GENERATOR DETAIL

NOVEMBER 04, 2020

(DPZ00545)-ENGINE (9LW04732)-GENERATOR (DK600445)-GENSET

For Help Desk Phone Numbers Click here

Selected Model

Engine: 3412	**Generator Frame:** 597	**Genset Rating (kW):** 640.0	**Line Voltage:** 400
Fuel: Diesel	**Generator Arrangement:** 1492443	**Genset Rating (kVA):** 800.0	**Phase Voltage:** 230
Frequency: 50	**Excitation Type:** Self Excited	**Pwr. Factor:** 0.8	**Rated Current:** 1154.7
Duty: STANDBY	**Connection:** SERIES STAR	**Application:** EPG	**Status:** Current

Version: 41205 /39310 /41309 /10735

Spec Information

Generator Specification

Frame: 597 **Type:** SR4B	**No. of Bearings:** 1
Winding Type: RANDOM WOUND	**Flywheel:** 18.0
Connection: SERIES STAR	**Housing:** 0
Phases: 3	**No. of Leads:** 12
Poles: 4	**Wires per Lead:** 4
Sync Speed: 1500	**Generator Pitch:** 0.8

Generator Efficiency

Per Unit Load	kW	Efficiency %
0.25	160.0	93.9
0.5	320.0	96.0
0.75	480.0	96.3
1.0	640.0	96.2

Reactances	Per Unit	Ohms
SUBTRANSIENT - DIRECT AXIS X''_d	0.1305	0.0261
SUBTRANSIENT - QUADRATURE AXIS X''_q	0.1335	0.0267
TRANSIENT - SATURATED X'_d	0.1955	0.0391
SYNCHRONOUS - DIRECT AXIS X_d	2.7740	0.5548
SYNCHRONOUS - QUADRATURE AXIS X_q	1.4070	0.2814
NEGATIVE SEQUENCE X_2	0.1320	0.0264
ZERO SEQUENCE X_0	0.0635	0.0127

Time Constants	Seconds
OPEN CIRCUIT TRANSIENT - DIRECT AXIS T'_{d0}	3.1170
SHORT CIRCUIT TRANSIENT - DIRECT AXIS T'_d	0.2197
OPEN CIRCUIT SUBSTRANSIENT - DIRECT AXIS T''_{d0}	0.0093
SHORT CIRCUIT SUBSTRANSIENT - DIRECT AXIS T''_d	0.0071
OPEN CIRCUIT SUBSTRANSIENT - QUADRATURE AXIS T''_{q0}	0.0085
SHORT CIRCUIT SUBSTRANSIENT - QUADRATURE AXIS T''_q	0.0067
EXCITER TIME CONSTANT T_e	0.1400
ARMATURE SHORT CIRCUIT T_a	0.0305

Short Circuit Ratio: 0.5	Stator Resistance = 0.0061 Ohms	Field Resistance = 1.855 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	5.0%
Telephone influence factor: less than	50

Generator Excitation

	No Load	Full Load, (rated) pf	
		Series	Parallel
Excitation voltage:	9.65 Volts	44.86 Volts	Volts
Excitation current	2.14 Amps	8.18 Amps	Amps

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Generator Mechanical Information

Center of Gravity

Dimension X	-767.8 mm	-30.2 IN.
Dimension Y	0.0 mm	0.0 IN.
Dimension Z	0.0 mm	0.0 IN.

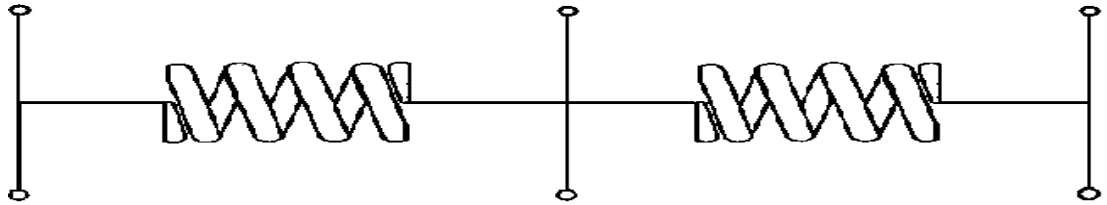
- "X" is measured from driven end of generator and parallel to rotor. Towards engine fan is positive. See General Information for details
- "Y" is measured vertically from rotor center line. Up is positive.
- "Z" is measured to left and right of rotor center line. To the right is positive.

