phone | | Fax | | | |
| Job Name | | | | | |
| Date | Location | | | | |
| Voltage (Circle) | 240V -1Ø | | | | |
| Fuel | | NG | LPV | | |
| Elec. Service | 100 Amp | 200 Amp | 400 Amp | Other | |
| NET SQUARE FOOTAGE | | | | | |
| GENERAL LOADS | Qty | Rating (Load) | Factor | Loads (VA) | Loads (kW) (VA ÷ 1,000) |
| General Lighting and General Use Receptacles | | 3 VA/ft² | 100% | | |
| Branch Circuits (1500 VA/ft²) | | | | | |
| Small Appliance Circuits (20 Amp) | | 1500 | 100% | | |
| Laundry Circuits | | 1500 | 100% | | |
| Fixed Appliances | | | | | |
| | | Full Current Rating | | | |
| Well | | | 100% | | |
| Sump Pump | | | 100% | | |
| Freezer | | | 100% | | |
| Microwave (Not counter-top model) | | | 100% | | |
| Disposal | | | 100% | | |
| Dishwasher | | | 100% | | |
| Range (See Table 220.55 for multiple cooking appliances) | | | 100% | | |
| Wall-Mounted Oven | | | 100% | | |
| Counter-Mounted Cooking Surface | | | 100% | | |
| Water Heater | | | 100% | | |
| Clothes Dryer | | | 100% | | |
| Garage Door Opener | | | 100% | | |
| Septic Grinder | | | 100% | | |
| Other (list) | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
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| | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
| Total General Loads | | | | VA | kW |
| HEAT / A-C LOAD | | | | | |
| A-C / Cooling Equipment | | | 100% | | |
| Heat Pump | | | | | |
| • Compressor (if not included as A-C) | | | 100% | | |
| • Supplemental Electric Heat | | | 65% | | |
| Electric Space Heating | | | | | |
| • Less than 4 separately controlled units | | | 65% | | |
| • 4 or more separately controlled units | | | 40% | | |
| System With Continuous Nameplate Load | | | 100% | | |
| Largest Heat / A-C Load (VA) VA kW | | | | | |
| GENERAL LOADS | | | | | |
| • 1st 10 kW of General Loads 100% kW | | | 100% | <u> </u> kW | |
| • Remaining General Loads (kW) 40% kW | | | 40% | <u> </u> kW | |
| CALCULATED GENERAL LOAD (kW) kW | | | | | <u> </u> kW |
| LARGEST HEAT / A-C LOAD 100% kW kW | | | | | <u> </u> kW |
| TOTAL CALCULATED LOAD (Net General Loads + Heat/A-C Load) | | | | | <u> </u> kW |

ONSITE ESTIMATING SHEET

Contractor _____ Email _____

Phone _____ Fax _____

Job Name _____

Date _____ Location _____

VOLTAGE 120/240 1Ø 120/208 3Ø 120/240 3Ø 277/480 3Ø

TYPE Natural Gas LP Vapor (LPV)

ELEC. SERVICE 100 Amp 200 Amp 400 Amp 600 Amp Other _____

Before installation contact local jurisdiction to confirm all requirements are met.
Jurisdictions may vary. Siemens recommends contacting local authorities prior to installation.

LOADS: Look for heavy building loads such as refrigeration, air conditioning, pumps or UPS systems.

Use the following for sizing and determining generator kW.

| TABLE 6 | Motor Load Table (refer to Table 1) | | | | |
|---------|-------------------------------------|----|-----|-------------------|--------------------------|
| Device | HP | RA | LRA | kW Running (= HP) | Starting kW ¹ |
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¹ Starting kW for HP < 7.5 starting kW = HP x 3
Starting kW for HP > 7.5 starting kW = HP x 2
Starting kW for loading with no listed HP, calculate HP based on running amps in the chart on the right

Applications

The QT Series does not meet the necessary requirements for the following applications:

- NEC 695 Fire Pumps
- NEC 700 Emergency Systems
- NFPA 20 Fire Pumps
- NFPA 99 Healthcare
- NFPA 110 Emergency Systems

Reference Codes

- Related Codes and Standards:
- NEC 225 Branch Circuits and Feeders
 - NEC 240 Overcurrent Protection
 - NEC 250 Grounding
 - NEC 445 Generators
 - NEC 700 Emergency Systems
 - NEC 701 Legally Required Standby
 - NEC 702 Optional Standby
 - NFPA 37 Installation & Use of Stationary Engines
 - NFPA 54 National Fuel Gas Code
 - NFPA 58 LP Gas Code

| To Calculate kW | |
|-----------------|--------------------------------------|
| 120 V 1Ø | Amps x 120/1000 = kW |
| 240 V 1Ø | Amps x 240/1000 = kW |
| 208 V 3Ø | (Amps x 208 x 1.732 x PF) /1000 = kW |
| 240 V 3Ø | (Amps x 240 x 1.732 x PF) /1000 = kW |
| 480 V 3Ø | (Amps x 480 x 1.732 x PF) /1000 = kW |

PF is application power factor (worst case 1.0)
Typical application power factor is 0.95.

| TABLE 7 | Non-Motor Load Table (refer to Table 2) | |
|---------|---|----|
| Device | Amps | kW |
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UPS Information
1.5 x kVA rating for a filtered system
3 – 5 x kVA rating for an unfiltered system
Siemens recommends you refer to the Siemens UPS Generator Compatibility sheet and contact the manufacturer of the UPS system to assist in your installation.

