

PROJECT NO. 6130-0139

FED. SUP CLASS
6125 & 6130

USER SYMBOLS:
NAVY - MC, CG
ARMY - EL
NAVY - AV, EL
USAF - B2

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12 272

PHASE ROTATION:
A - C - GROUND
27.5 V DC INPUT
3Ø 115 VOLTS LINE-
LINE AC OUTPUT
1Ø 115 VOLTS AC OUTPUT

THREE PHASE CONNECTION
(FOR MS16057-1 AND -2 INVERTERS ONLY)

SINGLE PHASE CONNECTION
(FOR MS16057-1, -2 OR -3 INVERTERS)

RECEPTACLE TO FIT
PLUG MS3106-MS-75
OR MS3108-MS-75

RECEPTACLE TO FIT PLUG
MS3106R145-75 OR
MS3108R145-75

MS16057-1

MS16057-2 & -3

Ⓕ REVISED

PART NO.	DESCRIPTION	USE
MS16057-1	3/1 PHASE ROTARY BRUSH-TYPE INVERTER	FOR RETROFIT ONLY
MS16057-2	3/1 PHASE STATIC INVERTER	FOR NEW APPLICATIONS AND RETROFIT
MS16057-3	1 PHASE STATIC INVERTER	FOR NEW APPLICATIONS AND SINGLE PHASE RETROFIT

P.A.
NAVY-AS
Other Cus
USAF - B2
ARMY-ME
Procurement Specification
MIL-I-7032

TITLE
INVERTER, 100/60 VA, 3/1 PHASE &
100VA, 1 PHASE, CLASS B,
MULTIPURPOSE
SUPERSEDES
E-1616 & AN3499

MILITARY STANDARD
MS16057
SHEET 1 OF 3

APPROVED 17 FEB. 61 REVISED (E) 7 JUL 72 (F) 30 NOV 73

USER SYMBOLS:
NAVY - MC
ARMY - AV
EL

REVIEWER SYMBOLS:
ARMY - EL
NAVY -
USAF - 82

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PARAMETERS AND CONDITIONS	NOMINAL VALUES				
	MS16057-1		MS16057-2		MS16057-3
	3Ø	1Ø	3Ø	1Ø	1Ø
INPUT: VOLTS, DC	27.5	27.5	27.5	27.5	27.5
OUTPUT: VOLTS, AC	115	115	115	115	115
FREQUENCY, HZ	400	400	400	400	400
VA TO 50,000 FT ALTITUDE	100	60	100	60	100
VA TO 65,000 FT ALTITUDE	NO OPERATION		100	60	100
PF MIN LAG	.95	.95	.75	.75	.75
PF MIN LEAD	.95	.95	.95	.95	.95
MIN EFFICIENCY, PERCENT AT FULL LOAD, UNITY PF, 27.5 VDC INPUT, SEA LEVEL, AND 25° ± 15°C AMBIENT	38	25	60	50	60
MAX WEIGHT, POUNDS	7.6		7.6		5.0

MS16057-1 INVERTER		
OPERATING CONDITIONS FOR ANY COMBINATION OF CONDITIONS LISTED WITHIN EACH SECTION, THE OUTPUT VOLTAGE AND FREQUENCY SHALL REMAIN WITHIN THE INDICATED LIMITS	OUTPUT LIMITS LIMITS APPLY TO EACH PHASE FOR THREE PHASE OPERATION UNLESS OTHERWISE SPECIFIED	
	RMS PHASE VOLTAGE	FREQUENCY, HZ
1. INPUT VOLTAGE VARIED BETWEEN 26 AND 29 VOLTS	LOW 105 HIGH 125	LOW 380 HIGH 420
2. LOAD VARIED FROM ZERO TO FULL LOAD		
3. AMBIENT TEMPERATURE VARIED BETWEEN -55°C AND 85°C		
4. UNIT MOUNTED IN ANY POSITION		
5. TEMPERATURE-ALTITUDE VARIED WITHIN THE RANGE ESTABLISHED BY CURVE 1 OF MS33543 EXCEPT NO OPERATION ABOVE 50,000 FT, ABOVE 85°C, OR BELOW -55°C.	LOW 100(a) HIGH 130(a)	LOW 380(a) HIGH 420(a)
6. LOAD POWER FACTOR VARIED FROM .95 LAG TO .95 LEAD		
7. UNIT MOUNTED IN ANY POSITION		
8. INPUT VOLTAGE VARIED FROM 19 TO 26 VOLTS FOR 3Ø OPERATION AND 17 TO 26 VOLTS FOR 1Ø OPERATION	LOW 100(a) HIGH 125(a)	LOW 360(a) HIGH 420(a)
9. INPUT VOLTAGE VARIED BETWEEN 26 AND 29 VOLTS	LOW 100 (3Ø) LOW 95 (1Ø) HIGH 125	LOW 380 HIGH 420
10. OUTPUT LOAD CURRENT VARIED FROM RATED FULL LOAD CURRENT TO 200% RATED FULL LOAD CURRENT FOR 5 SECONDS		

