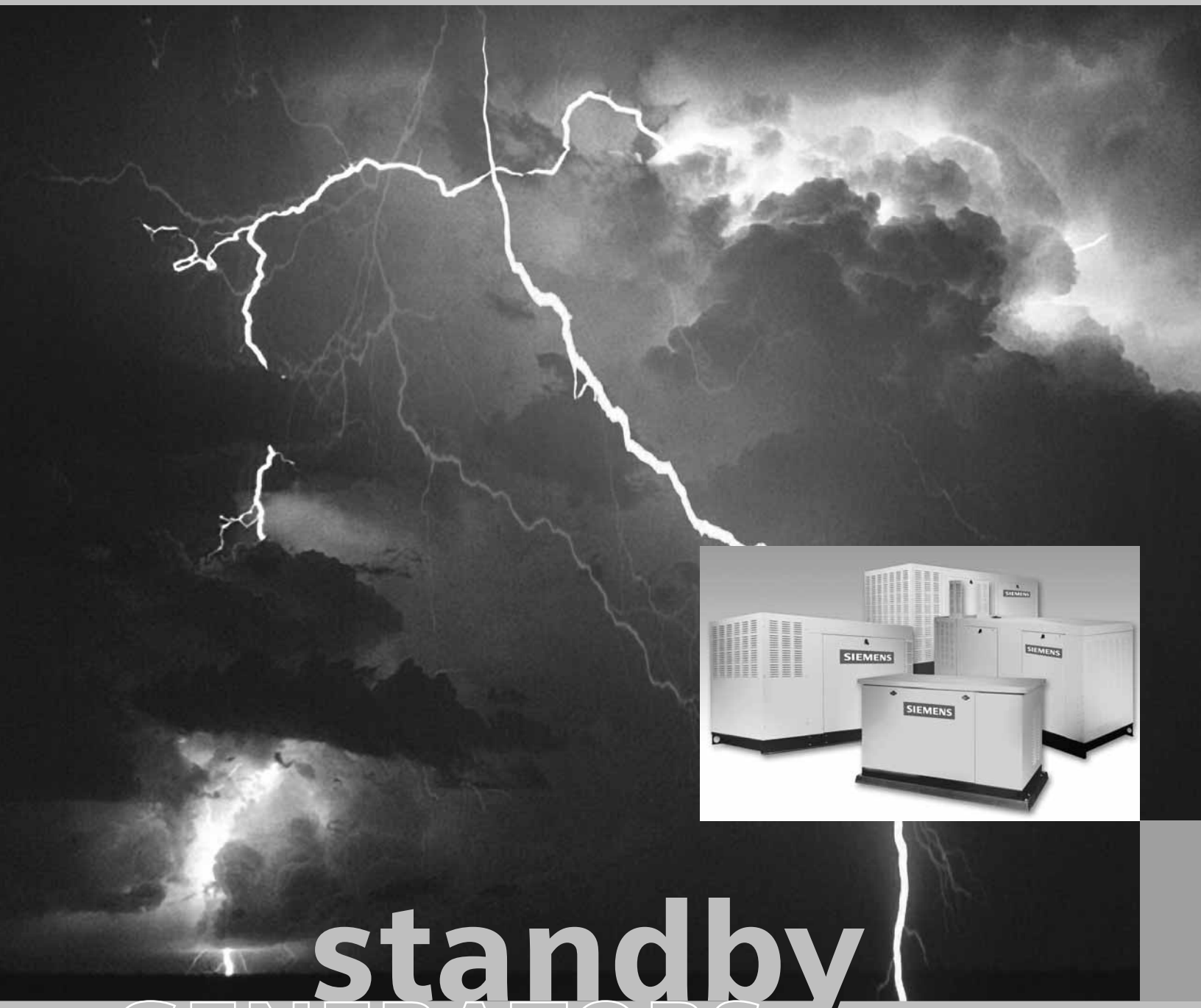
Sizing Guide



standby GENERATORS

SIEMENS

Generator Sizing Guide
General Information

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 final pages are perforated for easy removal and can be 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 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 Generac 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 and 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.