Transfer Switch Availability
SLD Type – 100, 150, 200 and 400 Amp service rated
SL Type – 100-800 3Ø and 600-800 1Ø Amp
SL Type – 100, 200, 400 Amp
PowerManager – 200 Amp service rated load shed switch
GenReady – 200 Amp service panel

Recommended Generator Size _____ Refer to Generator Sizing Instructions on other side of this sheet.

INSTALL NOTES:

1. Suggested concrete pad minimum thickness of 4" with 6" overhang on all sides. Composite pad included with air-cooled products.
2. Consult manual for installation recommendations.
3. Consult local authority having jurisdiction for local requirements.

ONSITE ESTIMATING SHEET

Generator Sizing Instructions:

There is not a single correct sizing solution. Following are several methods that, when mixed with good judgement, should result in an appropriately sized generator. Remember to consider load growth, seasonality, and effects of starting motors.

As municipalities and states adopt the new 2011 NEC Electrical Code, there may be new sizing requirements, spelled out in the code book, which the installation technician must follow. Always check with the local inspection department to confirm which code cycle will affect your install.

Never add Amps when sizing a generator. Convert Amps to kW and add kW to determine the required generator size. Power factors for various motor loads vary widely. Adding Amps without properly accounting for the power factor and/or mixing voltages will result in improperly sizing the generator.

When motors start, they create a current surge that step loads the generator and creates a voltage dip. After selecting a generator, reference the generator's surge capability using table 3. Verify that voltage dip is adequate for the application. Most commercial applications should be limited to about 15% voltage dip and residential applications should be limited to a 30% voltage dip.

Some applications utilize an uninterruptible power supply (UPS) to back up critical loads. Please read sizing guide for this load type.

Measurement Method

Use a clamp-on Amp meter or power analyzer to measure facility load levels. Clamp each leg separately and take the measurement during peak usage levels.

240V 1Ø Applications: To determine peak usage in kW, add the highest Amp readings from the two legs, multiply by 120 and divide by 1,000.
 $(L1 + L2)120 / 1000$

Size the generator 10 to 20% larger than the peak measured load.

3Ø Applications: Add the peak Amp readings from all three legs and divide by 3 to determine peak Amps. Multiply peak Amps by volts, multiply the result by 1.732 (square root of 3), then divide by 1000 to convert Amps to kW.

$$\text{Peak Amps} = (L1 + L2 + L3) / 3$$

$$\text{kW} = [(Peak Amps \times Volts) \times 1.732] / 1000^*$$

*Assumes power factor of 1.0

Size the generator 20 to 25% larger than the peak measured load.

Peak Amps = _____ Peak kW= _____

Project Layout

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Determining Existing Loads/Billing History Method 220.87 NEC 2011

Many customers have a utility rate structure that has a peak demand charge. Using a year's worth of electric bills, size the generator 25% larger than the largest peak demand. Verify motor and UPS load compatibility. Peak Demand = _____

Load Summation Method

- 1) Enter running kW for all motor loads (except the largest) expected to run during peak load levels into **table 6**. Refer to **table 1** for typical motor load sizes and electrical requirements.
 - 2) Enter kW for all non-motor loads expected to run during peak load levels into **table 7**. Refer to **table 2** for typical residential loads and rules of thumb.
 - 3) Add the running motor load kW, non-motor load kW, and the starting kW of the largest motor load.
- Motor load running total (minus largest motor): _____ kW (ref. table 6)
 Non-motor load total: _____ kW (ref. table 7)
 Starting load from largest cycling motor: _____ kW (ref. table 6)
 Total electrical loads: = _____ kW
- Select generator: Commercial (add 20 to 25% to total kW)
 Residential (add 10 to 20% to total kW)

- 4) Confirm that voltage dip is within acceptable limits by comparing motor LRA to generator surge capability (see table #3).
- 5) Confirm UPS compatibility (see page 6).

System Capacity – Load Calculation

If the local municipality or state you are in has adopted the 2011 NEC Code, you may be required to use this step. Article 702 of the 2011 NEC includes a new requirement for sizing (702.4). If no other method for sizing is acceptable, sizing of the generator shall be made in accordance with Article 220 of the NEC. The system capacity estimating sheet will guide you through this process.

DLM Load Control Module 702.4 (B) (2) (a) NEC 2011

The DLM Load Control Module is a 50 amp contact housed in a NEMA 3R enclosure for indoor and outdoor installation applications. Through the use of the DLM Modules in conjunction with any of the 100-400 amp Nexus Smart Switches, household or business loads can be intelligently managed enabling the use of a smaller, more efficient generator system. Up to four DLM Modules can be used with a single switch.

