GENERATOR DATA

(AT400240)-ENGINE (BAA126422A)-CEM

MARCH 01, 2021

For Help Desk Phone Numbers Click here

Selected Model

Engine: 3520	**Generator Frame:** 2650	**Genset Rating (kW):** 2000.0	**Line Voltage:** 10500
Fuel: Natural Gas	**Generator Arrangement:** 2760476	**Genset Rating (kVA):** 2500.0	**Phase Voltage:** 6062
Frequency: 50	**Excitation Type:** Permanent Magnet	**Pwr. Factor:** 0.8	**Rated Current:** 137.5
Duty: CONTINUOUS	**Connection:** SERIES STAR	**Application:** EPG	**Status:** Current
			Version: 39458 /39827 /38526 /6979

Spec Information

Generator Specification

Frame: 2650	**Type:** SR4BHV	**No. of Bearings:** 2
Winding Type: FORM WOUND		**Flywheel:** 21.0
Connection: SERIES STAR		**Housing:** 00
Phases: 3		**No. of Leads:** 6
Poles: 4		**Wires per Lead:** 1
Sync Speed: 1500		**Generator Pitch:** 0.667

Generator Efficiency

Per Unit Load	kW	Efficiency %
0.25	500.0	92.8
0.5	1000.0	95.6
0.75	1500.0	96.4
1.0	2000.0	96.6
1.1	2200.0	96.6

Reactances	Per Unit	Ohms
SUBTRANSIENT - DIRECT AXIS X''_d	0.2074	9.1476
SUBTRANSIENT - QUADRATURE AXIS X''_q	0.2239	9.8736
TRANSIENT - SATURATED X'_d	0.2502	11.0352
SYNCHRONOUS - DIRECT AXIS X_d	2.6296	115.9660
SYNCHRONOUS - QUADRATURE AXIS X_q	1.4344	63.2588
NEGATIVE SEQUENCE X_2	0.2162	9.5348
ZERO SEQUENCE X_0	0.0274	1.2100

Time Constants	Seconds
OPEN CIRCUIT TRANSIENT - DIRECT AXIS T'_{d0}	4.9240
SHORT CIRCUIT TRANSIENT - DIRECT AXIS T'_d	0.6500
OPEN CIRCUIT SUBSTRANSIENT - DIRECT AXIS T''_{d0}	0.0490
SHORT CIRCUIT SUBSTRANSIENT - DIRECT AXIS T''_d	0.0410
OPEN CIRCUIT SUBSTRANSIENT - QUADRATURE AXIS T''_{q0}	0.0250
SHORT CIRCUIT SUBSTRANSIENT - QUADRATURE AXIS T''_q	0.0040
EXCITER TIME CONSTANT T_e	0.2200
ARMATURE SHORT CIRCUIT T_a	0.0770

Short Circuit Ratio: 0.61	Stator Resistance = 0.2117 Ohms	Field Resistance = 1.3407 Ohms

Voltage Regulation

Voltage level adjustment: +/-	5.0%
Voltage regulation, steady state: +/-	0.5%
Voltage regulation with 3% speed change: +/-	0.5%
Waveform deviation line - line, no load: less than	2.0%
Telephone influence factor: less than	50

Generator Excitation

	No Load	Full Load, (rated) pf	
		Series	Parallel
Excitation voltage:	12.03 Volts	51.19 Volts	Volts
Excitation current	3.2 Amps	11.2 Amps	Amps

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Generator Mechanical Information

Center of Gravity

Dimension X	0.0 mm	0.0 IN.
Dimension Y	0.0 mm	0.0 IN.
Dimension Z	0.0 mm	0.0 IN.

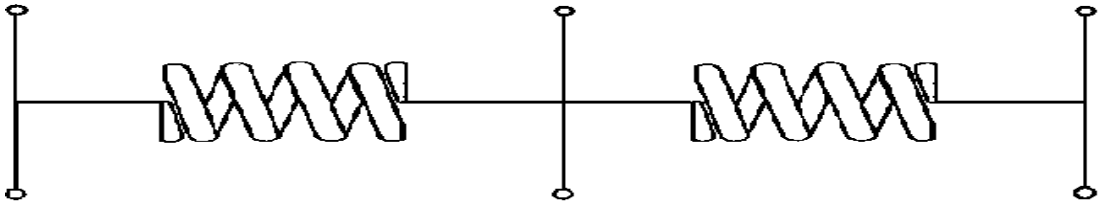
- "X" is measured from driven end of generator and parallel to rotor. Towards engine fan is positive. See General Information for details
- "Y" is measured vertically from rotor center line. Up is positive.
- "Z" is measured to left and right of rotor center line. To the right is positive.