(a) FOR THESE CONDITIONS, THE FREQUENCY/VOLTAGE RATIO SHALL REMAIN BETWEEN 3.0
AND 4.0.

P.A. NAVY-AS	TITLE INVERTER, 100/60VA, 3/1 PHASE & 100VA, 1 PHASE, CLASS B, MULTIPURPOSE	MILITARY STANDARD
Other Cust USA-MN ARMY-ME		MS16057
Procurement Specification MIL-I-70132	SUPERSEDES E-1616 & AN3499	SHEET 2 OF 5

REVIEWER SYMBOLS: USER SYMBOLS:
 ARMY - RL NAVY - MC, OS
 NAVY - AV, EL
 USAF - 82

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 6125 & 6130

MS16057-2 INVERTER		
OPERATING CONDITIONS FOR ANY COMBINATION OF CONDITIONS LISTED WITHIN EACH SECTION, THE OUTPUT VOLTAGE AND FREQUENCY SHALL REMAIN WITHIN THE INDICATED LIMITS	OUTPUT LIMITS LIMITS APPLY TO EACH PHASE FOR THREE PHASE OPERATION	
	RMS PHASE VOLTAGE	FREQUENCY HZ
1. INPUT VOLTAGE VARIED BETWEEN 26 AND 29 VOLTS	LOW 110	LOW 390
2. LOAD VARIED FROM ZERO TO FULL LOAD	HIGH 120	HIGH 410
3. TEMPERATURE-ALTITUDE VARIED WITHIN THE RANGE ESTABLISHED BY CURVE 1 OF MS33543 EXCEPT NO OPERATION ABOVE 65,000 FT, ABOVE 85°C OR BELOW -55°C.		
4. UNIT MOUNTED IN ANY POSITION		
5. LOAD PF VARIED FROM .75 LAG TO .95 LEAD	LOW 110	LOW 390
6. INPUT VOLTAGE VARIED BETWEEN 19 AND 26 VOLTS FOR 3Ø OPERATION	HIGH 120	HIGH 410
7. LOAD PF VARIED FROM .75 LAG TO .95 LEAD	LOW 100(a)	LOW 390(a)
8. INPUT VOLTAGE VARIED BETWEEN 17 AND 26 VOLTS FOR 1Ø OPERATION	HIGH 120(a)	HIGH 410(a)
9. INPUT VOLTAGE VARIED BETWEEN 26 AND 29 VOLTS	LOW 50	LOW 390
10. OUTPUT LOAD CURRENT VARIED FROM RATED FULL LOAD CURRENT TO 200% RATED FULL LOAD CURRENT FOR 5 SECONDS	HIGH 120	HIGH 410

(a) FOR THESE CONDITIONS THE FREQUENCY/VOLTAGE RATIO SHALL REMAIN BETWEEN 3.0
 AND 4.0.

MS16057-3 INVERTER		
OPERATING CONDITIONS FOR ANY COMBINATION OF CONDITIONS LISTED WITHIN EACH SECTION, THE OUTPUT VOLTAGE AND FREQUENCY SHALL REMAIN WITHIN THE INDICATED LIMITS	OUTPUT LIMITS	
	RMS VOLTAGE	FREQUENCY HZ
1. INPUT VOLTAGE VARIED BETWEEN 23 AND 29 VOLTS	LOW 112.5	LOW 393
2. LOAD VARIED FROM ZERO TO FULL LOAD	HIGH 117.5	HIGH 407
3. AMBIENT TEMPERATURE-ALTITUDE VARIED WITHIN THE RANGE ESTABLISHED BY CURVE 1 OF MS33543 EXCEPT NO OPERATION ABOVE 65,000 FT, ABOVE 85°C OR BELOW -55°C.		
4. UNIT MOUNTED IN ANY POSITION		
5. LOAD PF VARIED FROM .75 LAG TO .95 LEAD		
6. ALL VARIATIONS ABOVE EXCEPT INPUT VOLTAGE VARIED BETWEEN 17 AND 23 VOLTS	LOW 100(a)	LOW 393(a)
	HIGH 117.5(a)	HIGH 407(a)
7. INPUT VOLTAGE VARIED BETWEEN 26 AND 29 VOLTS	LOW 50	LOW 393
8. OUTPUT LOAD CURRENT VARIED FROM RATED FULL LOAD CURRENT TO 200% RATED FULL LOAD CURRENT FOR 5 SECONDS	HIGH 117.5	HIGH 407

