



# LaceLok™

## Cable Lacing Fastener

IDEAL INDUSTRIES, Inc.

Made in USA

Patent Pending

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## LaceLok™ Cable Lacing Fastener



*LaceLok™ Cable Lacing Fasteners are used as secondary supports for cable and wire bundling. They were developed to replace cable ties and hand tied lace, providing the ease of installation similar to a cable tie with the preferred properties of the lace.*

- Small, rounded fastener head reduces damage to wire bundles and surrounding components*
- Installs faster and easier than hand tying lace reducing labor costs*
- Laces constructed of Nomex® for excellent chemical & temperature resistance, as well as low abrasion to wire bundles*
- In weight critical applications, compared to cable ties, LaceLok™ Cable Lacing Fasteners weigh less and contribute more to overall fuel efficiency*
- LaceLok™ Cable Lacing Fasteners can be single, double or triple wrapped around wire bundles for increased tensile strength*

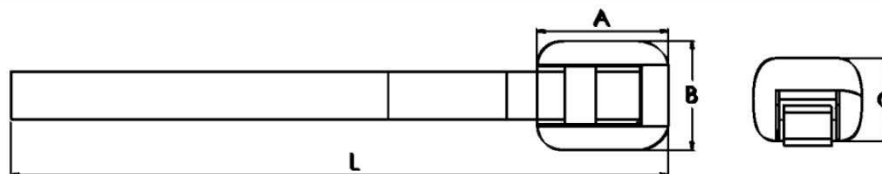
*Nomex® is a registered trademark of E.I. du Pont de Nemours and Co.*



# LaceLok™ Cable Lace Fastener



## Mechanical



### Fastener

- Length (A): 0.276 in (7.01mm)
- Width (B): 0.230 in (5.84mm)
- Height (C): 0.175 in (4.44mm)
- Weight: 0.0095 oz. (0.269 g)
- Length (L): 6-44 inches (152-1118 mm)
- Operating Temperature: -55°C to 260°C (-67°F to 500°F)\*
- Replaces 4 in (100mm) to 14 in (366 mm) Cable Ties
  - Single wrap exceeds 4 inch rating
  - Double wrap exceeds 7 inch rating
  - Triple wrap exceeds 14 inch rating
- All Testing per SAE AS23190

### Fastener

- Ultra High Temp Thermoplastic
  - Black
  - UV Resistant

### Lace

- Nomex®
  - Milspec A-A-52084
  - Size 2
  - Finish C
  - White

\*Operating temperature : Fastener rated at 300°C; lace rated at 260°C. Currently testing thermal shock at -60°C to 300°C



# Application Chart



Diameter of Bundle (in)	Cable tie length (in)	Cable tie Tensile strength (Pounds)	LaceLok™ CLF Sizes (in)	# of LaceLok™ CLF wraps	LaceLok™ CLF Tensile strength (Pounds)
<1	4	18	6	1	39
1	5	30	6	1	39
1	7	50	10	2	98
1.5	7	50	18	2	98
2	11	50	18	2	98
2.5	11	50	24	2	98
3	11	50	24	2	98
3.5	14	120	44	3	164
4	14	120	44	3	164

Diameter of Bundle (mm)	Cable tie length (mm)	Cable tie Tensile strength (Newtons)	LaceLok™ CLF Sizes (mm)	# of LaceLok™ CLF wraps	LaceLok™ CLF Tensile strength (Newtons)
<25.4	102	80	152	1	173
25.4	127	133	152	1	173
25.4	200	222	254	2	435
38.1	200	222	457	2	435
50.8	282	222	457	2	435
63.5	282	222	610	2	435
76.2	282	222	610	2	435
88.9	366	534	1118	3	729
101.6	366	534	1118	3	729



# Performance Testing



Testing completed based upon AS23190 criteria

- Moisture conditioning
- Tensile strength
- Temperature cycling
- Fluid immersion
  - Isopropyl alcohol
  - Lubricating oil
  - Hydraulic fluid
  - Jet fuel

