Stainless Steel Technical Information

Physical Characteristics of Stainless Steel and Aluminum

	Pan-Steel® Stainless Steel MS Strapping and Buckles	Pan-Steel® Stainless Steel Marker Plates, Tags, and Cable Ties	Pan-Alum™ Aluminum Marker Plates and Cable Ties
Material:	201 Grade Stainless Steel	304 and 316 Grade Stainless Steel	Aluminum – Natural and Anodized
Maximum temperature rating:	538°C	538°C	100°C
Minimum temperature rating:	-80°C	-80°C	-80°C
RoHS:	Compliant	Compliant	Compliant
Flammability:	Non-Flammable	Non-Flammable	Non-Flammable
Ultraviolet light resistance:	Excellent	Excellent	Good

Panduit Stainless Steel Cable Tie and Strapping Approvals

Logo (Symbol)	Agency	Spec /Approval	Requirement	Applicable Products
UL LISTED	Underwriters Laboratories, Inc.	Listing E56854	Dimensional, tensile, temp., cycling, humidity	MLT-S, MLT-LH, MLT-H, MLTEH15, MLTSH, MLTDEH and MLTDSH in 304, and 316. MSW38T15, MSW50T15, MSW63T15, MSBW38, MSBW50, MSBW63 in both 304 and 316 material. MSCW38T15, MSCW50T15, MSCW63T15, MSCNW38T15, MLTFCS, SH, MLTCH, MSCNW50T15, and MSW63T15 in 316 material.
CE	Conformite European	Low Voltage Directive 73/23/EEC (amended 93/68/EEC) MLT cable ties and MS straps also meet the requirements from EN50146	CE Marking is required for products sold within the European Union. CE Marking Directives specify the minimum performance of these products. Applying the CE mark signifies compliance with essential requirements of specific directives.	All MLT, MRT, MRS ties and MS straps.
ABS TYPE APPROVAL PROGRAM	Amer. Bureau of Shipping	Cert. #03-HS373867-PDA, 04-HS476898-PDA, 05-HS118592C/1-PDA, 06-HS152579-PDA, 05-HS118592A/2-PDA	Mechanical	All MLT ties and MS straps.
BUREAU VERITAS 1828	Bureau Veritas	Cert. #04048/D2 BV	Material specification, dimensional, visual	All uncoated MLT ties in 304 and 316 material.
DET NORSKE VERITAS ESTABLISHED 1864	Det Norske Veritas	Cert. # E-6540 E-6539	Salt mist test, tensile test, accelerated aging, vibration tests	All uncoated MLTS, MLTH, MLTE15, MLTDEH15, MLTSH, and MS strap coated and uncoated 316 material.
	Germanischer Lloyd	Cert. # 32666-83HH 51796-89HH	Mechanical	All uncoated stainless steel MLT ties and all MS straps.
	Lloyd's Register of Shipping	Cert. # 89/60123	Material specification, tensile test, vibration tests	All uncoated stainless steel MLT ties and all MS straps.
	RINA	Cert. # ELE71502CS	Material specification	All uncoated stainless steel MLT ties and all MS straps.
	SAE Int'l formerly US MIL	AS23190 formerly MS23109E	Dimensional, visual, vibration, temp. cycling, immersion	MLT-S and MLT-H ties in 304 and 306 material.
	US Coast Guard	File No.16703/46	Mechanical	MLT-H series cable ties.
	US Military	MIL-T-81306A/ MS90387-3	Mechanical	GS4MT installation tools.

