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PMail Mini Lesson

Western Region
Chris Woods - Applications Engineer
cfw@panduit.com (303) 257-1655

Topic: ***Mil-Spec Tools and Components***

United States Military Standard

A United States Defense Standard, often called a Military Standard, “MIL-STD”, “MIL-SPEC”, or (informally) “MilSpecs”.

"**MilSpecs**" are used to help achieve standardization objectives by the U.S. Department of Defense. Standardization is beneficial in achieving interoperability, ensuring products meet certain requirements, commonality, reliability, total cost of ownership, compatibility with logistics systems, and similar defense-related objectives. Defense Standards are also used by other non-Defense government organizations, technical organizations, and industry. **This PMail discusses definitions, history, usage of Defense Standards, as well as Panduit Tools and Products.**

Definition of Document Types

The Military doesn’t actually use Mil-Spec as a standard any longer (see a discussion of this in the *Origins* section below and on page 13 of this lesson). Mil-Spec still exists as a tight tolerance reference used by many builders. Although the official definition is different between types of documents, all the documents referred to in this PMail go by the general title of "military standard", including defense specifications, handbooks, and standards. The Government Accountability Office (GAO), says that *military specifications* "describe the physical and/or operational characteristics of a product", while *military standards* "detail the processes and materials that are used to make the product." *Military handbooks*, on the other hand, are primarily sources of compiled information and/or guidance. However, the GAO acknowledges that the terms are often used interchangeably.

Official definitions are provided by DOD 4120.24-M *Defense Standardization Program (DSP) Policies and Procedures*, March 2000, OUSD (Acquisition, Technology and Logistics):

Defense Handbook - A guidance document containing standard procedural, technical, engineering, or design information about the materiel, processes, practices, and methods covered by the DSP.

Defense Specification - A document that describes the essential technical requirements for purchased materiel that is military unique or substantially modified commercial items.

Defense Standard - A document that establishes uniform engineering and technical requirements for military-unique or substantially modified commercial processes, procedures, practices, and methods. There are five types of defense standards: interface standards, design criteria standards, manufacturing process standards, standard practices, and test method standards.

Standard - A document that establishes uniform engineering or technical criteria, methods, processes and practices.

Specification - A document prepared to support acquisition that describes the essential technical requirement for purchased materiel and the criteria for determining whether those requirements are met.

Origins

Defense standards evolved from the need to ensure proper performance and maintainability of military equipment. For example, due to differences in dimensional tolerances, in World War II American screws and bolts did not fit British equipment properly and were not fully interchangeable. Defense standards provided many benefits, such as minimizing the number of types of ammunition, ensuring compatibility of tools, and ensuring quality during production of military equipment.

The proliferation of standards had drawbacks. It was argued that the large number of standards, nearly 30,000 by 1990,

Topic: *Mil-Spec Tools and Components*

Origins - Continued

imposed unnecessary restrictions, increased cost to contractors, and hence the DOD, and impeded the incorporation of the latest technology. Responding to increasing criticism, **Secretary of Defense William Perry issued a memorandum in 1994 that prohibited the use of most defense standards without a waiver.** This has become known as the "Perry memo". Many defense standards were canceled. In their place, the DOD encouraged the use of industry standards, such as ISO 9000 series for quality assurance. The word “COTS” was coined to refer to the Military’s use of “Commercial-off-the-Shelf Components. Weapon systems were required to use "performance specifications" that described the desired features of the weapon, as opposed to requiring a large number of defense standards. In 2005 DOD issued a new memorandum which eliminated the requirement to obtain a waiver in order to use defense standards. The 2005 memo did not reinstate any canceled defense standards.

What’s the difference between MIL-SPEC and anything else?

Let’s take a typical application such as Aircraft Electrical Wiring using Aircraft Rated Terminals vs. Commercial Rated Terminals.

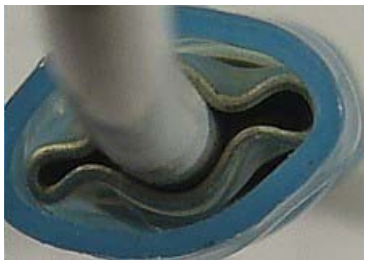
Stronger: Aircraft quality solderless terminals conform to MS25036 and MIL-T-7928 aircraft specifications, whereas other solderless terminals meet UL 486A. One difference is in the force required to break or separate the terminal from the conductor. Notice that the aircraft terminal has more metal at the crimp. For example, a 18 gauge (red) terminal manufactured to MIL-T-7928 Class 2 has a minimum tensile strength of 38 lbs. whereas UL are only required to meet 20lbs.

Vinyl Terminal (2-Piece)

Nylon Terminal (3-Piece)

Vibration Resistant: Aircraft vibrate so it’s important to support the wire close to but separate from the wire crimp. The PANDUIT Vinyl Terminal shown to the left (top) provides an “insulation grip” but is not sufficient for Mil-Spec. The combined 2-piece metal sleeve on the Nylon Terminal left (bottom) provides a crimp on the conductor as well as a “insulation crimp” on the conductor insulation. This type of connector prevents vibration of the wires where they leave the crimp. This type of two crimp terminal is required for high vibration applications where repeated flexing of the copper wires hardens the wires and results in breakage and a failed connections.

