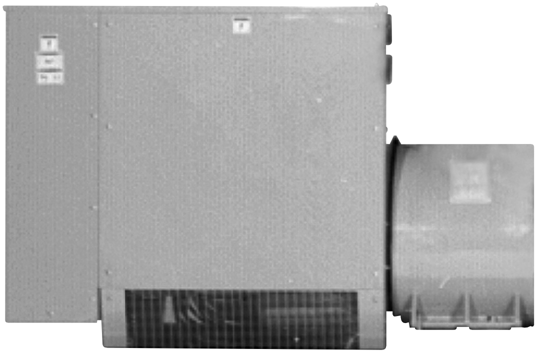
CATERPILLAR®



Shown with Optional Equipment

590 STANDBY/PRIME

Standby Power

50 Hz: 500-900 kVA   1500 rpm
60 Hz: 500-800 kW   1800 rpm

Prime Power

50 Hz: 455-810 kVA   1500 rpm
60 Hz: 455-725 kW   1800 rpm

STANDARD FEATURES

GENERAL

- Class H insulation (rotor and stator)
- Improved efficiency
- Motor starting capability in excess of 2.1 SkVA per continuous kW Prime Power (PP)
- Performance and design matched to Caterpillar engines
- Radio frequency noise suppression better than industry standards
- Twelve leads standard for differential protection
- Standards: meets or exceeds the requirements of IEC 34-1, NEMA MG 1-22, BS4999, BS5000, VDE0530, UTE5100, CSA22.2, ISO8528-3
- Superior construction and testing

MECHANICAL

- Wet, layer wound rotors individually tested to 125% of rated speed; prototypes to 150% @ 170° C for two hours; include full amortisseur bar end plates which minimize hunting and oscillations during transient loading, providing superior voltage stability
- Vibration isolation-mounted power cable connection box and low voltage wiring panel
- Power terminal strips standard in power cable connection box
- DIN rail-mounted terminal blocks
- Improved wire and terminal identification ensuring reliable connections

STATOR

- Optimum winding pitch for minimum total harmonic distortion
- Broad voltages:
  600V, 415V, 400V, 220V, & 208V @ 50 Hz
  480V, 440V, 380V, 240V, & 220V @ 60 Hz
- Windings coated with a fungus-resistant resin

EXCITATION SYSTEM

- Built-in paralleling capability with adjustable voltage droop
- Permanent Magnet excitation
- VR3F automatic voltage regulator with three-phase sensing, 2:1 Volts/Hz regulation for improved transient response

OPTIONAL FEATURES

- Self excitation
- Space heater
- Digital voltage regulator
- Digital voltage regulator with KVAR/PF control
- RFI filter — 82/499/EEC, 89/336/EEC, German VDE 875/10.84 A2 Level N, British BS800 standards, MIL-STD-461B and MIL-STD-461C (conducted, radiated, and susceptibility)
- Premium generators
  – Coastal insulation protection
  – Bearing temperature detector (RTD)
  – Stator winding temperature detectors (type J thermocouples)
  – Permanent magnet
  – Space heater

CATERPILLAR® SR4B GENERATOR

Type	Brushless, revolving field, solid-state automatic voltage regulator
Construction	Single bearing, three phase, wye connected
Insulation	Class H
Enclosure	Drip proof IP 22, guarded
Alignment	Pilot shaft
Overspeed capability	150%
Waveform	Less than 5% deviation
Paralleling capability	Standard with adjustable voltage droop
Voltage regulator	3-phase sensing with 2:1 Volts-per-Hertz response
Voltage regulation	Less than ± 1%
Voltage gain	Automatic
TIF	Less than 50
THD	Less than 5%
Number of leads	12

ROTOR CONSTRUCTION

The main rotor uses a layered winding that is "wet wound," with epoxy painted on the rotor and on each layer. This ensures bonding of all the wire layers together, bonding of the coils to the rotor laminations, and a sealed insulation system. The rotor epoxy is then oven-cured.

The exciter rotor is machine wound and receives two dips and bakes of a fungus-resisting resin.

Numerically controlled turning and grinding machines produce rotor shafts with close repeatable tolerances. Grade-8 bolts are used wherever joints are subject to induced stresses.

A complete coating of red sealer is applied to protect the rotors and shaft from moisture corrosion.

All rotor designs are prototype tested to 150 percent of rated speed at 170° C for two hours without any movement of material. Every production rotor is dynamically balanced in two planes to within 0.025 mm peak-to-peak amplitude and run at 125 percent of rated speed before assembly into the stator.