Generator WT = 2120 kg * Rotor WT = 768 kg * Stator WT = 1351 kg
4,674 LB 1,693 LB 2,978 LB

Rotor Balance = 0.0508 mm deflection PTP

Overspeed Capacity = 180% 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
11.8 LB IN. s^2	117.7 MLB IN./rad	5.0 IN.	101.2 LB IN. s^2	20.4 MLB IN./rad	3.3 IN.	1.5 LB IN. s^2
1.336 N m s^2	13.3 MN m/rad	127.0 mm	11.437 N m s^2	2.3 MN m/rad	83.8 mm	0.171 N m s^2

Total J

114.6 LB IN. s^2

12.944 N m s^2

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Generator Cooling Requirements - Temperature - Insulation Data

Cooling Requirements:		Temperature Data: (Ambient 40 ^{0}C)	
Heat Dissipated:	25.3 kW	**Stator Rise:**	130.0 ^{0}C
Air Flow:	93.6 m^3/min	**Rotor Rise:**	130.0 ^{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:	400 Volts
B BR 80/40	602.0 kVA
F BR -105/40	725.0 kVA
H BR - 125/40	800.0 kVA
F PR - 130/40	800.0 kVA

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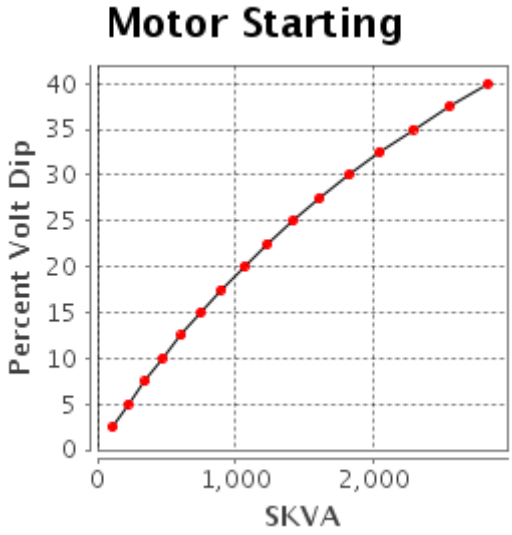
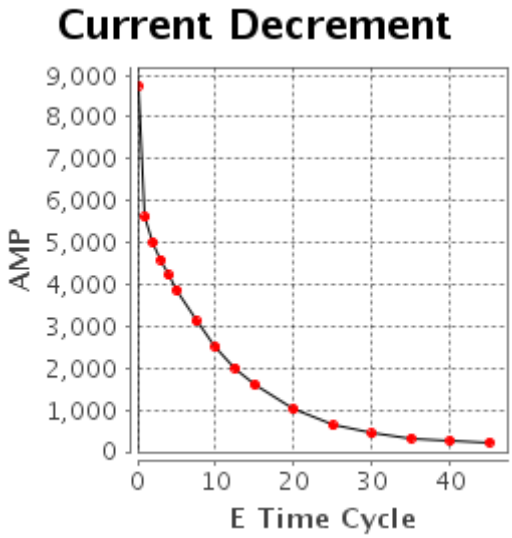
Starting Capability & Current Decrement
Motor Starting Capability (0.4 pf)

SKVA	Percent Volt Dip
109	2.5
223	5.0
343	7.5
470	10.0
605	12.5
747	15.0
898	17.5
1,059	20.0
1,229	22.5
1,411	25.0
1,606	27.5
1,815	30.0
2,039	32.5
2,280	35.0
2,540	37.5
2,823	40.0



Current Decrement Data

E Time Cycle	AMP
0.0	8,759
1.0	5,609
2.0	5,006
3.0	4,591
4.0	4,216
5.0	3,869
7.5	3,117
10.0	2,503
12.5	2,006
15.0	1,602
20.0	1,009
25.0	631
30.0	432
35.0	324
40.0	264
45.0	229



Instantaneous 3 Phase Fault Current: 8759 Amps **Instantaneous Line - Line Fault Current:** 7541 Amps