Generator WT = 0 kg	* Rotor WT = 0 kg	* Stator WT = 0 kg
0.0 LB	0.0 LB	0.0 LB

Rotor Balance = 0.0508 mm deflection PTP

Overspeed Capacity = 125% of synchronous speed

Generator Torsional Data



J1 = Coupling and Fan | **J2 = Rotor** | **J3 = Exciter End**

TOTAL J = J1 + J2 + J3

K1 = Shaft Stiffness between J1 + J2 (Diameter 1)

K2 = Shaft Stiffness between J2 + J3 (Diameter 2)

J1	K1	Min Shaft Dia 1	J2	K2	Min Shaft Dia 2	J3
939.6 LB IN. s^2	309.8 MLB IN./rad	5.5 IN.	91.0 LB IN. s^2	46.8 MLB IN./rad	5.0 IN.	2.5 LB IN. s^2
106.16 N m s^2	35.0 MN m/rad	140.0 mm	10.28 N m s^2	5.2884 MN m/rad	127.0 mm	0.277 N m s^2

Total J

1,033.0 LB IN. s^2

116.717 N m s^2

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Generator Cooling Requirements - Temperature - Insulation Data

Cooling Requirements:		**Temperature Data: (Ambient 40 ^{0}C)**	
Heat Dissipated:	70.4 kW	**Stator Rise:**	105.0 ^{0}C
Air Flow:	0.0 m^3/min	**Rotor Rise:**	105.0 ^{0}C

Insulation Class: H

Insulation Reg. as shipped: 100.0 MΩ minimum at 40 ^{0}C

Thermal Limits of Generator

Frequency:	50 Hz
Line to Line Voltage:	10500 Volts
B BR 80/40	2133.0 kVA
F BR -105/40	2500.0 kVA
H BR - 125/40	2813.0 kVA
F PR - 130/40	2813.0 kVA

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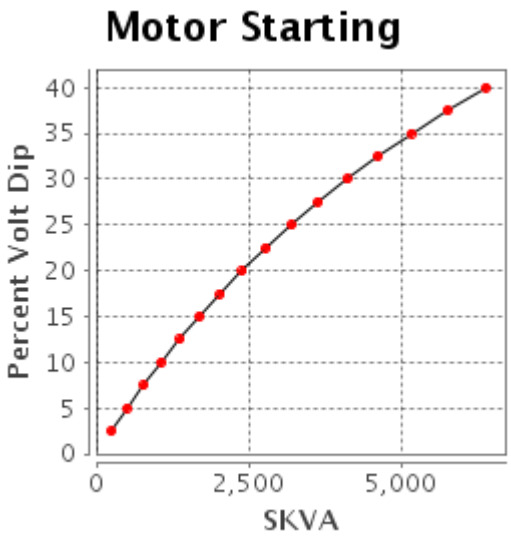
Starting Capability & Current Decrement
Motor Starting Capability (0.4 pf)

SKVA	Percent Volt Dip
246	2.5
505	5.0
778	7.5
1,066	10.0
1,371	12.5
1,693	15.0
2,036	17.5
2,399	20.0
2,786	22.5
3,199	25.0
3,640	27.5
4,113	30.0
4,620	32.5
5,167	35.0
5,758	37.5
6,397	40.0



Current Decrement Data

E Time Cycle	AMP
0.0	662
1.0	605
2.0	564
3.0	534
4.0	510
5.0	492
7.5	454
10.0	424
12.5	398
15.0	374
20.0	331
25.0	295
30.0	263
35.0	240
40.0	233
45.0	234

Instantaneous 3 Phase Fault Current: 662 Amps **Instantaneous Line - Line Fault Current:** 561 Amps