Ball Park Estimates (Do not use for final sizing)

Estimate based on 60% service size: (commercial)

- 240 Volts, 1 Ø: _____ Amps x .15 = _____ kW
 208 Volts, 3 Ø: _____ Amps x .22 = _____ kW
 240 Volts, 3 Ø: _____ Amps x .25 = _____ kW
 480 Volts, 3 Ø: _____ Amps x .50 = _____ kW

Estimate based on 40% service size: (residential)

- 240 Volts, 1 Ø: _____ Amps x .10 = _____ kW
 208 Volts, 3 Ø: _____ Amps x .15 = _____ kW
 240 Volts, 3 Ø: _____ Amps x .17 = _____ kW
 480 Volts, 3 Ø: _____ Amps x .34 = _____ kW

Estimate based on square footage

- Fast food, convenience stores, restaurants, grocery stores kW = 50 kW + 10 watts/sq. ft.
 Other commercial applications kW = 30 kW + 5 watts/sq. ft.
 Square footage = _____ Estimated kW = _____

Amps to kW Rule of Thumb (assumes .8 pf)

- For 480 volt systems Amps = kW x 1.5
 For 208 volt systems Amps = kW x 3.5
 For 240 volt 3 Ø systems Amps = kW x 3
 For 240 volt 1 Ø systems Amps = kW x 4

SYSTEM CAPACITY – LOAD CALCULATOR

DIRECTIONS FOR NEC 2011, ARTICLE 220, PART IV

| 220.80 Optional Feeder and Service Load Calculations (RESIDENTIAL) | NEC REFERENCE |
|--|---------------|
| SECTION CAN BE USED FOR DWELLING UNITS | 220.82 (A) |
| <ul style="list-style-type: none"> • Served by a single feeder conductor (generator) • 120/240 volt or 208Y/120 volt service • Ampacity of 100 amps or greater <p>The calculated load will be the result of adding</p> <ul style="list-style-type: none"> • 220.82 (B) General Loads, and 220.82 (B) • 220.82 (C) Heating and Air-Conditioning Load 220.82 (C) <p>• Calculated neutral load determined by 220.61. (Additional 70% demand factor can be taken for cooking appliances and dryers when tables 220.54 and/or 220.55 are used)</p> | |
| GENERAL LOADS | 220.82 (B) |
| <p>General Lighting and General-Use Receptacles</p> <ul style="list-style-type: none"> • Calculate at 3 VA per square foot 220.82 (B) (1) • Use exterior dimensions of the home to calculate square footage – do not include open porches, garages, or unused or unfinished spaces not adaptable for future use. <ul style="list-style-type: none"> • Add 20-amp small appliance & laundry circuits @ 1500 VA each 220.82 (B) (2) <p>Calculate the following loads at 100% of nameplate rating 220.82 (B) (3)</p> <ul style="list-style-type: none"> • Appliances fastened in place, permanently connected or located on a specific circuit 220.82 (B) (3) a • Ranges, wall-mounted ovens, counter-mounted cooking units (Tables 220.54 & 220.55) 220.82 (B) (3) b • Clothes dryers not connected to the laundry branch circuit 220.82 (B) (3) c • Water heaters 220.82 (B) (3) d • Permanently connected motors not included in Heat & Air-Conditioning Load section 220.82 (B) (4) | |
| HEATING & AIR-CONDITIONING LOADS | 220.82 (C) |
| <p>Include the largest of the following six selections (kVA load) in calculation</p> <p>Air Conditioning and Cooling 220.82 (C) (1)</p> <ul style="list-style-type: none"> • 100% of nameplate rating <p>Heat Pumps Without Supplemental Electric Heating 220.82 (C) (2)</p> <ul style="list-style-type: none"> • 100% of nameplate rating <p>Heat Pumps With Supplemental Electric Heating 220.82 (C) (3)</p> <ul style="list-style-type: none"> • 100% of nameplate rating of the heat pump compressor* • 65% of nameplate rating of supplemental electric heating equipment <ul style="list-style-type: none"> – If compressor & supplemental heat cannot run at the same time do not include the compressor <p>Electric Space Heating</p> <ul style="list-style-type: none"> • Less than 4 separately controlled units @ 65% of nameplate rating 220.82 (C) (4) • 4 or more separately controlled units @ 40% of nameplate rating 220.82 (C) (5) • 40% of nameplate rating if 4 or more separately controlled units <p>Electric Thermal Storage (or system where the load is expected to be continuous at nameplate rating 220.82 (C) (6)</p> <ul style="list-style-type: none"> • 100% of nameplate rating <p>• Systems of this type cannot be calculated under any other section of 220.82 (C).</p> | |
| LOAD CALCULATIONS | |
| <p>General Lighting Load 3 VA x ft²</p> <p>• Small Appliance & Laundry Circuits + 1500 VA per circuit</p> <p>• General Appliances & Motors (100% rated load) + <u>Total general appliances</u></p> <p>• Sum of all General Loads = Total General Load (VA)</p> <p>APPLY DEMAND FACTORS</p> <p>– First 10 kVA @ 100% = 10,000 VA</p> <p>– Remainder of General Loads @ 40% = <u>(Total VA - 10,000) x .40</u></p> <p>• HEAT / A-C LOAD @ 100% = Calculated General Load (VA)</p> <p><u>Largest Heat or A-C Load (VA)</u></p> <p>= TOTAL CALCULATED LOAD</p> | |

