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MILITARY STANDARD

DEFINITIONS OF TACTICAL, PRIME, PRECISE, AND UTILITY TERMINOLOGIES FOR CLASSIFICATION OF THE DOD MOBILE ELECTRIC POWER ENGINE GENERATOR SET FAMILY

FSC 6115

DEPARTMENT OF DEFENSE
Washington, D.C. 20301

DEFINITIONS OF TACTICAL, PRIME, PRECISE, AND UTILITY TERMINOLOGIES FOR CLASSIFICATION OF DOD MOBILE ELECTRIC POWER ENGINE GENERATOR SET FAMILY

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1. This Military Standard is mandatory for use by all Departments and Agencies of the Department of Defense.

2. Recommended corrections, additions, or deletions should be addressed to: Naval Facilities Engineering Command, US Naval Construction Battalion Center, ATTN: Code 156, Port Hueneme, California 93043.

FOREWORD

This Military Standard has been prepared for use by all Departments and Agencies of the Department of Defense. Its purpose is to define the criteria used in the classification of engine generator sets of the DOD Standard Family into Tactical and Prime, and into the subclassifications of Precise and Utility. It provides users an overview of the operating characteristics of the engine generator sets comprising the DOD Standard Family and serves as a ready reference and guide for the military services in the preparation of engine generator set specifications.

The parametric values listed in this Standard (Table II and III) represent the maximum or minimum values (as applicable) acceptable to all of the military services (Army, Navy, Air Force, and Marine Corps).

CONTENTS

			Page
Paragraph	1.	SCOPE	1
	2.	REFERENCE DOCUMENTS	1
	3.	DEFINITIONS	1
	4.	GENERAL REQUIREMENTS	3
	5.	DETAIL REQUIREMENTS	3

TABLES

Table I	Maximum dry weights for tactical generator sets	5
II	Electrical performance characteristic parameters - alternating current generator sets	6
III	Electrical performance characteristic parameters (maximum or minimum limits, as applicable), dc, Utility	8
IV	Standard voltage connections for 60 Hz, 50/60 Hz, and 400 Hz engine generator sets	9

1. SCOPE

1.1 This standard provides definitions for the classification of engine generator sets comprising the DOD Standard Family by Type, according to their application, weight, mobility, reliability, and life; by Class, according to their electrical performance characteristics; and by Mode, according to the frequency of the power generated. The table of electrical performance characteristics is annotated to reference the test method within MIL-STD-705 used to determine the value of the parameter listed. Separate tables are provided giving the voltage connections and reconnections available in each of the generator sets of the DOD Standard Family and the derating of the sets with temperature and altitude.

1.2 The DOD Mobile Electric Power Engine Generator Set Family covers a range in output capacity from 0.5 kilowatt (kw) through 750 kw and includes electrical power outputs at 60 Hertz (Hz), 50/60 Hz, 400 Hz, alternating current (ac), and direct current (dc). Detailed physical and electrical characteristics for each member of the DOD Standard Family are contained in MIL-STD-633.

2. REFERENCE DOCUMENTS

2.1 The latest issues of the following documents are applicable to the extent specified herein.

STANDARDS

MILITARY

MIL-STD-633 - Mobile Electric Power Engine Generator Set Family Characteristic Data Sheets.

MIL-STD-705 - Generator Sets, Engine Driven, Methods of Tests and Instructions

(Copies of military standards required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

OTHER

US Standard Atmosphere - 1962 (Prepared by Environmental Science Service, NASA, and US Air Force).

(Available from the Superintendent of Documents, US Government Printing Office, Washington, D. C. 20402.)

3. DEFINITIONS

3.1 Classification of engine generator sets. Engine generator sets are classified by Type, Class, and Mode as follows:

3.1.1 Type.

3.1.1.1 Type I - Tactical. Generator sets designed for high mobility in direct support of military forces where output of generator sets is normally, but not exclusively, used at generated voltage without necessity

of transformation or extensive distribution systems. Life characteristics are considered secondary to light weight, small size, and a high degree of mobility. Maximum weights for Tactical generator sets are listed in table I.

3.1.1.2 Type II - Prime. Generator sets designed for long term use in semi-fixed locations for extended periods of time, with size, weight, and mobility considered secondary to long life and reliability. Generator output is normally at high voltage for distribution purposes and requires transformation to utilization voltages at the load centers. Prime power generator sets may be expected to exceed the maximum weights shown in table I for Tactical sets.

