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MIL-STD-438E(SHIPS)
NOTICE 1
8 November 1983

MILITARY STANDARD

SCHEDULE OF PIPING, VALVES, FITTINGS
AND ASSOCIATED PIPING COMPONENTS FOR
SUBMARINE SERVICE

TO ALL HOLDERS OF MIL-STD-438E(SHIPS)

1. THE FOLLOWING PAGES OF MIL-STD-438E(SHIPS) HAVE BEEN REVISED AND SUPERSEDE
THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
E-1.1	8 November 1983	E-1.1	15 May 1973
E-1.2	8 November 1983	E-1.2	15 May 1973
E-1.3	8 November 1983	E-1.3	15 May 1973
E-1.4	8 November 1983	E-1.4	15 May 1973
E-2.1	8 November 1983	E-2.1	15 May 1973
E-2.2	8 November 1983	E-2.2	15 May 1973
E-2.3	8 November 1983	E-2.3	15 May 1973
E-3.1	8 November 1983	E-3.1	15 May 1973
E-3.2	8 November 1983	E-3.2	15 May 1973
E-3.3	8 November 1983	E-3.3	15 May 1973

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-STD-438E(SHIPS) will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the Military Standard is completely revised or canceled.

Preparing activity:
Navy - SH
(Project 4730-N089)

FSC 4730

MIL-STD-438E(SHIPS)
 8 November 1983

Category and group	Services	Design pressure psi	Maximum temperature degrees F	Remarks
E-1	Hydraulic service, inside pressure hull	3000	180	See notes E-1-1, E-1-2 and E-1-3

Item	Types	Material	Applicable documents	Remarks
Piping and tubing	Seamless	Corrosion-resistant steel	MIL-P-1144, type I, composition 304, 304L or 316, ASTM A 269, A 271 or A 312, grades TP 304, 316 or 316L	Composition 304L and 316L are the preferred materials
	Valves	70-30 copper-nickel alloy Bronze, aluminum-bronze, Naval brass, corrosion-resistant steel	MIL-T-16420 MIL-V-22687	-----
Valves	Ball, 1/8 - 2-1/2 inches	Corrosion-resistant steel, bronze, nickel-aluminum bronze, Naval brass	As approved	Union end or direct silver brazing or welding ends in accordance with Drawings 810-1385884, 810-1385888, 810-1385943, 810-1385948
	Globe, angle and needle	-----	Soft or metal coating design, as approved	
	Check	-----	As approved	
	Flow restrictor, fixed or variable	-----		
	Globe and angle, 1/4 - 1-1/4 inches	Aluminum bronze	MIL-V-24109	Union end connections
Control-special (includes directional, flow control, pressure regulating)	Relief	Aluminum alloy 6061-T6 (mechanically stress relieved), corrosion-resisting steel, bronze, nickel-aluminum-bronze, Naval brass	MIL-V-8813, MS28893, MIL-V-85245/1	MS33649, end connections
		Aluminum alloy 6061-T6 (mechanically stress relieved)	MIL-V-85245/2	
		Titanium		
		Corrosion-resistant steel	MIL-T-9047, 6Al-4V	Subplate or manifold mounted, as approved

Supersedes page E-1.1 of 15 May 1973.

MIL-STD-438E(SHIPS)
 8 November 1983

Category and group		Services	Design pressure psi	Maximum temperature degrees F	Remarks
E-1 (cont'd)		Hydraulic service inside pressure hull	3000	180	See notes E-1-1, E-1-2 and E-1-3