Converting VA TO kW (Single-phase applications with 1.0 power factor only) 1 kVA = 1 kW

220.54

Worksheet — NEC 2011, 220 Part IV

| | | | | | |
|--|----------|---------------------|---------|--------------------|----------------------------|
| Contractor | | Email | | | |
| Phone | | Fax | | | |
| Job Name | | | | | |
| Date | Location | | | | |
| Voltage (Circle) | 240V -1Ø | | | | |
| Fuel | | NG | LPV | | |
| Elec. Service | 100 Amp | 200 Amp | 400 Amp | Other | |
| NET SQUARE FOOTAGE | | | | | |
| GENERAL LOADS | Qty | Rating (Load) | Factor | Loads (VA) | Loads (kW) (VA ÷ 1,000) |
| General Lighting and General Use Receptacles | | 3 VA/ft² | 100% | | |
| Branch Circuits (1500 VA/ft²) | | | | | |
| Small Appliance Circuits (20 Amp) | | 1500 | 100% | | |
| Laundry Circuits | | 1500 | 100% | | |
| Fixed Appliances | | | | | |
| | | Full Current Rating | | | |
| Well | | | 100% | | |
| Sump Pump | | | 100% | | |
| Freezer | | | 100% | | |
| Microwave (Not counter-top model) | | | 100% | | |
| Disposal | | | 100% | | |
| Dishwasher | | | 100% | | |
| Range (See Table 220.55 for multiple cooking appliances) | | | 100% | | |
| Wall-Mounted Oven | | | 100% | | |
| Counter-Mounted Cooking Surface | | | 100% | | |
| Water Heater | | | 100% | | |
| Clothes Dryer | | | 100% | | |
| Garage Door Opener | | | 100% | | |
| Septic Grinder | | | 100% | | |
| Other (list) | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
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| | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
| Total General Loads | | | | VA | kW |
| HEAT / A-C LOAD | | | | | |
| A-C / Cooling Equipment | | | 100% | | |
| Heat Pump | | | | | |
| • Compressor (if not included as A-C) | | | 100% | | |
| • Supplemental Electric Heat | | | 65% | | |
| Electric Space Heating | | | | | |
| • Less than 4 separately controlled units | | | 65% | | |
| • 4 or more separately controlled units | | | 40% | | |
| System With Continuous Nameplate Load | | | 100% | | |
| Largest Heat / A-C Load (VA) | | | | | |
| GENERAL LOADS | | | | | |
| • 1st 10 kW of General Loads 100% kW | | | 100% | <u> </u> kW | |
| • Remaining General Loads (kW) 40% kW | | | 40% | <u> </u> kW | |
| CALCULATED GENERAL LOAD (kW) | | | | | <u> </u> kW |
| LARGEST HEAT / A-C LOAD | | | | | <u> </u> kW |
| TOTAL CALCULATED LOAD (Net General Loads + Heat/A-C Load) | | | | | <u> </u> kW |

ONSITE ESTIMATING SHEET

Contractor _____ Email _____
 Phone _____ Fax _____
 Job Name _____
 Date _____ Location _____

VOLTAGE 120/240 1Ø 120/208 3Ø 120/240 3Ø 277/480 3Ø
 TYPE Natural Gas LP Vapor (LPV)
 ELEC. SERVICE 100 Amp 200 Amp 400 Amp 600 Amp Other _____

Before installation contact local jurisdiction to confirm all requirements are met. Jurisdictions may vary. Siemens recommends contacting local authorities prior to installation.

LOADS: Look for heavy building loads such as refrigeration, air conditioning, pumps or UPS systems.

Use the following for sizing and determining generator kW.

| TABLE 6 | | Motor Load Table (refer to Table 1) | | | | |
|---------|----|-------------------------------------|-----|-------------------|--------------------------|--|
| Device | HP | RA | LRA | kW Running (= HP) | Starting kW ¹ | |
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¹ Starting kW for HP < 7.5 starting kW = HP x 3
 Starting kW for HP > 7.5 starting kW = HP x 2
 Starting kW for loading with no listed HP, calculate HP based on running amps in the chart on the right

Applications

The QT Series does not meet the necessary requirements for the following applications:

- NEC 695 Fire Pumps
- NEC 700 Emergency Systems
- NFPA 20 Fire Pumps
- NFPA 99 Healthcare
- NFPA 110 Emergency Systems

Reference Codes

Related Codes and Standards:

- NEC 225 Branch Circuits and Feeders
- NEC 240 Overcurrent Protection
- NEC 250 Grounding
- NEC 445 Generators
- NEC 700 Emergency Systems
- NEC 701 Legally Required Standby
- NEC 702 Optional Standby
- NFPA 37 Installation & Use of Stationary Engines
- NFPA 54 National Fuel Gas Code
- NFPA 58 LP Gas Code

| To Calculate kW | |
|-----------------|---------------------------------------|
| 120 V 1Ø | Amps x 120/1000 = kW |
| 240 V 1Ø | Amps x 240/1000 = kW |
| 208 V 3Ø | (Amps x 208 x 1.732 x PF) / 1000 = kW |
| 240 V 3Ø | (Amps x 240 x 1.732 x PF) / 1000 = kW |
| 480 V 3Ø | (Amps x 480 x 1.732 x PF) / 1000 = kW |