Slip resistance-prescribed by NAVAIR

Testing completed based upon SAE A-A-52084

- Flammability

Testing completed based upon AS 23190/4

- Vibration

Testing completed based upon SAE AS4373

- Extended life fuel immersion
- Coax cable signal strength loss

Fuel immersion life testing-new to NAVAIR-not required in upcoming mil-spec

- Monthly tensile strength testing during fuel immersion



# Performance Testing



Reference X92SP1406547

## Requirements

Paragraph	Req. #	Description	Meets: Y/N/(U)NKNOWN	Comments
8.1 Design	1	Design Proposal	Y	Proposed Product: Cable Lace Fastener
	2	Harness Shape	Y	
	3	Sleeve Installation	U	Requires sleeve specifications and test
	4	Self Opening	Y	Permanent fastener activation
	5	Distributed Force	Y	
	6	Tight Installation	Y	
	7	Non-Marking	Y	
	8	Sharp Edges	Y	
	9	Combining to Harness	Y	
	10	Non-Jamming	Y	
	11	Non-Aggressive	Y	
	12	Non-Metallic	Y	
	13	Removable Without Damage	Y	
8.2 Installation and Tools	15	Non-Operator Dependent	Y	Activation force governed by fastener design and repeatable
	16	Process Capability	U	Statistical test data required
	17	5 Second Installation	N	Installation 10 - 15 s
	18	5 Second Un-installation	Y	
	19	FOD Free	U	Installation includes trimming operation that requires management by the operator
	20	Damage to Aircraft Components	Y	
	21	Negative Health Effects	Y	Installation similar to existing cable ties





# Performance Testing



Requirements				
Paragraph	Req. #	Description	Meets: Y/N/(U)NKNOWN	Comments
8.3 Bundle Diameter Range	25	Min Bundle Diameter	Y	
	26	Max Bundle Diameter	Y	
8.4 Dimensions	27	Harness Radius	N	Fastener head height 4.44 mm
8.5 Mass	28	Mass of Device	Y	
8.6.1 Material Type	29	Proposed by Supplier	Y	
	30	EHS, ROHS Compliance	Y	
	31	Chemically Neutral	Y	
	32	Insulation, dielectric, aging, moisture	Y	
8.6.2 Temperature	33	-65 °C - 150 °C Operating Range	Y	Tested per SAE AS23190 section 4.7.4.2 (MIL-STD-202 Method 107, Condition B, Step 3)
	34	-65 °C - 260 °C Operating Range	U	Curently testing
	35	-65 °C - 1000 °C Operating Range	N	
8.6.3 Color	36	Color Code	Y	
8.6.4 Heat Aging	37	EN4057-306	U	EN4057-306 must be reviewed, Tensile strength tested per AS23190 Section 4.7.3
8.6.5 Flammability	38	ABD0031 7.1	U	ABD0031 must be reviewed, Flammability testing per A-A-52084 Section 5.2.4



# Performance Testing



Requirements				
Paragraph	Req. #	Description	Meets: Y/N/(U)NKNOWN	Comments
8.6.6 Smoke Density	39	ABD0031 7.3	U	ABD0031 must be reviewed, smoke density test results provided by material supplier
8.6.7 Toxicity	40	ABD0031 7.4	U	ABD0031 must be reviewed, products of combustion provided by material supplier
8.6.8 U.V. Resistance	41	EN4057-307, EN4057-401	U	Requirements of EN4057-307 and EN4057-401 must be reviewed
8.6.9 Fluid Resistance	42	Fluid Resistance	U	EN2591-315 must be reviewed, Fluid immersion tested be SAE AS23190 Section 4.7.5
8.6.10 Humidity	45	Humidity	U	EN2591-321 must be reviewed, moisture conditioning tested per SAE AS23190 Section 4.7.3
8.6.11 Fungus Resistance	46	Fungus Resistance	U	EN2591-321 must be reviewed, fungus resistance not tested on assembly
8.7.1 Loop Tensile Strength	47	Loop Tensile Strength	U	EN4057-401 must be reviewed, tensile testing performed per SAE AS23190 Section 4.7.3
8.7.2 Uniformly Distributed Force	48	Uniformly Distributed Force	Y	
8.7.3 Vibration Test	49	Vibration Test	U	EN2591-402 must be reviewed, vibration testing performed as described in MIL-SPEC
8.7.4 Shock	50	Shock Resistance	U	EN2591-402 Method A must be reviewed, shock resistance not tested
8.7.5 Transversal Movement	51	Transversal Movement	Y	
8.8 Installation Test	52	Installation Test	Y	
9 Quality Assurance	53	Qualification Test Procedure	Y	
10 Designation and Marking	54	Package/Part Marking	Y	





