



advancecomponents.com 972-446-5500

# INDUSTRIAL PREFERRED PRODUCT CATALOG



Wire & Tube Management

Component Mounting

Panel Assembly

ARaymond ™

MORE THAN FASTENING

 TINERMAN

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## About Us

ARaymond Tinnerman, part of the ARaymond Network, is a global supplier of fastening solutions. The company collaborates with its industrial customers on a day-to-day basis, combining its technical expertise with the customer's market sector skills to enable the development of customized solutions to support long-term partnerships. Engineers analyze the production lines, identify potential areas of improvement, and propose solutions to simplify the processes and cut costs. This strategy of collaboration is at the forefront of the major innovations or improvements that target one essential objective: the reduction of the total cost of ownership.

ARaymond has always envisioned the future with a combination of imagination and realism. Since its inception in 1865, the company has supported the glove, shoe, leather, textile, radio, construction, industrial and automotive markets, each representing a decisive stage in the company's evolution. In 2009, ARaymond acquired Tinnerman®, another century old fastener manufacturer with strong brand recognition in the United States. ARaymond now has more than 25 manufacturing facilities across the globe.

ARaymond's standard product portfolio includes stamped metal fasteners, plastic fasteners and molded wire and cable management systems. ARaymond has equipped 220 engineers, located at 12 R&D centers, with the latest design software, in-house SLA modeling and fast prototyping capabilities. Collectively, these resources provide the ability to design innovative products to meet application needs.

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# Custom Solutions

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Our fastening experts can provide you with customized solutions to fit your specific assembly needs. Our solutions are tested and approved in our state-of-the-art facilities located across the globe.

## Our business: more than fastening...

With 150 years of experience, ARaymond Network designs and manufactures attachment and assembly solutions in its five confirmed areas of expertise:

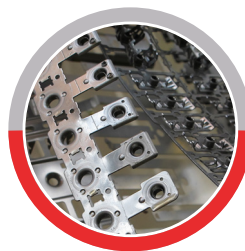
- **Engineering and Services:** developing customized solutions. Combining the advanced engineering team's technical expertise with the customer's market sector skills enables the development of customized solutions. Engineers analyze the production lines, identify potential areas of improvement, and propose solutions to simplify processes and cut costs. ARaymond has equipped 220 engineers, located at 12 R&D centers, with the latest design software, in-house SLA modeling and fast prototyping capabilities.
- **Metal Processing:** cutting, bending, stamping and roll forming of metal. We work mostly with carbon steel, stainless steel, brass and copper in thicknesses of 0.2 to 6.35 mm, and can provide single or multi-layer surface treatments.
- **Plastic Injection:** overmolding, bi-injection with over 300 thermoplastic materials available (polyamide, polyethylene, polyvinyl acetates, polypropylenes and more). The ARaymond Network production facilities are equipped with presses as large as 1,000 tons and 128-cavity molds. For applications calling for tracking, RFID (Radio Frequency IDentification) tags can be incorporated directly into the product.
- **Bonding Services:** customized solutions using quick-dry adhesives. This expertise is based on innovative assembly technology that is especially suitable for materials where attaching to glass is a key consideration.
- **Assembly:** metal/metal, plastic/plastic, and combinations of the two materials. We handle all modes of assembly: manual, semi-automated and cycle-time optimized automated assembly, as well as continuous motion assembly that can produce up to 24,000 parts per hour.

We can offer you our latest innovations, developed to increase your productivity: traceability, plastic parts that absorb vibrations, fast-curing adhesive tablets, an automatic assembly gun and fluid connections.

[Please contact us for more information on our areas of expertise or for custom solutions.](#)



Engineering & Services



Metal Processing



Plastic Injection



Bonding Services



Assembly



# Finding the Right Product Quickly

We have developed a selection guide to help you easily find product...

Our selection guide is on pages 10-11.

You can use the table to identify the product family you need:

• The first column shows the application being fastened: cables, tubes, panels, trim pieces, etc. They are grouped by the following functions:

- assembling
- protecting and finishing
- connecting

Each function is identified by a color code, which matches the color coding used in the catalog pages.

• The top row indicates which element the part will be fastened to: stud, panel edge, panel hole, cable/tube...

Each type of element is identified by an installation image, found in the catalog pages and used to confirm your selection. Simply match what you want to attach with what you want to mount it on and you'll find the product line you need with a reference to the appropriate page number in the catalog.

		ON WHAT	
		Panel edges	Panel holes
ASSEMBLING	Cables or Tubes	Edge Mounting Cable Ties	Plug Mounting Cable Ties
		Edge Mounting Cable Clips	Plug in Cable Clips & Plug in Clip
		Cable Edge Clips	Plug in Adapters
		Edge Mounting Adapters	Trim Clips
Panels & Trim	Panel Clips	Panel Pins	
Shafts, Screws & Bolts			
PROTECTING & FINISHING	Panels	Metal Straps on Nuts	Plastic Straps on Nuts
		Metal Straps on Nuts	Metal Straps on Nuts
CONNECTING	Wires		Spring Rings, Caps & Connectors
		Panel Grounding Clips	



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# Finish and Material Descriptions - Metal

A few points should be clarified with your quality and production departments, as well as with your sales person:

- Type of assembly: Manual or automatic?
- Corrosion resistance: How many hours?
- Environment in which the assembly is located: Saline or polluted atmosphere?
- Colors: Will the part be visible? What colors are desirable?
- **Additional finishes available - Please contact us for more details**

## Common Finishes for Metal Parts



Finishes / Surface Treatments				Corrosion Resistance*	
Finish Code	Legacy Code	Color	Description	Red Rust	White Rust
1002	27		Plain Finish Oil Dip	None	None
6200	576		Degrease	None	None
3001	3B	Silver	Zinc Electroplate with Tri Clear Passivation	56	24
5100	4	Grey/Black	Zinc Phosphate & Oil	72	None
4072	360	Black	2 Coats Black Paint (Zinc Phosphate Base)	96	48
4073	67	Silver	2 Coats Aluminum Paint (Zinc Phosphate Base)	96	
4074	1	Olive Drab	2 Coats Olive Drab Paint (Zinc Phosphate Base)	96	
3805	598	Grey	Mechanical Zinc with Tri Clear Passivation	120	48
4078	440	Black	2 Coats Black Paint & Oil Dip (Zinc Phosphate Base)	168	72
3630	613	Grey	Mechanical Zinc with Tri Clear Passivation and Torque / Tension Sealer	240	96
3034	590	Silver	Zinc Nickel Electroplate with Tri Clear Passivation	480	240
6002	3963	Silver	2 Coats Geomet & 1 Coat Plus Topcoat	480	240
6003	4252	Black	2 Coats Geomet & 1 Coat Black Topcoat	480	
6004	3965	Silver	2 Coats Geomet & 1 Coat Plus ML Topcoat	720	240
6007	3252	Black	2 Coats Geomet & 2 Coats Black Paint	720	240
4004	450	Grey	2 Coats Magni 511 (Zinc Phosphate Base)	840	240
3026	415	Black	Zinc Nickel Electroplate with Black Passivation & Torque/Tension Sealer	960	240
4032	463	Black	1 Coat Magni 575 & 2 Coats Black (Zinc Phosphate Base)	1000	480

\* For information only/According to Salt Spray test - Data of June 2013

\* Depends on the geometry of the part

Note: Some finishes/coatings are not recommended on certain products due to part configurations

## Material Descriptions

Unless designated otherwise, the majority of our stamped metal fasteners are manufactured in spring or pre-hardened steel.

# Material Descriptions - Plastic

ARaymond Tinnerman plastic parts are manufactured in various common polymers such as Nylon, Acetal, Polyethylene, Polypropylene, ABS and others.

- Most parts are available in natural, black and grey, but other colors can be produced as well.

**Please contact us regarding specific material needs or specialty colors.**

## Common Materials for Plastic Parts



Surface Treatments			
Finish Code	Legacy Code	Material	Description
0117	AE	ABS	ABS
5107; 5108	AG	Acetal	POM - General Purpose Copolymer
5003; 5106; 5556	AG	Acetal	POM - High Flow Copolymer
3110	AA	Nylon	PA46 Heat Stabilized
2532	AA	Nylon	PA66 Heat Stabilized
2136; 2532	AA	Nylon	PA66 Heat Stabilized Impact Modified
2134	AA	Nylon	PA66 Impact Modified UV Protection
2529	AA	Nylon	PA66/6 Heat Stabilized Impact Modified
1106	AC	Nylon - Glass Filled	PA6 Glass Filled - 13%
2127	AC	Nylon - Glass Filled	PA66 Glass Filled - 13%
2129	AC	Nylon - Glass Filled	PA66 Glass Filled - 43%
4103; 4128; 4130	AD	Polypropylene	Polypropylene
4129	AB	Polyethylene	Low Density Polyethylene



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# Engineering Data for Spring Steel Fasteners

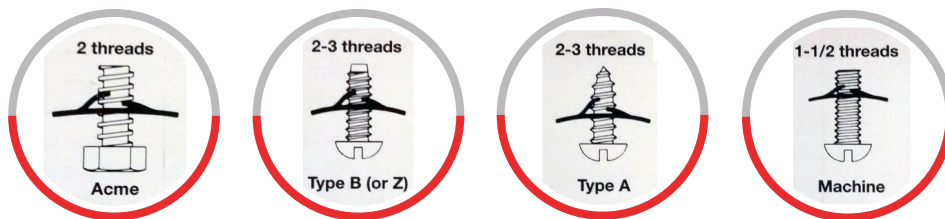
## Recommended Values for Peak Fastener Performance

Screw Size	Threads per Inch	Max. Diameter	Root Diameter	Standard Max. Thickness	Clearance Hole Diameter	Installation Torque (in lbs.)	Tensile Load Limit
2-56	56	.086	.063	.010	.109	*	*
2-A	32	.088	.061	.017	.109	*	*
2-B	32	.088	.064	.017	.109	*	*
4-36	36	.112	.080	.012	.125	3"	100 lbs
4-40	40	.112	.080	.012	.125	3"	100 lbs
4 A	24	.114	.083	.022	.125	9"	300 lbs
4 B	24	.114	.086	.022	.125	9"	300 lbs
6-32	32	.138	.099	.019	.156	5"	150 lbs
6 A	18	.141	.102	.025	.156	11"	400 lbs
6 B	20	.139	.104	.025	.156	11"	400 lbs
8-32	32	.164	.125	.017	.187	7"	250 lbs
8 A	15	.168	.123	.028	.187	17"	600 lbs
8 B	18	.166	.122	.028	.187	17"	600 lbs
10-24	24	.190	.138	.022	.218	12"	350 lbs
10 A	12	.194	.133	.031	.218	31"	800 lbs
10 B	16	.189	.141	.031	.218	31"	800 lbs
12-24	24	.190	.138	.022	.218	12"	350 lbs
12 A	11	.221	.162	.034	.250	34"	900 lbs
1/4-20	20	.250	.188	.025	.281	30"	600 lbs
14 A	10	.254	.185	.037	.281	48"	1150 lbs
14 B	14	.246	.192	.037	.281	48"	1150 lbs
5/16-18	18	.312	.243	.028	.343	30"	1000 lbs
56 B	12	.315	.244	.044	.343	16"	1200 lbs
56 ACME	10	.312	.232	.044	.343	19"	2200 lbs
20 A	9	.333	.234	.044	.375	*	*
3/8 ACME	12	.375	.282	.060	.406	*	*
3/8 B	12	.380	.309	.060	.406	19"	2500 lbs
24 A	9	.390	.291	.060	.421	*	*

\* Computed on application

While ARaymond Tinnerman fasteners provide a strong and reliable double-locking action with standard screws, even greater strength can be attained by increasing the material thickness of the fastener and using A or B type screws.

## Screw Lengths



The proper lengths of machine screws to use with ARaymond Tinnerman fasteners are the same as for general practice, i.e., 1-1/2 thread protrusion beyond the threads (or prongs) of the fastener.

Since A or B type sheet metal screws taper at the end, longer screws **must** be used. Sheet metal screws must protrude 2 to 3 threads beyond the prongs to assure proper grip on the full root diameter of the screw.

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***Important - Most ARaymond Tinnerman spring steel fasteners shown in this catalog are of the standard-thread fit class unless otherwise specified.***

**Standard Fit:** ARaymond Tinnerman fasteners have a free-running fit on the screw threads for maximum speed in assembly. When the screw is tightened, the arch in the base diminishes, forcing the prongs inward and upward at the root of the threads and creating a high-resistance back-off torque.

**Zip-on Fit:** ARaymond Tinnerman fasteners made with longer, more resilient prongs permit zipping the fastener over screw threads. Only one or two turns of the screw are necessary to tighten. Excellent for rapid assembly. Not recommended where heavy torque/tensile loads are applied.

**Prevailing Torque Fit:** ARaymond Tinnerman fasteners are made to provide a restraining torque at any location on the screw threads. This fit is recommended when the fastener is used as an adjustment nut and/or in high-vibration applications.

### ***Average Torques and Tensile Values***

ARaymond Tinnerman fasteners are tightened only enough to produce the **inward thread lock** and **arched spring lock** described in the chart on the left. They derive their locking characteristics, holding power and vibration resistance solely from spring tension. Unlike ordinary threaded nuts, they do not have to be tightened with a great amount of torque. In fact, any torque applied beyond the recommended installation torques charted on the left is excessive and could result in loss of spring tension resiliency.

The table shows the **average** amount of torque to use in tightening ARaymond Tinnerman fasteners, plus the **average** tensile load limits. These averages were determined through exhaustive testing. It is recommended that these values be followed. Averages were established as guides for general application. Consult your ARaymond Tinnerman representative for torque and tensile data on special or specific parts.

Tests prove that ARaymond Tinnerman fasteners will withstand greater tensile loads if the screw holes provide **minimum** clearance. We recommend the screw clearance hole diameters listed in the chart. These do not apply to self-retaining fasteners, e.g. "U" or "J" types, where part of the fastener engages the mounting or clearance hole.