PF is application power factor (worst case 1.0)
 Typical application power factor is 0.95.

| TABLE 7 Non-Motor Load Table (refer to Table 2) | | |
|--|------|----|
| Device | Amps | kW |
| | | |
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UPS Information

1.5 x kVA rating for a filtered system
 3 – 5 x kVA rating for an unfiltered system

Siemens recommends you refer to the Siemens UPS Generator Compatibility sheet and contact the manufacturer of the UPS system to assist in your installation.

Transfer Switch Availability

- SLD Type** – 100, 150, 200 and 400 Amp service rated
 - SL Type** – 100-800 3Ø and 600-800 1Ø Amp
 - SL Type** – 100, 200, 400 Amp
 - PowerManager** – 200 Amp service rated load shed switch
 - GenReady** – 200 Amp service panel
- RTS and GenReady switches only work with the R-controller.

Recommended Generator Size _____ Refer to Generator Sizing Instructions on other side of this sheet.

INSTALL NOTES:

1. Suggested concrete pad minimum thickness of 4" with 6" overhang on all sides. Composite pad included with air-cooled products.
2. Consult manual for installation recommendations.
3. Consult local authority having jurisdiction for local requirements.

SYSTEM CAPACITY – LOAD CALCULATOR

| DIRECTIONS FOR NEC 2011, ARTICLE 220, PART IV | | NEC REFERENCE |
|--|---|--|
| 220.80 Optional Feeder and Service Load Calculations (RESIDENTIAL) | | |
| SECTION CAN BE USED FOR DWELLING UNITS | | 220.82 (A) |
| <ul style="list-style-type: none"> • Served by a single feeder conductor (generator) • 120/240 volt or 208Y/120 volt service • Ampacity of 100 amps or greater The calculated load will be the result of adding | | |
| <ul style="list-style-type: none"> • 220.82 (B) General Loads, and • 220.82 (C) Heating and Air-Conditioning Load | | 220.82 (B) 220.82 (C) |
| <ul style="list-style-type: none"> • Calculated neutral load determined by 220.61. (Additional 70% demand factor can be taken for cooking appliances and dryers when tables 220.54 and/or 220.55 are used) | | |
| GENERAL LOADS | | 220.82 (B) |
| General Lighting and General-Use Receptacles | | |
| <ul style="list-style-type: none"> • Calculate at 3 VA per square foot • Use exterior dimensions of the home to calculate square footage – do not include open porches, garages, or unused or unfinished spaces not adaptable for future use. | | 220.82 (B) (1) |
| <ul style="list-style-type: none"> • Add 20-amp small appliance & laundry circuits @ 1500 VA each | | 220.82 (B) (2) |
| Calculate the following loads at 100% of nameplate rating | | 220.82 (B) (3) |
| <ul style="list-style-type: none"> • Appliances fastened in place, permanently connected or located on a specific circuit • Ranges, wall-mounted ovens, counter-mounted cooking units (Tables 220.54 & 220.55) • Clothes dryers not connected to the laundry branch circuit • Water heaters • Permanently connected motors not included in Heat & Air-Conditioning Load section | | 220.82 (B) (3) a 220.82 (B) (3) b 220.82 (B) (3) c 220.82 (B) (3) d 220.82 (B) (4) |
| HEATING & AIR-CONDITIONING LOADS | | 220.82 (C) |
| Include the largest of the following six selections (kVA load) in calculation | | |
| Air Conditioning and Cooling | | 220.82 (C) (1) |
| <ul style="list-style-type: none"> • 100% of nameplate rating | | |
| Heat Pumps Without Supplemental Electric Heating | | 220.82 (C) (2) |
| <ul style="list-style-type: none"> • 100% of nameplate rating | | |
| Heat Pumps With Supplemental Electric Heating | | 220.82 (C) (3) |
| <ul style="list-style-type: none"> • 100% of nameplate rating of the heat pump compressor* • 65% of nameplate rating of supplemental electric heating equipment <ul style="list-style-type: none"> – If compressor & supplemental heat cannot run at the same time do not include the compressor | | |
| Electric Space Heating | | |
| <ul style="list-style-type: none"> • Less than 4 separately controlled units @ 65% of nameplate rating • 4 or more separately controlled units @ 40% of nameplate rating • 40% of nameplate rating if 4 or more separately controlled units | | 220.82 (C) (4) 220.82 (C) (5) |
| Electric Thermal Storage (or system where the load is expected to be continuous at nameplate rating) | | 220.82 (C) (6) |
| <ul style="list-style-type: none"> • 100% of nameplate rating • Systems of this type cannot be calculated under any other section of 220.82 (C). | | |
| LOAD CALCULATIONS | | |
| General Lighting Load | | 3 VA x ft ² |
| • Small Appliance & Laundry Circuits | + | 1500 VA per circuit |
| • General Appliances & Motors (100% rated load) | + | <u>Total general appliances</u> |
| • Sum of all General Loads | = | Total General Load (VA) |
| APPLY DEMAND FACTORS | | |
| – First 10 kVA @ 100% | = | 10,000 VA |
| – Remainder of General Loads @ 40% | = | <u>(Total VA - 10,000) x .40</u> |
| | = | Calculated General Load (VA) |
| • HEAT / A-C LOAD @ 100% | = | <u>Largest Heat or A-C Load (VA)</u> |
| | = | TOTAL CALCULATED LOAD |