Two crimps; one to hold the aircraft wire and one to hold the insulation. Shown below is the right crimping tool, CT-400, (Military Specification - MIL-DTL-22520) for aircraft crimps. The biggest difference between this tool and our other controlled cycle hand tools is that the crimp is made using an equal press (In-line) motion vs. the scissor like motion of the others. Each crimp is formed to its own size and shape. Notice the insulation crimp (shown to the right of the tool) is formed around the insulation so it supports and grabs the insulation without crushing it.



Better Electrical Contact: MIL wire connectors also have multiple 'V' grooves inside the barrel to help grip the aircraft wire. These grooves help to break-up the tin plating upon crimping. This exposes clean copper to the wires and assures a low resistance connection.

Fewer crimp errors: Crimp connector tools form both crimps at the same time. The ratchet handle will not open and release the terminal until it is fully squeezed. This prevents under crimps. MIL-DTL-22520 tools come with a calibrating GO-NO-GO tool that verifies the proper crimp diameter. No operator guessing as how much to crimp the terminal.

Quote from AC43.13-1B Chg. 1 11-69, "The crimp on terminal lugs and splices must be installed using a high quality ratchet-type crimping tool" . These tools are qualified to MIL-DTL-22520 are to be used for crimping terminal lugs. All MIL-DTL-22520 hand crimping tools have a self-locking ratchet, which prevents the tool from opening until the crimp is complete. MIL-DTL-22520 establishes a single specification which sets forth performance requirements for all crimp tools to be used on military standard connectors.

Topic: *Mil-Spec Tools and Components*

Pan-Term Loose Piece and Reel-Fed Ring Terminals.

The **Panduit Terminals** listed in the tables below are approved for listing on QPL AS7928 and meet all the testing requirements of Aerospace Standard SAE-AS7928(formerlyMIL-T-7928G) and the dimensional requirements of Aerospace Standard SAE-AS25036 (formerly MS25036).

MS25036	Loose Piece Nylon Ins. Without Funnel Entry Class 1&2	Loose Piece Nylon Ins. With Funnel Entry Class 2	Reel-Smart Nylon Ins. Without Funnel Entry Class 2	Reel-Smart Nylon Ins. With Funnel Entry Class 2
MS25036-101	PNI8-6RN	PNFI8-6RN	PNI8-6RN-3K	PNFI8-6RN-3K
MS25036-102	PNI8-6R	PNFI8-6R	PNI8-6R-3K	PNFI8-6R-3K
MS25036-103	PN18-10R	PNFI8-10R	PNI8-10R-3K	PNFI8-10R-3K
MS25036-104	PN18-56R	PNFI8-56R		
MS25036-105	PN18-38R	PNFI8-38R		
MS25036-106	PNI4-6RN	PNFI4-6RN	PNI4-6RN-3K	PNFI4-6RN-3K
MS25036-107	PNI4-6R	PNFI4-6R	PNI4-6R-3K	PNFI4-6R-3K
MS25036-108	PN14-10R	PNFI4-10R	PNI4-10R-3K	PNFI4-10R-3K
MS25036-109	PN14-56R	PNFI4-56R		
MS25036-110	PN14-38R	PNFI4-38R		
MS25036-111	PNI0-6R	PNFI0-6R	PNI0-6R-2K	PNFI0-6R-2K
MS25036-112	PNI0-I0R	PNFI0-I0R	PNI0-I0R-2K	PNFI0-I0R-2K
MS25036-113	PNI0-56R	PNFI0-56R	PNI0-56R-2K	PNFI0-56R-2K
MS25036-114	PNI0-38R	PNFI0-38R	PNI0-38R-2K	PNFI0-38R-2K
MS25036-148	PNI8-4RN	PNFI8-4RN	PNI8-4RN-3K	PNFI8-4RN-3K
MS25036-149	PNI8-8R	PNFI8-8R	PNI8-8R-3K	PNFI8-8R-3K
MS25036-150	PN18-14R	PNFI8-14R	PNI8-14R-3K	PNFI8-14R-3K
MS25036-152	PNI4-4R	PNFI4-4R	PNI4-4R-3K	PNFI4-4R-3K
MS25036-153	PNI4-8R	PNFI4-8R	PNI4-8R-3K	PNFI4-8R-3K
MS25036-154	PN14-14R	PNFI4-14R	PNI4-14R-3K	PNFI4-14R-3K
MS25036-156	PNI0-8R	PNFI0-8R	PNI0-8R-2K	PNFI0-8R-2K
MS25036-157	PNI0-14R	PNFI0-14R	PNI0-14R-2K	PNFI0-14R-2K

MS20659	Loose Piece Non-Insulated Class 1
MS20659-105	PI0-I0R
MS20659-107	PI0-56R
MS20659-128	PI0-38R
MS20659-165	PI0-6R

For Class 1 crimps - The special tool must be obtained from the Military.

For Class 2 crimps - use CT-400 & CT-460 crimp tools for loose pcs and CP-861 or CP-871 press and CA-800EZ or CA9 Applicators for Reel-Smart terminals.