Instantaneous Line - Neutral Fault Current: 10520 Amps

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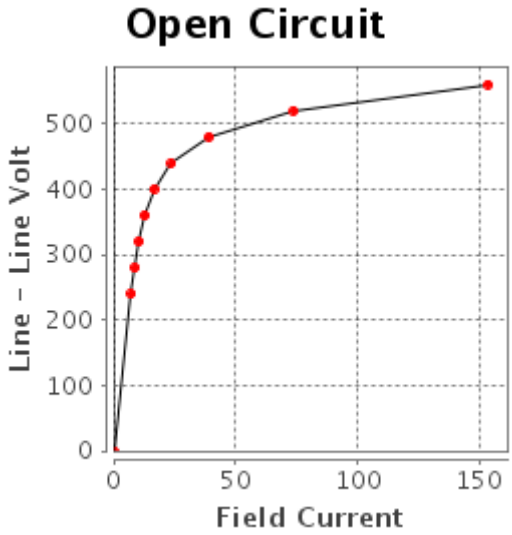
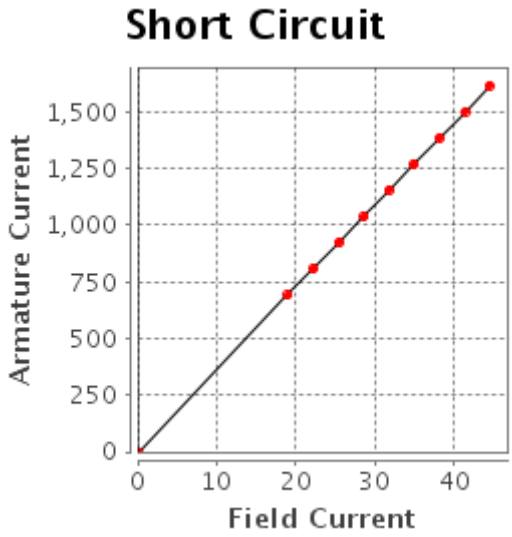
Generator Output Characteristic Curves
Open Circuit Curve

Field Current	Line - Line Volt
0.0	0
7.3	240
8.7	280
10.4	320
12.7	360
16.5	400
23.8	440
39.2	480
73.9	520
153.5	560



Short Circuit Curve

Field Current	Armature Current
0.0	0
19.0	693
22.2	808
25.4	924
28.6	1,039
31.7	1,155
34.9	1,270
38.1	1,386
41.3	1,501
44.4	1,617



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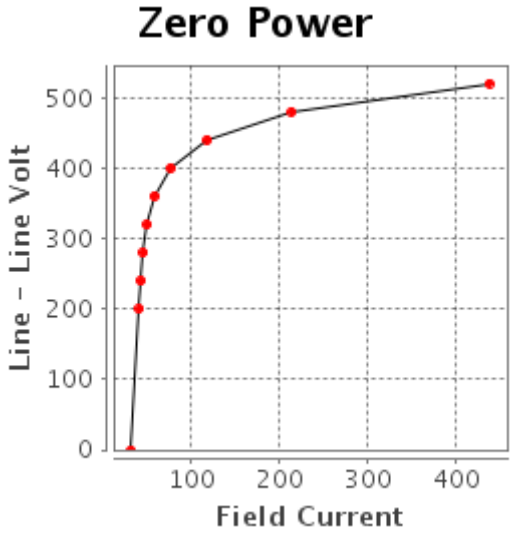
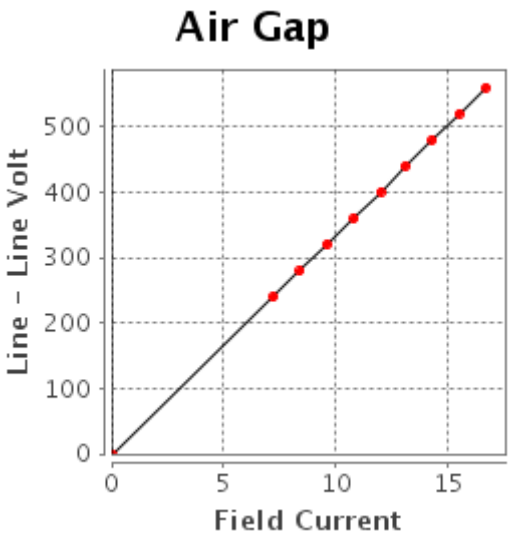
Generator Output Characteristic Curves
Zero Power Factor Curve