Converting VA TO kW (Single-phase applications with 1.0 power factor only) 1 kVA = 1 kW

220.54

Worksheet — NEC 2011, 220 Part IV

| | | | | | |
|--|----------|---------------------|---------|--------------------|----------------------------|
| Contractor | | Email | | | |
| Phone | | Fax | | | |
| Job Name | | | | | |
| Date | Location | | | | |
| Voltage (Circle) | 240V -1Ø | | | | |
| Fuel | | NG | LPV | | |
| Elec. Service | 100 Amp | 200 Amp | 400 Amp | Other | |
| NET SQUARE FOOTAGE | | | | | |
| GENERAL LOADS | Qty | Rating (Load) | Factor | Loads (VA) | Loads (kW) (VA ÷ 1,000) |
| General Lighting and General Use Receptacles | | 3 VA/ft² | 100% | | |
| Branch Circuits (1500 VA/ft²) | | | | | |
| Small Appliance Circuits (20 Amp) | | 1500 | 100% | | |
| Laundry Circuits | | 1500 | 100% | | |
| Fixed Appliances | | Full Current Rating | | | |
| Well | | | 100% | | |
| Sump Pump | | | 100% | | |
| Freezer | | | 100% | | |
| Microwave (Not counter-top model) | | | 100% | | |
| Disposal | | | 100% | | |
| Dishwasher | | | 100% | | |
| Range (See Table 220.55 for multiple cooking appliances) | | | 100% | | |
| Wall-Mounted Oven | | | 100% | | |
| Counter-Mounted Cooking Surface | | | 100% | | |
| Water Heater | | | 100% | | |
| Clothes Dryer | | | 100% | | |
| Garage Door Opener | | | 100% | | |
| Septic Grinder | | | 100% | | |
| Other (list) | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
| | | | 100% | | |
| Total General Loads | | | | VA | kW |
| HEAT / A-C LOAD | | | | | |
| A-C / Cooling Equipment | | | 100% | | |
| Heat Pump | | | | | |
| • Compressor (if not included as A-C) | | | 100% | | |
| • Supplemental Electric Heat | | | 65% | | |
| Electric Space Heating | | | | | |
| • Less than 4 separately controlled units | | | 65% | | |
| • 4 or more separately controlled units | | | 40% | | |
| System With Continuous Nameplate Load | | | 100% | | |
| Largest Heat / A-C Load (VA) VA kW | | | | | |
| GENERAL LOADS | | | | | |
| • 1st 10 kW of General Loads 100% kW | | | 100% | <u> </u> kW | |
| • Remaining General Loads (kW) 40% kW | | | 40% | <u> </u> kW | |
| CALCULATED GENERAL LOAD (kW) kW | | | | | <u> </u> kW |
| LARGEST HEAT / A-C LOAD 100% kW kW | | | | | <u> </u> kW |
| TOTAL CALCULATED LOAD (Net General Loads + Heat/A-C Load) | | | | | <u> </u> kW |

ONSITE ESTIMATING SHEET

Contractor _____ Email _____
 Phone _____ Fax _____
 Job Name _____
 Date _____ Location _____

VOLTAGE 120/240 1ø 120/208 3ø 120/240 3ø 277/480 3ø
 TYPE Natural Gas LP Vapor (LPV)
 ELEC. SERVICE 100 Amp 200 Amp 400 Amp 600 Amp Other _____

Before installation contact local jurisdiction to confirm all requirements are met.
 Jurisdictions may vary. Siemens recommends contacting local authorities prior to installation.

LOADS: Look for heavy building loads such as refrigeration, air conditioning, pumps or UPS systems.

Use the following for sizing and determining generator kW.

| TABLE 6 | Motor Load Table (refer to Table 1) | | | | |
|---------|-------------------------------------|----|-----|-------------------|--------------------------|
| Device | HP | RA | LRA | kW Running (= HP) | Starting kW ¹ |
| | | | | | |
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¹ Starting kW for HP < 7.5 starting kW = HP x 3
 Starting kW for HP > 7.5 starting kW = HP x 2
 Starting kW for loading with no listed HP, calculate HP based on running amps in the chart on the right

- Applications**
 The QT Series does not meet the necessary requirements for the following applications:
- NEC 695 Fire Pumps
 - NEC 700 Emergency Systems
 - NFPA 20 Fire Pumps
 - NFPA 99 Healthcare
 - NFPA 110 Emergency Systems