Item	Types	Material	Applicable documents	Remarks
Valves (cont'd)	Sampling and bleed	Aluminum alloy 7075-T651 or as qualified	MIL-V-81940	---
Fittings	Socket welding	Corrosion-resistant steel QQ-S-763, classes 304, 304L, 316 or 316L or ASTM A 403, grade WP316, WP316L, WP304 or WP304L Copper-nickel, MIL-C-15726	ANSI B16.11	---
	Butt welding	Corrosion-resistant steel QQ-S-763, classes 304, 304L, 316 or 316L or ASTM A 403, grade WP316, WP316L, WP304 or WP304L	ANSI B16.9	---
	Silver brazing (od type)	Valve bronze	Drawing 810-1385944	
	Silver brazing (nps type)	Valve bronze	Drawing 810-1385941	---
		Bronze	Drawing 810-1385942	1500 psi maximum
	Silver brazing, outlet bosses, 1/8 - 2 inches	Nickel-aluminum-bronze	Drawing 810-1385963	---
		Copper-nickel alloy	Drawing 810-1385950	
	Unions, silver brazing (od type)	Valve bronze	Drawing 810-1385948	
	Unions, silver brazing (nps type)	Bronze, valve bronze, copper-nickel, nickel-aluminum-bronze	Drawing 810-1385943	
		Valve bronze, nickel-aluminum-bronze	Drawing 810-1385946	1/8 inch - 2 inches 1500 psi maximum
	Unions, butt or socket weld	Corrosion-resistant steel, QQ-S-763, classes 304, 304L, 316 or 316L or ASTM A 403, grade WP316, 316L, WP304 or WP304L	Drawing 810-1385884 Drawing 810-1385888	

Supersedes page E-1.2 of 15 May 1973.

MIL-STD-438E(SHIPS)
 8 November 1983

Category and group	Services	Design pressure psi	Maximum temperature degrees F	Remarks
E-1 (cont'd)	Hydraulic service hull inside pressure hull	3000	180	See note E-1-1, E-1-2 and E-1-3

Item	Types	Material	Applicable documents	Remarks
Fittings (cont'd)	Unions, adapter-tail-pieces for O-ring sealed unions	Corrosion-resistant steel, class 304 or 316, condition A, or ASTM A 403, grades WP304 or WP316	As approved	
Flanges	Butt weld or socket weld	70-30 copper-nickel, MIL-C-15726 Corrosion-resistant steel, ASTM A 403, grade WP316, WP316L, WP304 or WP304L	As approved	-----
	Silver brazing end	Valve-bronze, MIL-B-16541, gun metal, QQ-C-390, alloy D5; copper-nickel, MIL-C-15726; manganese-bronze, QQ-B-728, class A	As approved	
	Flanges, weld and blank	Corrosion-resistant steel, QQ-S-763, class 304, condition A or ASTM A 182, grade F304	As approved	-----
Gasket	O-rings and sheet stock	Fluorocarbon elastomer	MIL-R-83248	-----
Flange bolting (in bilge)	Bolts	Nickel-copper alloy or nickel-copper aluminum alloy	MIL-S-1222	-----
	Nuts			-----
Flange bolting (not in bilge)	Bolts and capscrews	Various	Select from MIL-STD-1251	-----
	Nuts	Various	MIL-S-1222	

Supersedes page E-1.3 of 15 May 1973.

MIL-STD-438E(SHIPS)
8 November 1983

NOTES TO CATEGORY AND GROUP E-1:

- E-1-1 The table of components for this group includes items for use with corrosion-resistant steel tubing and copper-nickel tubing and also includes components for pipe size outside diameters (nps type) as well as tube size outside diameters (od type). Where corrosion-resistant steel components are used, they shall be joined either by welding or by mechanical couplings, as specified. Corrosion-resistant steel components shall not be brazed except where unavoidable and then with specific approval of the command or agency concerned or its field representative. Care shall be taken in selecting components to insure that all are compatible as to sizing (for example, whether they are in nps sizes or od sizes) and that where interconnection between these different sizing systems are required, suitable adapters are provided for.
- E-1-2 For new designs, hydraulic systems shall not be brazed. However, brazing of hydraulic systems during overhaul, conversion or repair is permitted for systems already containing brazed joints.
- E-1-3 Socket weld and silver braze fabrication shall be limited to service applications expected to see less than 100,000 cycles where the magnitude of the pressure variation exceeds 2000 psi.