3.1.2 Class.

3.1.2.1 Class I - Precise. Generator sets designed to provide close control of voltage and frequency performance for critical applications. See table I.

3.1.2.2 Class 2 - Utility. Generator sets designed to provide power for general purpose applications. There are three grades of ac Utility power ranging from that which is equivalent to and compatible with commercial power distribution systems (Class 2A) to that needed for utilitarian purposes (Class 2C) where requirements for voltage and frequency control are minimal. See table II for ac parametric values and table III for dc values.

3.1.3 Mode.

3.1.3.1 Mode I. Generator sets capable of operating at either 50 or 60 Hz.

3.1.3.2 Mode II. Generator sets operating at 400 Hz.

3.1.3.3 Mode III. Generator sets operating only at 60 Hz.

3.1.3.4 Mode IV. Generator sets providing dc output.

3.2 Standard voltage connections for engine generator sets. The standard voltage connections for generator sets are listed in table IV. Where more than one standard voltage connection is shown for a DOD standard kw rating, suitable means are provided to enable reconnecting the generator windings to give all specified output voltages at the load terminals of the generator sets.

3.3 Altitudes. Altitude, shown in feet above mean sea level (msl), is defined as atmospheric pressure corresponding to the specified altitude as given in the US Standard Atmosphere, 1962:

Altitude	Atmospheric Pressure inches Hg	mm Hg (metric)
0 (msl)	29.92	760.0
1500 feet	28.33	719.7
5000 feet	24.90	632.4
8000 feet	22.23	564.6

4. GENERAL REQUIREMENTS

4.1 Environmental conditions. The electrical performance characteristic parameters listed in tables II and III are applicable throughout the range of temperatures and altitudes as follows:

DOD Standard kw rating	Capacity at Environmental Conditions				
	msl, -25°F to +125°F (-31.7°C to +51.7°C)	msl, -65°F to +125°F (-53.9°C to +51.7°C)	1500 ft 90°F (32.2°C)	5000 ft 107°F (41.7°C)	8000 ft 95°F (35°C)
0.5, 1.5 kw reciprocating engine driven	Rated kw	-	Rated kw	Rated kw	90% rated kw
3 thru 200 kw reciprocating engine driven & gas turbine engine driven (GTED)	Rated kw	Rated kw	Rated kw	Rated kw	90% rated kw
Above 200 thru 750 kw reciprocating engine driven	Rated kw	-	Rated kw	80% rated kw	75% rated kw
Above 200 thru 750 kw GTED	Rated kw -25°F to +60°F (-31.7°C to +15.5°C) 70% rated kw to 125°F (51.7°C)	-	90% rated kw	75% rated kw	70% rated kw

4.2 Power rating. Engine generator sets with dual frequency capability (50/60 Hz) are permitted to have kw ratings at 50 Hz which are 5/6 of the 60 Hz kw rating. The ac generator sets 3 kw and larger are rated at 0.8 power factor (pf) lagging. Sets below 3 kw are rated at unity (1.0) power factor.

5. DETAIL REQUIREMENTS

Not applicable.

Custodians:
Army - ME
Navy - YD
AF - 11

Review Activities:
Army - CE
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AF - 13, 80

User Activities:
Army - EL, MU
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Preparing Activity:
Navy - YD

Project No. 6115-0261

Table I. Maximum dry weights for tactical generator sets

kw rating	Maximum Dry Weight (pounds)
.5	100
1.5	150
3.0	300
5.0	1,100
10	1,400
15	3,000
30	3,500
60	5,000
100	7,000
150	9,000
200	10,500
500/750	32,000

NOTE: 1. Maximum dry weight is the weight of the generator set less fuel, coolant, lubricant, electrolyte, and optional equipment. Optional equipment weights are shown in MIL-STD-633.

Table II. Electrical performance characteristics parameters - alternating current generator sets