- Reference Codes**
 Related Codes and Standards:
- NEC 225 Branch Circuits and Feeders
 - NEC 240 Overcurrent Protection
 - NEC 250 Grounding
 - NEC 445 Generators
 - NEC 700 Emergency Systems
 - NEC 701 Legally Required Standby
 - NEC 702 Optional Standby
 - NFPA 37 Installation & Use of Stationary Engines
 - NFPA 54 National Fuel Gas Code
 - NFPA 58 LP Gas Code

| To Calculate kW | |
|-----------------|--------------------------------------|
| 120 V 1ø | Amps x 120/1000 = kW |
| 240 V 1ø | Amps x 240/1000 = kW |
| 208 V 3ø | (Amps x 208 x 1.732 x PF) /1000 = kW |
| 240 V 3ø | (Amps x 240 x 1.732 x PF) /1000 = kW |
| 480 V 3ø | (Amps x 480 x 1.732 x PF) /1000 = kW |

PF is application power factor (worst case 1.0)
 Typical application power factor is 0.95.

| TABLE 7 | Non-Motor Load Table (refer to Table 2) | |
|---------|---|----|
| Device | Amps | kW |
| | | |
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UPS Information
 1.5 x kVA rating for a filtered system
 3 – 5 x kVA rating for an unfiltered system
 Siemens recommends you refer to the Siemens UPS Generator Compatibility sheet and contact the manufacturer of the UPS system to assist in your installation.

Transfer Switch Availability
SLD Type – 100, 150, 200 and 400 Amp service rated
SL Type – 100-800 3ø and 600-800 1ø Amp
SL Type – 100, 200, 400 Amp
PowerManager – 200 Amp service rated load shed switch
GenReady – 200 Amp service panel
RTS and GenReady switches only work with the R-controller.

Recommended Generator Size _____ Refer to Generator Sizing Instructions on other side of this sheet.

INSTALL NOTES:

1. Suggested concrete pad minimum thickness of 4" with 6" overhang on all sides. Composite pad included with air-cooled products.
2. Consult manual for installation recommendations.
3. Consult local authority having jurisdiction for local requirements.

SYSTEM CAPACITY – LOAD CALCULATOR

| DIRECTIONS FOR NEC 2011, ARTICLE 220, PART IV ART IV | | NEC REFERENCE |
|--|--|---------------|
| 220.80 Optional Feeder and Service Load Calculations (RESIDENTIAL) | | |
| SECTION CAN BE USED FOR DWELLING UNITS | | 220.82 (A) |
| <ul style="list-style-type: none"> • Served by a single feeder conductor (generator) • 120/240 volt or 208Y/120 volt service • Ampacity of 100 amps or greater <p>The calculated load will be the result of adding</p> <ul style="list-style-type: none"> • 220.82 (B) General Loads, and 220.82 (B) • 220.82 (C) Heating and Air-Conditioning Load 220.82 (C) <p>• Calculated neutral load determined by 220.61. (Additional 70% demand factor can be taken for cooking appliances and dryers when tables 220.54 and/or 220.55 are used)</p> | | |
| GENERAL LOADS | | 220.82 (B) |
| <p>General Lighting and General-Use Receptacles</p> <ul style="list-style-type: none"> • Calculate at 3 VA per square foot 220.82 (B) (1) • Use exterior dimensions of the home to calculate square footage – do not include open porches, garages, or unused or unfinished spaces not adaptable for future use. <ul style="list-style-type: none"> • Add 20-amp small appliance & laundry circuits @ 1500 VA each 220.82 (B) (2) <p>Calculate the following loads at 100% of nameplate rating</p> <ul style="list-style-type: none"> • Appliances fastened in place, permanently connected or located on a specific circuit 220.82 (B) (3) • Ranges, wall-mounted ovens, counter-mounted cooking units (Tables 220.54 & 220.55) 220.82 (B) (3) a • Clothes dryers not connected to the laundry branch circuit 220.82 (B) (3) b • Water heaters 220.82 (B) (3) c • Permanently connected motors not included in Heat & Air-Conditioning Load section 220.82 (B) (3) d | | |
| HEATING & AIR-CONDITIONING LOADS | | 220.82 (C) |
| <p>Include the largest of the following six selections (kVA load) in calculation</p> <p>Air Conditioning and Cooling 220.82 (C) (1)</p> <ul style="list-style-type: none"> • 100% of nameplate rating <p>Heat Pumps Without Supplemental Electric Heating 220.82 (C) (2)</p> <ul style="list-style-type: none"> • 100% of nameplate rating <p>Heat Pumps With Supplemental Electric Heating 220.82 (C) (3)</p> <ul style="list-style-type: none"> • 100% of nameplate rating of the heat pump compressor* • 65% of nameplate rating of supplemental electric heating equipment <ul style="list-style-type: none"> – If compressor & supplemental heat cannot run at the same time do not include the compressor <p>Electric Space Heating</p> <ul style="list-style-type: none"> • Less than 4 separately controlled units @ 65% of nameplate rating 220.82 (C) (4) • 4 or more separately controlled units @ 40% of nameplate rating 220.82 (C) (5) • 40% of nameplate rating if 4 or more separately controlled units <p>Electric Thermal Storage (or system where the load is expected to be continuous at nameplate rating 220.82 (C) (6)</p> <ul style="list-style-type: none"> • 100% of nameplate rating <p>• Systems of this type cannot be calculated under any other section of 220.82 (C).</p> | | |
| LOAD CALCULATIONS | | |
| <p>General Lighting Load 3 VA x ft²</p> <p>• Small Appliance & Laundry Circuits + 1500 VA per circuit</p> <p>• General Appliances & Motors (100% rated load) + <u>Total general appliances</u></p> <p>• Sum of all General Loads = Total General Load (VA)</p> | | |
| APPLY DEMAND FACTORS | | |
| <p>– First 10 kVA @ 100% = 10,000 VA</p> <p>– Remainder of General Loads @ 40% = <u>(Total VA - 10,000) x .40</u></p> <p>• HEAT / A-C LOAD @ 100% = Calculated General Load (VA)</p> <p>= <u>Largest Heat or A-C Load (VA)</u></p> <p>= TOTAL CALCULATED LOAD</p> | | |