# Weight Comparison to Cable Ties

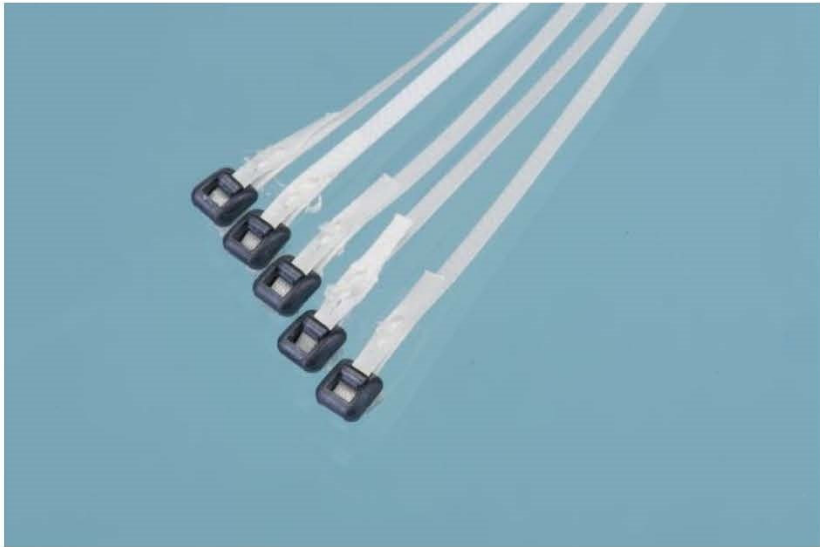
- LaceLok™ Cable Lacing Fastener (single wrapped) is 14% lighter than a 4 inch (100mm) leading Nylon® Mil Spec Cable Tie on a 7/8 inch (22mm) bundle
- LaceLok™ Cable Lacing Fastener (double wrapped) is 63% lighter than a 7" (200mm) leading Nylon® Mil Spec Cable Tie on a 1 inch (25mm) bundle; and 67% lighter on a 1-½ inch (38mm) bundle
- LaceLok™ Cable Lacing Fastener (triple wrapped) is 79% lighter than a 14" (366 mm) leading Nylon® Mil Spec Cable Tie on a 1-½ inch (38 mm) bundle



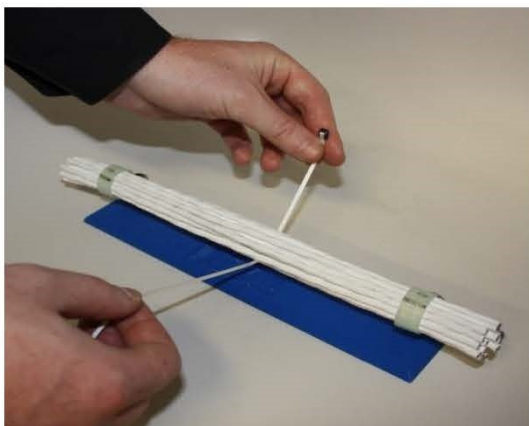
# LaceLok™ Cable Lacing Fastener



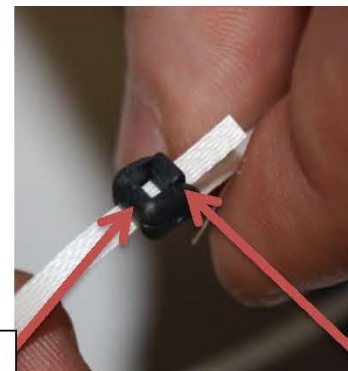
- Installation
  - Very similar to installation of a cable tie
  - Uses a hand tool to tighten down to bundle and cut the excess lace



**Step 1** Slide LaceLok™ CLF underneath the cable bundle.



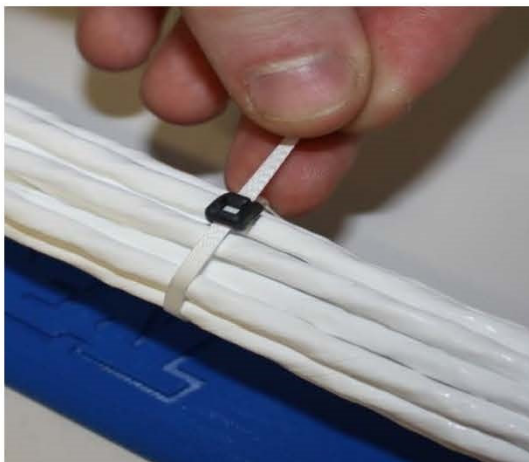
**Step 2** Slide tail end through opening of buckle ensuring end of lace slides under pin on buckle.



Opening

Pin

**Step 3** Cinch lace tight against cable bundle.



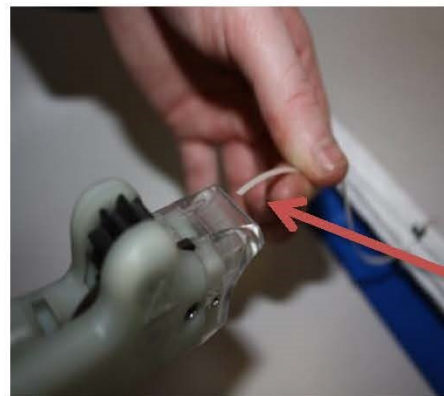
**Step 4** Loop end of lace over pin and back through opening.



