

METRIC

MIL-STD-2113A

18 September 1989

SUPERSEDING

MIL-STD-2113

23 JULY 1980

MILITARY STANDARD

RADIO FREQUENCY CIRCULATORS AND ISOLATORS,

SELECTION OF



AMSC N/A

FSC 5985

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

MIL-STD-2113A

FOREWORD

1. This military standard is approved for use by all Departments and Agencies of the Department of Defense.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Defense Electronics Supply Center, ATTN: DESC-ES, 1507 Wilmington Pike, Dayton, OH 45444-5276, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

MIL-STD-2113A

CONTENTS

<u>PARAGRAPH</u>		<u>PAGE</u>
1.	SCOPE - - - - -	1
1.1	Scope - - - - -	1
1.2	Purpose - - - - -	1
2.	APPLICABLE DOCUMENTS- - - - -	2
2.1	Government documents- - - - -	2
2.1.1	Specifications, standards, and handbooks- - - - -	2
3.	DEFINITIONS - - - - -	3
3.1	Terms and definitions - - - - -	3
4.	GENERAL REQUIREMENTS- - - - -	4
4.1	Selection of circulators and isolators- - - - -	4
4.2	Criteria for selection- - - - -	4
4.3	Application and use - - - - -	4
5.	DETAILED REQUIREMENTS - - - - -	7
5.1	Detailed requirements - - - - -	7
6.	NOTES - - - - -	8
6.1	Subject term (key word) listing - - - - -	8
6.2	Changes from previous issue - - - - -	8
 <u>TABLE</u>		
I.	Circulators (3 ports) with series SMA connectors	5
II.	Circulators (4 ports) with series SMA connectors	5
III.	Circulators (3 ports) waveguide	5
IV.	Isolators with series SMA connectors	6

MIL-STD-2113A

1. SCOPE

1.1 Scope. This standard establishes the formats, contents, and procedures for the preparation of military standards, handbooks, and bulletins.

1.2 Purpose. The purpose of this standard is to:

- a. Provide the equipment designer with a list of circulators and isolators considered standard for use in military applications.
- b. Restrict the number of circulators and isolators for use in military applications in order to provide effective logistic support of equipment.
- c. Establish criteria pertinent to choice and application of circulators and isolators for use in military equipment.

MIL-STD-2113A

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

MILITARY

MIL-C-28790 - Circulator, Radio Frequency, General Specification for.

MIL-I-28791 - Isolator, Radio Frequency, General Specification for.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA, 19120-5099.)

MIL-STD-2113A

3. DEFINITIONS

3.1 Terms and definitions. The terms and definitions used in this standard are those commonly encountered in circulator and isolator engineering practices.

MIL-STD-2113A

4. GENERAL REQUIREMENTS

4.1 Selection of circulators and isolators. Circulators to be used in military applications shall be selected from those listed in tables I, II, and III. Isolators to be used in military applications shall be selected from those listed in table IV.

4.2 Criteria for selections. The criteria for the selection of circulators and isolators for inclusion in this standard are:

- a. The circulators and isolators shall be considered by representatives of the military departments the best available type for current applications.
- b. Availability of the circulators and isolators shall be reasonably certain.
- c. The circulators and isolators shall have an approved military specification.

4.3 Application and use. Circulators and isolators used in military applications shall be representative of manufactured lots possessing acceptable material and physical and electrical characteristics and shall in no manner degrade the operational characteristics of the equipment in which used.

MIL-STD-2113A

TABLE I. Circulators (3 ports) with series SMA connectors.

Part number	Frequency range	Isolation	Insertion loss	VSWR	Operating temperature range	Power rating (AVG)
	<u>GHz</u>	<u>dB (min)</u>	<u>dB (min)</u>	<u>Max</u>		<u>Watts min</u>
M28790/1-001	9.50 - 10.0	20	0.3	1.25:1	-54°C to +95°C	10
M28790/1-002	12.5 - 13.5	20	0.3	1.25:1	-54°C to +95°C	10
M28790/1-003	7.0 - 11.0	20	0.5	1.30:1	-54°C to +95°C	10
M28790/1-004	11.0 - 18.0	20	0.5	1.30:1	-54°C to +95°C	10
M28790/1-005	0.95 - 1.225	20	0.5	1.25:1	-54°C to +85°C	50
M28790/1-006	9.0 - 9.2	20	0.3	1.25:1	-29°C to +70°C	1
M28790/2-01	.15 - .18	10	2.0	2.20:1	-50°C to +100°C	10

TABLE II. Circulators (4 ports) with series SMA connectors.

Part number	Frequency range	Isolation	Insertion loss	VSWR	Operating temperature range	Power rating (AVG)
	<u>GHz</u>	<u>dB (min)</u>	<u>dB (min)</u>	<u>Max</u>		<u>Watts min</u>
M28790/3-01	.60 - .80	18	0.5	1.30:1	-50°C to +100°C	20

TABLE III. Circulators (3 ports) waveguide.

Part number	Frequency range	Isolation	Insertion loss	VSWR	Operating temperature range	Power rating (AVG)
	<u>GHz</u>	<u>dB (min)</u>	<u>dB (min)</u>	<u>Max</u>		<u>Watt min</u>
M28790/6-01	10.8 - 18.0	10	1.0	2.00:1	0°C to +75°C	100
M28790/6-03	9.5 - 10.6	20	0.3	1.20:1	-55°C to +125°C	225

MIL-STD-2113A

TABLE IV. Isolators with series SMA connectors.