Chemical Resistance at 70°F (21°C) Temperature

Chemical	%	304 and 316 Stainless Steel*	Chemical	%	304 and 316 Stainless Steel*	Chemical	%	304 and 316 Stainless Steel*	Chemical	%	304 and 316 Stainless Steel*
Arsenic Acid	40	E	Cider		E	Methyl Alcohol	100	E	Sodium Bisulfate	10	E
Acetone	100	E	Dichloroethane	100	E	Methyl Chloride	100	E	Sodium Borate	All	E
Aluminum Hydroxide	AQ C.S.	E	Diethyl Ether	100	E	Methyl Ethyl Ketone	100	E	Sodium Carbonate	5	E
Ammonium Carbonate	5	E	Ethyl Alcohol	100	E	Naphtha	100	E	Sodium Chlorate	25	E
Ammonium Hydroxide	10	E	Ethyl Chloride	100	E	Nitric Acid	30 – 70	E	Sodium Chloride	2	E
Ammonium Nitrate		E	Ethyl Glycol	100	E	Nitrous Acid	5	E	Sodium Fluoride	5	F
Ammonium Sulfate	10	S	Ferric Hydroxide	All	E	Oleic Acid	100	E	Sodium Hydroxide	10	E
Barium Carbonate	All	E	Ferric Nitrate	10	E	Oxalic Acid	10	E	Sodium Hyposulfite	AQ C.S.	E
Barium Chloride	5	E	Ferrous Sulfate	10	E	Paraffin	100	E	Sodium Nitrate	5	E
Barium Sulfate	10	E	Fuel Oil	100	E	Petroleum Ether	100	E	Sodium Nitrite	AQ C.S.	E
Barium Sulfide	10	E	Furfural	100	E	Phenol	90	E	Sodium Percolate	10	E
Benzene	100	E	Gallic Acid	AQ C.S.	E	Phosphoric Acid	10	E	Sodium Phosphate	5	E
Benzoic Acid	100	E	Gasoline	100	E	Picric Acid	1	S	Sodium Sulfate	5	E
Butyric Acid	50	E	Glycerine	100	E	Potassium Bromide	AQ C.S.	S	Sodium Thiosulfate	5	S
Calcium Carbonate	AQ C.S.	E	Hydrocyanic Acid	All	E	Potassium Carbonate 1%	—	E	Stearic Acid	100	E
Calcium Chlorate	10	E	Hydrogen Peroxide	30	E	Potassium Chlorate	AQ C.S.	E	Sulfur	100	E
Calcium Hydroxide	20	E	Hydrogen Sulfide	Dry	E	Potassium Dichromate	40	E	Sulfur Dioxide	All	E
Calcium Hydrochlorite	2	F	Idoform	100	E	Potassium Ferrocyanide	25	E	Sulfuric Acid	100	E
Calcium Sulfate	2	E	Isopropyl Alcohol	100	E	Potassium hydroxide	5	E	Sulfuric Acid	5	F
Carbon Tetrachloride	—	—	Jet Fuel	100	E	Potassium Iodide	All	E	Tannic Acid	10	E
Chlorine (Wet)	—	F	Lactic Acid	100	E	Potassium Nitrate	50	E	Tartaric Acid	50	E
Chlorine (Dry)	—	F	Lanolin	10	E	Potassium Permanganate	5	E	Tetrahydrofuran	100	E
Chloroacetic Acid	30	F	Lead Acetate	5	E	Potassium Sulfate	5	E	Toluene	100	F
Chloroform	100	E	Magnesium Carbonate	All	E	Potassium Sulfide	AQ C.S.	E	Xylene	100	E
Chromic Acid	5	E	Magnesium Chloride	10	F	Propyl Alcohol	100	E	Zinc Chloride	70	E
Citric Acid	50	E	Magnesium Nitrate	All	E	Silver Nitrate	10	E	Zinc Nitrate	AQ C.S.	E
Copper Cyanide	10	E	Malic Acid	AQ C.S.	E	Sodium Acetate	60	E	Zinc Sulfate	AQ C.S.	E
Copper Nitrate	50	E	Mercury	100	E	Sodium Bicarbonate	All	E			

*E = Excellent, S = Satisfactory, F = Fair, AQ C.S. = Aqueous Cold Saturated, All = All % Concentrations.