Controlled Cycle Crimping Tools – In-Line

- Military specialty tools help meet military and nuclear test requirements for Class 2 applications
- In-line crimp action for greater dielectric strength with uniform insulation compression
- Calibration-recalibration is possible for maintaining exact crimp dimensions

Part Number	Part Description	Std. Pkg. Qty.
CT-400	Crimps #22 – 14 *PANDUIT* insulated terminals, disconnects, and splices. Comes complete with tools for calibration. Has adjustable pre-load and emergency ratchet. Helps meet military and nuclear requirements.	1
CT-460	Crimps #16 – 10 *PANDUIT* insulated terminals, disconnects, and splices. Has same features as CT-400 above.	1

Topic: *Mil-Spec Tools and Components*

Pan-Steel Cable Ties

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)

Current Military Standard Part Number	*PANDUIT* Part Number
M23190/3-1	MLT2S-CP
M23190/3-1	MLT2S-CP316
M23190/3-2	MLT4S-CP
M23190/3-2	MLT4S-CP316
M23190/3-3	MLT6S-CP
M23190/3-3	MLT6S-CP316
M23190/3-4	MLT8S-CP
M23190/3-4	MLT8S-CP316
M23190/3-5	MLT2H-LP
M23190/3-5	MLT2H-LP316
M23190/3-6	MLT4H-LP
M23190/3-6	MLT4H-LP316
M23190/3-7	MLT6H-LP
M23190/3-7	MLT6H-LP316
M23190/3-8	MLT8H-LP
M23190/3-8	MLT8H-LP316
M23190/3-9	MLT10H-LP
M23190/3-9	MLT10H-LP316

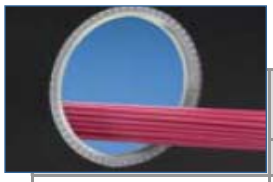
GM4MT Hand Operated Installation Tool

- Qualified product listed per MIL Standard MS90387-3
- Automatically tensions and cuts off tie when predetermined tension is reached
- Installs standard .18 inch (4.6mm), light-heavy .25 inch (6.4mm) and heavy .31 inch (7.9mm) cross section ties

Topic: *Mil-Spec Tools and Components*

Abrasion Protection Mounts, Grommet Edging and Heat Shrink

PANDUIT Mil-Spec abrasion protection products provide an economical and easy way to insulate, protect and bundle components and cable. A wide variety of sizes and materials are available to meet a broad range of applications. To help assure optimum quality, PANDUIT abrasion protection products are designed and manufactured to meet applicable quality standards including International, UL, Military, ISO and Aerospace.



Grommet Edging

	Width A		Height B		Panel Thickness Range		Material	Temperature Range
	In.	mm	In.	mm	In.	mm		
GE52-C	.15	3.8	.16	3.9	.015 – .052	0.4 – 1.3	Nylon 6.6	-40°F to 149°F (-40°C to 65°C)
GE52-C69	.15	3.8	.16	3.9	.015 – .052	0.4 – 1.3	Flame Retardant	
GE85-C	.18	4.5	.16	3.9	.052 – .085	1.3 – 2.2	Nylon 6.6	
GE85-C69	.18	4.5	.16	3.9	.052 – .085	1.3 – 2.2	Flame Retardant Nylon 6.6	
GE128-C	.22	5.6	.16	3.9	.085 – .128	2.2 – 3.3	Nylon 6.6	
GE128-C69	.22	5.6	.16	3.9	.085 – .128	2.2 – 3.3	Flame Retardant Nylon 6.6	
GE192-L	.33	8.3	.23	5.8	.128 – .192	3.3 – 4.9	Nylon 6.6	
GE192-L69	.33	8.3	.23	5.8	.128 – .192	3.3 – 4.9	Flame Retardant Nylon 6.6	
GE255-L	.39	9.8	.24	6.1	.192 – .255	4.9 –- 6.5	Nylon 6.6	
GE318-L	.46	11.3	.26	6.5	.255 –.318	6.5 – 8.1	Nylon 6.6	
GE380-Q	.52	13.1	.26	6.5	.318 – .380	8.1 – 9.7	Nylon 6.6	
GE510-Q	.64	16.3	.26	6.5	.380 – .510	9.7 – 13.0	Nylon 6.6	

Military Standard MS21266 in 12 3/4" Lengths

Multiple Tie Plates

	No. of Bundles	Used with Cable Ties‡	L	W	H	Mounting Method	Mil. Std. Part Number
			In.	mm	In.		
MTP1S-E6-C	1	M, I, S	1.75	44.5	.50	#6 (M3) Screw	MS3339-1-9
MTP1H-E6-C	1	M, I, S, HS, LH, H	2.09	53.1	.63	#6 (M3) Screw	MS3339-6-9
MTP2S-E6-C	2	M, I, S	3.00	76.2	.50	#6 (M3) Screw	MS3339-2-9
MTP2H-E6-C	2	M, I, S, HS, LH, H	3.59	91.2	.63	#6 (M3) Screw	MS3339-7-9
MTP3S-E6-C	3	M, I, S	4.25	108.0	.50	#6 (M3) Screw	MS3339-3-9
MTP3H-E6-C	3	M, I, S, HS, LH, H	5.09	129.3	.63	#6 (M3) Screw	MS3339-8-9
MTP4S-E6-C	4	M, I, S	5.50	139.7	.50	#6 (M3) Screw	MS3339-4-9
MTP4H-E6-C	4	M, I, S, HS, LH, H	6.59	167.4	.63	#6 (M3) Screw	MS3339-9-9
MTP5S-E6-C	5	M, I, S	6.75	171.5	.50	#6 (M3) Screw	MS3339-5-9
MTP5H-E6-C	5	M, I, S, HS, LH, H	8.09	205.5	.63	#6 (M3) Screw	MS3339-10-9
MTP6H-E6-C	6	M, I, S, HS, LH, H	9.59	243.6	.63	#6 (M3) Screw	MS3339-11-9

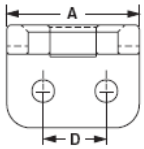
Cable tie cross section sizes: M = Miniature, I = Intermediate, S = Standard, HS = Heavy-Standard, LH = Light-Heavy and H = Heavy.