If you have a technical question regarding sizing or installation, contact Siemens Technical Service Center toll free at 800-844-0029 during normal business hours (8 a.m. to 5 p.m. CST).

Generator Sizing Guide
Table 1 – Motor Load Reference

AC and Heat Pumps

		Running Load				Starting Load			
Description	**Hp**	**Running kW**	**Amps at 240V 1ø**	**Amps at 208V 3ø**	**Amps at 480V 3ø**	**Starting kW**	**LR Amps at 240V 1ø**	**LR Amps at 208V 3ø**	**LR Amps at 480V 3ø**
1 Ton (12,000 BTU)	1	1	5	3	1	3	25	17	7
2 Ton (24,000 BTU)	2	2	10	7	3	6	50	33	14
3 Ton (36,000 BTU)	3	3	15	10	4	9	75	50	22
4 Ton (48,000 BTU)	4	4	20	13	6	12	100	67	29
5 Ton (60,000 BTU)	5	5	25	16	7	15	125	83	36
7.5 Ton (85,000 BTU)	7.5	7.5	37	24	11	17	188	125	54
10 Ton (120,000 BTU)	5 Hp (x2)	10	49	33	14	15	125	83	36
10 Ton (120,000 BTU)	10 Hp	10	49	33	14	20	250	167	72
15 Ton (180,000 BTU)	7.5 Hp (x2)	15	74	49	21	17	188	125	54
15 Ton (180,000 BTU)	15 Hp	15	74	49	21	30	375	250	108
20 Ton (240,000 BTU)	10 Hp (x2)	20	98	65	28	20	250	167	72
20 Ton (240,000 BTU)	20 Hp	20	n/a	65	28	40	500	333	144
25 Ton (300,000 BTU)	25	25	n/a	82	35	50	625	416	180
30 Ton (360,000 BTU)	15 Hp (x2)	30	n/a	98	42	30	375	250	108
30 Ton (360,000 BTU)	30 Hp	30	n/a	98	42	60	750	500	217
40 Ton (480,000 BTU)	20 Hp (x2)	40	n/a	131	57	40	500	333	144
40 Ton (480,000 BTU)	40 Hp	40	n/a	131	57	80	1000	666	289
50 Ton (480,000 BTU)	25 Hp (x2)	50	n/a	163	71	50	625	416	180
50 Ton (480,000 BTU)	50 Hp	50	n/a	163	71	100	1250	833	361

General Residential

		Running Load			Starting Load		
Description	**Hp**	**Running kW**	**Amps at 120V 1ø**	**Amps at 240V 1ø**	**Starting kW**	**LR Amps 120V 1ø**	**LR Amps 240V 1ø**
Refrigerator, Sump Pump, 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 and Septic Lift Pump	2	2	19.6	9.8	6	100	50

Generator Sizing Guide
Table 2 – Non-Motor Load Reference

General 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	5	n/a	21
Range oven	5	n/a	21
Hot water	4.5	n/a	19
Stove top per burner	1.5	n/a	6
General receptacles per 1000 ft.^{2}	1	8.3	n/a
Lighting per 1000 ft.^{2}	0.75	6.3	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

Generator Sizing Guide
Table 3 – Surge Capability

Siemens Liquid Cooled Generators Operating at <3600 RPM

	Rated Output			Surge Capability			Surge Capability		
	(Running Amps)			LR Amps at 15% Voltage Dip			LR Amps at 30% Voltage Dip		
Size (kW)	240V 1ø	208V 3ø	480V 3ø	240V 1ø	208V 3ø	480V 3ø	240V 1ø	208V 3ø	480V 3ø
25	104	87	38	71	47	26	133	89	52
70	292	243	105	275	183	106	550	366	212
80	333	278	120	275	183	106	550	366	212
100	417	347	150	371	247	142	738	491	284
130	542	451	195	546	364	209	1088	724	419