Rigorous Tests and Physical Properties of Stainless Steel

STRENGTH: Panduit® Pan-Steel® Stainless Steel Ties and Straps are tested per the SAE Standard AS23190 formerly U.S. Military Specification MIL-S-23190, minimum loop tensile test. This test consists of applying a tie to a split mandrel and then measuring the force required to separate the (two) halves until the tie fails. These minimum loop tensile strengths are given for the various products on pages B3.5 through B3.25.

TEMPERATURE EXTREMES: Panduit® Pan-Steel® Stainless Steel Ties and Straps are 100% stainless steel in the alloy provided (locking head, locking ball, and body all provided from the same grade of material ordered).

Various temperature tests have been successfully completed. One such test is the U.S. Military Temperature Cycling Test per Thermal Shock Method 107, Test Condition B of MIL-STD-202. This test exposes the parts from low temperature -85°F (-65°C) to high temperature 275°F (135°C) to low temperature -85°F (-65°C). After exposure, the parts must be free of cracks, distortions, breaks, release of locking device; and meet the minimum loop tensile requirements.

SHOCK AND VIBRATION: Panduit® Pan-Steel® Standard and Heavy Cross Section ties have passed the U.S. Military random vibration Test Method 214. Test Condition II, Letter J of MIL-STD-202. This test consists of applying parts to a bundle and then vibrating them with random vibration for 8 hours in each of two mutually perpendicular directions. The parts are then subjected to further temperature testing and finally have to pass the minimum loop tensile strength test.

Panduit® Pan-Steel® Extra Heavy, Super Heavy, MSW50 Strapping and MSW63 Strapping have passed the U.S. Military Shock and Vibration Testing per MIL-STD-167 and MIL-S-901D. The ties were subjected to vibrations in all three planes from 4 – 50 Hz and Shock testing in all three planes utilizing a hammer shock machine.

SALT SPRAY: Panduit® Pan-Steel® Stainless Steel Ties and Straps have been subjected to salt spray tests without signs of corrosion or reduction in performance.

OUTDOOR EXPOSURE: Panduit® Pan-Steel® Stainless Steel Ties and Straps have been exposed outdoors at New Lenox, Illinois USA since 1985. At the printing of this catalog, there has been no sign of corrosion or loss of performance.

FLUID IMMERSION: Panduit® Pan-Steel® Stainless Steel Ties were immersed in: 1-Hydraulic Fluid, 2-Turbine Fuel, 3-Lubricating Oil, and 4-Isopropyl Alcohol for four hours at temperatures of 122°F (50°C). Per SAE Standard AS23190, the parts were then subjected to and passed the minimum loop tensile test.

RADIATION: Installed cable ties of various materials have been exposed to different amounts of radiation to determine the maximum acceptable limit. These tests were conducted by Panduit to determine the acceptability for use in various areas of nuclear power plants (accumulated over 40 year life). Radiation resistance is $2x10^8$ rads.

Military Cross Reference (AS23190)

Military Standard Part Number	Panduit Part Number
AS23190/3-1	MLT2S-CP
AS23190/3-1	MLT2S-CP316
AS23190/3-2	MLT4S-CP
AS23190/3-2	MLT4S-CP316
AS23190/3-3	MLT6S-CP
AS23190/3-3	MLT6S-CP316
AS23190/3-4	MLT8S-CP
AS23190/3-4	MLT8S-CP316
AS23190/3-5	MLT2H-LP
AS23190/3-5	MLT2H-LP316
AS23190/3-6	MLT4H-LP
AS23190/3-6	MLT4H-LP316
AS23190/3-7	MLT6H-LP
AS23190/3-7	MLT6H-LP316
AS23190/3-8	MLT8H-LP
AS23190/3-8	MLT8H-LP316
AS23190/3-9	MLT10H-LP
AS23190/3-9	MLT10H-LP316

Order number of pieces required, in multiples of Standard Package Quantity.

Prime items appear in **BOLD**.