(a) FOR THESE CONDITIONS THE FREQUENCY/VOLTAGE RATIO SHALL REMAIN BETWEEN 3.0
 AND 4.0.

P. A. NAVY-AS	TITLE INVERTER, 100/60VA, 3/1 PHASE & 100VA, 1 PHASE, CLASS B, MULTIPURPOSE.	MILITARY STANDARD
Other Cust USAF - P1		MS16057
ARMY-ME	SUPERSEDES E-1616 & AN3499	SHEET 3 OF 8
Procurement Specification MIL-1-70-32		

DID FORM 672-1 (Coordinated)

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

APPROVED 17 FEB 61 REVISED 17 FEB 61 FOR CHANGES SEE SHEET 1

1. This document is prepared in accordance with the policy of all Departments
of the Navy and the Department of Defense. It is the policy of all Departments
of the Navy and the Department of Defense to make available to all Agencies of the Department of Defense Selection for all new
engineering and design applications and for repetitive use shall
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NOTES: MS16057-1, -2, AND -3

1. DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED, FRACTIONS $\pm \frac{1}{64}$, DECIMALS $\pm .015$.
2. THE AIRCRAFT MANUFACTURER SHALL ALLOW CLEARANCE OF AT LEAST ONE INCH AT EACH END OF THE INVERTER IN ADDITION TO THE MAXIMUM DIMENSIONS SHOWN ON THIS DRAWING, FOR INSTALLATION AND VENTILATION.
3. THE WEIGHT AND DIMENSIONS SHOWN ON THIS DRAWING SHALL INCLUDE WEIGHT AND DIMENSIONS OF ALL AUXILIARY APPARATUS NECESSARY TO MAKE THIS PRODUCT CONFORM TO THIS DRAWING AND THE PROCUREMENT SPECIFICATION.
4. PERMISSION OF THE PROCURING ACTIVITY SHALL BE OBTAINED FOR AN APPLICATION OF THIS INVERTER OUTSIDE THE SPECIFIED LIMITS.
5. FOR THREE PHASE AIRCRAFT APPLICATIONS, THE LOAD ON ANY ONE PHASE SHALL NOT EXCEED ONE THIRD OF THE TOTAL THREE PHASE INVERTER RATING.

NOTES: MS16057-1 ONLY

7. THIS INVERTER DESIGN SHALL BE SUCH THAT IT MAY BE LOADED EITHER 3Ø OR 1Ø BUT NOT SIMULTANEOUSLY. WHEN USED 3Ø, THE LOADS PER PHASE SHALL NOT DIFFER BY MORE THAN 10 VA.
8. THIS INVERTER SHALL INCORPORATE A STATIC, SEMICONDUCTOR-TYPE VOLTAGE AND FREQUENCY REGULATOR.