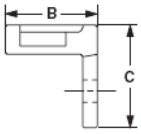
Topic: *Mil-Spec Tools and Components*

Abrasion Protection Mounts, Grommet Edging and Heat Shrink (...continued)

Right Angle Mounts

- Hold cable bundles away from the sharp edges of bulkheads or cabinet holes
- Can also be used to mount cable bundles adjacent to any surface
- Material: Nylon 6.6

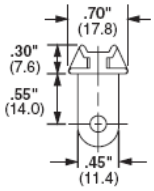


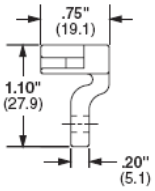


Used with Cable Ties	Length		Width		Height		Mounting Method	Mil. Std. Part Number
	In.	mm	In.	mm	In.	mm		
RAMS-S3-M	M, I, S,	.56	14.2	.39	9.9	.44	11.0	#3 (M2.5) Screw or 3/32 (2.4) Rivet	MS3341-2-9
RAMH-S6-D	M, I, S, HS, LH, H	1.00	25.4	.75	19.1	1.00	25.4	#6 (M3) Screw or 1/8 (3.2) Rivet	MS3341-1-9

Lightening Hole Mounts

- Secure cable bundles that run through bulkhead lightening holes
- Protect cable bundles from sharp edges
- For indoor use only
- Material: Nylon 6.6





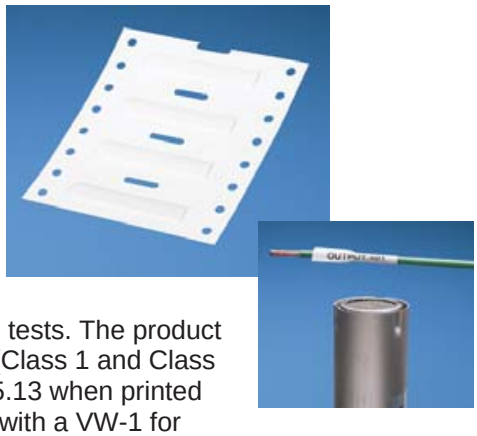
Used with Cable Ties‡	Mounting Method	Mil. Std. Part Number
LHMS-S6-D	M, I, S	#6 (M3) Screw or 9/64 (3.5) Rivet	MS3340-1-9

Heat Shrink Tubing

Series Part Number	Class	Government Designation	Type
HSTT Series	1 or 2	AMS-DTL-23053/5	DRY SHRINK™ HEAT SHRINK
HSTTV Series	3	AMS-DTL-23053/5	
HSTTN Series	2	AMS-DTL-23053/1	
HSTTT Series	3	AMS-DTL-23053/12	
HSTTK Series		AMS-DTL-23053/8	
HSTTA Series	3	AMS-DTL-23053/4	DAMP SHRINK™ HEAT SHRINK
HSTTRA Series	1	AMS-DTL-23053/4	
HST Series		AMS-DTL-23053/15	WET SHRINK™ HEAT SHRINK

Topic: *Mil-Spec Tools and Components*

Military Grade Heat Shrink Labels



Specifications - Military grade heat shrink labels shall be pre-cut, heat-shrinkable flattened polyolefin and shall readily accept thermal transfer print. The product shall meet the material requirements and physical properties of AMS-DTL-23053/5C (Class 1 and Class 3). Product shall meet print performance of MIL-M-81531 and MIL-STD-883E, Notice 4, Method 2015.13 when printed with RMH4BL or RMR4BL series thermal transfer ribbons. Product shall pass UL 224 standard with a VW-1 for flammability.

Applications - PANDUIT military grade heat shrink labels are designed to meet the specifications above. This solution provides a lower operating temperature, more durable label and printed legends that meet stringent military standards and tests. The product meets the material requirements and physical properties of AMS-DTL-23053/5C (Class 1 and Class 3), print performance of MIL-M-81531 and MIL-STD-883E, Notice 4, Method 2015.13 when printed with RMH4BL and RMR4BL-S thermal transfer ribbons, passes UL 224 standard with a VW-1 for flammability and meets testing requirements for nuclear plant (Class 1E) harsh environments (white and yellow only). When used in conjunction with PANDUIT ® EASY-MARK ™ Labeling Software, time-savings and reduced errors can be realized when creating legends and text.

Technical Information	
Material:	Pre-cut, heat-shrinkable flattened polyolefin meets the material and physical properties of AMS-DTL-23053/5C (Class 1 and Class 3) requirements
Print method:	Thermal transfer or dot-matrix
Service temperature range:	–67°F to 275°F (–67°C to 135°C)
Shrink temperature:	194°F to 248°F (90°C to 120°C)
Printability:	Product meets print performance of MIL-M-81531 and MIL-STD-883E, Notice 4, Method 2015.13 when printed with RMH4BL or RMR4BL series thermal transfer ribbons
Tested for nuclear plant (class 1E) harsh environments:	Printed markers meet requirements for radiation exposure, thermal aging, and LOCA/MSLB environmental testing; test margins related to IEEE 323-2003 were used (white and yellow only)
Recommended ribbon:	Normal use: Hybrid – RMH4BL for TDP43MY series printer or RHH4BL-S for TDP42HY series printer
	Most durable use: Resin – RMR4BL for TDP43MY series printer or RHR4BL-S for TDP42HY series printers
	For use with black color heat shrink - White ribbon RMR4WH should be used
RoHS compliance:	Material is RoHS compliant per European Directive 2002/95/EC on the Restriction of Hazardous Substances (RoHS)
Flammability:	Product passes UL 224 Standard, VW-1 for flammability