Siemens Generators Operating at 3600 RPM

	Rated Output			Surge Capability			Surge Capability		
	(Running Amps)			LR Amps at 15% Voltage Dip			LR Amps at 30% Voltage Dip		
Size (kW)	240V 1ø	208V 3ø	480V 3ø	240V 1ø	208V 3ø	480V 3ø	240V 1ø	208V 3ø	480V 3ø
7	29	24	11	23	n/a	n/a	46	n/a	n/a
10	42	35	15	31	n/a	n/a	63	n/a	n/a
13	54	45	20	38	n/a	n/a	75	n/a	n/a
16	67	56	24	46	n/a	n/a	92	n/a	n/a
20	83	69	30	63	42	24	121	80	47
25	104	87	38	71	47	26	138	92	53
35	146	121	53	104	69	40	204	136	78
45	188	156	68	146	97	57	292	194	112
60	250	208	90	179	119	69	354	236	136
70	292	243	105	246	164	95	496	330	190
100	417	347	150	333	222	128	663	441	255
150	625	520	226	558	372	215	1121	747	431

Note: All kW models listed above are based on nominal LP rating.

Generator Sizing Guide
Table 4 – Fuel Pipe Sizing

Natural Gas

kW	Pipe Size (in.) 0.75"	1"	1.25"	1.5"	2"	2.5"	3"
7	55	200	820				
10	20	85	370	800			
13	10	50	245	545			
16		40	190	425			
20		20	115	265	950		
25		10	75	180	660		
35			35	95	370	915	
45			15	60	260	650	
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 vapor (LPV)

kW	Pipe Size (in.) 0.75"	1"	1.25"	1.5"	2"	2.5"	3"
7	165	570					
10	70	255	1000				
13	45	170	690				
16	30	130	540				
20	15	80	340	745			
25		50	235	520			
35		20	125	290	1030		
45			82	195	725		
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: – Table values are maximum pipe run in feet.
– Pipe sizing is based on .5" H_2O pressure drop.
– Sizing includes a nominal number of elbows and tees.
– Please verify adequate service and meter sizing.

Generator Sizing Guide
Table 5 – LP Vapor (LPV) Tank Sizing

Vapor Withdrawal

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

Note: Tank BTU capacity and generator run times based upon maintaining a minimum tank fuel level of 20%.

LP Vapor (LPV) Withdrawal Fuel Consumption

Load (kW)	BTU / Hr	Gal / Hr
7	110,000	1.2
10	190,000	2.1
13	215,000	2.4
16	252,000	2.8
20	340,000	3.8
25	390,000	4.3
35	500,000	5.5
45	620,000	6.8
60	800,000	8.8
70	950,000	10.5
80	1,100,000	12.2
100	1,400,000	15.5
130	1,800,000	19.9
150	2,050,000	22.7

Note: Fuel consumption based on a generator 80% loaded.

Generator Sizing Guide
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. 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 .5 hertz. These units will need to have their frequency tolerance increased to a minimum of 2 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%. 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.

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
APC	Back-UPS Series	Smart-UPS Series	Symmetra Series
Liebert	PowerSure PST and PSP	PowerSure PSA and PSI	UPStation and Nfinity Series
Powerware	3000 Series	5000 Series	9000 Series

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

Generator Sizing Guide
Onsite Estimating Sheet

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

VOLTAGE ☐ 120/240 1Ø ☐ 120/208 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

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.