MIL-STD-438E(SHIPS)
 8 November 1983

Category and group	Services	Design pressure psi	Maximum temperature degrees F	Remarks
E-2	Hydraulic service out-side the pressure hull	3000	160	See note E-2-1

Item	Types	Material	Applicable documents	Remarks
Piping and tubing	Seamless	Corrosion-resistant steel	MIL-P-1144, type I composition 316L or ASTM A 269, A 271 or A 312, grade TP 316L	-----
		70-30 copper-nickel Nickel-copper alloy	MIL-T-16420 MIL-T-1368	
Valves	Ball	Corrosion-resistant steel	MIL-V-22687	Welding ends -----
	Globe, angle and check Control-special (includes directional, flow control, pressure regulating)	As approved	As approved	
Fittings	Socket welding	Corrosion-resistant steel, QQ-S-763, class 316L or ASTM A 403, grade WP316L	ANSI B16.11	-----
	Butt welding	70-30 copper-nickel alloy, MIL-C-15726 Corrosion-resistant steel, QQ-S-763, class 316L or ASTM A 403, grade WP316L 70-30 copper-nickel alloy, MIL-C-15726	ANSI B16.9	
Flanges	Weld neck or socket weld	70-30 copper-nickel alloy, MIL-C-15726 Corrosion-resistant steel, QQ-S-763, class 316L or ASTM A 403, grade WP316L	As approved	"O" ring face

Supersedes page E-2.1 of 15 May 1973.

MIL-STD-438E(SHIPS)
 8 November 1983

Category and group	Services	Design pressure psi	Maximum temperature degrees F	Remarks
E-2 (Cont'd)	Hydraulic service outside the pressure hull	3000	160	See note E-2-1

Item	Types	Material	Applicable documents	Remarks
Gaskets	O-rings and sheet stock	Fluorocarbon, elastomer	MIL-R-83248	-----
Bolting	Bolts	Nickel-copper-alloy, or nickel-copper-aluminum alloy	MIL-S-1222	-----
	Cap screws	Corrosion-resistant steel	Select from MIL-STD-1251	MS18116 is invoked for hull integrity fasteners
		Nickel-copper alloy	MIL-S-1222	
Nuts		Nickel-copper-aluminum alloy	MIL-S-1222	
		Nickel-copper alloy, or nickel-copper-aluminum alloy	MIL-S-1222	-----

Supersedes page E-2.2 of 15 May 1973.

MIL-STD-438E(SHIPS)
8 November 1983

NOTES TO CATEGORY AND GROUP E-2:

- E-2-1 The table of components for this group includes items for use with corrosion-resistant steel tubing and copper-nickel tubing and also includes components for pipe size outside diameters (nps type) as well as tube size outside diameters (od type). Where corrosion-resistant steel components are used, they shall be joined either by welding or by mechanical couplings, as specified. Corrosion-resistant steel components shall not be silver brazed except where unavoidable and then with specific approval of the command or agency concerned or its field representative. Care shall be taken in selecting components to insure that all are compatible as to sizing (for example, whether they are in nps sizes or od sizes) and that where interconnection between these different sizing systems are required, adapters are provided for.

MIL-STD-438E(SHIPS)

8 November 1983

Category and group		Services		Design pressure psi	Maximum temperature degrees F	Remarks
E-3		Low pressure hydraulic systems inside pressure hull (including return lines)		700	180	See note E-3-1