NOTES: MS16057-2 ONLY

9. THIS INVERTER SHALL BE A COMPLETELY STATIC SEMICONDUCTOR DEVICE EMPLOYING NO MOVING PARTS.
10. THIS INVERTER DESIGN SHALL BE SUCH THAT IT MAY BE LOADED EITHER 3 ϕ OR 1 ϕ BUT NOT SIMULTANEOUSLY.
11. THE OUTPUT VOLTAGE DURING LOAD CHANGES BETWEEN FULL AND NO LOAD SHALL RECOVER TO AND REMAIN WITHIN 10 PERCENT OF ITS STEADY STATE CONDITION WITHIN 0.1 SECOND.
12. THE TOTAL HARMONIC AND EXTRANEOUS FREQUENCY CONTENT OF THE WAVEFORM SHALL NOT EXCEED 5 PERCENT OF THE FUNDAMENTAL UNDER THE CONDITIONS OF THE PARAGRAPH ENTITLED "WAVEFORM" IN MIL-I-7032, FOR BOTH 60VA 1 ϕ AND 100VA 3 ϕ OPERATION.
13. FOR THREE PHASE OPERATION, THE PHASE DISPLACEMENT BETWEEN ADJACENT PHASES SHALL BE $120^\circ \pm 4^\circ$ FOR BOTH BALANCED AND UNBALANCED LOAD CONDITIONS.
14. THE USEABLE LIFE SHALL BE AT LEAST 2500 HOURS UNDER THE CONDITIONS OF THE "LIFE" TEST SPECIFIED IN MIL-I-7032. AS A DESIGN OBJECTIVE, THE UNIT SHALL HAVE A USEABLE LIFE OF AT LEAST 10,000 HOURS.

NOTES: MS16057-3 ONLY

15. THIS INVERTER SHALL BE A COMPLETELY STATIC SEMICONDUCTOR DEVICE EMPLOYING NO MOVING PARTS.
16. THIS INVERTER SHALL BE DESIGNED TO DELIVER SINGLE PHASE POWER ONLY.
17. ONE OR TWO PLACARDED PIN JACKS SHALL BE PROVIDED ON THE CONNECTOR SIDE TO ENABLE THE OUTPUT VOLTAGE TO BE MEASURED EITHER BETWEEN THE TWO PINS OR BETWEEN THE SINGLE PIN AND THE INVERTER CASE. THE PIN JACKS SHALL ACCEPT THE PROD PIN OF $.078 \pm .002$ INCHES IN DIAMETER.

P.A. NAVY-AS	TITLE INVERTER, 100/60VA, 3/1 PHASE & 100VA, 1 PHASE, CLASS B, MULTIPURPOSE	MILITARY STANDARD
QTY: Cust USA - 12		MS16057
ARMY-ME	SUPERSEDES E-1616 & AN3499	SHEET 4 OF 5
Procurement Specification NLT-1-70112		