Table 7

Non-Motor Load Table (refer to Table 2)

Device	Amps	kW

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

QT Upgrade Required
These applications require an upgrade from the QT Series:
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 701 Legally Required Standby
NEC 702 Optional Standby
NFPA 37 Installation and Use of Stationary Engines
NFPA 54 National Fuel Gas Code
NFPA 58 LP Gas Code

To Calculate kW (refer to page 2 for shortcut)	
120 V 1Ø	Amps x 120/1000 = kW
240 V 1Ø	Amps x 240/1000 = kW
208 V 3Ø	Amps x 208 x √3 x PF/1000 = kW
240 V 3Ø	Amps x 240 x √3 x PF/1000 = kW
480 V 3Ø	Amps x 480 x √3 x PF/1000 = kW

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

Resources in Sizing Guide
Surge Capability Chart – References running amps of units and LRA
Propane Tank Sizing Chart – Measures fuel consumption of generator units
Motor Load Reference Guide – Reference guide for basic motor loads
Non-Motor Load Reference Guide – Reference guide for non-motor loads
Fuel Piping Sizing Chart – Assists in calculating adequate pipe size for natural gas and propane
UPS – Generator Compatibility

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 notify the manufacturer of the UPS system to assist in your installation.

Transfer Switch Availability
SR6ST – 100 and 200 Amp service entrance rated
RTS – 100, 200, 400 Amp
SR6SI switch only works with R100 controller.
XT 6XR – 100, 150, 200, 300, 400, 600, 800 Amp
HTS switch only works with H100 controller. Avail. in NEMA 1, NEMA 3R and NEMA 12. Refer to Siemens product catalog for the appropriate transfer switch.

INSTALL NOTES:
1. Suggested concrete pad minimum thickness of 4" with 12" overhang on all sides. Fiberglass pad included with air-cooled products.
2. Consult manual for installation recommendations.
3. Consult local authority having jurisdiction for local requirements.

Generator Sizing Guide
Onsite Estimating Sheet

Generator Sizing Instructions:
There is not a single correct sizing solution. The instructions below identify multiple methods that, when mixed with good judgment, should result in a moderately sized generator. Remember to consider load growth, seasonality, and effects of starting motors.

When motors start, they create a current surge that step loads the generator. As a result of this step loading, the generator will experience a voltage dip. After selecting a generator, reference the generator's surge capability using Table 3. Verify that the generator voltage dip is adequate for the application. Most commercial applications should be limited to 15% voltage dip and residential applications should be limited to 30% voltage dip.

Some commercial applications utilize one or multiple uninterruptible power supplies (UPS) to backup critical loads. Please read sizing guidelines for this load type.

Measurement Method
Use a clamp-on amp meter or power analyzer to measure facility load levels. The measurement should be made at peak load levels. Size the generator 25% larger than the peak measured load. Verify motor and UPS load compatibility.
Measured Amps = _____

Billing History Method
Many commercial 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 all motors loads expected to run during peak load levels into Table 6. Reference Table 1 for typical motor sizes and electrical requirements.

2) Enter all non-motor loads expected to run during peak load levels into Table 7. Reference Table 2 for typical residential loads and rules of thumb.

3) Sum the running motor load data but do not include the largest motor that is cycling. Add to this value the non-motor load data and the starting kW for the largest cycling motor.

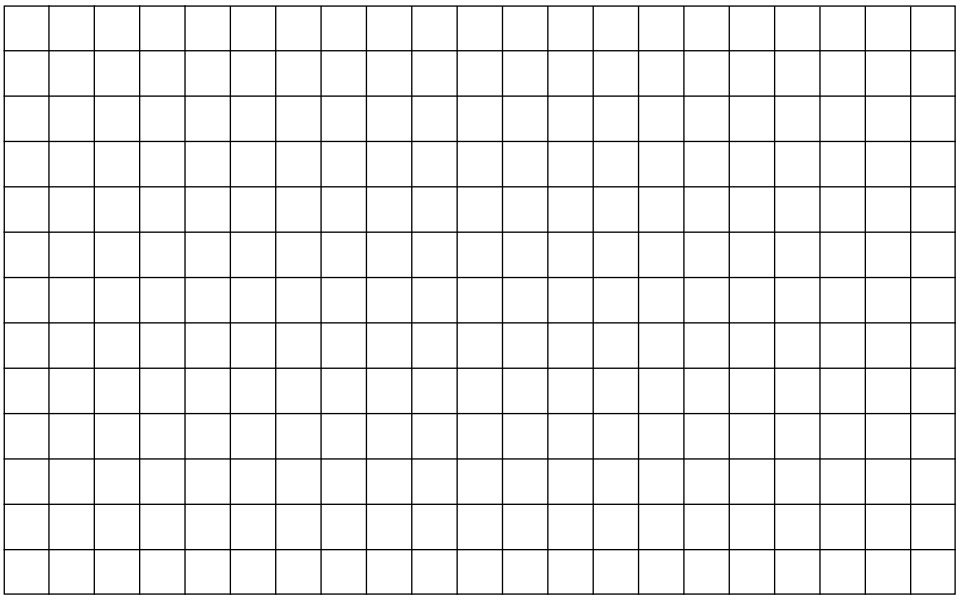
Motor running load total (minus largest cycling motor):		_____ kW	(Ref. Table 6)
Motor starting load from largest cycling motor:	+	_____ kW	(Ref. Table 6)
Non-motor load total:	+	_____ kW	(Ref. Table 7)
Total (above items):	=	_____ kW	
Select generator (Total x 1.25)		_____ kW	