Excessive small parts handling can be drastically reduced through the use of the ARaymond Tinnerman principle of spring tension fastening. Fully documented case histories prove that assembly savings of 30% to 80% have resulted from the following inherent benefits:

- **easier handling, faster application**
- **elimination of lockwashers, spanner washers and other loose pieces**
- **perform multiple functions**
- **self-retaining, self-locking**
- **no special tools, skills or equipment required**
- **will not "freeze" to threads or clog with paint**
- **ideal for service locations, reusable indefinitely**
- **lock on unthreaded studs**
- **many types used without screw, stud or mounting hole**

# SELECTION GUIDE

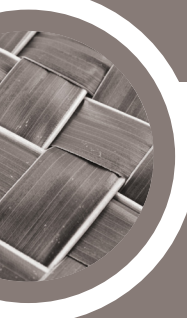
ON Studs







ON Panel Edges





## ASSEMBLING


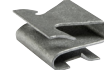


Nuts, Bolts & Shaft Retainers



-  Speed Nuts® & On-Serts® p.14-17
-  Palnut® Stamped Nuts p.18-25
-  Palnut® Push-Ons p. 26-35
-  Palnut® Decorative p. 36-37




-  U-Nuts p. 42-50
-  U-Shaped Bolt Retainers p. 51

Panels & Trim

-  Balance Clips p. 62-63
-  Panel Clips p. 64-67

Cables & Tubes

-  Stud Mount Cable Ties p. 92
-  Stud Mount Cable Clips p. 98-99

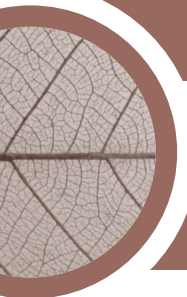
-  Edge Mount Cable Ties p. 93
-  Edge Mount Cable Clips p.100-103
-  Edge Mount Adaptors **NEW** p. 112

## PROTECTING & FINISHING





Panels

## CONNECTING



Wires

-  Grounding Wire Connectors **NEW** p. 122
-  Lugged Grounding Connectors **NEW** p. 123



IN Panel Holes



ON / TO  
Cables or Tubes



ON Flat surfaces



Speed Grip Cage Nuts **REFRESHED**  
p. 52-54



Expansion Nuts  
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Tubulars  
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Solar Clips  
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Panel Pins & Push-Rivets  
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Standard Cable Ties  
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Tube Mount Cable Ties  
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Plug Mount Cable Ties  
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Plug Mount Cable Clips  
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Tube Mount Cable Clips  
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Adhesive Mount Cable Clips  
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Plug In Adaptors **NEW**  
p. 113



Spring Rings **NEW**  
p. 116-117



Caps & Grommets **NEW**  
p. 118-119



# ASSEMBLING Nuts, Bolts & Shaft Retainers



ON Studs

## Speed Nuts®

Flat Type



p.14-15

Twin Type



p.16



ON Studs

## On-Serts®

On-Serts®



p.17



ON Studs

## Palnut® Stamped Nuts

Threaded - Lock-Nut / Hex



p.18-19

Threaded - Lock-Nut / Washer



p.20-21

Self-Threading / Hex










p.22-23

Self-Threading / Washer



p.24-25

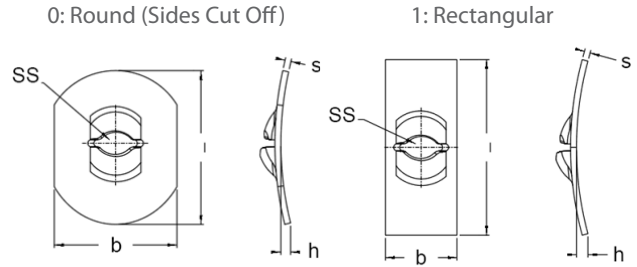
Palnut® Push-Ons		 ON Studs
Sheared Impression (PS)		p.26-27
V-Shaped Notched Impression (PV)		p.28
Rectangular - Removable		p.29
High-Strength Retaining Rings (Thinwalls) (PG)		p.30-31
Inserts (PN)		p.32-33
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Palnut® Decorative Push-Ons		 ON Studs
Two-Piece Decorative Caps		p. 36
One-Piece Decorative Top Hats		p.37

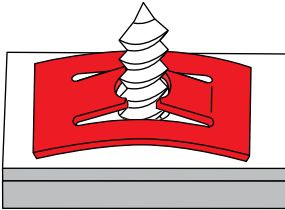
Special Stud Receiver		 ON Studs
Special Stud Receivers - Grooved Shafts		p.38

Ball Stud Receivers		 ON Flat Surfaces
Ball Stud Receivers - Spring Catches		p. 39

**Speed Nuts®**  
Flat Type



**APPLICATION INFORMATION**



- Used with screws to hold two panels together
- Replace threaded nuts, lock washers and spanner washers
- Require less torque than standard hex nuts
- Fast and easy to install
- Provide maximum holding power at minimum cost per fastener
- Won't shake loose from vibration, yet can be easily loosened when desired without worry about rust-frozen screw threads
- Can be installed prior to painting processes so threads won't fill
- Used in smaller applications where space is limited, such as small electrical or mechanical devices



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On Studs

# Speed Nuts® Flat Type

Imperial

Part Number	Legacy Part Number	Thread Specification (SS)	Length (l)	Width (b)	Material Thickness (s)	Part Shape
135775	C07795-440	4-40	0.440	0.250	0.012	1
136624	C08595-012	6-32	0.380	0.343	0.012	0
136600	C07000-8	8-18 (ST4.2)	0.630	0.410	0.028	1
136601	C07000-832	8-32	0.500	0.310	0.017	1
136597	C07000-10	10-16 (ST4.8)	0.750	0.500	0.031	1
136513	C00917-10Z	10-16 (ST4.8)	0.870	0.375	0.031	1
136520	C01150-1024	10-24	0.750	0.437	0.022	1
136521	C01151-1024	10-24	0.750	0.437	0.022	1
136598	C07000-1420	1/4-20	0.750	0.500	0.025	1
136634	C09375-012	1/4-20	1.310	1.312	0.012	1
136632	C09186-014	5/16-18	0.880	0.687	0.014	0
136625	C08617-017	3/8-16	1.000	0.687	0.017	1
136522	C01156-014	7/16-20	0.910	0.687	0.014	0
137472	D07516-017	1/2-13	1.220	0.875	0.017	1

*Most parts manufactured in spring steel*

Speed Nuts® & Painuts®

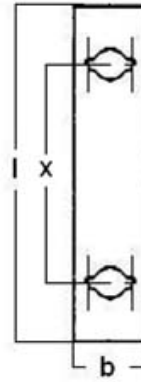


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On Studs

## Speed Nuts® Twin Type

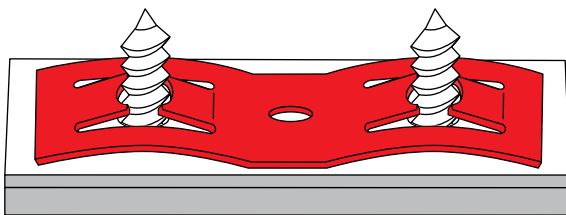


Imperial

Part Number	Legacy Part Number	Thread Specification	Length (l)	Width (b)	Screw Gap (x)	Material Thickness
137345	C70926-440	4-40	1.254	0.250	0.964	0.011
136591	C06069-632	6-32	1.625	0.375	1.000	0.017
136592	C06069-832	8-32	1.625	0.375	1.000	0.017
140762	C14187-8	8-18 (ST4.2)	2.150	0.375	1.500	0.028
136497	C00385-1420	1/4-20	2.380	0.500	1.500	0.025

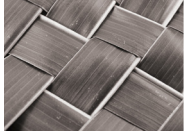
*Most parts manufactured in spring steel*

### APPLICATION INFORMATION



- Used with screws to hold two panels together
- Replace threaded nuts, lock washers and spanner washers
- Require less torque than standard hex nuts
- Fast and easy to install
- Provide maximum holding power at minimum cost per fastener
- Won't shake loose from vibration, yet can be easily loosened when desired without worry about rust-frozen screw threads
- Can be installed prior to painting processes so threads won't fill
- Used in smaller applications where space is limited, such as small electrical or mechanical devices



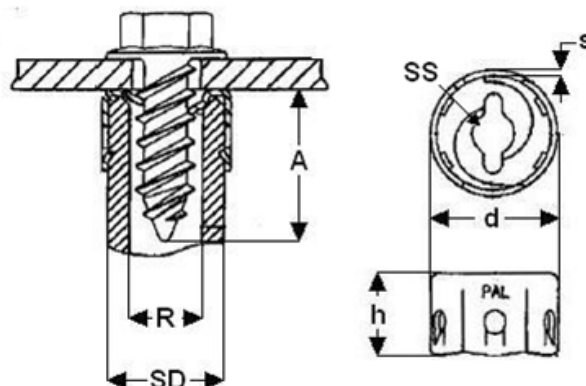


# ASSEMBLING Nuts, Bolts & Shaft Retainers



On Studs

## On-Serts®



### Imperial

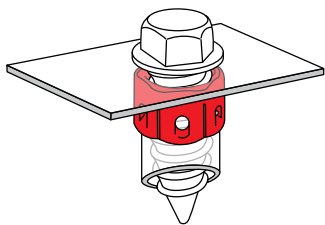
Part Number	Legacy Part Number	Thread Specification (SS)	Diameter (SD)	Hole Diameter (R)	Hole Height Min. (A)	Height (h)	Diameter (d)	Material Thickness (s)
138426	NR 440004	4-40	0.247-0.253	0.125-0.156	0.250	0.220	0.284	0.015
138427	NR 620005	6-18	0.154-0.16	0.157-0.213	0.266	0.230	0.354	0.017
138429	NR 818005	8-18 (ST4.2)	0.309-0.315	0.629-0.628	0.297	0.230	0.354	0.017
138425	NR 101606	10-16 (ST4.8)	0.372-0.378	0.160-0.164	0.375	0.230	0.422	0.018

### Metric

Part Number	Legacy Part Number	Thread Specification (SS)	Diameter (SD)	Hole Diameter (R)	Hole Height Min. (A)	Height (h)	Diameter (d)	Material Thickness (s)
138424	NR 050095	M5x0.8	9.444-9.596	4.700-6.350	9.520	5.840	10.720	0.430

Most parts manufactured in spring steel

### APPLICATION INFORMATION



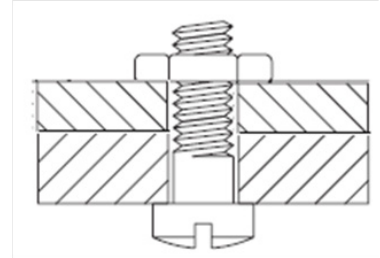
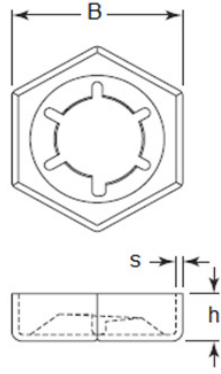
- Used in hollow boss applications to increase the screw holding strength of the joint
- Fast and easy to install
- Won't shake loose from vibration, yet can be easily loosened when desired without worry about rust-frozen screw threads



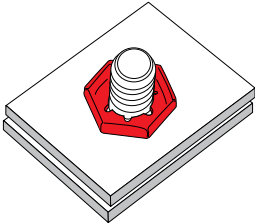
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## Palnut® Stamped Nuts

Threaded - Lock-Nut / Hex



### APPLICATION INFORMATION



- Used with a common screw to hold panels together
- Used in place of traditional hex nuts for reduced weight or applications requiring lower torques
- Can be used in applications where screw length is restricted
- Can be used with a standard hex nut to act as a jam nut



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On Studs

# Palnut® Stamped Nuts

Threaded - Lock-Nut / Hex

## Imperial

Part Number	Legacy Part Number	Thread Specification	Drive (B)	Height (h)	Material Thickness (s)
138735	RM 632004	6-32	1/4"	0.080	0.012
138714	RF 142000	1/4-20	7/16"	0.123	0.020
138721	RF 516180	5/16-18	1/2"	0.134	0.020
138719	RF 381600	3/8-16	9/16"	0.145	0.020
138731	RL 716200	7/16-20	5/8"	0.150	0.020
138710	RE 716280	7/16-28	5/8"	0.111	0.014
138712	RF 121300	1/2-13	3/4"	0.179	0.026
138713	RF 122000	1/2-20	3/4"	0.172	0.023
138726	RF 916180	9/16-18	7/8"	0.193	0.023
138747	RR 581100	5/8-11	1"	0.224	0.034
138718	RF 341000	3/4-10	1 1/8"	0.246	0.038
138727	RH 180000	1-8	1 5/8"	0.336	0.049

## Metric

Part Number	Legacy Part Number	Thread Specification	Drive (B)	Height (h)	Material Thickness (s)
135255	RF 051613	M5x1.6	13mm	3.50	0.51
138711	RF 060011	M6x1.0	11mm	3.05	0.46
138716	RF 160024	M16x2.0	24mm	5.44	0.84

Most parts manufactured in spring steel

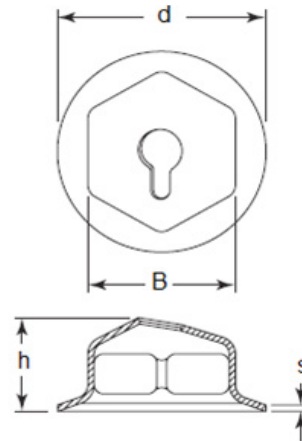
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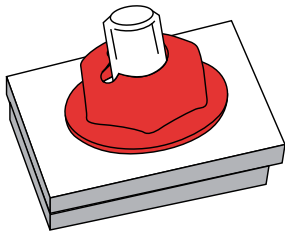
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## Palnut® Stamped Nuts

Threaded - Lock-Nut / Washer

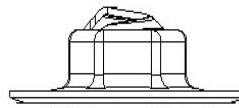


### APPLICATION INFORMATION



- Used in place of traditional hex nuts for reduced weight or applications requiring lower torques
- Parts feature a stamped, integral washer allowing the part to accommodate a larger hole without the need for a separate loose washer
- Sealants can be applied to reduce moisture and noise intrusion

### DESIGN VARIATIONS



(D) WASHER DISHED

- D - Provides protection to the mating panel



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On Studs

## Palnut® Stamped Nuts

Threaded - Lock-Nut / Washer

### Imperial

Part Number	Legacy Part Number	Thread Specification	Drive (B)	Diameter (d)	Height (h)	Material Thickness (s)	Design Variation
138135	DZ 002191	6-20	11/32"	0.469	0.212	0.014	-
138110	DO 632007	6-32	5/16"	0.437	0.204	0.014	-
138112	DO 832075	8-32	11/32"	0.469	0.212	0.014	-
138111	DO 832010	8-32	11/32"	0.625	0.234	0.015	-
138105	DO 102408	10-24	3/8"	0.500	0.231	0.017	-
138107	DO 102412	10-24	3/8"	0.750	0.269	0.017	-
138109	DO 142095	1/4-20	7/16"	0.594	0.261	0.020	-
138108	DO 142013	1/4-20	7/16"	0.812	0.292	0.020	-

### Metric

Part Number	Legacy Part Number	Thread Specification	Drive (B)	Diameter (d)	Height (h)	Material Thickness (s)	Design Variation
138099	DO 040012	M4x0.7	9mm	12.00	5.65	0.36	-
138100	DO 050014	M5x0.8	10mm	14.00	5.79	0.38	-
138134	DZ 002171	M6x1.0	11mm	21.00	6.86	0.46	D (Dished)
138104	DO 060024	M6x1.0	11mm	24.00	7.75	0.46	-
138101	DO 051614	M5x1.6	10mm	14.00	6.40	0.46	-
138102	DO 051619	M5x1.6	10mm	18.88	7.35	0.43	-
138136	DZ 051612	M5x1.6	11mm	21.00	6.85	0.46	D (Dished)

Most parts manufactured in spring steel

Speed Nuts® & Palnuts®



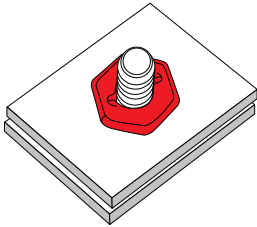
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## Palnut® Stamped Nuts

Self-Threading / Hex



### APPLICATION INFORMATION



- Used in place of traditional hex nuts for reduced weight or applications requiring lower torques but form their own thread on a smooth die cast, mild steel or plastic stud
- The interference caused by the nut and stud creates a strong locking force that prevents disassembly
- Impression is near the base of the part, assisting when stud height and assembly space is limited