REVIEWER SYMBOLS: NAVY - MC, CG
ARMY - EL
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18. THE OUTPUT VOLTAGE DURING STARTING SHALL BE AT ITS STEADY STATE CONDITION WITHIN TWO SECONDS AFTER APPLICATION OF INPUT VOLTAGE AND SHALL REMAIN AT THAT CONDITION THEREAFTER. DURING THE 2 SECOND STARTING PERIOD, THE MAXIMUM PEAK OUTPUT VOLTAGE SHALL NOT EXCEED 198 VOLTS. THE INVERTER SHALL CONFORM TO THIS REQUIREMENT FROM NO LOAD TO FULL LOAD, FROM 17 VOLTS TO 29 VOLTS INPUT, AND WITHIN ANY REQUIRED TEMPERATURE-ALTITUDE CONDITION.
19. WHEN COMPUTING EFFICIENCY, MEAN (AVERAGE) VALUES OF INPUT VOLTAGE AND CURRENT SHALL BE USED AND ROOT MEAN SQUARE (RMS) VALUES OF OUTPUT VOLTAGE AND CURRENT SHALL BE USED.
20. THE TOTAL HARMONIC AND EXTRANEIOUS FREQUENCY CONTENT OF THE WAVEFORM SHALL NOT EXCEED 5 PERCENT OF THE FUNDAMENTAL NOR SHALL ANY INDIVIDUAL HARMONIC OR EXTRANEIOUS FREQUENCY EXCEED 3 PERCENT OF THE FUNDAMENTAL UNDER THE CONDITIONS OF THE PARAGRAPH ENTITLED "WAVEFORM" IN MIL-I-7032.
21. THE MINIMUM USEABLE LIFE SHALL BE 2500 HOURS UNDER THE CONDITIONS OF THE "LIFE" TEST SPECIFIED IN MIL-I-7032. AS A DESIGN OBJECTIVE, THE UNIT SHALL HAVE A USEABLE LIFE OF AT LEAST 10,000 HOURS.
22. THE INVERTER SHALL NOT BE DAMAGED WHEN THE INPUT VOLTAGE IS UNIFORMLY VARIED FROM ZERO TO 32 VOLTS AND BACK TO ZERO OVER A 5 MINUTE PERIOD UNDER ANY RATED LOAD CONDITION.
23. AFTER DELIVERING SPECIFIED OVERLOAD OR SHORT CIRCUIT CURRENT FOR AT LEAST 5 SECONDS PER MIL-I-7032, THE INVERTER SHALL HAVE AUTOMATIC, ELECTRONIC OVERLOAD AND SHORT CIRCUIT PROTECTION. THE INVERTER SHALL THEN OPERATE FOR AT LEAST 15 MINUTES WITHOUT DAMAGE INTO THIS OVERLOAD OR SHORT CIRCUIT. NORMAL OUTPUT VOLTAGE SHALL OCCUR AUTOMATICALLY WITHIN 2 SECONDS AFTER REMOVAL OF THE OVERLOAD OR SHORT CIRCUIT. THE INVERTER SHALL MEET THE ABOVE REQUIREMENTS WHEN THE INVERTER IS INITIALLY ENERGIZED INTO AN OVERLOAD OR SHORT CIRCUIT OR WHEN THE OVERLOAD OR SHORT CIRCUIT IS APPLIED WITH THE INVERTER OPERATING UNDER ANY NORMAL RATED LOAD CONDITION.
24. DURING THE "RECOVERY TIME" TEST OF MIL-I-7032 THE MAXIMUM PEAK OUTPUT VOLTAGE SHALL NOT EXCEED 198 VOLTS.
25. THE INVERTER SHALL NOT INFLUENCE THE DC POWER SUPPLY SYSTEM IN EXCESS OF THE LIMITS SPECIFIED IN THE PARAGRAPH ENTITLED "INFLUENCE ON ELECTRIC SYSTEM" OF MIL-STD-704. THE DC POWER SUPPLY SYSTEM SHALL BE A STANDARD AIRCRAFT SYSTEM RATED 20 AMPERES OR MORE. PEAK TO MEAN INPUT RIPPLE CURRENTS SHALL NOT EXCEED 2 AMPERES WHEN THE INVERTER IS OPERATED FROM A ZERO IMPEDANCE SOURCE.
26. THE INVERTER SHALL MEET THE REQUIREMENTS OF THIS DRAWING AND THE PROCUREMENT SPECIFICATION WHEN SUPPLIED WITH POWER CONFORMING TO THE REQUIREMENTS OF MIL-STD-704. THE INVERTER SHALL NOT BE DAMAGED BY INPUT SURGE AND SPIKE VOLTAGES AS DEFINED THEREIN.
27. THE INVERTER SHALL NOT HAVE AN EXTERNAL VOLTAGE ADJUSTMENT.
28. THE INVERTER SHALL NOT REQUIRE ANY WARMUP.
29. BOTH NARROWBAND AND BROADBAND CONDUCTED AND RADIATED ELECTROMAGNETIC INTERFERENCE SHALL BE WITHIN THE LIMITS OF MIL-STD-461 WHEN TESTED IN ACCORDANCE WITH MIL-STD-462, METHODS C03 AND R02. THE LOWER TEST FREQUENCY SHALL BE LIMITED TO 150 KHZ FOR BOTH TESTS. THE INVERTER SHALL MEET THE REQUIREMENTS UNDER ANY INPUT VOLTAGE AND LOAD CONDITION SPECIFIED BY THIS DRAWING. DURING THIS TEST, THE INVERTER LOAD POWER FACTOR SHALL BE ADJUSTED SUCH THAT THE COMBINED POWER FACTOR OF THE LOAD AND ALL AUXILIARY TEST EQUIPMENT REQUIRED SHALL PRESENT A TOTAL LOAD POWER FACTOR TO THE INVERTER WITHIN THE RANGE SPECIFIED BY THIS DRAWING.

FOR DESIGN PURPOSES THIS STANDARD TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN. REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON DATE OF INVITATIONS FOR BID.

P.A. NAVY-AS Other Cost USAF-A ARMY-ME Procurement Specification MIL-I-7032	TITLE INVERTER, 100/60VA, 3/1 PHASE & 100VA, 1 PHASE, CLASS B, MULTIPURPOSE SUPERSEDES E-1616 & AN3499	MILITARY STANDARD MS16057 SHEET 5 OF 5
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APPROVED 17 FEB 61 REVISED (F) FOR CHANGES SEE SHEET 1

DD FORM 572-1 (Coordinated)

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Naval Air Engineering Center
Philadelphia, PA 19112

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