MAIN STATOR CONSTRUCTION

New square lamination stator design

Stator coil pitch, coil distribution, and skew are designed to produce optimum waveform and minimum total harmonic content.

Stator slots are insulated by slot liners and coil separators. Slot liners, coil separators, and top sticks provide a minimum of 25 mm (1 in) distance from the coil to ground. The thickness of liners, separators, and phase sheets provides superior protection between phases and ground.

Low voltage stator windings are given a 3000 volt "high pot" test (150 percent of the NEMA and IEC requirements for 480 volt generators) before the insulation is applied. The stators are then given a dip and bake treatment of polyester material, followed by a dip and bake treatment of epoxy resin. This sealed stator is then given a final 2000 volt "high pot" test.

	50 Hz 1500 rpm — Standby							
Frame	591	592	593	594	595	596	597	598
Voltage	400	400	400	400	400	400	400	400
Ratings								
130° C Rise								
kV•A	500	550	600	650	700	750	800	900
kW	400	440	480	520	560	600	640	720
Eff (%)	93.2	93.1	94.2	94.3	94.5	95.3	95.3	95.3

Reactances (per unit)								
Subtransient-Direct Axis X"d	.1940	.2029	.1369	.1618	.1820	.1278	.1293	.1659
Subtransient Quadrature Axis X"q	.1884	.1977	.1348	.1599	.1808	.1289	.1306	.1692
Transient Saturated X'd	.2686	.2787	.1989	.2268	.2562	.1863	.1892	.2372
Synchronous Direct Axis Xd	3.3738	3.6194	2.7089	3.0668	3.4954	2.6980	2.7566	3.3544
Synchronous Quadrature Axis Xq	1.6726	1.7821	1.3345	1.5059	1.7156	1.3189	1.3469	1.6441
Negative Sequence X2	.1912	.2003	.1358	.1609	.1814	.1284	.1300	.1676
Zero Sequence Xo	.0422	.0790	.0319	.0382	.0435	.0778	.0571	.1022
Time Constants (seconds)								
Open Circuit Transient Direct Axis T'do	2.1654	2.2983	2.6756	2.5268	2.7613	2.9691	2.9805	2.9485
Short Circuit Transient Direct Axis T'd	.1724	.1770	.1964	.1869	.2024	.2050	.2046	.2085
Open Circuit Subtransient Direct Axis T"do	.0105	.0107	.0102	.0108	.0108	.0105	.0104	.0109
Short Circuit Subtransient Direct Axis T"d	.0021	.0020	.0016	.0017	.0015	.0013	.0013	.0013
Open Circuit Subtransient Quad Axis T"qo	.0082	.0087	.0084	.0090	.0091	.0091	.0091	.0098
Short Circuit Subtransient Quad Axis T"q	.0002	.0002	.0001	.0001	.0001	.0001	.0001	.0001
Armature Ta	.0284	.0266	.0226	.0287	.0310	.0286	.0284	.0377

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	60 Hz 1800 rpm — Standby						
Frame	591	592	593	594	595	596	597
Voltage	480	480	480	480	480	480	480
Ratings							
130° C Rise kW kV•A	 500 625	 550 688	 600 750	 650 813	 700 875	 750 938	 800 1000
Eff (%)	93.7	93.6	94.6	94.6	94.8	95.5	95.5

Reactances (per unit)							
Subtransient-Direct Axis X"d	.2021	.2114	.1426	.1686	.1896	.1331	.1347
Subtransient Quadrature Axis X"q	.1962	.2059	.1404	.1666	.1883	.1343	.1361
Transient Saturated X'd	.2797	.2903	.2072	.2363	.2669	.1940	.1971
Synchronous Direct Axis Xd	3.5143	3.7702	2.8217	3.1946	3.6410	2.8104	2.8715
Synchronous Quadrature Axis Xq	1.7423	1.8653	1.3901	1.5687	1.7870	1.3738	1.4030
Negative Sequence X2	.1991	.2087	.1415	.1676	.1889	.1337	.1354
Zero Sequence Xo	.0439	.0823	.0332	.0398	.0454	.0810	.0595

Time Constants (seconds)							
Open Circuit Transient Direct Axis T'do	2.1654	2.2983	2.6756	2.5268	2.7613	2.9691	2.9805
Short Circuit Transient Direct Axis T'd	.1724	.1770	.1964	.1869	.2024	.2050	.2046
Open Circuit Subtransient Direct Axis T"do	.0105	.0107	.0102	.0108	.0108	.0105	.0104
Short Circuit Subtransient Direct Axis T"d	.0017	.0017	.0014	.0014	.0013	.0011	.0011
Open Circuit Subtransient Quad Axis T"qo	.0082	.0087	.0084	.0090	.0091	.0091	.0091
Short Circuit Subtransient Quad Axis T"q	.0001	.0001	.0001	.0001	.0001	.0001	.0001
Armature Ta	.0284	.0266	.0226	.0287	.0310	.0286	.0285