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On Studs



## Palnut® Stamped Nuts Self-Threading / Hex

### Imperial

Part Number	Legacy Part Number	Stud Size	Drive (B)	Height (h)	Material Thickness (s)
138844	SR 094005	3/32"	5/16"	0.100	0.017
138846	SR 125004	1/8"	1/4"	0.088	0.014
138848	SR 156000	5/32-4mm	11/32"	0.110	0.016
138849	SR 188006	3/16"	3/8"	0.116	0.019
138827	SP 219000	7/32"	7/16"	0.118	0.015
138851	SR 250000	1/4"	1/2"	0.140	0.025
138852	SR 375011	3/8"	11/16"	0.166	0.026

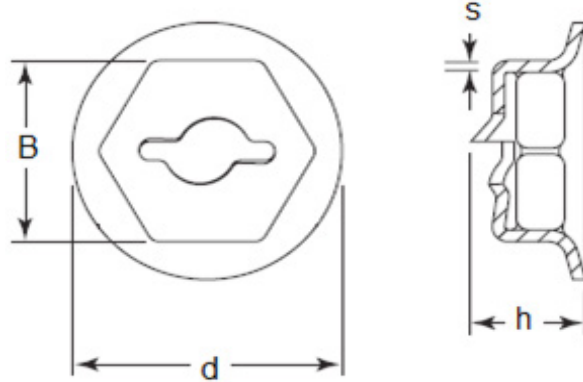
### Metric

Part Number	Legacy Part Number	Stud Size	Drive (B)	Height (h)	Material Thickness (s)
138840	SR 030008	3mm	8mm	2.65	0.41
138842	SR 050010	5mm	10mm	2.75	0.48
138843	SR 060013	6mm	13mm	3.40	0.64
138853	SR 630013	1/4"	13mm	3.40	0.64

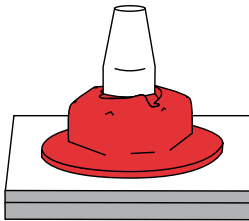
*Most parts manufactured in spring steel*



**Palnut® Stamped Nuts**  
Self-Threading / Washer

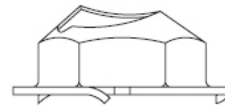


**APPLICATION INFORMATION**

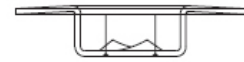


- Used in place of traditional hex nuts for reduced weight or applications requiring lower torques, but form their own thread on a smooth die cast, mild steel or plastic stud
- The interference caused by the nut and stud creates a strong locking force that prevents disassembly
- Integral washer accommodates a larger mating hole to compensate for component build variation
- One-piece design eliminates the need for multiple small parts, reducing inventory space
- A seal can be added to prevent noise and water intrusion

**DESIGN VARIATIONS**



(G) WASHER WITH SERRATION



(K) INTERNAL HEX DRIVE

- G - Torque limiting feature to protect panels during installation
- K - Internal drive feature that reduces the installation tool size and space needed to effectively fasten the part



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On Studs

## Palnut® Stamped Nuts

Self-Threading / Washer

### Imperial

Part Number	Legacy Part Number	Stud Size	Drive (B)	Diameter (d)	Height (h)	Material Thickness (s)	Design Variation
138787	SD 125007	1/8"	5/16"	0.437	0.186	0.017	-
138790	SD 156007	5/32-4mm	11/32"	0.450	0.202	0.018	-
138792	SD 188008	3/16"	3/8"	0.500	0.217	0.017	-
138861	SZ 001966	3/16"	3/8"	0.750	0.153	0.018	K
138795	SD 250095	1/4"	7/16"	0.594	0.247	0.021	-
138804	SF 312014	5/16"-8mm	1/2"	0.875	0.309	0.023	-
138828	SP 330012	11/32"	9/16"	0.750	0.290	0.022	G

### Metric

Part Number	Legacy Part Number	Stud Size	Drive (B)	Diameter (d)	Height (h)	Material Thickness (s)	Design Variation
138862	SZ 002003	5mm	10mm	14.82	5.03	0.51	G
138786	SD 050015	5mm	10mm	15.00	5.40	0.43	-
138815	SK 050021	5mm	10mm	21.00	6.84	0.48	-
138800	SF 060015	6mm	11mm	15.00	6.35	0.53	-
138801	SF 060018	6mm	11mm	18.00	7.18	0.53	-
138806	SF 630018	1/4"	3/8"	18.00	7.06	0.53	-
138802	SF 080020	5/16"-8mm	13mm	20.00	7.85	0.58	-
138829	SP 330016	11/32"	1/2"	25.40	7.98	0.58	G

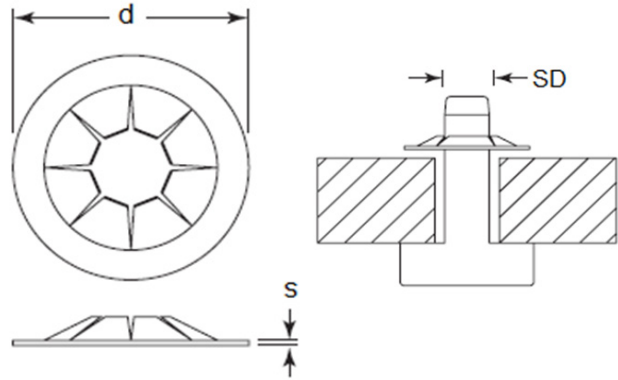
*Most parts manufactured in spring steel*

Speed Nuts® & Palnuts®

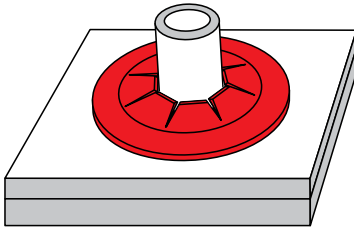


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## Palnut® Push-Ons Sheared Impression (PS)



### APPLICATION INFORMATION



- Used over a round stud to prevent two panels from disengaging
- Feature inner teeth that slide over and bite onto the stud
- The sheared teeth within the PS style parts provide flexibility, allowing accommodation of larger stud variations
- No tools required, eliminating time-consuming assembly operations
- Low profile design allows parts to be used in areas where space is limited



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On Studs

## Palnut® Push-Ons

### Sheared Impression (PS)

#### Imperial

Part Number	Legacy Part Number	Stud Size	Stud Diameter (SD)	Diameter (d)	Material Thickness (s)	Number of Prongs
138612	PS 062032	1/16"	.060 - .065	0.195	0.010	6
138615	PS 094032	3/32"	.091 - .097	0.195	0.010	6
138620	PS 125306	1/8"	.122 - .128	0.375	0.009	6
138619	PS 125006	1/8"	.122 - .128	0.375	0.014	6
138578	PD 156307	5/32-4mm	.153 - .158	0.437	0.010	8
138575	PD 156007	5/32-4mm	.153 - .158	0.437	0.014	8
138623	PS 188307	3/16"	.185 - .191	0.437	0.010	8
138621	PS 188007	3/16"	.185 - .191	0.437	0.014	8
138580	PD 219385	7/32"	.216 - .222	0.531	0.012	8
138579	PD 219085	7/32"	.216 - .222	0.531	0.016	8
138627	PS 250075	1/4"	.247 - .253	0.531	0.016	8
138632	PS 312310	5/16"-8mm	.310 - .316	0.625	0.015	8
138631	PS 312010	5/16"-8mm	.310 - .316	0.625	0.020	8
138636	PS 375312	3/8"	.372 - .378	0.750	0.017	8
138635	PS 375012	3/8"	.372 - .378	0.750	0.026	8
138637	PS 438014	7/16"	.436 - .441	0.875	0.030	8
138629	PS 250385	1/4"	.247 - .253	0.531	0.012	8
138638	PS 500016	1/2"	.497 - .503	1.000	0.035	8
138691	PZ 002015	5/8"	.622 - .628	1.000	0.016	8

#### Metric

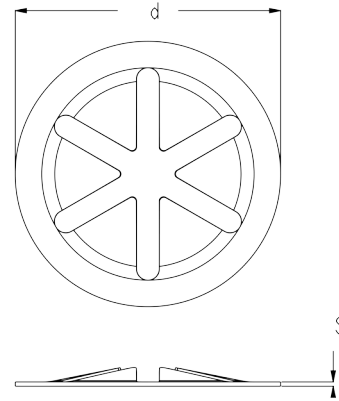
Part Number	Legacy Part Number	Stud Size	Stud Diameter (SD)	Diameter (d)	Material Thickness (s)	Number of Prongs
138606	PS 050311	5mm	4.92 - 5.05	11.10	0.25	8
138604	PS 050011	5mm	4.92 - 5.05	11.10	0.36	8
138610	PS 060313	6mm	5.92 - 6.05	13.50	0.25	8
138608	PS 060013	6mm	5.92 - 6.05	13.50	0.41	8
138617	PS 100319	10mm	9.92 - 10.05	19.00	0.38	8
138618	PS 120022	12mm	11.92 - 12.05	22.10	0.86	8

*Most parts manufactured in spring steel*



On Studs

## Palnut® Push-Ons V-Shaped Notched Impression (PV)



### Imperial

Part Number	Legacy Part Number	Stud Size	Stud Diameter Range	Diameter (d)	Material Thickness (s)
138662	PV 250015	1/4"	0.247 - 0.253	0.937	0.015
138663	PV 312015	5/16"-8mm	0.310 - 0.316	0.937	0.015
138664	PV 375015	3/8"	0.372 - 0.378	0.937	0.015
138665	PV 438015	7/16"	0.435 - 0.441	0.937	0.015
138666	PV 500015	1/2"	0.497 - 0.503	0.937	0.015

### Metric

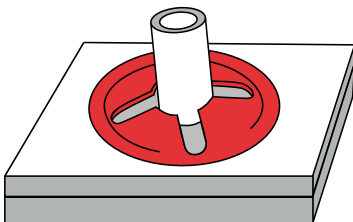
Part Number	Legacy Part Number	Stud Size	Stud Diameter Range	Diameter (d)	Material Thickness (s)
138661	PV 050024	5mm	4.92 - 5.05	23.80	0.38
138690	PZ 002011	6mm	5.92 - 6.05	23.80	0.38
138667	PV 880018	11/32"	8.72 - 8.85	18.00	0.50

*Most parts manufactured in spring steel*



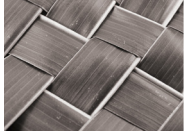
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### APPLICATION INFORMATION



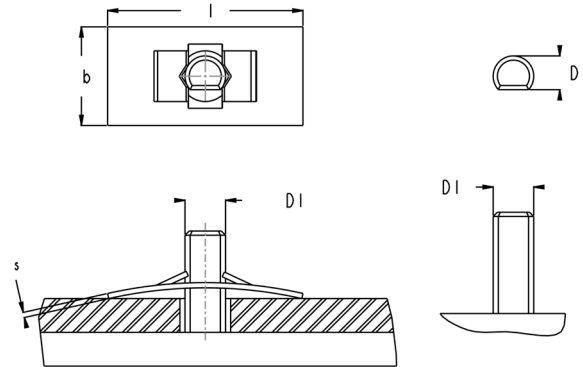
- Used over a round stud to prevent two panels from disengaging
- Feature inner teeth that slide over and bite onto the stud
- The notched teeth within PV style parts provide flexibility, allowing accommodation of larger stud variations and reduce insertion efforts
- No tools required, eliminating time-consuming assembly operations
- Low profile design allows parts to be used in areas where space is limited





On Studs

## Palnut® Push-Ons Rectangular - Removable



Imperial

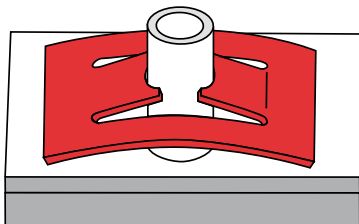
Part Number	Legacy Part Number	Stud Diameter (D1)	Alt. Stud Diameter (D)	Length (l)	Width (b)	Material Thickness (s)
136668	C12002-012	3/32"	0.069 - 0.079	0.450	0.230	0.012
137517	D12003-012	1/8"	0.095 - 0.105	0.580	0.310	0.012
136669	C12005-017	3/16"	0.145 - 0.155	0.630	0.380	0.017
136670	C12007-017	1/4"	0.195 - 0.205	0.620	0.440	0.017
136671	C12008-020	5/16"-8mm	0.255 - 0.245	0.690	0.500	0.02

Most parts manufactured in spring steel



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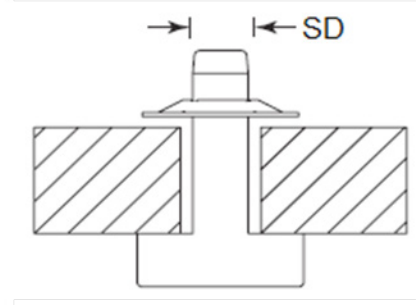
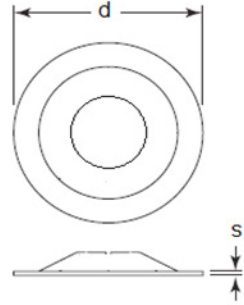
### APPLICATION INFORMATION



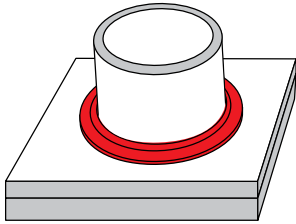
- Used on smooth, unthreaded shafts to hold panels together
- No special tools required, eliminating time-consuming assembly operations
- Can be removed on a D-shaped stud by twisting the part 90 degrees
- For light duty applications
- Low profile design makes them ideal for applications where space is limited

## Palnut® Push-Ons

High-Strength Retaining Rings (Thinwalls) (PG)



### APPLICATION INFORMATION



- Used on a smooth, unthreaded shaft or stud
- Designed with a rigid interior, making them suited for high retention applications
- Replace high cost parts such as snap or bearing rings and cotter pins
- Many made from stainless steel, providing long-life and corrosion resistance
- Low-profile design makes them ideal for applications where space is limited
- Commonly used on conveyor roller systems, small hand tools, toys and electronics