Converting VA TO kW (Single-phase applications with 1.0 power factor only) 1 kVA = 1 kW

220.54

Worksheet — NEC 2011, 220 Part IV

| | | | | | | | | | | | | | |
|--|--|--|--|--|--|---------------------|---------------|---------|--------------------|----------------------------|--|-------|--|
| Contractor | | | | | | Email | | | | | | | |
| Phone | | | | | | Fax | | | | | | | |
| Job Name | | | | | | | | | | | | | |
| Date | | | | | | Location | | | | | | | |
| Voltage (Circle) | | | | | | 240V -1Ø | | | | | | | |
| Fuel | | | | | | NG | | LPV | | | | | |
| Elec. Service | | | | | | 100 Amp | | 200 Amp | | 400 Amp | | Other | |
| NET SQUARE FOOTAGE | | | | | | | | | | | | | |
| GENERAL LOADS | | | | | | Qty | Rating (Load) | Factor | Loads (VA) | Loads (kW) (VA ÷ 1,000) | | | |
| General Lighting and General Use Receptacles | | | | | | | 3 VA/ft² | 100% | | | | | |
| Branch Circuits (1500 VA/ft²) | | | | | | | | | | | | | |
| Small Appliance Circuits (20 Amp) | | | | | | | 1500 | 100% | | | | | |
| Laundry Circuits | | | | | | | 1500 | 100% | | | | | |
| Fixed Appliances | | | | | | Full Current Rating | | | | | | | |
| Well | | | | | | | | 100% | | | | | |
| Sump Pump | | | | | | | | 100% | | | | | |
| Freezer | | | | | | | | 100% | | | | | |
| Microwave (Not counter-top model) | | | | | | | | 100% | | | | | |
| Disposal | | | | | | | | 100% | | | | | |
| Dishwasher | | | | | | | | 100% | | | | | |
| Range (See Table 220.55 for multiple cooking appliances) | | | | | | | | 100% | | | | | |
| Wall-Mounted Oven | | | | | | | | 100% | | | | | |
| Counter-Mounted Cooking Surface | | | | | | | | 100% | | | | | |
| Water Heater | | | | | | | | 100% | | | | | |
| Clothes Dryer | | | | | | | | 100% | | | | | |
| Garage Door Opener | | | | | | | | 100% | | | | | |
| Septic Grinder | | | | | | | | 100% | | | | | |
| Other (list) | | | | | | | | 100% | | | | | |
| | | | | | | | | 100% | | | | | |
| | | | | | | | | 100% | | | | | |
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| | | | | | | | | 100% | | | | | |
| | | | | | | | | 100% | | | | | |
| Total General Loads | | | | | | | | | VA | kW | | | |
| HEAT / A-C LOAD | | | | | | | | | | | | | |
| A-C / Cooling Equipment | | | | | | | | 100% | | | | | |
| Heat Pump | | | | | | | | | | | | | |
| • Compressor (if not included as A-C) | | | | | | | | 100% | | | | | |
| • Supplemental Electric Heat | | | | | | | | 65% | | | | | |
| Electric Space Heating | | | | | | | | | | | | | |
| • Less than 4 separately controlled units | | | | | | | | 65% | | | | | |
| • 4 or more separately controlled units | | | | | | | | 40% | | | | | |
| System With Continuous Nameplate Load | | | | | | | | 100% | | | | | |
| Largest Heat / A-C Load (VA) VA kW | | | | | | | | | | | | | |
| GENERAL LOADS | | | | | | | | | | | | | |
| • 1st 10 kW of General Loads 100% kW | | | | | | | | 100% | <u> </u> kW | | | | |
| • Remaining General Loads (kW) 40% kW | | | | | | | | 40% | <u> </u> kW | | | | |
| CALCULATED GENERAL LOAD (kW) kW | | | | | | | | | | <u> </u> kW | | | |
| LARGEST HEAT / A-C LOAD 100% kW kW | | | | | | | | | | <u> </u> kW | | | |
| TOTAL CALCULATED LOAD (Net General Loads + Heat/A-C Load) | | | | | | | | | | <u> </u> kW | | | |

NOTES

A series of 25 horizontal lines provided for taking notes.

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