Heat Shrink Size	Part Number
1/8" (3.1mm) diameter:	H050X025H*T
	H075X025H*T
	H100X025H*T
	H150X025H*T
	H200X025H*T
3/16" (4.7mm) diameter:	H050X034H*T
	H075X034H*T
	H100X034H*T
	H150X034H*T
	H200X034H*T
	H050X044H*T
1/4" (6.3mm) diameter:	H075X044H*T
	H100X044H*T
	H150X044H*T
	H200X044H*T
3/8" (9.5mm) diameter:	H050X064H*T
	H100X064H*T
	H200X064H*T
1/2" (12.7mm) diameter:	H100X084H*T
	H200X084H*T
1" (25.4mm) diameter:	H100X165H*T
	H200X165H*T

Topic: *Mil-Spec Tools and Components*

Panduit Cable TIes

The *PANDUIT* Cable Ties and Marker Ties listed in the tables below meet all of the testing requirements of Aerospace Standard SAE-AS23190A (formerly MIL-S-23190E) and the dimensional requirements of Aerospace Standards SAE-AS33671 (formerly MS3367) and SAE-AS33681 (formerly MS3368). * Weather Resistant per ASTM D 4066-94B

Cable Tie Cross Reference						
Mil. Std. Part Number	**Color**	**Pan-Ty®**	**Dome-Top® Barb Ty**	**Sta-Strap®**	**Belt-Ty™ In-Line**	**Contour-Ty®**
MS3367-1-0	Black *	PLT2S-C00, -M00	---	---	---	---
MS3367-1-1	Brown	PLT2S-C1, -M1	BT2S-M1	---	---	---
MS3367-1-2	Red	PLT2S-C2, -M2	BT2S-M2	---	---	---
MS3367-1-3	Orange	PLT2S-C3, -M3	BT2S-M3	---	---	---
MS3367-1-4	Yellow	PLT2S-C4Y, -M4Y	BT2S-M4Y	---	---	---
MS3367-1-5	Green	PLT2S-C5, -M5	BT2S-M5	---	---	---
MS3367-1-6	Blue	PLT2S-C6, -M6	BT2S-M6	---	---	---
MS3367-1-7	Purple	PLT2S-C7, -M7	BT2S-M7	---	---	---
MS3367-1-8	Gray	PLT2S-C8, -M8	BT2S-M8	---	---	---
MS3367-1-9	Natural	PLT2S-C, -M, -VMR	BT2S-C, -M	SST2S-C, -M	---	---
MS3367-2-0	Black *	PLT4S-C00, -M00	---	---	---	---
MS3367-2-1	Brown	PLT4S-M1	---	---	---	---
MS3367-2-2	Red	PLT4S-C2, -M2	BT4S-M2	SST4S-M2	---	---
MS3367-2-3	Orange	PLT4S-C3, -M3	BT4S-M3	---	---	---
MS3367-2-4	Yellow	PLT4S-C4Y, -M4Y	BT4S-M4Y	---	---	---
MS3367-2-5	Green	PLT4S-C5, -M5	BT4S-M5	---	---	---
MS3367-2-6	Blue	PLT4S-C6, -M6	BT4S-M6	---	---	---
MS3367-2-7	Purple	PLT4S-C7, -M7	BT4S-M7	---	---	---
MS3367-2-8	Gray	PLT4S-C8, -M8	BT4S-M8	---	---	---
MS3367-2-9	Natural	PLT4S-C, -M	BT4S-C, -M	SST4S-C, -M	---	---
MS3367-3-0	Black *	PLT4H-L00, -TL00	---	---	---	---
MS3367-3-1	Brown	PLT4H-TL1	---	---	---	---
MS3367-3-2	Red	PLT4H-TL2	---	---	---	---
MS3367-3-3	Orange	PLT4H-TL3	---	---	---	---
MS3367-3-4	Yellow	PLT4H-TL4Y	---	---	---	---
MS3367-3-5	Green	PLT4H-TL5	---	---	---	---
MS3367-3-6	Blue	PLT4H-TL6	---	---	---	---
MS3367-3-9	Natural	PLT4H-L, -C, -TL	BT4LH-L, -TL	SST4H-L, -D	---	---
MS3367-4-0	Black *	PLT1M-C00, -M00, -XMR00	---	---	---	---
MS3367-4-0	Black *	PLT1.5M-XMR00	---	---	---	---