**Step 5** Cinch lace tight against the cable bundle. LaceLok™ CLF is now ready to be activated with application tool.



**Step 6** Slide end of lace through opening nose of application tool.



Nose Piece

**Step 7** Pull trigger on application tool. Lace will be pulled through gear set. This allows tool to activate.



Gear Set

**Step 8** Ensure LaceLok™ CLF head is nested properly in nose piece of tool. , Lace should be traveling through tool in direction tangent to bundle

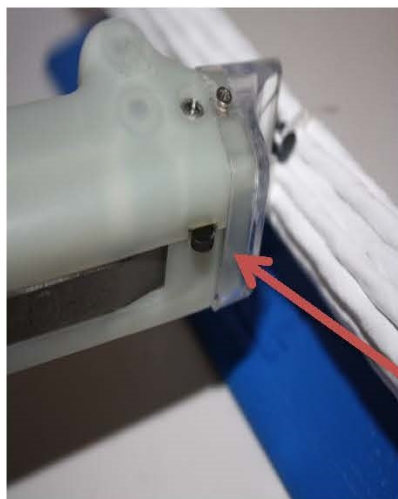




**Step 9** Pull trigger on application tool to activate the pin. This will clinch lace tight within the buckle.



**Step 10** Once the pin on the LaceLok™ CLF has been activated, application tool will also cut end of tail.



**FYI** If the application tool does not cut the lace, activate the pin, or is jammed; push the pawl release and pull the gun away from the cable bundle. The lace will be able to slide back through the gear set. The blue arrow represents the direction the pawl release needs to be pushed.

Pawl Release





# Conclusions: LaceLok™ CLF



- Versus hand tied lace
  - Faster and easier to install
  - Reduces repetitive motion injuries
  - More consistent tension on cable bundle
  - Stays more secure in chemical exposure situations
- Versus Nylon® cable ties
  - Softer for less cable bundle abrasion
  - Smaller head than most cable ties
  - Lighter for fuel savings
  - Larger temperature range
  - Better UV resistance



REPLACES HAND TIES  
& CABLE TIES

## Cable Lacing Fastener

### FEATURES/BENEFITS:



PATENTS PENDING

INSTALLS FASTER & EASIER THAN HAND TYING

- + LABOR SAVINGS
- + REDUCED REPETITIVE HAND MOTIONS

LACE IS SOFTER THAN CABLE TIE

- + REDUCES WEAR ON WIRE BUNDLES

LACE MAKES CONTACT ALL THE WAY AROUND THE BUNDLE

- + REDUCES ABRASION

FASTENER HEAD IS SMALLER & MORE ROUNDED THAN CABLE TIE HEAD

- + REDUCES THE LIKELYHOOD OF DAMAGE TO BUNDLE & SURROUNDING COMPONENTS
- + REDUCES ABRASIONS TO INSTALLER

LIGHTER THAN CABLE TIE

- + IMPROVES FUEL EFFICIENCY

### MECHANICAL:

FASTENER:  
LENGTH: 0.276 in (7.01mm)  
WIDTH: 0.230 in (5.84mm)  
HEIGHT: 0.175 in (4.44mm)  
WEIGHT: 0.0095 oz (.0269 g)  
  
OVERALL LENGTH WITH LACE: 7.625"

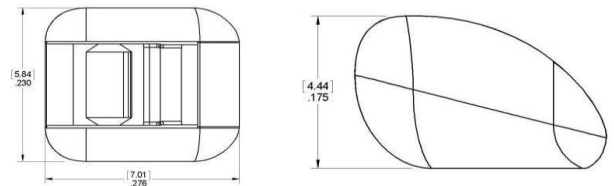
### PHYSICAL:

FASTENER: ULTRA HIGH TEMP THERMOPLASTIC, UV RESISTENT  
  
LACE: NOMEX®  
  
TEMPERATURE: MIN TEMP RATING 150°C  
  
COLOR: FASTENER: BLACK  
LACE: (WHITE WITH BLACK TRACER)

### STANDARDS & SPECIFICATIONS:

LACE IN MILSPEC A-A-52084 Size 2 Finish C

### DIMENSIONS (mm):



### ORDERING INFO:

CATALOG #  
45-XXXX

CARTON QTY:

TBD  
TBD  
TBD  
TBD

WEIGHT LBS (KG):

TBD  
TBD  
TBD

### FACTORY CONTACT:



### SALES CONTACT:

AWM Weidner  
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70794 Filderstadt  
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NOMEX IS A REGISTERED TRADEMARK OF E I DUPONT

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