Instantaneous Line - Neutral Fault Current: 913 Amps

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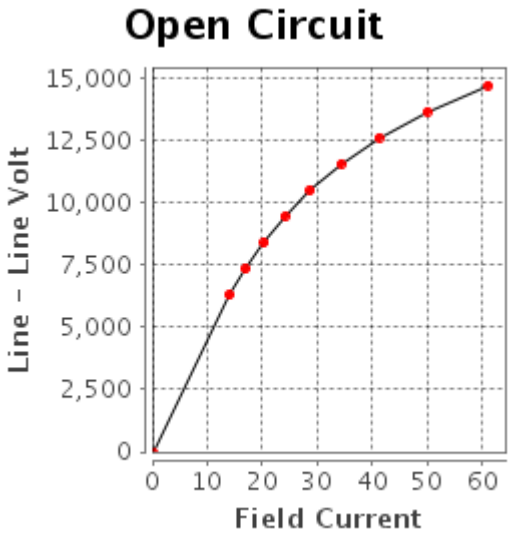
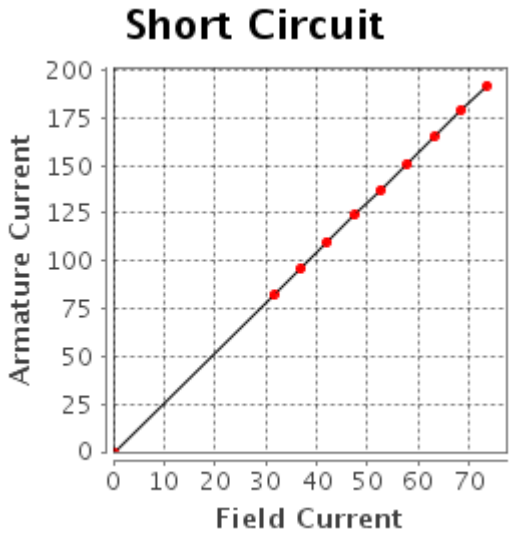
Generator Output Characteristic Curves
Open Circuit Curve

Field Current	Line - Line Volt
0.0	0
14.0	6,300
16.9	7,350
20.3	8,400
24.1	9,450
28.7	10,500
34.3	11,550
41.2	12,600
50.0	13,650
61.1	14,700



Short Circuit Curve

Field Current	Armature Current
0.0	0
31.5	82
36.8	96
42.0	110
47.3	124
52.5	137
57.8	151
63.0	165
68.3	179
73.5	192



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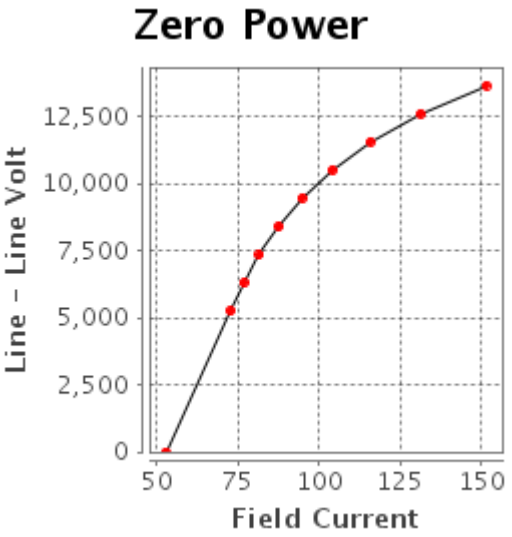
Generator Output Characteristic Curves
Zero Power Factor Curve

Field Current	Line - Line Volt
52.5	0
72.6	5,250
76.7	6,300
81.5	7,350
87.4	8,400
94.7	9,450
104.0	10,500
115.8	11,550
131.2	12,600
151.4	13,650



Air Gap Curve

Field Current	Line - Line Volt
0.0	0
10.8	6,300
12.6	7,350
14.5	8,400
16.3	9,450
18.1	10,500
19.9	11,550
21.7	12,600
23.5	13,650
25.3	14,700