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On Studs

## Palnut® Push-Ons

### High-Strength Retaining Rings (Thinwalls) (PG)

Imperial

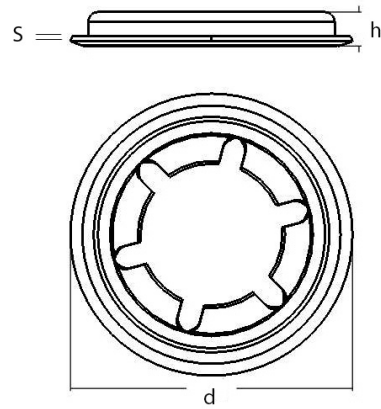
Part Number	Legacy Part Number	Stud Diameter (SD)	Diameter (d)	Material Thickness (s)
138893	<b>T99220SS-128</b>	0.059 - 0.065	0.150	0.006
138939	<b>T99220SS-93</b>	0.075 - 0.081	0.178	0.006
138918	<b>T99220SS-60</b>	0.090 - 0.096	0.218	0.008
138931	<b>T99220SS-83</b>	0.114 - 0.120	0.245	0.010
138904	<b>T99220SS-167</b>	0.122 - 0.128	0.194	0.012
138942	<b>T99220SS-96</b>	0.122 - 0.128	0.245	0.008
138924	<b>T99220SS-74</b>	0.122 - 0.128	0.325	0.006
138926	<b>T99220SS-77</b>	0.127 - 0.133	0.245	0.006
138901	<b>T99220SS-153</b>	0.140 - 0.146	0.260	0.008
138920	<b>T99220SS-66</b>	0.153 - 0.159	0.260	0.008
138869	T99220-162	0.159 - 0.165	0.437	0.014
138922	<b>T99220SS-68</b>	0.185 - 0.191	0.312	0.006
138891	<b>T99220SS-126</b>	0.185 - 0.191	0.375	0.012
138910	<b>T99220SS-196</b>	0.234 - 0.239	0.531	0.017
138585	PG 237043	0.237 - 0.243	0.437	0.022
138929	<b>T99220SS-80</b>	0.247 - 0.253	0.312	0.006
138913	<b>T99220SS-259</b>	0.247 - 0.253	0.437	0.020
138868	T99220-119	0.247 - 0.253	0.625	0.022
138897	<b>T99220SS-137</b>	0.247 - 0.253	0.625	0.010
138870	T99220-171	0.247 - 0.253	0.750	0.025
138888	<b>T99220SS-118</b>	0.297 - 0.303	0.500	0.020
138919	<b>T99220SS-64</b>	0.310 - 0.316	0.437	0.010
138867	T99220-112	0.310 - 0.316	0.625	0.022
138896	<b>T99220SS-132</b>	0.337 - 0.346	0.562	0.010
138906	<b>T99220SS-173</b>	0.369 - 0.375	0.500	0.020
138937	<b>T99220SS-91</b>	0.372 - 0.378	0.625	0.010
138890	<b>T99220SS-122</b>	0.427 - 0.433	0.625	0.010
138905	<b>T99220SS-172</b>	0.434 - 0.439	0.575	0.010
138872	T99220-193	0.492 - 0.498	0.750	0.010
138889	<b>T99220SS-120</b>	0.497 - 0.503	0.750	0.010
136447	136447	0.666 - 0.672	1.000	0.034
136446	136446	0.981 - 0.987	1.438	0.040
138875	T99220-208	0.997 - 1.003	1.750	0.018
140860	PG 317545	1.247 - 1.253	1.772	0.043

Metric

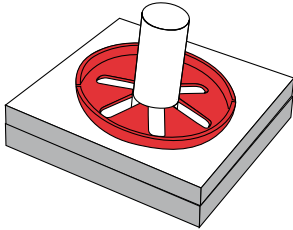
Part Number	Legacy Part Number	Stud Diameter (SD)	Diameter (d)	Material Thickness (s)
138915	<b>T99220SS-261</b>	7.95 - 7.99	12.60	0.51
138874	T99220-201	11.98 - 12.05	19.90	1.06
138912	<b>T99220SS-258</b>	12.60 - 12.60	19.05	0.56
138873	T99220-200	13.98 - 14.02	21.90	1.06
138877	T99220-223	14.92 - 15.05	23.05	0.51
239864	239864	19.93 - 20.00	26.16	1.19
138883	<b>T99220SS-100</b>	15.77 - 15.90	19.05	0.38
138584	PG 190025	19.00 - 19.10	25.40	0.64
225547	225547	19.93 - 20.00	29.46	1.00
138880	T99220-264	24.93 - 25.00	34.00	1.20
140776	T99220-266	29.93 - 30.00	39.91	1.20
138881	T99220-265	34.93 - 35.00	46.00	1.20
239270	239270	39.93 - 40.00	50.80	1.20

**Part numbers in bold italics indicate manufactured in stainless steel**  
 Remainder of parts manufactured in spring steel  
 Note: Ability to manufacture up to 50mm / 2 inch stud diameter - contact for pricing

Palnut® Push-Ons  
Insert (PN)



APPLICATION INFORMATION



- Used on a smooth, unthreaded shaft or stud to prevent two panels from disengaging
- Their inner teeth slide over and bite into the stud
- The dished base of the PN style parts provide a larger bearing surface so parts can be installed with automated assembly
- No special tools required, eliminating time-consuming assembly operations
- Can be pre-assembled to trim pieces



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On Studs

# Palnut® Push-Ons Insert (PN)

## Imperial

Part Number	Legacy Part Number	Stud Size	Diameter (d)	Height (h)	Material Thickness (s)
137339	C70578-010	1/16"	0.060 - 0.064	0.312	0.010
138595	PN 125007	1/8"	0.122 - 0.128	0.433	0.010
136699	C13790-012	5/32-4mm	0.153 - 0.159	0.375	0.012
136653	C10592-012	3/16"	0.185 - 0.191	0.470	0.012
135268	207300	3/16"	0.185 - 0.191	0.562	0.012
135269	207500	1/4"	0.247 - 0.253	0.562	0.012
135263	206600	1/4"	0.247 - 0.253	0.726	0.017
135264	206700	5/16"-8mm	0.309 - 0.315	0.726	0.017
138600	PR 375010	3/8"	0.372 - 0.378	0.625	0.015
135262	206300	3/8"	0.372 - 0.378	0.726	0.015
135270	207600	3/8"	0.372 - 0.378	1.145	0.017
135266	206900	7/16"	0.435 - 0.441	0.726	0.017
135273	207900	7/16"	0.435 - 0.441	1.145	0.017
135271	207700	1/2"	0.497 - 0.503	1.145	0.017
135272	207800	5/8"	0.622 - 0.627	1.145	0.017
135800	212900	3/4"-19mm	0.747 - 0.753	1.145	0.017

## Metric

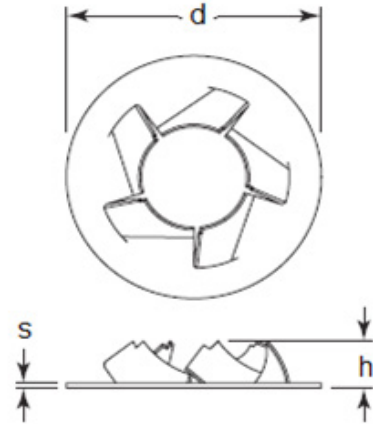
Part Number	Legacy Part Number	Stud Size	Diameter (d)	Height (h)	Material Thickness (s)
138593	PN 050011	5mm	4.93 - 5.07	11.00	0.25
236078	236078	5mm	4.93 - 5.07	14.28	0.30
138594	PN 060011	6mm	5.93 - 6.07	11.00	0.43
237217	237217	6mm	5.93 - 6.07	14.28	0.30
237218	237218	6mm	5.93 - 6.07	18.52	0.43
237219	237219	10mm	9.93 - 10.07	18.52	0.43
135265	206800	.354" (9mm)	8.92 - 9.08	18.52	0.43
237220	237220	10mm	9.93 - 10.07	29.08	0.46
237220	237221	12mm	11.93 - 12.07	29.08	0.46
138596	PN 220036	22mm	21.93 - 22.07	35.50	0.50

Most parts manufactured in spring steel

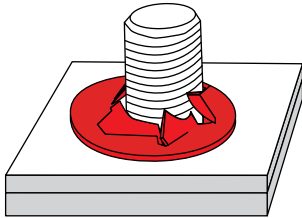


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**Palnut® Push-Ons**  
Bolt Retainers (PT)



**APPLICATION INFORMATION**



- Used in assembly applications where screws or bolts need to be retained in place before a nut is positioned and tightened
- Their inner teeth slide over and bite onto a screw or bolt
- No special tools required, eliminating time-consuming assembly operations
- Low-profile design, allowing parts to be used in applications where space is limited

**DESIGN VARIATIONS**



(M) DISHED



(R) FLAT

- M - Eases automated assembly and can be pre-installed to trim panels
- R - Standard flat design
- 4 - 4 Prongs
- 5 - 5 Prongs
- 6 - 6 Prongs



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On Studs

## Palnut® Push-Ons Bolt Retainers (PT)

### Imperial

Part Number	Legacy Part Number	Thread Specification	Diameter (d)	Height (h)	Material Thickness (s)	Design Variation
138649	PT 138055	6-20	0.344	0.049	0.010	R4
138653	PT 164006	8-18	0.375	0.049	0.010	R4
138654	PT 190007	10-16	0.437	0.065	0.012	R4
138655	PT 250008	1/4-20	0.500	0.078	0.010	R5
138657	PT 312010	5/16-18	0.625	0.082	0.014	R5
138658	PT 375125	3/8-16	0.783	0.093	0.015	R6
138659	PT 438135	7/16-20	0.843	0.103	0.015	R6
138660	PT 500015	1/2-20	0.938	0.122	0.015	R6

### Metric

Part Number	Legacy Part Number	Thread Specification	Diameter (d)	Height (h)	Material Thickness (s)	Design Variation
138640	PT 040010	M4x0.7	9.52	1.27	0.25	R4
138642	PT 050011	M5x0.8	11.10	1.65	0.30	R5
135217	PT 060013	M6x1.0	12.70	2.18	0.25	R5
135213	PT 060017	M6x1.0	17.00	2.18	0.25	R5
135209	PT 080016	M8x1.25	15.90	2.10	0.36	R5
138697	PZ 002185	M8x1.25	23.80	2.58	0.33	M5
138646	PT 100020	M10x1.5	19.87	2.36	0.38	R6
138647	PT 120021	M12x1.75	21.41	2.94	0.38	R6
138650	PT 140025	M14x2.0	25.00	3.30	0.38	R6

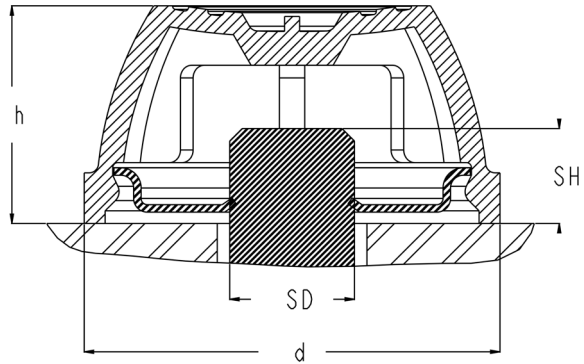
*Most parts manufactured in spring steel*





On Studs

## Palnut® Decorative Push-Ons Two-Piece Decorative Caps

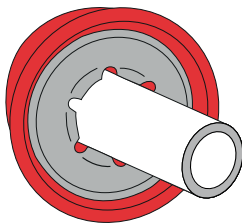


Imperial

Part Number	Legacy Part Number	Description	Stud Diameter (SD)	Diameter (d)	Height (h)	Material Thickness	Shaft Height (SH)	# of Prongs
138123	KPS 125105	Small Cap	1/8"	0.656	0.344	0.012	0.150 - 0.250	3
138124	KPS 156105	Small Cap	5/32-4mm	0.656	0.344	0.012	0.150 - 0.250	3
138254	KPS 188105	Small Cap	3/16"	0.656	0.344	0.012	0.150 - 0.250	3
138255	KPS 250105	Small Cap	1/4"	0.656	0.344	0.012	0.150 - 0.250	4
138256	KPS 250135	Medium Cap	1/4"	0.835	0.440	0.015	0.175 - 0.350	4
138257	KPS 312135	Medium Cap	5/16"-8mm	0.835	0.440	0.015	0.175 - 0.350	6
138258	KPS 375135	Medium Cap	3/8"	0.835	0.440	0.015	0.175 - 0.350	6
138260	KPS 438135	Medium Cap	7/16"	0.835	0.440	0.015	0.175 - 0.350	6
138259	KPS 375210	Large Cap	3/8"	1.300	0.645	0.017	0.200 - 0.525	6
138262	KPS 438210	Large Cap	7/16"	1.300	0.645	0.017	0.200 - 0.525	6
138263	KPS 500210	Large Cap	1/2"	1.300	0.645	0.017	0.200 - 0.525	6
138264	KPS 625210	Large Cap	5/8"	1.300	0.645	0.017	0.200 - 0.525	6
138265	KPS 750210	Large Cap	3/4"-19mm	1.300	0.645	0.017	0.200 - 0.525	6

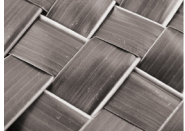
High-density polyethylene cap (Phthalate-free and lead-free)  
Insert manufactured in high carbon spring steel  
*Metric sizes available upon request*

### APPLICATION INFORMATION



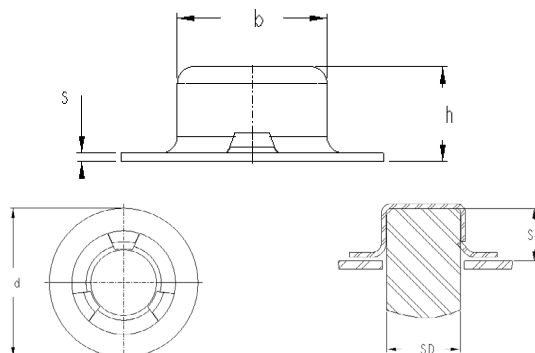
- Used over shafts, studs or rods to hide unattractive stud ends
- Combines the reliability of spring steel with an aesthetically appealing cap
- Provides dependable, vibration resistant assembly
- Insertion and retention to stud is dependent on stud size and material
- Commonly used on miscellaneous household items that feature axles such as lawn carts and rolling garbage cans
- Available in black, red or white and can be customized to meet a specific application

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On Studs

## Palnut® Decorative Push-Ons One-Piece Decorative Top Hats - All Metal



### Imperial

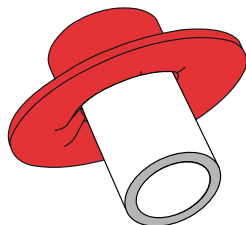
Part Number	Replaces Part Number	Stud Diameter (SD)	Outside Diameter (d)	Height (h)	Hat Diameter (b)	Material Thickness (s)	Shaft Height (SH)
228911	PW 250008	1/4"	0.500	0.205	0.289	0.018	0.100 - 0.175
230982	PZ 001725	5/16"-8mm	0.562	0.286	0.358	0.020	0.100 - 0.250
228873	PW 375012	3/8"	0.750	0.270	0.431	0.025	0.100 - 0.250
138682	PW 438014	7/16"	0.875	0.328	0.504	0.030	0.150 - 0.270
138683	PW 500015	1/2"	0.937	0.328	0.567	0.031	0.150 - 0.270
238010	PW 625019	5/8"	1.188	0.413	0.693	0.031	0.200 - 0.375

### Metric

Part Number	Replaces Part Number	Stud Diameter (SD)	Outside Diameter (d)	Height (h)	Hat Diameter (b)	Material Thickness (s)	Shaft Height (SH)
229047	PW 060014	6mm	14.28	5.25	7.00	0.45	2.50 - 4.75
229049	PW 100019	10mm	19.05	6.86	11.33	0.61	3.00 - 6.25
138673	PW 120022	12mm	22.23	8.33	13.74	0.81	3.75 - 6.75

Most parts manufactured in spring steel

### APPLICATION INFORMATION



- Used over shafts, studs or rods to hide unattractive stud ends
- Combines the reliability of spring steel with various decorative coatings for applications where the fastener will remain visible
- Provides dependable vibration resistant assembly
- Insertion and retention to stud is dependent on stud size and material
- Commonly used on miscellaneous household items that feature axles such as lawn carts and rolling garbage cans