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	50 Hz 1500 rpm — Prime							
Frame	591	592	593	594	595	596	597	598
Voltage	400	400	400	400	400	400	400	400
Ratings								
130° C Rise								
kV•A	455	500	545	600	635	680	725	810
kW	364	400	436	480	508	544	580	648
Eff (%)	93.5	93.4	94.4	94.4	94.7	95.4	95.4	95.5

Reactances (per unit)								
Subtransient-Direct Axis X"d	.1765	.1845	.1244	.1494	.1651	.1159	.1172	.1493
Subtransient Quadrature Axis X"q	.1714	.1797	.1224	.1476	.1640	.1169	.1184	.1523
Transient Saturated X'd	.2444	.2534	.1806	.2094	.2324	.1689	.1715	.2135
Synchronous Direct Axis Xd	3.0701	3.2904	2.4605	2.8309	3.1708	2.4462	2.4982	3.0189
Synchronous Quadrature Axis Xq	1.5221	1.6201	1.2122	1.3901	1.5563	1.1958	1.2206	1.4797
Negative Sequence X2	.0621	.1821	.1234	.1485	.1645	.1164	.1178	.1508
Zero Sequence Xo	.0135	.0719	.0289	.0352	.0395	.0705	.0518	.0919
Time Constants (seconds)								
Open Circuit Transient Direct Axis T'do	2.1654	2.2983	2.6756	2.5268	2.7613	2.9691	2.9805	2.9485
Short Circuit Transient Direct Axis T'd	.1724	.1770	.1964	.1869	.2024	.2050	.2046	.2085
Open Circuit Subtransient Direct Axis T"do	.0105	.0107	.0102	.0108	.0108	.0105	.0104	.0109
Short Circuit Subtransient Direct Axis T"d	.0021	.0020	.0016	.0017	.0015	.0013	.0013	.0013
Open Circuit Subtransient Quad Axis T"qo	.0082	.0087	.0084	.0090	.0091	.0091	.0091	.0098
Short Circuit Subtransient Quad Axis T"q	.0002	.0001	.0001	.0001	.0001	.0001	.0001	.0001
Armature Ta	.0284	.0266	.0226	.0287	.0310	.0286	.0285	.0377

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	60 Hz 1800 rpm — Prime						
Frame	591	592	593	594	595	596	597
Voltage	480	480	480	480	480	480	480
Ratings							
130° C Rise							
kW	455	500	545	591	635	680	725
kV•A	569	625	681	739	794	850	906
Eff (%)	93.8	93.8	94.7	94.7	95.0	95.6	95.6

Reactances (per unit)							
Subtransient-Direct Axis X"d	.1839	.1922	.1296	.1533	.1720	.1207	.1221
Subtransient Quadrature Axis X"q	.1785	.1872	.1275	.1515	.1708	.1218	.1233
Transient Saturated X'd	.2546	.2639	.1882	.2148	.2421	.1759	.1786
Synchronous Direct Axis Xd	3.1980	3.4275	2.5631	2.9046	3.3029	2.5481	2.6023
Synchronous Quadrature Axis Xq	1.5855	1.6876	1.2627	1.4263	1.6211	1.2456	1.2715
Negative Sequence X2	.1812	.1897	.1285	.1524	.1714	.1212	.1227
Zero Sequence Xo	.0400	.0748	.0301	.0362	.0411	.0735	.0539

Time Constants (seconds)							
Open Circuit Transient Direct Axis T'do	2.1654	2.2983	2.6756	2.5268	2.7613	2.9691	2.9805
Short Circuit Transient Direct Axis T'd	.1724	.1770	.1964	.1869	.2024	.2050	.2046
Open Circuit Subtransient Direct Axis T"do	.0105	.0107	.0102	.0108	.0108	.0105	.0104
Short Circuit Subtransient Direct Axis T"d	.0017	.0017	.0014	.0014	.0013	.0011	.0011
Open Circuit Subtransient Quad Axis T"qo	.0082	.0087	.0084	.0090	.0091	.0091	.0091
Short Circuit Subtransient Quad Axis T"q	.0001	.0001	.0001	.0001	.0001	.0000	.0000
Armature Ta	.0284	.0266	.0226	.0287	.0310	.0286	.0285

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