Topic: *Mil-Spec Tools and Components*

Panduit Cable TIes

Cable Tie Cross Reference						
Mil. Std. Part Number	**Color**	**Pan-Ty®**	**Dome-Top® Barb Ty**	**Sta-Strap®**	**Belt-Ty™ In-Line**	**Contour-Ty®**
MS3367-4-1	Brown	PLT1M-C1, -M1, -XMR1	BT1M-M1	---	---	---
MS3367-4-2	Red	PLT1M-C2, -M2, -XMR2	BT1M-M2	---	---	---
MS3367-4-3	Orange	PLT1M-C3, -M3, -XMR3	BT1M-M3	---	---	---
MS3367-4-4	Yellow	PLT1M-C4Y, -M4Y, -XMR4Y	BT1M-M4Y	---	---	---
MS3367-4-5	Green	PLT1M-C5, -M5, -XMR5	BT1M-M5	---	---	---
MS3367-4-6	Blue	PLT1M-C6, -M6, -XMR6	BT1M-M6	---	---	---
MS3367-4-7	Purple	PLT1M-C7, -M7, -XMR7	BT1M-M7	---	---	---
MS3367-4-8	Gray	PLT1M-C8, -M8, -XMR8	BT1M-M8	---	---	---
MS3367-4-9	Natural	PLT1M-C, -M, -XMR	BT1M-C, -M, -XMR	SST1M-C, -M	---	---
MS3367-4-9	Natural	PLT.7M-C, -M	---	---	---	---
MS3367-4-9	Natural	PLT1.5M-XMR	BT1.5M-XMR	---	---	---
MS3367-5-0	Black *	PLT1.5I-M00	---	---	---	---
MS3367-5-1	Brown	PLT1.5I-C1, -M1	BT1.5I-M1	---	---	---
MS3367-5-2	Red	PLT1.5I-C2, -M2	BT1.5I-M2	---	---	---
MS3367-5-3	Orange	PLT1.5I-C3, -M3	BT1.5I-M3	---	---	---
MS3367-5-4	Yellow	PLT1.5I-C4Y, -M4Y	BT1.5I-M4Y	---	---	---
MS3367-5-5	Green	PLT1.5I-C5, -M5	BT1.5I-M5	---	---	---
MS3367-5-6	Blue	PLT1.5I-C6, -M6	BT1.5I-M6	---	---	---
MS3367-5-7	Purple	PLT1.5I-C7, -M7	BT1.5I-M7	---	---	---
MS3367-5-8	Gray	PLT1.5I-C8, -M8	BT1.5I-M8	---	---	---
MS3367-5-9	Natural	PLT1.5I-C, -M	BT1.5I-C, -M	SST1.5I-C, -M	---	---
MS3367-6-9	Natural	PLT8LH-L, -C,	BT8LH-L, -C	SST8H-L, -D	---	---
MS3367-6-9	Natural	---	BT9LH-L, -C	---	---	---
MS3367-7-0	Black *	PLT3S-C00, -M00	---	---	---	---
MS3367-7-1	Brown	PLT3S-M1	---	---	---	---
MS3367-7-2	Red	PLT3S-C2, -M2	BT3S-C2	---	---	---
MS3367-7-3	Orange	PLT3S-M3	---	---	---	---
MS3367-7-4	Yellow	PLT3S-M4Y	---	---	---	---
MS3367-7-5	Green	PLT3S-M5	---	---	---	---
MS3367-7-6	Blue	PLT3S-M6	---	---	---	---
MS3367-7-7	Purple	PLT3S-M7	---	---	---	---
MS3367-7-8	Gray	PLT3S-M8	---	---	---	---

Topic: *Mil-Spec Tools and Components*

Panduit Cable Ties

Cable Tie Cross Reference						
Mil. Std. Part Number	**Color**	**Pan-Ty®**	**Dome-Top® Barb Ty**	**Sta-Strap®**	**Belt-Ty™ In-Line**	**Contour-Ty®**
MS3367-7-9	Natural	PLT3S-C, -M	BT3S-C, -M	SST3S-C, -M	---	---
MS3367-8-9	Natural	PLT5H-L, -C	---	---	---	---
MS3367-9-9	Natural	PLT6H-L, -C	---	---	---	---
MS3367-11-9	Natural	PLT8H-L, -C	---	---	---	---
MS3367-14-9	Natural	PLT13H-Q, -C	---	---	---	---
MS3367-20-9	Natural	PLT5EH-Q, -C	---	---	---	---
MS3367-21-9	Natural	PLT6EH-Q, -C	---	---	---	---
MS3367-22-9	Natural	PLT8EH-Q, -C	---	---	---	---
MS3367-23-9	Natural	---	---	---	ILT2S-C, -M	---
MS3367-24-9	Natural	---	---	---	ILT4S-C, -M	---
MS3367-25-9	Natural	---	---	---	ILT4LH-TL	---
MS3367-26-9	Natural	---	---	---	--	---
MS3367-27-9	Natural	---	---	---	--	---
MS3367-29-9	Natural	---	---	---	ILT3S-C, -M	---
MS3367-30-9	Natural	---	---	---	---	CBR1M-M
MS3367-31-9	Natural	---	---	---	---	CBR1.5M-M
MS3367-32-1	Brown	---	---	---	---	CBR2M-M1
MS3367-32-2	Red	---	---	---	---	CBR2M-M2
MS3367-32-3	Orange	---	---	---	---	CBR2M-M3
MS3367-32-4	Yellow	---	---	---	---	CBR2M-M4Y
MS3367-32-5	Green	---	---	---	---	CBR2M-M5
MS3367-32-6	Blue	---	---	---	---	CBR2M-M6
MS3367-32-7	Purple	---	---	---	---	CBR2M-M7
MS3367-32-9	Natural	---	---	---	---	CBR2M-M
MS3367-33-9	Natural	---	---	---	---	CBR1.5I-M
MS3367-34-1	Brown	---	---	---	---	CBR3I-M1
MS3367-34-2	Red	---	---	---	---	CBR3I-M2
MS3367-34-3	Orange	---	---	---	---	CBR3I-M3
MS3367-34-4	Yellow	---	---	---	---	CBR3I-M4Y
MS3367-34-5	Green	---	---	---	---	CBR3I-M5
MS3367-34-6	Blue	---	---	---	---	CBR3I-M6
MS3367-34-7	Purple	---	---	---	---	CBR3I-M7
MS3367-34-8	Gray	---	---	---	---	CBR3I-M8
MS3367-34-9	Natural	---	---	---	---	CBR3I-M