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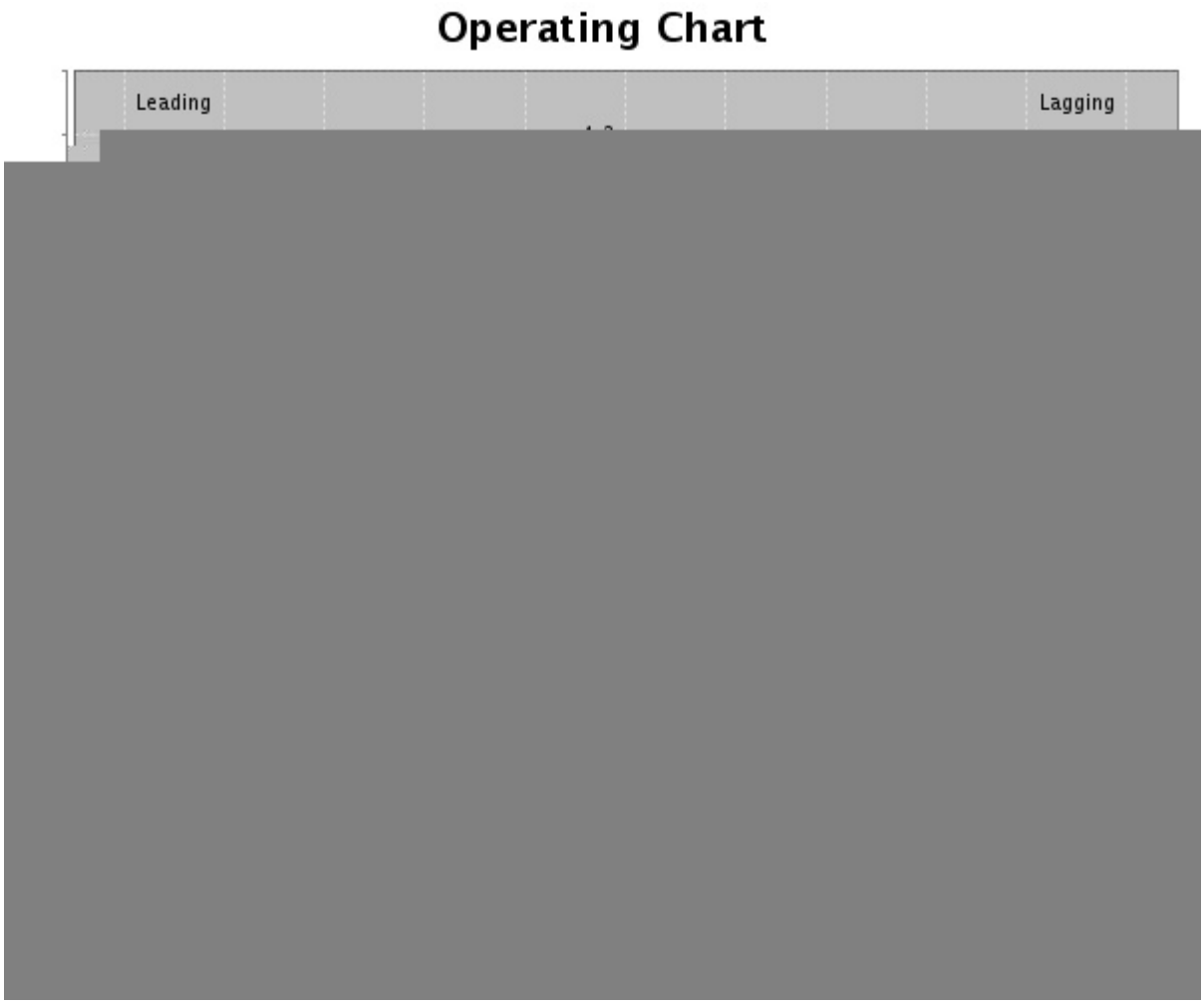
Reactive Capability Curve



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General Information

DM7802
GENERATOR GENERAL INFORMATION

I. GENERATOR MOTOR STARTING CAPABILITY CURVES
A. THE MOTOR STARTING CURVES ARE REPRESENTATIVE OF THE DATA OBTAINED BY THE FOLLOWING PROCEDURE:
1. THE CATERPILLAR GENERATOR IS DRIVEN BY A SYNCHRONOUS DRIVER.
2. VARIOUS SIZE THREE PHASE INDUCTION MOTORS (NEMA CODE F) ARE STARTED ACROSS THE LINE LEADS OF THE UNLOADED GENERATOR.
3. THE RESULTING VOLTAGE DIPS ARE RECORDED WITH AN OSCILLOSCOPE.
4. MOTOR HORSEPOWER HAS BEEN CONVERTED TO STARTING KILOVOLT AMPERES (SKVA).
5. RECORDED VOLTAGE DIPS HAVE BEEN EXPRESSED AS A OF GENERATOR RATED VOLTAGE.