4) Verify voltage dip compatibility using generator Surge Capability Table 3. Verify UPS compatibility using sizing guidelines provided.

Initial Estimate and Cross Check Methods
These methods are for initial estimates and cross checks only. Size the generator using one of the above methods.

Estimate based on 60% service size:
240 Volts, 1Ø: _____ amps x .15 = _____ kW
208 Volts, 3Ø: _____ amps x .22 = _____ kW
480 Volts, 3Ø: _____ amps x .50 = _____ kW

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



LP
LPG: 8.55 ft.^{3}/lb., 4.24 lbs./gal., 2500 btu/ft.^{3}
LPG: 36 ft.^{3} = 1 gal.

Natural Gas
1 cubic foot = 1,000 BTUs
1 therm = 100,000 BTUs
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

Air Conditioning
1 hp per 1 ton
1 ton = 12,000 btu

Rule of Thumb
For 480 volt systems kW x 1.5 = Amps
For 208 volt systems kW x 3.5 = Amps
For 240 volt single phase systems kW x 4 = Amps

Generator Sizing Guide
Onsite Estimating Sheet

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Motor starting load from largest cycling motor:	+	_____ kW	(Ref. Table 6)
Non-motor load total:	+	_____ kW	(Ref. Table 7)
Total (above items):	=	_____ kW	
Select generator (Total x 1.25)		_____ kW	

4) Verify voltage dip compatibility using generator Surge Capability Table 3. Verify UPS compatibility using sizing guidelines provided.

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LP
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LPG: 36 ft.^{3} = 1 gal.

Natural Gas
1 cubic foot = 1,000 BTUs
1 therm = 100,000 BTUs
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

Air Conditioning
1 hp per 1 ton
1 ton = 12,000 btu

Rule of Thumb
For 480 volt systems kW x 1.5 = Amps
For 208 volt systems kW x 3.5 = Amps
For 240 volt single phase systems kW x 4 = Amps

Generator Sizing Guide
Onsite Estimating Sheet

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

VOLTAGE ☐ 120/240 1Ø ☐ 120/208 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

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.

Table 7

Non-Motor Load Table (refer to Table 2)

Device	Amps	kW

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

QT Upgrade Required
These applications require an upgrade from the QT Series:
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 701 Legally Required Standby
NEC 702 Optional Standby
NFPA 37 Installation and Use of Stationary Engines
NFPA 54 National Fuel Gas Code
NFPA 58 LP Gas Code

To Calculate kW (refer to page 2 for shortcut)	
120 V 1Ø	Amps x 120/1000 = kW
240 V 1Ø	Amps x 240/1000 = kW
208 V 3Ø	Amps x 208 x √3 x PF/1000 = kW
240 V 3Ø	Amps x 240 x √3 x PF/1000 = kW
480 V 3Ø	Amps x 480 x √3 x PF/1000 = kW

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

Resources in Sizing Guide
Surge Capability Chart – References running amps of units and LRA
Propane Tank Sizing Chart – Measures fuel consumption of generator units
Motor Load Reference Guide – Reference guide for basic motor loads
Non-Motor Load Reference Guide – Reference guide for non-motor loads
Fuel Piping Sizing Chart – Assists in calculating adequate pipe size for natural gas and propane
UPS – Generator Compatibility

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 notify the manufacturer of the UPS system to assist in your installation.