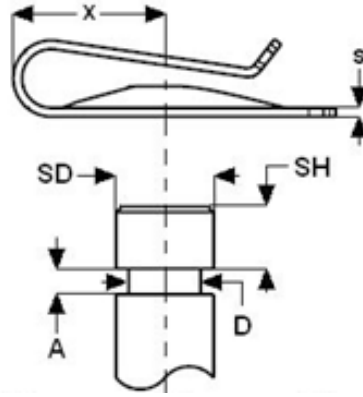
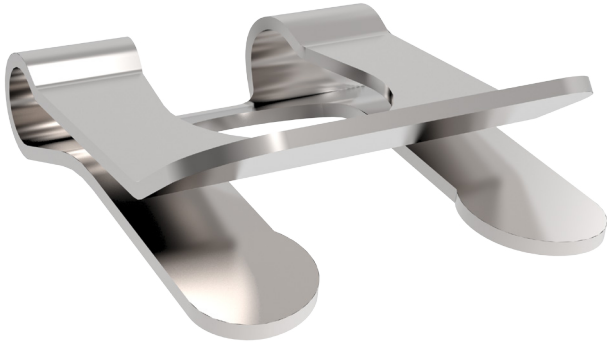


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On Studs

## Special Stud Receivers Grooved Shafts

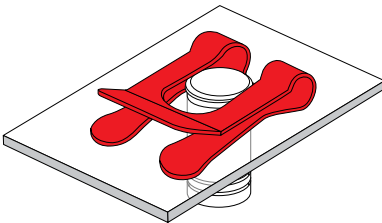


Metric

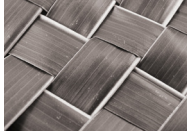
Part Number	Legacy Part Number	Stud Diameter (SD)	Groove Diameter (D)	Groove Height (A)	Stud Height (SH)	Throat Length (x)	Material Thickness (s)
054633	054633	6mm - 1/4"	4.90 - 5.10	1.300	2.00 - 4.00	6.000	0.400
136940	C57843-071M	8mm - 5/16"	5.76 - 5.92	2.110	2.00 - 4.00	13.550	0.710

*Most parts manufactured in spring steel*

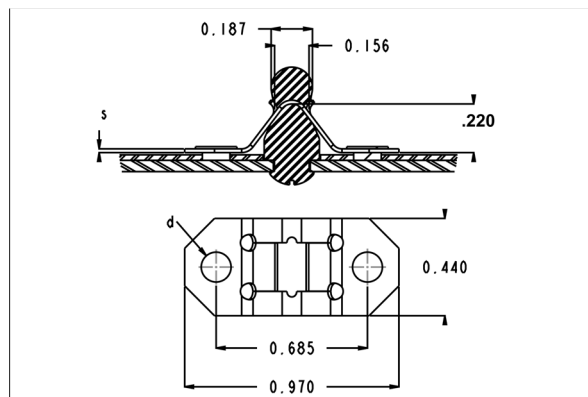
### APPLICATION INFORMATION



- Used to assemble panels to grooved shafts
- When latched, the spring legs of the clip continually bear inward on the stud, holding the latched unit snug against the panel
- Wear and tear on bosses and panels are eliminated because there is no direct contact



## Ball Stud Receivers Spring Catches

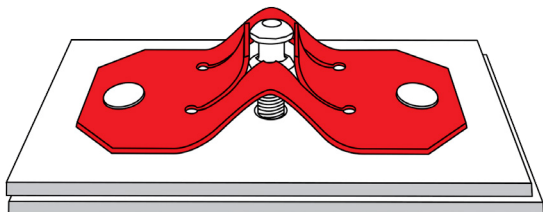


Metric

Part Number	Legacy Part Number	Pull Out Force on Ball Stud (lbs.)	Pull Out Force on Serrated Pin (lbs.)	Mounting Hole Diameter (d)	Material Thickness (s)
136582	C04893-012	3.50	5.00	0.105	0.012
136583	C04893-017	8.00	9.00	0.105	0.017
135307	C04893-028	18.00	24.00	0.105	0.028
136537	C01663-012	3.50	5.00	0.135	0.012
136538	C01663-017	8.00	9.00	0.135	0.017
136539	C01663-022	12.00	13.00	0.135	0.022
136540	C01663-028	18.00	24.00	0.135	0.028

*Most parts manufactured in spring steel*

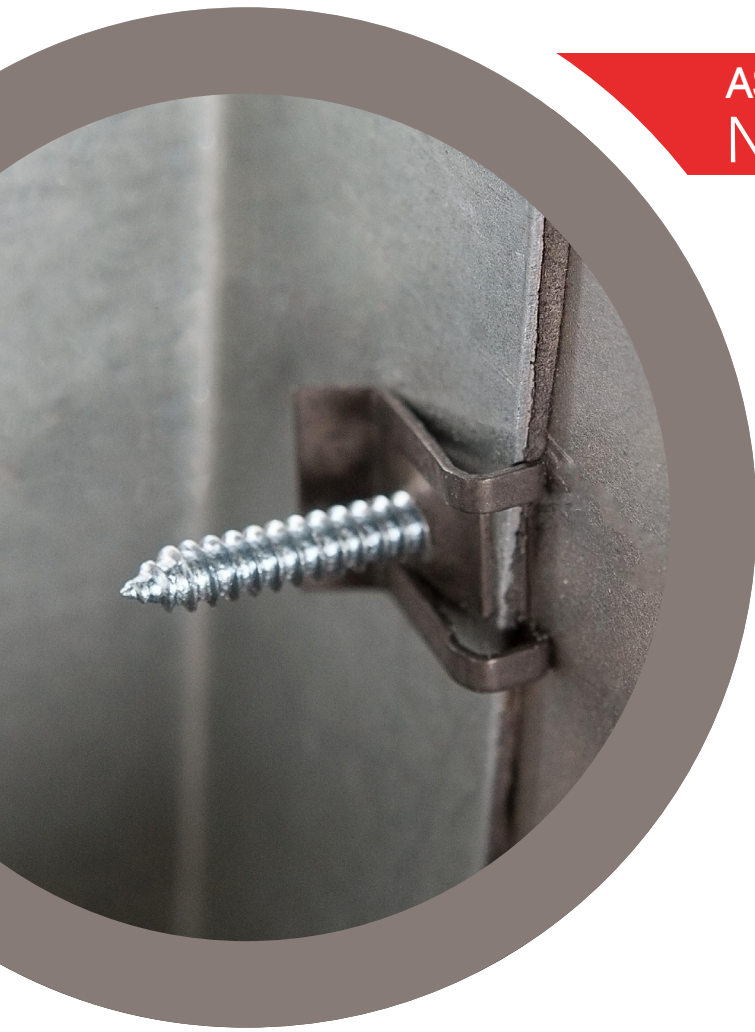
### APPLICATION INFORMATION



- Used to secure doors and other serviceable panels
- When latched, the spring legs of the clip continually bear inward on the stud, holding the latched unit snug against the panel
- Wear and tear is eliminated because there is no direct contact

ASSEMBLING

Nuts, Bolts & Shaft Retainers



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ON Panel Edges

## U-Nuts



Speed Nuts® - U-Shaped



p.42-43



U-Nut 5-Prong



p.44-45



U-Nut Tapped Barrel



p.46-47



U-Nut Retainer



p.48-49



Align Nuts



p.50



ON Panel Edges

## U-Shaped Bolt Retainers



U-Shaped Bolt Retainer



p.51



IN Panel holes

## Speed Grip Cage Nuts



Cage Nuts **\*\*Refreshed Line\*\***



p.52-54



IN Panel holes

## Expansion Nuts



Plastic



p.55



Metal

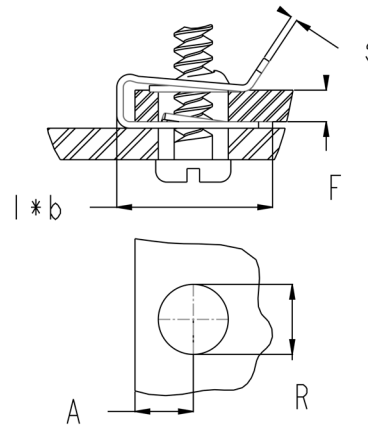


p.56-57

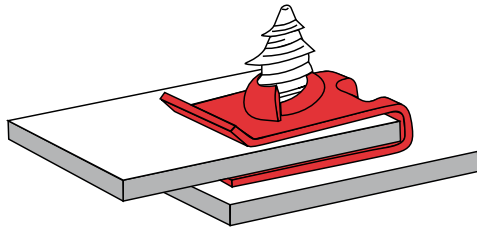


## U-Nuts

Speed Nut® U-Shaped



### APPLICATION INFORMATION



- Used to provide simple, rapid attachment of mating panels
- Parts self-retain in screw-receiving position
- Self-retention feature improves assembly time and eliminates costly welding and clinching costs
- Corrects misalignment in panel mounting holes
- Part does not turn as the screw is driven and will not freeze on screw threads
- Serviceable - parts disassemble easily and reliably
- Can be used wherever a screw or bolt is used and in place of clinch nuts and weld nuts
- Easy to assemble, requiring no special tools
- The strength of the joint greatly depends on the type of impression and screw size

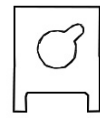
### DESIGN VARIATIONS



(A) STRAIGHT UPPER LEG



(C) NO RETAINER ON LOWER LEG



(D) RELIEF NOTCH

(J) "J" NUT

(H) BARBS ON LOWER LEGS

(3) KEYHOLE IMPRESSION



(E) CORNERS CUT OFF



(F) FULL EXTRUSION ON LOWER LEG



(G) BARB ON TOP LEG



(U) WIDE PANEL RANGE NUT

- A - No lead in. Used where space is limited
- C - Alternative retention feature on plastic panels
- D, E - Eliminate material to reduce insertion efforts
- F - Alternative retention feature for 360 degree contact
- G - Alternative or additional retention feature
- H - Alternative retention feature
- J - Alternative body form to reduce material
- U - Accommodates larger panel range
- 2 - Legacy Speed Nut® style impression
- 3 - Current keyhole impression





On Panel Edges

# U-Nuts

## Speed Nut® - U-Shaped

Imperial

Part Number	Legacy Part Number	Thread Specification (SS)	Panel Thickness (F)	Throat Distance (A)	Hole Diameter (R)	Width (b)	Length (l)	Material Thickness (s)	Design Variation
136594	C06227-632	6-32	0.041 - 0.051	0.156	0.187 - 0.187	0.310	0.360	0.017	2AJ
136898	C46551-011	6-32	0.018 - 0.023	0.187	0.187 - 0.187	0.312	0.370	0.011	3
137515	D11351-632	6-32	0.110 - 0.125	0.171	0.156 - 0.156	0.500	0.350	0.017	2C
137500	D08109-8	8-18 (ST4.2)	0.045 - 0.062	0.187	0.218 - 0.218	0.500	0.520	0.028	2D
136593	C06077-8Z	8-18 (ST4.2)	0.060 - 0.070	0.234	0.250 - 0.250	0.500	0.520	0.028	2AD
137623	D98448-8Z	8-18 (ST4.2)	0.091 - 0.110	0.220	0.220 - 0.220	0.423	0.417	0.024	3CH
137532	D19640-8AB	8-18 (ST4.2)	0.025 - 0.150	0.250	0.280 - 0.280	0.535	0.770	0.028	3AU
137425	D00885-8	8-18 (ST4.2)	0.037 - 0.064	0.296	0.250 - 0.250	0.437	0.630	0.028	2D
136708	C15127-8	8-18 (ST4.2)	0.168 - 0.198	0.281	0.218 - 0.218	0.406	0.610	0.028	2J
137463	D06377-8AB	8-18 (ST4.2)	0.070 - 0.150	0.312	0.328 - 0.328	0.430	0.750	0.028	2DU
137507	D09031-8	8-18 (ST4.2)	0.102 - 0.125	0.406	0.281 - 0.281	0.625	0.700	0.028	2D
137442	D01793-8	8-18 (ST4.2)	0.064 - 0.093	0.437	0.281 - 0.281	0.625	0.700	0.028	2D
137598	D97295-028	8-18 (ST4.2)	0.025 - 0.150	0.480	0.280 - 0.280	0.340	0.970	0.028	3ACU
137531	D19640-10AB	10-16 (ST4.8)	0.025 - 0.150	0.250	0.280 - 0.280	0.531	0.770	0.031	3AU
137506	D09031-10	10-16 (ST4.8)	0.102 - 0.125	0.406	0.281 - 0.281	0.625	0.700	0.031	2D
136548	C01880-10Z	10-16 (ST4.8)	0.156 - 0.187	0.750	0.281 - 0.281	0.437	1.140	0.031	2
136523	C01197-1024	10-24	0.109 - 0.120	0.281	0.312 - 0.312	0.437	0.630	0.020	2F
136619	C08048-1024	10-24	0.045 - 0.062	0.515	0.250 - 0.250	0.375	0.970	0.022	2J
136547	C01880-1024	10-24	0.156 - 0.187	0.750	0.281 - 0.281	0.437	1.140	0.020	2
137520	D13398-1032	10-32	0.045 - 0.062	0.250	0.250 - 0.250	0.625	0.570	0.017	2D
137419	D00521-1420	1/4-20	0.051 - 0.109	0.312	0.359 - 0.359	0.500	0.780	0.025	2
136707	C14969-1420	1/4-20	0.051 - 0.109	0.312	0.343 - 0.343	0.500	0.790	0.025	2F
136706	C14860-1420	1/4-20	0.064 - 0.125	0.500	0.343 - 0.343	0.500	0.970	0.025	2G
137511	D09569-1420	1/4-20	0.060 - 0.156	0.937	0.343 - 0.343	0.625	1.240	0.025	2E
137525	D17453-1420	1/4-20	0.156 - 0.190	0.906	0.343 - 0.343	0.625	1.225	0.025	2E

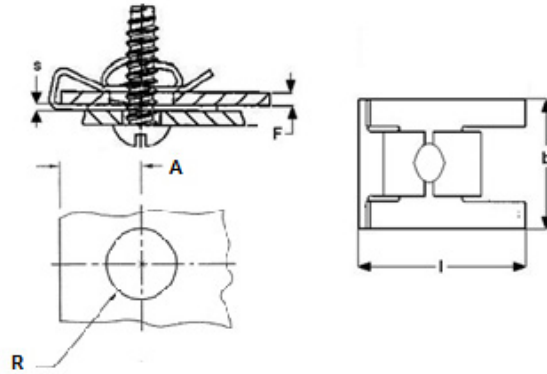
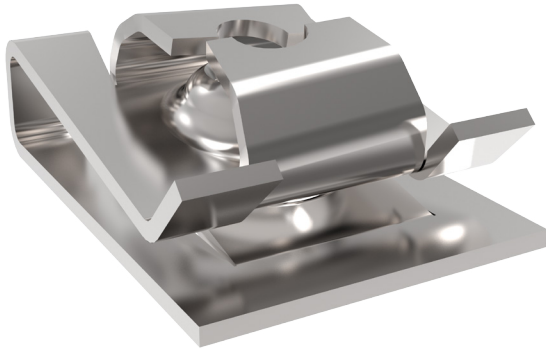
Metric