Characteristic parameter	Precise Class 1	Utility Class 2A	Utility Class 2B	Utility Class 2C	Test Method MIL-STD-705
a. Voltage characteristics					
1. Regulation (%)	1	2	3	4	608.1
2. Steady-state-stability (variation) (bandwidth%)					
(a) Short term (30 seconds)	1	1	2	2	608.1
(b) Long term (4 hours)	2	2	4	4	608.2
3. Transient performance					
(a) Application of rated load					
(1) Dip	15	20	20	30	619.2
(2) Recovery (seconds)	0.5	3	3	3	619.2
(b) Rejection of rated load					
(1) Rise (%)	15	30	30	30	619.2
(2) Recovery (seconds)	0.5	3	3	3	619.2
(c) Application of simulated motor load (twice rated current)					
(1) Dip (%)	30	N/A	40	N/A	619.1
(2) Recovery to 95% of rated voltage (seconds) (Note 1)	0.7	N/A	5	N/A	619.1
4. Waveform (Note 2)					
(a) Maximum deviation factor (%)	5	5	5	6	601.1
(b) Maximum individual harmonic (%)	2	2	2	3	601.4
5. Voltage unbalance with unbalanced load (%) (Note 3)	5	5	5	5	620.2
6. Phase balance voltage (%)	1	1	1	1	508.1
7. Voltage adjustment range (%) (min) (Note 4)	-5 +17	±10	-5 +17 (Note 5)	-5 +5	511.1
b. Frequency characteristics					
1. Regulation (%)	0-3 Adj'able	0-5 Adj'able	3	3	608.1
2. Steady-state-stability (variation) (bandwidth %)					
(a) Short term (30 seconds)	0.5	0.5	2	4	608.1
(b) Long term (4 hours)	1	1	3	4	608.2

Table II. (Continued)

Characteristic parameter	Precise Class 1	Utility Class 2A	Utility Class 2B	Utility Class 2C	Test Method MIL-STD-705
3. Transient performance					
(a) Application of rated load					
(1) Undershoot (%)	4	4	4	4	608.1
(2) Recovery (seconds)	2	4	4	4	608.1
(b) Rejection of rated load					
(1) Overshoot (%)	4	4	4	5	608.1
(2) Recovery (seconds)	2	4	4	6	608.1
4. Frequency adjustment range (%) (min) (Where required)	±3	±4	±3	±3	511.2

NOTES:

1. The voltage shall stabilize at or above this voltage (not applicable to all sets rated 5 kw or smaller, or 500 kw and larger).
2. Specified values are for three phase output; for single phase, add additional 1%.
3. With generator set connected for three phase output and supplying a single line-to-line, unity power factor, load of 25% of rated current and with no other load on the set. (Not applicable for single phase connections of sets.)
4. For Mode II sets, upper voltage adjustment is +10% of rated voltage. For Mode I sets operating at 50 Hz, upper voltage adjustment may be limited to the nominal voltages shown in table IV, Note 4.
5. Values shown are for sets rated at 15 kw and above.

Table III. Electrical performance characteristic parameters (maximum or minimum limits, as applicable), dc, Utility

Characteristic parameters	Value	Test method MIL-STD-705
Voltage characteristics		
a. Regulation (%)	4	608.1
b. Steady-state-stability (variation) (bandwidth %)	2	608.1
c. Transient performance		
1. Application of rated load		
(a) Dip (%)	30	619.2
(b) Recovery (seconds)	2	619.2
2. Rejection of rated load		
(a) Rise (%)	40	619.2
(b) Recovery (seconds)	2	619.2
d. Ripple voltage (%)	5.5	650.1
e. Voltage adjusting range	(Note 1)	511.1

NOTE: 1. The voltage adjustment range is 23 to 35 volts at normal ambient temperatures and ±5 percent of nominal (28 volts) at extreme temperatures.

Table IV. Standard voltage connections for 60 Hz, 50/60 Hz, and 400 Hz engine generator sets

	Voltage Connections (ac)						
	Single phase			Three phase			
DOD Standard kw rating	120 volt, 2 wire	240 volt, 2 wire	120/240 volt, 3 wire	120/208 volt, 4 wire	240/416 volt, 4 wire	2400/4160 volt, 4 wire	2400 volt, 3 wire
0.5	X						
1.5	X	X					
3, 5	X	X	X	X			
10	X		X	X			
15, 30, 60, 100, 150, 200				X	(Note 2) (Note 4) X		
500, 750						(Note 4) X	X

NOTES: 1. An "X" in voltage connection column(s) opposite a standard kw rating group indicates provision for connection and operation at all voltage connections so identified.

2. Voltage adjustment range provides for continuous operation at 277/480 volts

3. The DOD Standard Family also includes 28 volt, dc engine generator sets rated 0.5 kw, 1.5 kw, and 3 kw.

4. Engine generator sets rated for 50/60 Hz have provision for operation at 50 Hz with 3 phase voltages as follows:

220/380 volts for the 240/416 connection for sets rated 15-200 kw and
2200/3800 volts for the 2400/4160 volt connection for sets above 200 thru 750 kw

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