Item	Types	Material	Applicable documents	Remarks
Piping and tubing	Seamless	Corrosion-resistant steel	MIL-P-1144, type I composition 304 or 316 or ASTM A 269, A 271, or A 312, grades TP 316, 316L, 304 or 304L	Composition 304L and 316L are the preferred materials
		70-30 copper-nickel	MIL-T-16420	
Valves		Copper	MIL-T-24107	Use limited to non-pressured vent and drain piping
	Ball, 1/8 - 2-1/2 inches	Bronze, aluminum-bronze, corrosion-resistant steel	MIL-V-22687	Union end or direct silver brazing or welding ends
	Globe and angle, 1/4 - 1-1/4 inches	Aluminum-bronze	MIL-V-24109	Union end connections
	Stop; globe, angle, or needle	Bronze	Drawing 810-4384536 or commercial, as approved	400 psi maximum
	Swing check, union or direct brazing ends		Drawing 810-1385721	
	Check	Corrosion-resistant steel, bronze, nickel-aluminum-bronze, Naval brass	As approved	Union end or direct silver brazing or welding ends in accordance with Drawings 810-1385884, 810-1385888, 810-1385943, 810-1385948
	Flow restrictor, fixed or variable			
	Relief, above 500 psig	Aluminum alloy 6061-T6 (mechanically stress relieved), corrosion-resistant steel, bronze, nickel-aluminum bronze, Naval brass	MIL-V-8813, MS28893 MIL-V-85245/1 MIL-V-85245/2	MS33649, end connections
	Relief, below 500 psig		As approved	

Supersedes page E-3.1 of 15 May 1973.

MIL-STD-438E(SHIPS)

8 November 1983

Category and group	Services	Design pressure psi	Maximum temperature degrees F	Remarks
E-3 (cont'd)	Low pressure hydraulic systems inside pressure hull (including return lines)	700	180	See note E-3-1

Item	Types	Material	Applicable documents	Remarks
Valves (cont'd)	Control-special (includes directional, flow control, pressure regulating)	Aluminum alloy, 6061-T6 (mechanically stress relieved), as approved	As approved	Subplate or manifold mounted, as approved
	Sampling and bleed	Aluminum alloy 7075-T651 or as qualified	MIL-V-81940	
Fittings	Silver brazing, nps type	Bronze	MIL-F-1183	400 psi maximum
	Silver brazing, od type	Bronze	MIL-F-24227	
	Butt welding, seamless	Corrosion-resistant steel, QQ-S-763, classes 304, 304L, 316, 316L or ASTM A 403, grade WP316, WP316L, WP304 or WP304L	ANSI B16.9	-----
	Socket welding	70-30 copper-nickel alloy	MIL-F-24202	
	Unions	Copper-nickel, MIL-C-15726	ANSI B16.11	400 psi, maximum
		Bronze	MIL-F-1183	
Flanges	Silver-braze outlet bosses	Bronze, nickel-aluminum-bronze	MIL-F-24227	-----
		70-30 copper-nickel alloy	Drawing 810-1385946	
			Drawing 810-1385948	
			Drawing 810-1385950	
	Welding neck or socket weld	70-30 copper-nickel alloy, MIL-C-15726	As approved	-----
		Corrosion-resistant steel, QQ-S-763, class 316L or ASTM A 403, grade WP316L		

Supersedes page E-3.2 of 15 May 1973.

MIL-STD-438E(SHIPS)
 8 November 1983

Category and group	Services	Design pressure psi	Maximum temperature degrees F	Remarks
E-3 (cont'd)	Low pressure hydraulic systems inside pressure hull (including return lines)	700	180	See note E-3-1

Item	Types	Material	Applicable documents	Remarks
Gaskets	O-rings and sheet stock	Fluorocarbon, elastomer	MIL-R-83248	---
Flange bolting (in bilge)	Bolts	Nickel-copper alloy or nickel-copper-aluminum alloy	MIL-S-1222	---
	Nuts			
Flange bolting (not in bilge)	Cap screws and bolts	Various	Select from MIL-STD-1251 MIL-S-1222	---
	Nuts	Various		

NOTES TO CATEGORY AND GROUP E-3:

E-3-1 For new designs, hydraulic systems shall not be brazed. However, brazing of hydraulic systems during overhaul, conversion or repair is permitted for systems already containing brazed joints.