Part Number	Legacy Part Number	Thread Specification(SS)	Panel Thickness (F)	Throat Distance (A)	Hole Diameter (R)	Width (b)	Length (l)	Material Thickness (s)	Design Variation
137375	C71784-M42141	ST4.2 (8-18)	2.00 - 3.00	6.00	7.00 - 7.00	12.00	13.50	0.71	2DG
137939	D99228-M42141	ST4.2 (8-18)	0.60 - 2.00	7.00	7.90 - 7.90	13.00	15.00	0.71	3DKU
138972	US 420014	ST4.2 (8-18)	2.25 - 3.00	7.20	5.80 - 5.80	9.30	12.90	0.60	3
138973	US 420519	ST4.2 (8-18)	0.65 - 3.80	8.64	6.98 - 6.98	13.60	19.30	0.67	3DU
137679	D98712-064M	ST4.2 (8-18)	2.20 - 3.10	10.00	8.00 - 8.00	14.50	17.60	0.64	3D
137662	D98665-071M	ST4.2 (8-18)	1.00 - 1.27	12.70	7.92 - 7.92	14.98	20.95	0.71	4J
137370	C71743-M47159	ST4.8 (10-16)	2.46 - 2.66	6.80	7.00 - 7.00	12.70	14.10	0.64	3JZ

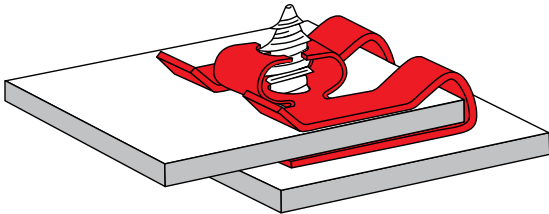
Most parts manufactured in spring steel

## U-Nuts

5-Prong (Prevailing Torque)



### APPLICATION INFORMATION



- Used to provide simple, rapid attachment of mating panels
- Parts self-retain in screw-receiving position
- A viable alternative for coarse screw threads
- The 5-prong feature adds prevailing torque and increases destruction torque
- The nut is slid onto the panel edge and over the panel hole
- Self-retention feature improves assembly time and eliminates costly welding and clinching costs
- Corrects misalignment in panel mounting holes
- Part does not turn as the screw is driven and will not freeze on screw threads
- Serviceable - parts disassemble easily and reliably
- Can be used wherever a screw or bolt is used and in place of clinch nuts and weld nuts
- Easy to assemble, requiring no special tools
- The strength of the part corresponds to the strength of the screw



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On Panel  
Edges

## U-Nuts

### 5- Prong (Prevailing Torque)

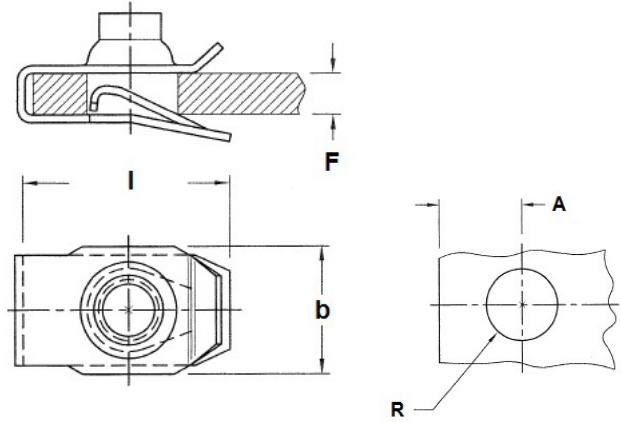
*Metric*

Part Number	Legacy Part Number	Thread Specification	Panel Thickness (F)	Throat Distance (A)	Hole Diameter (R)	Width (b)	Length (l)
137607	D98316-071M	ST4.2 (8-18)	0.50 - 1.80	7.92	8.33 - 8.33	13.78	19.50
137608	D98317-071M	ST4.2 (8-18)	1.80 - 3.80	7.90	8.30 - 8.30	13.78	19.50
137736	D98860-071M	ST4.2 (8-18)	2.40 - 2.90	8.00	6.75 - 6.75	14.00	18.50
137643	D98585-071M	ST4.2 (8-18)	2.40 - 2.90	8.00	6.75 - 6.75	14.00	18.50
137360	C71667-M42141	ST4.2 (8-18)	1.80 - 4.00	8.70	8.00 - 8.00	13.60	18.40
137900	D99174-071M	ST4.2 (8-18)	0.80 - 1.20	14.00	8.33 - 8.33	13.77	25.20
137621	D98434-071M	ST4.2 (8-18)	1.80 - 3.80	14.00	8.33 - 8.33	13.77	25.20

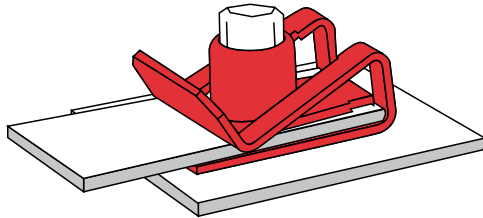
*Most parts manufactured in spring steel*

### U-Nuts

Tapped Barrel



#### APPLICATION INFORMATION



- Used to provide simple, rapid attachment of mating panels
- Parts self-retain in screw-receiving position
- Preferred alternative for machine screws
- The barrel comes in prevailing torque and free-spinning options
- The nut is slid onto the panel edge and over the panel hole
- Self-retention feature improves assembly time and eliminates costly welding and clinching costs
- Corrects misalignment in panel mounting holes
- Part does not turn as the screw is driven and will not freeze on screw threads
- Serviceable - parts disassemble easily and reliably
- Can be used wherever a screw or bolt is used and in place of clinch nuts and weld nuts
- Easy to assemble, requiring no special tools
- The tapped barrel strength equals that of the screw



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On Panel Edges

## U-Nuts Tapped Barrel

Imperial

Part Number	Legacy Part Number	Thread Specification	Panel Thickness (F)	Throat Distance (A)	Hole Diameter (R)	Width (b)	Length (l)	Torque
138337	LUGS832006	8-32	0.020 - 0.079	0.383	0.280 - 0.280	0.492	0.681	5
138347	LUGZ103239	10-32	0.070 - 0.100	0.270	0.260 - 0.260	0.510	0.600	5
138332	LUGS142059	1/4-20	0.025 - 0.150	0.450	0.390 - 0.390	0.560	0.920	5
138334	LUGS561863	5/16-18	0.025 - 0.150	0.500	0.437 - 0.437	0.670	0.980	5
138333	LUGS381683	3/8-16	0.050 - 0.200	0.660	0.562 - 0.562	0.930	1.290	5

Metric

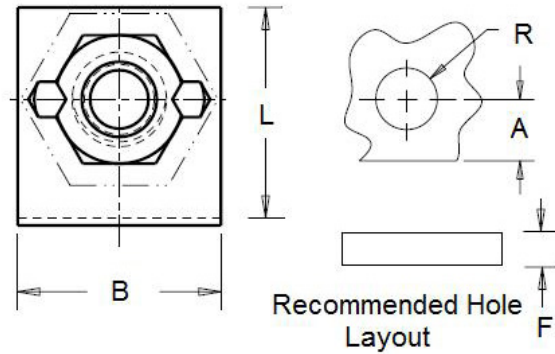
Part Number	Legacy Part Number	Thread Specification	Panel Thickness (F)	Throat Distance (A)	Hole Diameter (R)	Width (b)	Length (l)	Torque
135211	D99390-M42141	ST4.2 (8-18)	2.00 - 3.00	8.60	7.93 - 7.93	12.50	16.90	6
138056	D99389-M42141	ST4.2 (8-18)	0.50 - 2.00	9.10	7.93 - 7.93	12.50	17.30	6
138280	LPGS420018	ST4.2 (8-18)	0.65 - 3.80	14.00	7.55 - 7.55	12.50	22.00	6
138322	LUGS060023	M6x1.0	0.80 - 4.00	12.00	10.30 - 10.30	14.22	23.37	5
138268	LPGS060023	M6x1.0	0.80 - 4.00	12.00	10.30 - 10.30	14.22	23.37	6
135210	LUGZ002112	M6x1.0	0.80 - 3.81	12.00	10.30 - 10.30	14.22	23.37	5
138282	LPGZ002112	M6x1.0	0.80 - 3.81	12.00	10.30 - 10.30	14.22	23.37	6
135206	LUGZ002241	M6x1.0	0.80 - 3.81	12.00	10.30 - 10.30	14.22	23.37	5
135202	LPGZ002241	M6x1.0	0.80 - 3.81	12.00	10.30 - 10.30	14.22	23.37	6
138326	LUGS061512	M6x1.0	0.80 - 4.00	11.00	7.93 - 7.93	15.00	24.00	5
138324	LUGS060030	M6x1.0	1.00 - 2.50	19.75	10.30 - 10.30	14.50	29.50	5
138328	LUGS080025	M8x1.25	0.80 - 4.00	13.00	11.70 - 11.70	17.02	24.89	5
138272	LPGS080025	M8x1.25	0.80 - 4.00	13.00	11.70 - 11.70	17.02	24.89	6
138289	LPGZ080025	M8x1.25	0.80 - 4.00	13.00	11.70 - 11.70	17.02	24.89	6
138330	LUGS085725	M8x1.25	1.50 - 5.50	13.00	11.70 - 11.70	17.02	24.89	5
135220	LPGS085725	M8x1.25	1.50 - 5.50	13.00	11.70 - 11.70	17.02	24.89	6
138329	LUGS080031	M8x1.25	1.50 - 5.50	20.00	11.70 - 11.70	17.00	31.50	5
138273	LPGS080031	M8x1.25	1.50 - 5.50	20.00	11.70 - 11.70	17.00	31.50	6
138331	LUGS100033	M10x1.5	1.50 - 5.50	17.50	15.00 - 15.00	17.50	32.50	5
138276	LPGS100033	M10x1.5	1.50 - 5.50	17.00	12.00 - 12.00	24.00	33.50	6

Most parts manufactured in spring steel  
5: Free Spinning Barrel  
6: Prevailing Torque Barrel

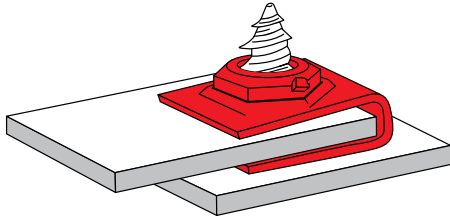
Self-Retaining Threaded Nuts

## U-Nuts

Nut Retainer

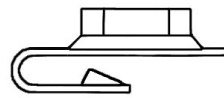


### APPLICATION INFORMATION

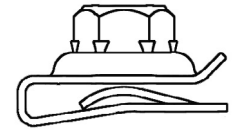


- Used to provide simple, rapid attachment of mating panels
- Parts self-retain in screw-receiving position
- Preferred alternative for larger screw sizes
- The nut is slid onto the panel edge and over the panel hole
- Self-retention feature improves assembly time and eliminates costly welding and clinching costs
- Corrects misalignment in panel mounting holes
- Part does not turn as the screw is driven and will not freeze on screw threads
- Serviceable - parts disassemble easily and reliably
- Can be used wherever a screw or bolt is used and in place of clinch nuts and weld nuts
- Easy to assemble, requiring no special tools
- Combine the strength of the nut with the flexibility of the spring steel cage

### DESIGN VARIATIONS



J-TYPE



U-TYPE



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On Panel  
Edges

## U-Nuts Nut Retainer

### Imperial

Part Number	Legacy Part Number	Thread Specification	Panel Thickness (F)	Throat Distance (A)	Hole Diameter (R)	Width (b)	Length (l)	Type
136828	C30110-1024	10-24	0.093 - 0.135	0.375	0.437 - 0.437	0.560	0.730	J-Type
136850	C33945-1032	10-32	0.050 - 0.075	0.375	0.343 - 0.343	0.687	0.710	U-Type
136851	C33945-1420	1/4-20	0.050 - 0.075	0.375	0.343 - 0.343	0.687	0.710	U-Type
136829	C30110-1420	1/4-20	0.093 - 0.135	0.375	0.437 - 0.437	0.560	0.730	J-Type
137560	D31758-1032	10-32	0.060 - 0.070	0.272	0.281 - 0.281	0.500	0.570	U-Type

### Metric

Part Number	Legacy Part Number	Thread Specification	Panel Thickness (F)	Throat Distance (A)	Hole Diameter (R)	Width (b)	Length (l)	Type
136856	C33962SS-1024	10-24	2.92 - 3.18	9.52	0.30 - 7.62	17.45	18.04	U-Type
136841	C33892-1024	10-24	0.81 - 2.36	12.70	0.44 - 10.00	15.87	24.01	J-Type
136842	C33892-1032	10-32	0.81 - 2.36	12.70	0.44 - 10.00	15.87	24.01	J-Type
136844	C33896-1420	1/4-20	2.29 - 3.56	12.70	0.53 - 12.80	19.05	26.29	J-Type
136843	C33892-1420	1/4-20	0.81 - 2.36	12.70	0.44 - 10.00	15.87	24.01	J-Type
136848	C33924-1420	1/4-20	0.81 - 2.36	19.84	0.39 - 10.00	15.87	30.88	J-Type
136854	C33952-5618	5/16-18	1.27 - 2.29	13.87	0.50 - 12.80	19.05	26.67	J-Type
136840	C33883-5618	5/16-18	3.18 - 3.43	11.43	0.50 - 12.70	14.73	23.85	J-Type
136846	C33896-5618	5/16-18	2.29 - 3.56	12.70	0.50 - 12.80	19.05	26.29	J-Type
136855	C33953-5618	5/16-18	3.23 - 4.14	12.70	0.44 - 11.10	19.05	25.40	J-Type
136853	C33952-3816	3/8-16	0.05 - 0.09	0.55	0.50 - 0.50	0.75	26.67	J-Type
136845	C33896-3816	3/8-16	2.29 - 3.56	12.70	0.50 - 12.80	19.05	26.29	J-Type
136847	C33896-M61	M6x1.0	2.29 - 3.56	12.70	12.80 - 12.80	19.05	26.29	J-Type

*Most parts manufactured in spring steel*

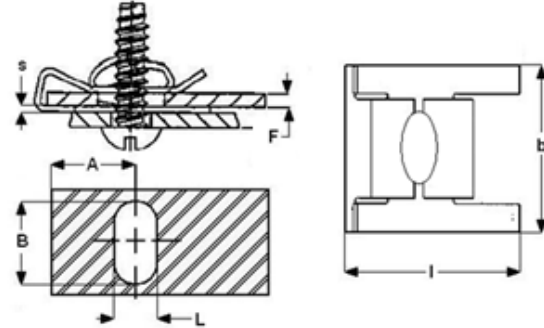
Self-Retaining Threaded Nuts





On Panel  
Edges

## U-Nuts Align Nuts

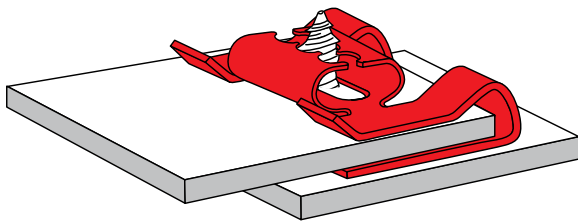


Metric

Part Number	Legacy Part Number	Thread Specification	Panel Thickness (F)	Throat Distance (A)	Hole Size (LxB)	Width (b)	Length (l)
137648	D98612-8Z	ST4.2 (8-18)	1.80 - 2.00	7.00	16.9 x 7.5	23.80	21.50