II. USE OF THE MOTOR STARTING CAPABILITY CURVES.
A. CALCULATE THE SKVA REQUIRED BY THE MOTOR FOR FULL VOLTAGE STARTING ACROSS THE LINE IF THE VALUE IS NOT LISTED ON THE MOTOR DATA PLATE.
1. MOTORS CONFORMING TO NEMA STANDARDS
MULTIPLY THE MOTOR HORSEPOWER BY THE NEMA SKVA/HP FIGURE. FOR NEMA CODE F,USE 5.3 SKVA/HP; FOR NEMA CODE G, USE 6.0 SKVA/HP.
2. ALL OTHER MOTORS:
MULTIPLY THE RATED VOLTAGE BY THE LOCKED ROTOR AMPERE AND BY 0.001732. (IF THE LOCKED ROTOR AMPERES ARE NOT LISTED, MULTIPLY THE FULL LOAD (RUNNING) AMPERES BY
B. USE THE ABOVE SKVA WITH THE MOTOR STARTING TABLE.
1. ACROSS LINE STARTING:
READ ACROSS THE ROW OF "ACROSS THE LINE STARTING SKVA IF THE DESIRED VALUE OF SKVA IS NOT GIVEN, CALCULATE THE DIP BY FINDING THE PROPER SKVA INTERVAL AND INTERPOLATING AS FOLLOWS:
SKVA1 IS THE SKVA TABLE ENTRY JUST SMALLER THAN THE DESIRED SKVA, DIP1 IS THE DIP FOR SKVA2, AND SKVA2 IS THE SKVA TABLE ENTRY JUST GREATER THAN THE DESIRED SKVA. THE DIP (IN PERCENT) AT THE DESIRED SKVA IS:
DIP = DIP1 + (SKVA - SKVA1) * 2.5 /
(SKVA2 - SKVA1)
NOTE:VOLTAGE DIPS GREATER THAN 35% MAY CAUSE MAGNETIC CONTACTORS TO DROP OUT.

2. REDUCED VOLTAGE STARTING:
REFER TO THE FOLLOWING TABLE. MULTIPLY THE CALCULATE ACROSS LINE SKVA BY THE MULTIPLIER LISTED FOR THE SPECIFIC STARTING METHOD. APPLY THE RESULT TO THE STARTING TABLE AS IN II A, TO CALCULATE THE EXPECTED VOLTAGE DIP:

TYPE OF REDUCED VOLTAGE STARTING	MULTIPLY LINE SKVA BY
80% TAP	.80
65% TAP	.65
50% TAP	.50

45% TAP .45
Wye start,delta run .33

AUTOTRANSFORMER
80% TAP .68
65% TAP .46
50% TAP .29

NOTE: REDUCE VOLTAGE STARTING LOWERS THE MAXIMUM REQUIRED MOTOR skVA.
3. Part winding starting:
Most common is half-winding start, full-winding run. Multiply the full motor, accross line starting skVA by 0.6. Apply the result to the selected curve as in ii. A above. Read the expected voltage dip, for the required skVA.

III.DEFINITION:
A. GENERATOR TERMS
MODEL: Engine Sales model
ENG TYPE: DI = Direct Injection,
NA = Naturally aspirated, etc
HZ: Running frequency, hertz
RATING TYPE: PP, SB (prime power or standby)
KW: Base rating electrical kilowatts (ekW)
VOLTS: Rating terminal, line to line
GEN ARR: Cat generator arrangement part number
GEN FRAME: Generator frame size designation
CONN: Generator output connection
(star, wye, delta, ect.)
POLES: Number of pole pieces on rotor.
(eg. A 4 pole generator run at 1800)
RPM will produce 60 Hz alternating current. A 6 pole generator run at 1200 RPM will produce 60 Hz alternating current.)
B. GENERATOR TEMPERATURE RISE:
The indicated temperature rise indicated the NEMA limits for standby or prime power applications. These rises are used for calculating the losses and efficiencies and are not necessarily indicative of the actual temperature rise of a given machine.

C. CENTER OF GRAVITY
The specified center of gravity is for the generator only.
For single bearing, and two bearing close coupled generators, the cent er of gravity is measured from the generator/engine flywheel housing i nterface and from the centerline of the rotor shaft.

For two bearing, standalone generators, the center of gravity is measu red from the end of the rotor shaft and from the centerline of the rot or shaft.

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D. GENERATOR DECREMENT CURRENT CURVES

The generator decrement current curve gives the symmetrical current supplied by the generator for a three phase bolted fault at the generator terminals. Generators equipped with the series boost attachment or generators with PM excitation system will supply 300% of rated current for at least 10 seconds.

E. GENERATOR EFFICIENCY CURVES
The efficiency curve is representative of the overall generator efficiency over the normal range of the electrical load and at the specified parameters. This is not the overall engine generator set efficiency curve.