Field Current	Line - Line Volt
31.7	0
40.5	200
42.3	240
44.9	280
49.2	320
57.7	360
76.2	400
117.8	440
213.7	480
437.0	520



Air Gap Curve

Field Current	Line - Line Volt
0.0	0
7.2	240
8.4	280
9.6	320
10.8	360
12.0	400
13.1	440
14.3	480
15.5	520
16.7	560



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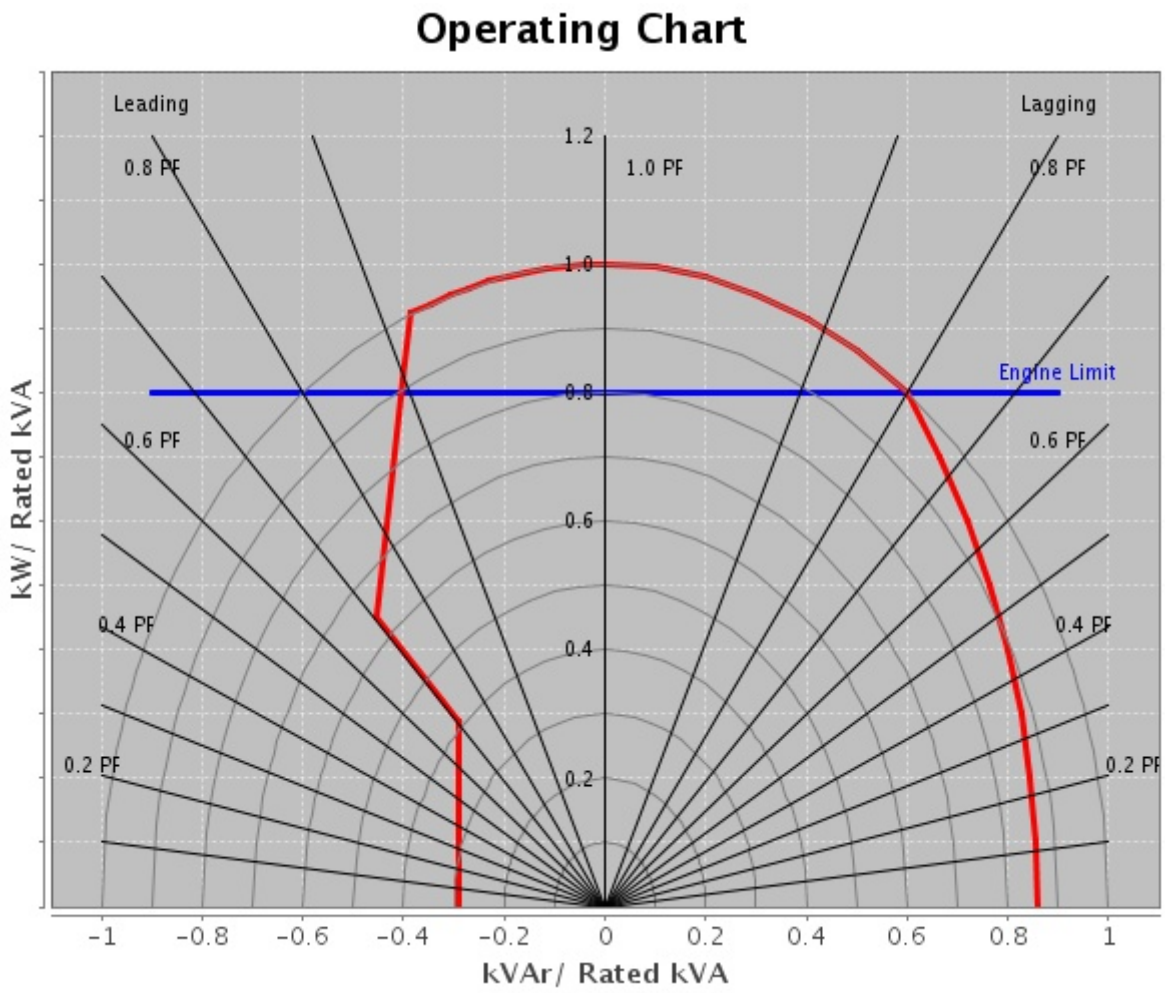
Reactive Capability Curve



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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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red from the end of the rotor shaft and from the centerline of the rot
or shaft.

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.

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