*Most parts manufactured in spring steel*

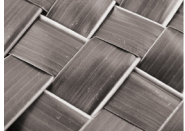
### APPLICATION INFORMATION



- Used to provide simple, rapid attachment of mating panels
- Corrects misalignment in panel mounting holes
- The nut is slid onto the panel edge and over the panel hole
- Parts self-retain in screw-receiving position
- Part does not turn as the screw is driven and will not freeze on screw threads
- Serviceable - parts disassemble easily and reliably
- Easy to assemble, requiring no special tools

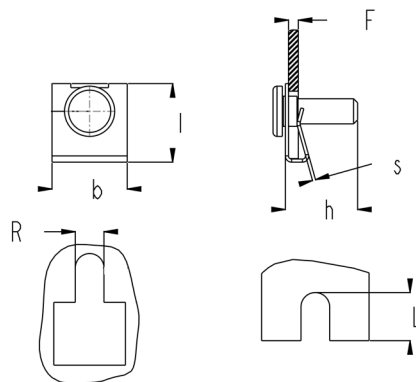


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On Panel  
Edges

## U-Shaped Bolt Retainers



### Imperial

Part Number	Legacy Part Number	Thread Specification	Panel Thickness (F)	Slot Width (R)	Slot Length (L)	Width (b)	Length (l)	Screw Height (h)	Material Thickness (s)
136860	C34030-1420	1/4-20	0.098 - 0.118	0.395 - 0.405	0.680	0.750	0.750	0.750	0.030
229986	229986	1/4-20	0.098 - 0.118	0.395 - 0.405	0.680	0.750	0.750	1.000	0.030

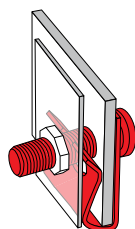
### Metric

Part Number	Legacy Part Number	Thread Specification	Panel Thickness (F)	Slot Width (R)	Slot Length (L)	Width (b)	Length (l)	Screw Height (h)	Material Thickness (s)
136862	C34114-M61	M6x1.0	0.08 - 1.07	9.45 - 9.55	14.28	17.45	14.43	13.60	0.43

*Most parts manufactured in spring steel*

Self-Retaining Threaded Nuts

### APPLICATION INFORMATION

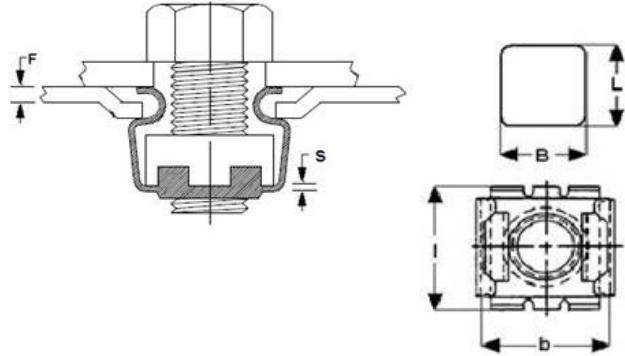


- Used in applications where it's advantageous to pre-assemble the bolt to the panel
- Nut is driven to secure the component
- Component can "hang" from the bolt, allowing both hands to be free during the assembly operation

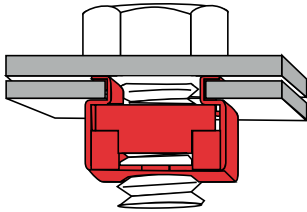


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## Speed Grip Cage Nuts \*\*Refreshed Line\*\*



### APPLICATION INFORMATION



- Used to attach components to panels with square holes
- Snap readily into bolt receiving position at center panel locations and retain themselves in place
- Can be applied at any convenient spot along the assembly line
- Installation does not require any special tools or skills, eliminating the need for special operations
- The nut floats within the cage to account for normal build variation
- Ideal for blind location assembly
- Serviceable - parts disassemble easily and reliably
- Commonly used on serviceable access panels and cabinet construction for various industries



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In Panel  
Holes

## Speed Grip Cage Nuts \*\*Refreshed Line\*\*

Imperial

Part Number	Replaces Part Number	Thread Specification	Panel Thickness (F)	Hole Width (B)	Nominal Hole Length (L)	Width (b)	Length (l)	Material Thickness (s)
242664	D07931-832	8-32	0.020 - 0.063	0.343 - 0.380	0.377	0.490	0.520	0.020
242665	D07941-832	8-32	0.063 - 0.105	0.343 - 0.380	0.377	0.490	0.520	0.020
242666	D07951-832	8-32	0.093 - 0.126	0.343 - 0.380	0.377	0.490	0.520	0.020
242667	D31365-832	8-32	0.125 - 0.156	0.343 - 0.380	0.377	0.490	0.520	0.020
242669	D07931-1024	10-24	0.020 - 0.063	0.343 - 0.380	0.377	0.490	0.520	0.020
242670	D07941-1024	10-24	0.063 - 0.105	0.343 - 0.380	0.377	0.490	0.520	0.020
242671	D07951-1024	10-24	0.093 - 0.126	0.343 - 0.380	0.377	0.490	0.520	0.020
242672	D31365-1024	10-24	0.125 - 0.156	0.343 - 0.380	0.377	0.490	0.520	0.020
242674	D07931-1032	10-32	0.020 - 0.063	0.343 - 0.380	0.377	0.490	0.520	0.020
242675	D07941-1032	10-32	0.063 - 0.105	0.343 - 0.380	0.377	0.490	0.520	0.020
242676	D07951-1032	10-32	0.093 - 0.126	0.343 - 0.380	0.377	0.490	0.520	0.020
242677	D31365-1032	10-32	0.125 - 0.156	0.343 - 0.380	0.377	0.490	0.520	0.020
242679	D07931-1224	12-24	0.020 - 0.063	0.343 - 0.380	0.377	0.490	0.520	0.020
242680	D07941-1224	12-24	0.063 - 0.105	0.343 - 0.380	0.377	0.490	0.520	0.020
242681	D07951-1224	12-24	0.093 - 0.126	0.343 - 0.380	0.377	0.490	0.520	0.020
242682	D31365-1224	12-24	0.125 - 0.156	0.343 - 0.380	0.377	0.490	0.520	0.020
242684	D07988-1420	1/4-20	0.020 - 0.063	0.343 - 0.380	0.377	0.490	0.520	0.020
240846	D07998-1420	1/4-20	0.063 - 0.105	0.343 - 0.380	0.377	0.490	0.520	0.020
242685	D07956-1420	1/4-20	0.093 - 0.126	0.343 - 0.380	0.377	0.490	0.520	0.020
242686	D31365-1420	1/4-20	0.125 - 0.156	0.343 - 0.380	0.377	0.490	0.520	0.020
242922	D07937-5618	5/16-18	0.020 - 0.056	0.460 - 0.508	0.505	0.640	0.660	0.025
242923	D07953-5618	5/16-18	0.057 - 0.092	0.460 - 0.508	0.505	0.640	0.660	0.025
242924	D07957-5618	5/16-18	0.093 - 0.126	0.460 - 0.508	0.505	0.640	0.660	0.025
242925	D07935-5618	5/16-18	0.127 - 0.162	0.460 - 0.508	0.505	0.640	0.660	0.025
242926	D31910-5618	5/16-18	0.177 - 0.197	0.460 - 0.508	0.505	0.640	0.660	0.025
242927	D07937-3816	3/8-16	0.020 - 0.056	0.460 - 0.508	0.505	0.640	0.660	0.025
242928	D07953-3816	3/8-16	0.057 - 0.092	0.460 - 0.508	0.505	0.640	0.660	0.025
242929	D07957-3816	3/8-16	0.093 - 0.126	0.460 - 0.508	0.505	0.640	0.660	0.025
242930	D07935-3816	3/8-16	0.127 - 0.162	0.460 - 0.508	0.505	0.640	0.660	0.025
242931	D31910-3816	3/8-16	0.177 - 0.197	0.460 - 0.508	0.505	0.640	0.660	0.025
<b>242947</b>	<b>D07968-3816</b>	3/8-16	0.020 - 0.092	0.558 - 0.593	0.590	0.835	0.865	0.025
<b>242948</b>	<b>D07969-3816</b>	3/8-16	0.092 - 0.126	0.558 - 0.593	0.590	0.835	0.865	0.025
<b>242949</b>	<b>D30683-3816</b>	3/8-16	0.126 - 0.210	0.558 - 0.593	0.590	0.835	0.865	0.025
<b>242950</b>	<b>D30096-3816</b>	3/8-16	0.210 - 0.260	0.558 - 0.593	0.590	0.835	0.865	0.025

*Most parts manufactured in spring steel  
Note: Parts noted in red have been designed but not released at the time of  
catalog publication. Parts may still be purchased under the old legacy number.*



In Panel  
Holes

## Speed Grip Cage Nuts **\*\*Refreshed Line\*\***

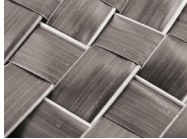
Imperial Continued

Part Number	Replaces Part Number	Thread Specification	Panel Thickness (F)	Hole Width (B)	Nominal Hole Length (L)	Width (b)	Length (l)	Material Thickness (s)
242951	D07968-7614	7/16-14	0.020 - 0.092	0.558 - 0.593	0.590	0.835	0.865	0.025
242952	D07969-7614	7/16-14	0.092 - 0.126	0.558 - 0.593	0.590	0.835	0.865	0.025
242953	D30683-7614	7/16-14	0.126 - 0.210	0.558 - 0.593	0.590	0.835	0.865	0.025
242954	D30096-7614	7/16-14	0.210 - 0.260	0.558 - 0.593	0.590	0.835	0.865	0.025
242955	D07968-1213	1/2-13	0.020 - 0.092	0.558 - 0.593	0.590	0.835	0.865	0.025
242956	D07969-1213	1/2-13	0.092 - 0.126	0.558 - 0.593	0.590	0.835	0.865	0.025
242957	D30683-1213	1/2-13	0.126 - 0.210	0.558 - 0.593	0.590	0.835	0.865	0.025
242958	D30096-1213	1/2-13	0.210 - 0.260	0.558 - 0.593	0.590	0.835	0.865	0.025

Metric

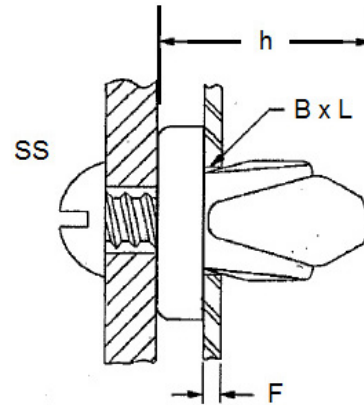
Part Number	Replaces Part Number	Thread Specification	Panel Thickness (F)	Hole Width (B)	Nominal Hole Length (L)	Width (b)	Length (l)	Material Thickness (s)
242693	D07931-M508	M5x0.8	0.50 - 1.60	8.71 - 9.65	9.58	12.45	13.21	0.51
242694	D07941-M508	M5x0.8	1.60 - 2.70	8.71 - 9.65	9.58	12.45	13.21	0.51
242695	D07951-M508	M5x0.8	2.40 - 3.20	8.71 - 9.65	9.58	12.45	13.21	0.51
242696	D31365-M508	M5x0.8	3.20 - 4.00	8.71 - 9.65	9.58	12.45	13.21	0.51
242698	D07988-M61	M6x1.0	0.50 - 1.60	8.71 - 9.65	9.58	12.45	13.21	0.51
242699	D07998-M61	M6x1.0	1.60 - 2.70	8.71 - 9.65	9.58	12.45	13.21	0.51
242700	D07956-M61	M6x1.0	2.40 - 3.20	8.71 - 9.65	9.58	12.45	13.21	0.51
242701	D31365-M61	M6x1.0	3.20 - 4.00	8.71 - 9.65	9.58	12.45	13.21	0.51
242937	D07937-M8125	M8x1.25	0.70 - 1.40	11.68 - 12.90	12.83	16.26	16.76	0.64
242938	D07953-M8125	M8x1.25	1.40 - 2.30	11.68 - 12.90	12.83	16.26	16.76	0.64
242939	D07957-M8125	M8x1.25	2.30 - 3.20	11.68 - 12.90	12.83	16.26	16.76	0.64
242940	D07935-M8125	M8x1.25	3.20 - 4.10	11.68 - 12.90	12.83	16.26	16.76	0.64
242941	D31910-M8125	M8x1.25	4.10 - 5.00	11.68 - 12.90	12.83	16.26	16.76	0.64
242942	D07937-M1015	M10x1.5	0.70 - 1.40	11.68 - 12.90	12.83	16.26	16.76	0.64
242943	D07953-M1015	M10x1.5	1.40 - 2.30	11.68 - 12.90	12.83	16.26	16.76	0.64
242944	D07957-M1015	M10x1.5	2.30 - 3.20	11.68 - 12.90	12.83	16.26	16.76	0.64
242945	D07935-M1015	M10x1.5	3.20 - 4.10	11.68 - 12.90	12.83	16.26	16.76	0.64
242946	D31910-M1015	M10x1.5	4.10 - 5.00	11.68 - 12.90	12.83	16.26	16.76	0.64
242963	D07968-12175	M12x1.75	0.50 - 2.30	14.20 - 15.10	15.00	21.21	22.00	0.64
242964	D07969-12175	M12x1.75	2.30 - 3.20	14.20 - 15.10	15.00	21.21	22.00	0.64
242965	D30683-12175	M12x1.75	3.20 - 5.30	14.20 - 15.10	15.00	21.21	22.00	0.64
242966	D30096-12175	M12x1.75	5.30 - 6.60	14.20 - 15.10	15.00	21.21	22.00	0.64

*Most parts manufactured in spring steel  
Note: Parts noted in red have been designed but not released at the time of  
catalog publication. Parts may still be purchased under the old legacy number.*



In Panel  
Holes

## Expansion Nuts Plastic

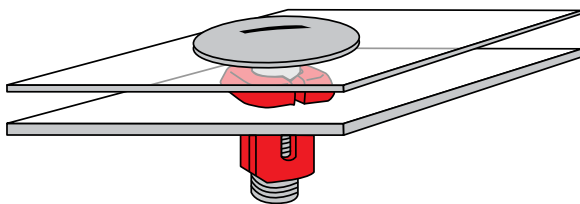


Imperial

Part Number	Legacy Part Number	Thread Specification (SS)	Panel Thickness (F)	Hole Width (B)	Hole Length (L)	Height (h)
137033	C61374AA-250	#8 (ST4.2), #10 (ST4.8)	0.020 - 0.076	0.250 - 0.281	0.266	0.690
137020	C60053AA-031	#8 (ST4.2), #10 (ST4.8)	0.020 - 0.076	0.250 - 0.281	0.266	0.471
137036	C61408AA-125	#8 (ST4.2), #10 (ST4.8)	0.020 - 0.076	0.250 - 0.281	0.266	0.565

*Most parts manufactured in nylon*

### APPLICATION INFORMATION



- Used to attach components to a panel with holes
- Fast, vibration-resistant attachment in blind or center-panel locations where only one side is accessible
- For applications where metal to metal contact is not desired
- Snap easily into rectangular or oblong holes
- Completely enclosed in plastic, the screw threads are protected from corrosion or galvanic action
- All designs can be incorporated with a seal
- For higher retention performance, use metal expansion nuts