Topic: *Mil-Spec Tools and Components*

Panduit Cable Ties

Cable Tie Cross Reference						
Mil. Std. Part Number	**Color**	**Pan-Ty®**	**Dome-Top® Barb Ty**	**Sta-Strap®**	**Belt-Ty™ In-Line**	**Contour-Ty®**
MS3367-7-9	Natural	PLT3S-C, -M	BT3S-C, -M	SST3S-C, -M	---	---
MS3367-8-9	Natural	PLT5H-L, -C	---	---	---	---
MS3367-9-9	Natural	PLT6H-L, -C	---	---	---	---
MS3367-11-9	Natural	PLT8H-L, -C	---	---	---	---
MS3367-14-9	Natural	PLT13H-Q, -C	---	---	---	---
MS3367-20-9	Natural	PLT5EH-Q, -C	---	---	---	---
MS3367-21-9	Natural	PLT6EH-Q, -C	---	---	---	---
MS3367-22-9	Natural	PLT8EH-Q, -C	---	---	---	---
MS3367-23-9	Natural	---	---	---	ILT2S-C, -M	---
MS3367-24-9	Natural	---	---	---	ILT4S-C, -M	---
MS3367-25-9	Natural	---	---	---	ILT4LH-TL	---
MS3367-26-9	Natural	---	---	---	--	---
MS3367-27-9	Natural	---	---	---	--	---
MS3367-29-9	Natural	---	---	---	ILT3S-C, -M	---
MS3367-30-9	Natural	---	---	---	---	CBR1M-M
MS3367-31-9	Natural	---	---	---	---	CBR1.5M-M
MS3367-32-1	Brown	---	---	---	---	CBR2M-M1
MS3367-32-2	Red	---	---	---	---	CBR2M-M2
MS3367-32-3	Orange	---	---	---	---	CBR2M-M3
MS3367-32-4	Yellow	---	---	---	---	CBR2M-M4Y
MS3367-32-5	Green	---	---	---	---	CBR2M-M5
MS3367-32-6	Blue	---	---	---	---	CBR2M-M6
MS3367-32-7	Purple	---	---	---	---	CBR2M-M7
MS3367-32-9	Natural	---	---	---	---	CBR2M-M
MS3367-33-9	Natural	---	---	---	---	CBR1.5I-M
MS3367-34-1	Brown	---	---	---	---	CBR3I-M1
MS3367-34-2	Red	---	---	---	---	CBR3I-M2
MS3367-34-3	Orange	---	---	---	---	CBR3I-M3
MS3367-34-4	Yellow	---	---	---	---	CBR3I-M4Y
MS3367-34-5	Green	---	---	---	---	CBR3I-M5
MS3367-34-6	Blue	---	---	---	---	CBR3I-M6
MS3367-34-7	Purple	---	---	---	---	CBR3I-M7
MS3367-34-8	Gray	---	---	---	---	CBR3I-M8
MS3367-34-9	Natural	---	---	---	---	CBR3I-M

Topic: *Mil-Spec Tools and Components*

Panduit Cable Ties

Cable Tie Cross Reference						
Mil. Std. Part Number	**Color**	**Pan-Ty®**	**Dome-Top® Barb Ty**	**Sta-Strap®**	**Belt-Ty™ In-Line**	**Contour-Ty®**
MS3367-35-9	Natural	---	---	---	---	CBR4I-M
MS3367-36-9	Natural	---	---	---	---	CBR2S-M
MS3367-37-9	Natural	---	---	---	---	CBR3S-M
MS3367-38-9	Natural	---	---	---	---	CBR4S-M
MS3367-39-9	Natural	---	---	---	---	CBR2HS-D
MS3367-40-9	Natural	---	---	---	---	CBR4LH-TL
MS3367-41-9	Natural	---	---	---	---	CBR6LH-C
MS3368-1-2A	Red	PLM2S-D2	---	---	---	---
MS3368-1-3A	Orange	PLM2S-D3	---	---	---	---
MS3368-1-4A	Yellow	PLM2S-C4Y, -D4Y	---	---	---	---
MS3368-1-5A	Green	PLM2S-D5	---	---	---	---
MS3368-1-6A	Blue	PLM2S-D6	---	---	---	---
MS3368-1-8A	Gray	PLM2S-D8	---	---	---	---
MS3368-1-9A	Natural	PLM2S-C, -D	BM2S-C, -D	---	---	---
MS3368-1-9B	Natural	---	---	SSM2S-C, -D	---	---
MS3368-2-2A	Red	PLM4S-D2	---	---	---	---
MS3368-2-4A	Yellow	PLM4S-D4Y	---	---	---	---
MS3368-2-6A	Blue	PLM4S-D6	---	---	---	---
MS3368-2-9A	Natural	PLM4S-C, -D	BM4S-C, -D	---	---	---
MS3368-2-9B	Natural	---	---	SSM4S-D	---	---
MS3368-3-4C	Yellow	PL2M2S-D4Y	---	---	---	---
MS3368-3-9C	Natural	PL2M2S-L, -D	B2M2S-D	---	---	---
MS3368-4-4D	Yellow	PL3M2S-D4Y	---	---	---	---
MS3368-4-9D	Natural	PL3M2S-L, -D	B3M2S-TL	---	---	---
MS3368-5-1E	Brown	PLM1M-M1	---	---	---	---
MS3368-5-2E	Red	PLM1M-M2	---	---	---	---
MS3368-5-3E	Orange	PLM1M-M3	---	---	---	---
MS3368-5-4E	Yellow	PLM1M-M4Y	---	---	---	---
MS3368-5-5E	Green	PLM1M-M5	---	---	---	---
MS3368-5-6E	Blue	PLM1M-M6	---	---	---	---
MS3368-5-7E	Purple	PLM1M-M7	---	---	---	---
MS3368-5-8E	Gray	PLM1M-M8	---	---	---	---
MS3368-5-9E	Natural	PLM1M-C, -M	BM1M-C, -M	---	---	---