Transfer Switch Availability
SR6ST – 100 and 200 Amp service entrance rated
RTS – 100, 200, 400 Amp
SR6SI switch only works with R100 controller.
XT 6XR – 100, 150, 200, 300, 400, 600, 800 Amp
HTS switch only works with H100 controller. Avail. in NEMA 1, NEMA 3R and NEMA 12. Refer to Seimens product catalog for the appropriate transfer switch.

INSTALL NOTES:
1. Suggested concrete pad minimum thickness of 4" with 12" overhang on all sides. Fiberglass pad included with air-cooled products.
2. Consult manual for installation recommendations.
3. Consult local authority having jurisdiction for local requirements.

Generator Sizing Guide
Onsite Estimating Sheet

Generator Sizing Instructions:
There is not a single correct sizing solution. The instructions below identify multiple methods that, when mixed with good judgment, should result in a moderately sized generator. Remember to consider load growth, seasonality, and effects of starting motors.

When motors start, they create a current surge that step loads the generator. As a result of this step loading, the generator will experience a voltage dip. After selecting a generator, reference the generator's surge capability using Table 3. Verify that the generator voltage dip is adequate for the application. Most commercial applications should be limited to 15% voltage dip and residential applications should be limited to 30% voltage dip.

Some commercial applications utilize one or multiple uninterruptible power supplies (UPS) to backup critical loads. Please read sizing guidelines for this load type.

Measurement Method
Use a clamp-on amp meter or power analyzer to measure facility load levels. The measurement should be made at peak load levels. Size the generator 25% larger than the peak measured load. Verify motor and UPS load compatibility.
Measured Amps = _____

Billing History Method
Many commercial 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 all motors loads expected to run during peak load levels into Table 6. Reference Table 1 for typical motor sizes and electrical requirements.

2) Enter all non-motor loads expected to run during peak load levels into Table 7. Reference Table 2 for typical residential loads and rules of thumb.

3) Sum the running motor load data but do not include the largest motor that is cycling. Add to this value the non-motor load data and the starting kW for the largest cycling motor.

Motor running load total (minus largest cycling motor):		_____ kW	(Ref. Table 6)
Motor starting load from largest cycling motor:	+	_____ kW	(Ref. Table 6)
Non-motor load total:	+	_____ kW	(Ref. Table 7)
Total (above items):	=	_____ kW	
Select generator (Total x 1.25)		_____ kW	

4) Verify voltage dip compatibility using generator Surge Capability Table 3. Verify UPS compatibility using sizing guidelines provided.

Initial Estimate and Cross Check Methods
These methods are for initial estimates and cross checks only. Size the generator using one of the above methods.

Estimate based on 60% service size:
240 Volts, 1Ø: _____ amps x .15 = _____ kW
208 Volts, 3Ø: _____ amps x .22 = _____ kW
480 Volts, 3Ø: _____ amps x .50 = _____ kW

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

LP
LPG: 8.55 ft.^{3}/lb., 4.24 lbs./gal., 2500 btu/ft.^{3}
LPG: 36 ft.^{3} = 1 gal.

Natural Gas
1 cubic foot = 1,000 BTUs
1 therm = 100,000 BTUs
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

Air Conditioning
1 hp per 1 ton
1 ton = 12,000 btu

Rule of Thumb
For 480 volt systems kW x 1.5 = Amps
For 208 volt systems kW x 3.5 = Amps
For 240 volt single phase systems kW x 4 = Amps

Notes

Siemens Energy & Automation, Inc.
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