Part number	Frequency range	Isolation	Insertion loss	VSWR	Operating temperature range	Input power rating (AVG)
M28791/1-001	9.50 - 10.0	20	0.3	1.25:1	-55°C to +95°C	10
M28791/1-002	12.5 - 13.5	20	0.3	1.25:1	-55°C to +95°C	10
M28791/1-003	7.0 - 11.0	20	0.5	1.30:1	-55°C to +95°C	10
M28791/1-004	11.0 - 18.0	20	0.5	1.30:1	-55°C to +95°C	10
M28791/1-005	0.95 - 1.225	20	0.5	1.25:1	-54°C to +85°C	2
M28791/1-006	0.95 - 1.225	22	0.4	1.25:1	0°C to +71°C	2
M28791/1-007	0.96 - 1.215	18	0.5	1.25:1		75
M28791/1-008	1 - 2	18	0.5	1.30:1	0°C to +71°C	2
M28791/1-009	1.255 - 1.41	20	0.4	1.25:1	-28°C to +65°C	5
M28791/1-010	1.26 - 1.666	20	0.5	1.25:1	-40°C to +65°C	0.03
M28791/1-011	1.495 - 1.65	20	0.3	1.25:1	-28°C to +65°C	5
M28791/1-012	1.53 - 1.87	20	0.5	1.25:1	-20°C to +70°C	2
M28791/1-013	1.8 - 4.2	20	0.8	1.50:1	-40°C to +75°C	2
M28791/1-014	2 - 4	20	0.4	1.25:1	-55°C to +125°C	1
M28791/1-015	2 - 4	20	0.4	1.25:1	-54°C to +71°C	2
M28791/1-016	2.16 - 4.16	18	0.5	1.35:1	-55°C to +85°C	2
M28791/1-017	2.2 - 4.2	18	0.5	1.35:1	-55°C to +85°C	2
M28791/1-018	2.7 - 2.9	20	0.4	1.25:1	-41°C to +53°C	2
M28791/1-019	3.6 - 8.4	20	0.5	1.50:1	-40°C to +75°C	2
M28791/1-020	4.0 - 8.0	20	0.5	1.30:1	-55°C to +125°C	1
M28791/1-021	4.0 - 8.0	20	0.4	1.25:1	-54°C to +70°C	2
M28791/1-022	4.16 - 8.16	18	0.5	1.35:1	-55°C to +85°C	2
M28791/1-023	4.2 - 8.2	18	0.5	1.35:1	-55°C to +85°C	2
M28791/1-024	4.35 - 4.85	25	0.5	1.18:1	-40°C to +71°C	2
M28791/1-025	7 - 11	30	0.4	1.10:1	-54°C to +105°C	10
M28791/1-026	7.55 - 12.85	25	1.2	1.35:1	-40°C to +75°C	2
M28791/1-027	8 - 12	20	0.4	1.25:1	-54°C to +70°C	1
M28791/1-028	8 - 12	20	0.4	1.25:1	-54°C to +71°C	2
M28791/1-029	8 - 12	40	0.8	1.25:1	0°C to +65°C	2
M28791/1-030	8.16 - 12.56	18	0.5	1.35:1	-55°C to +85°C	2
M28791/1-031	8 - 16	17	0.7	1.35:1	-45°C to +85°C	2
M28791/1-032	12 - 18.5	30	1.2	1.35:1	-40°C to +75°C	2
M28791/1-033	12 - 18	18	0.6	1.30:1	-54°C to +71°C	2
M28791/1-034	12.4 - 18	40	0.8	1.25:1	0°C to +65°C	2
M28791/1-035	12.56 - 18.16	17	1.0	1.45:1	-55°C to +85°C	2
M28791/4-01	.85 - 1.05	20	0.5	1.25:1	-45°C to +71°C	2

MIL-STD-2113A

5. DETAILED REQUIREMENTS

5.1 Detailed requirements. The detailed requirements for circulators and isolators listed in this standard are covered by the applicable MIL-C-28790 and MIL-I-28791 specification sheets.

MIL-STD-2113A

6. NOTES:

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Subject term (key word) listing.

Circulation
Isolation

6.2 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

MIL-STD-2113A

CONCLUDING MATERIAL

Custodians:

Army - ER
Navy - EC
Air Force - 85

Review activities:

Army - AR, MI
Navy - OS, SH
Air Force - 17, 99
DLA - ES

User activities:

Army - AV
Navy - AS, CG, MC
Air Force - 19

Preparing activity:
Navy - EC

Agent:
DLA - ES

(Project 5985-1028)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-STD-2113A		2. DOCUMENT TITLE RADIO FREQUENCY CIRCULATORS AND ISOLATORS, SELECTION OF	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
b. ADDRESS (Street, City, State, ZIP Code)		<input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify): _____	
5. PROBLEM AREAS			
a. Paragraph Number and Wording:			
b. Recommended Wording:			
c. Reason/Rationale for Recommendation:			
6. REMARKS			
7a. NAME OF SUBMITTER (Last, First, MI) - Optional		b. WORK TELEPHONE NUMBER (Include Area Code) - Optional	
c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional		8. DATE OF SUBMISSION (YYMMDD)	

(TO DETACH THIS FORM, CUT ALONG THIS LINE.)