Topic: *Mil-Spec Tools and Components*

Cable Tie Installation Tools

The PANDUIT Installation Tools listed in this section meet all of the testing requirements of MIL-T -81306 and the dimensional

Mil. Std. Part Number	Panduit P/N
MS90387-1	GTS, GS2B
MS90387-2	GS4H
MS90387-3	GS4MT

Military Standards Conversion

Since the old Mil-Spec system is being phased out and newer SAE standards are being adopted, SAE has put together a process that is used to convert from “MIL-” to “AS-” . The full process is described on the SAE International Website. Below is a summary of how the conversion works.

http://www.sae.org/standardsdev/military/milproc.htm

Aerospace Council Procedures for Conversion of Military Standards

The SAE Aerospace Council has approved this process for the conversion of military standards into SAE standards. The conversion projects stem from government Preparing Activities (PA) that are releasing specifications and standards to Non Government Standards Bodies (NGSB). These procedures establish continuity among the SAE committees, and address two major concerns, technical equivalency and approval of the resultant SAE document.

Please note that DOD did not support changing the Preparing Activity or design authority to an NGSB. Their desire is to have the standards converted to the NGSB format and issued as an NGS. Similarly, the SAE cover sheet adoption process was unacceptable.

Supersession Information

Through the AIA Early Warning Project Group (EWPG), the aerospace industry has taken a firm position that the DOD cancellation notice should list a specific NGSB replacement document. This paper trail facilitates the procurement of material or other products to the appropriate follow-on standard. The government PA accomplishes this action, but may need reinforcement from the committee. Procedures are in place to acquire the cancellation notices for DOD standards converted into SAE documents.

Document Numbering

The primary purpose of controlling document numbering for the conversions is to minimize its impact on part numbers. Therefore, DOD standards converted to SAE standards will have an SAE number that consists of the appropriate SAE prefix and the DOD document number. The part numbering requirements within the document will not change.

Examples:

QQ-A-200 becomes AMS QQ-A-200 (federal spec)
MIL-H-83797 becomes AS83797 (mil spec)

QPL Information

For legal reasons, SAE standards may not include or relate to the creation of a qualified products list. However, the converted standard may include requirements and procedures, but actual implementation of the QPL can only be included as a section or an attachment for historic reference. Standards approved using the accelerated process carry an introductory notice stating this information.

QPL information in the converted document will not be changed until a revision of the published SAE standard is made. The suggested time frame for this action is within three years after publication.

Other Topics for Research

Military Connector Specifications
ASTM International
National Aerospace Standard (NAS)
National Aerospace Standard, Metric (NASM)
Standardization
Specification
Military technology and equipment
Standards organizations
International standard
American National Standards Institute
Institute of Environmental Sciences and Technology -IEST
M13486

Topic: ***Mil-Spec Tools and Components***

Non-exhaustive list of reference documents

H4 Handbook, a handbook containing vendor CAGE code details

H8 Handbook, another handbook containing vendor CAGE code details

MIL-E-7016F, pertains to the analysis of AC and DC loads on an aircraft.

MIL-STD-105, Sampling Procedures and Tables for Inspection by Attributes (withdrawn)

MIL-STD-188, a series related to telecommunications

MIL-STD-202, quality standards for electronic parts.

MIL-STD-498, on software development and documentation

MIL-STD 461, "Requirements for the control of electromagnetic interference characteristics of subsystems and equipment"

MIL-STD-810, test methods for determining the environmental effects on equipment

MIL-STD-882, standard practice for system safety

MIL-STD-883, test method standard for microcircuits

MIL-STD-1246C, particle and molecular contamination levels for space hardware (has been replaced with IEST-STD-1246).

MIL-STD-1394, this is concerned with the construction quality of hats and is often confused with IEEE 1394.

MIL-STD-2196, pertains to optical fiber communications

MIL-STD-2361, pertains to digital development, acquisition, and delivery of Army administrative, training and doctrine, and technical equipment publications in SGML.

MIL-PRF-38534, General Specification For Hybrid Microcircuits.

MIL-PRF-38535, General Specification For Integrated Circuits (Microcircuits) Manufacturing.

That's it for this lesson.

I'd like to thank all the Product Divisions that provided information for this PMail. Without your continued expert advice and input my job putting this training together would be allot more difficult.

Thanks to my colleague George Capek for asking great questions with great timing!

Please remember that this and all PMail Mini Lessons are for training purposes only. I try to be accurate, but DO NOT assume that the information in this or any PMail is the final word on any subject discussed.

Always consult the latest Panduit Product bulletins, Marketing Updates, and specific product manuals for the latest product information.

As always, good luck out there! Call me with any questions you might have while selling our great products!

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Chris Woods
Applications Engineer - Western Region
Cellular: (303) 257-1655
Customer Service: (800) 777-3300
cfw@panduit.com