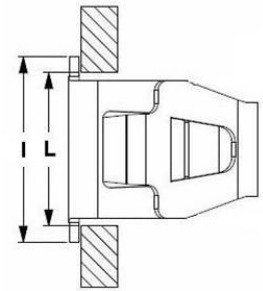
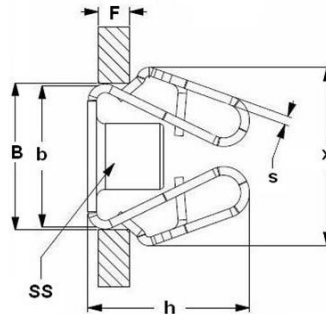


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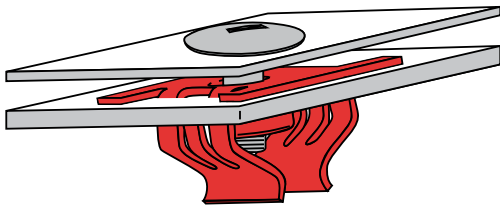


## Expansion Nuts

Metal



### APPLICATION INFORMATION

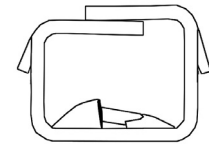


- Used to attach components to a panel with rectangular holes
- Fast, vibration-resistant attachment in blind or center-panel locations where only one side is accessible
- Snap easily into rectangular holes and are self-retained by spring legs
- Nut is pushed into the hole, panel is positioned and screw driven
- Available in box or robotics style designs
- Used on sheet metal to sheet metal attachments (great for attaching components and accessory equipment)
- Expanded spring legs lock over the panel and provide a double-locking action on the screw (supplying the joint strength)

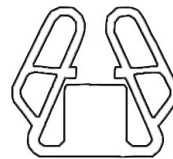
### DESIGN VARIATIONS



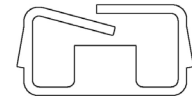
(3D)



(3K)



(5EF)



(5K)

- 3 - Single impression - keyhole (standard for coarse threads)
- 5 - Tapped barrel (increases joint strength)
- D - Tapered design (IPTS) (alternative body style)
- E - Rolled legs, robotics style (design assists in automated assembly)
- F - Screw engages outer arm (increases retention)
- K - Box shaped design (accommodates wider panel range)



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In Panel  
Holes

## Expansion Nuts

### Metal

Metric

Part Number	Legacy Part Number	Thread Specification (SS)	Panel Thickness (F)	Hole Width (B)	Hole Length (L)	Height (h)	Material Thickness (s)	Design Variation
137650	D98621-8Z	ST4.2 (8-18)	0.70 - 1.00	8.55-8.75	8.65	7.35	0.64	3K
137763	D98928-M42141	ST4.2 (8-18)	0.70 - 1.00	8.55-8.75	8.65	6.90	0.64	3K
137672	D98683-8Z	ST4.2 (8-18)	1.00 - 1.50	8.55-8.75	8.65	7.35	0.64	3K
137726	D98833-8Z	ST4.2 (8-18)	1.40 - 2.10	8.55-8.75	8.65	7.35	0.64	3K
137822	D99032-M42141	ST4.2 (8-18)	0.70 - 2.15	8.55-8.75	8.65	6.90	0.64	3K
137833	D99049-M42141	ST4.2 (8-18)	0.70 - 2.15	8.55-8.75	8.65	6.90	0.64	3KX
138225	IPTS426401	ST4.2 (8-18)	0.70 - 1.00	8.65-8.65	8.65	10.80	0.58	3D
138227	IPTS428119	ST4.2 (8-18)	1.60 - 1.90	8.65-8.95	8.80	10.80	0.58	3D
137974	D99280-M42141	ST4.2 (8-18)	0.70 - 2.15	8.55-8.75	10.75	6.90	0.64	3K
137713	D98797-064M	ST4.2 (8-18)	1.25 - 1.75	11-11.2	9.10	12.60	0.64	3E
137752	D98912-064M	ST4.2 (8-18)	2.30 - 2.80	11-11.2	9.10	12.30	0.64	3E
137893	D99152-064M	ST4.2 (8-18)	2.10 - 2.50	8-10.2	8.10	12.40	0.64	3E
138024	D99353-M42141	ST4.2 (8-18)	2.30 - 2.80	10-10.2	10.00	11.90	0.64	5EF
138069	D99404-M42141	ST4.2 (8-18)	2.30 - 2.80	11-11.2	9.10	12.70	0.64	5EF
137985	D99294-071M	M5x1.6	2.30 - 2.80	11-11.2	9.10	12.30	0.71	3E
137940	D99229-M48159	ST4.8 (10-16)	0.66 - 2.10	11.75-12.25	12.00	7.90	0.64	3K
137754	D98914-064M	ST4.8 (10-16)	0.66 - 0.84	11.9-12.1	12.00	13.60	0.64	3E
135200	D99042-M61	M6x1.0	2.00 - 2.50	14.8-15	14.90	14.00	0.86	5EP
137951	D99249-M61	M6x1.0	0.70 - 2.00	13.75-14.03	9.39	10.70	0.86	5K
137987	D99296-M61	M6x1.0	2.00 - 3.80	13.75-14.03	9.39	10.70	0.86	3E
137826	D99038-M61	M6x1.0	0.70 - 1.50	19.8-20	12.65	10.50	0.86	5K
135216	D98952-M61	M6x1.0	0.65 - 1.80	15.75-15.25	15.00	9.70	0.86	5KL

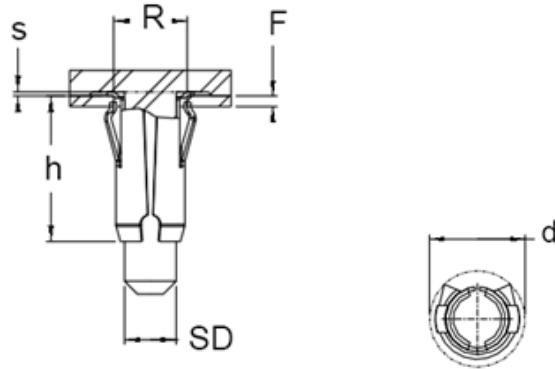
*Most parts manufactured in spring steel*

Self-Retaining Threaded Nuts

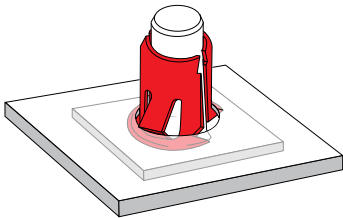


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**Tubulars**



**APPLICATION INFORMATION**



- Used to attach trim strips, access plates, or any light application where removability is a factor to a panel
- Part snaps into the panel hole first, then accepts a stud
- The self-equalizing retaining legs are formed into a dart-type configuration for easy mounting and assure a snug, rattle-free installation
- Parts are hidden - provides for unblemished exposed panel surfaces
- Easily installed - snap together in seconds without tools
- Insertion and retention performance is dependent on component attributes and material

**DESIGN VARIATIONS**



SLIDE FIT



REMOVABLE LOCK



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In Panel  
Holes

## Tubulars

### Imperial

Part Number	Legacy Part Number	Stud Diameter (SD)	Panel Thickness (F)	Hole Diameter (R)	Height (h)	Material Thickness (s)	Stud Engaging Feature
136576	C03810-012	0.122 - 0.128	0.089 - 0.095	0.162 - 0.162	0.220	0.012	Standard
136559	C023745S-012	0.122 - 0.128	0.060 - 0.066	0.161 - 0.161	0.250	0.012	Standard
136780	C22519-115	0.185 - 0.191	0.115 - 0.121	0.228 - 0.228	0.460	0.011	Standard
137451	D02822-064	0.185 - 0.191	0.062 - 0.068	0.228 - 0.228	0.450	0.012	Standard
136555	C02201-094	0.185 - 0.191	0.092 - 0.098	0.228 - 0.228	0.450	0.012	Standard
136554	C02201-081	0.185 - 0.191	0.079 - 0.081	0.228 - 0.228	0.450	0.011	Standard
136573	C03598-036	0.247 - 0.253	0.034 - 0.040	0.281 - 0.284	0.460	0.012	Standard
136795	C24583-012	0.122 - 0.128	0.001 - 0.001	0.162 - 0.162	0.220	0.011	Slide
136801	C25112-049	0.151 - 0.161	0.049 - 0.059	0.228 - 0.228	0.440	0.011	Removable
137446	D02350-032	0.185 - 0.191	0.030 - 0.044	0.228 - 0.228	0.460	0.012	Removable
136561	C02442-081	0.185 - 0.191	0.079 - 0.085	0.228 - 0.228	0.460	0.012	Removable
136891	C44043-081	0.185 - 0.191	0.081 - 0.097	0.228 - 0.228	0.460	0.011	Removable
136567	C02866-125	0.185 - 0.191	0.123 - 0.129	0.228 - 0.228	0.460	0.011	Removable
136778	C22310-030	0.247 - 0.253	0.030 - 0.034	0.312 - 0.312	0.360	0.014	Removable
136772	C21585-040	0.247 - 0.253	0.040 - 0.062	0.312 - 0.312	0.360	0.014	Removable
136569	C03318-125	0.247 - 0.253	0.123 - 0.129	0.312 - 0.312	0.360	0.014	Removable

### Metric

Part Number	Legacy Part Number	Stud Diameter (SD)	Panel Thickness (F)	Hole Diameter (R)	Height (h)	Material Thickness (s)	Stud Engaging Feature
136575	C03598SS-075	6.28 - 6.43	1.85 - 2.00	7.17 - 7.17	12.20	0.30	Standard
137690	D98747-036M	9.00 - 9.20	0.00 - 0.00	10.50 - 10.50	6.40	0.36	Slide

*Most parts manufactured in spring steel*



# ASSEMBLING Panels & Trim



ON Panel Edges

## Balance Clips



69 Series Thin Blade



p.62



17-18 Series Thick Blade



p.63



ON Panel Edges

## Panel Clips



S-Clips



p.64-65



U-Clips



p.66-67



IN Panel Holes

## Panel Clips



Dart Clips - Metal



p.68-69



U-Clips - Special



p.70-71



IN Panel Holes

## Trim Clips



Standard



p.72-73



High-Strength



p.74-75



Right Angle



p.76



Dart Style - Round Holes



p.77



Dart Style - Square Holes



p.78



Single-Sided



p.79



IN Panel Holes

## Solar Clips



PowAR Snap®

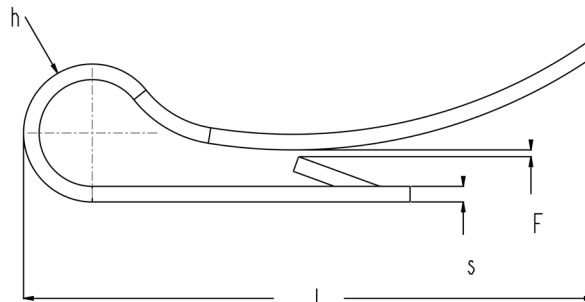


p.80-81



On Panel  
Edges

## Balance Clips 69 Series Thin Blade

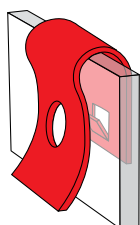


Imperial

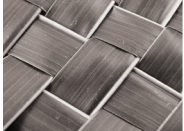
Part Number	Legacy Part Number	Weight (Grains)	Width	Length (l)	Height (h)	Material Thickness (s)	Gap Max (F)
136364	97-09017	6.25	0.216	0.630	0.03	0.013	0
136212	69-125	12.5	0.343	0.795	0.078	0.012	0
136363	97-09016	12.5	0.435	0.630	0.03	0.013	0
136216	69-25	25	0.343	0.782	0.078	0.025	0.020
136218	69-37 1/2	37.5	0.515	0.833	0.078	0.025	0.015
136219	69-50	50	0.688	0.816	0.078	0.025	0.020
136359	97-09009	62	0.860	0.810	0.078	0.026	0.020
136220	69-75	75	1.032	0.814	0.078	0.025	0.020
136361	97-09011	87	1.203	0.810	0.078	0.026	0.020
136211	69-100	100	1.375	0.826	0.078	0.025	0.020
136213	69-150	150	1.500	0.897	0.156	0.032	0.030
136215	69-200	200	2.000	0.890	0.156	0.032	0.030

*Most parts manufactured in spring steel*

### APPLICATION INFORMATION

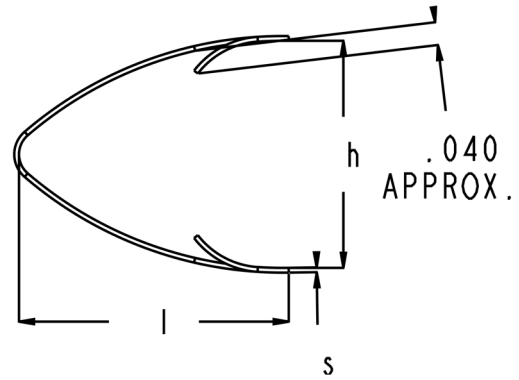
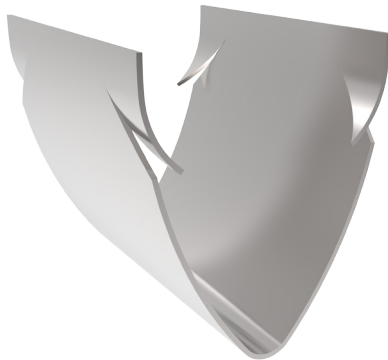


- U-shaped or V-shaped self-retaining fasteners designed to assemble to fan blades
- Used to balance blade weight in order to optimize performance



On Panel  
Edges

## Balance Clips 17-18 Series Thick Blade

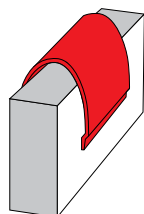


Imperial

Part Number	Legacy Part Number	Weight (Ounces)	Width	Length (l)	Height (h)	Material Thickness (s)
135728	17-1	0.125	0.625	1.076	0.738	0.020
135729	17-2	0.250	1.125	1.173	0.774	0.020
135731	17-3	0.500	1.500	1.062	0.778	0.031
135733	17-4	1.000	2.500	1.057	0.743	0.035
135734	17-5	1.500	2.500	1.057	0.782	0.047
135735	17-6	2.000	2.500	1.043	0.655	0.062
135758	18-1/4	0.250	0.500	1.750	1.187	0.028
135757	18-1/2	0.500	1.000	1.750	1.187	0.028
135756	18-1	1.000	1.250	1.750	1.187	0.045

Most parts manufactured in spring steel

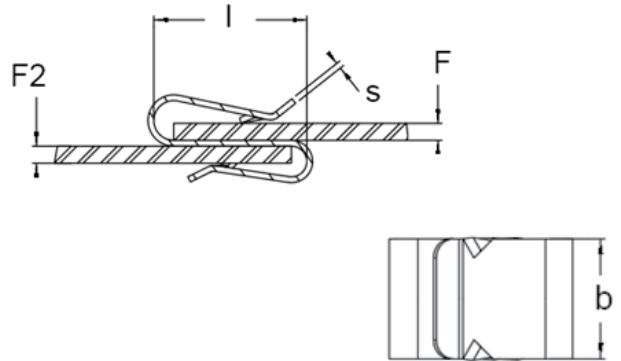
### APPLICATION INFORMATION



- U-shaped or V-shaped self-retaining fasteners designed to assemble to fan blades
- Used to balance blade weight in order to optimize performance



**Panel Clips**  
S-Clips

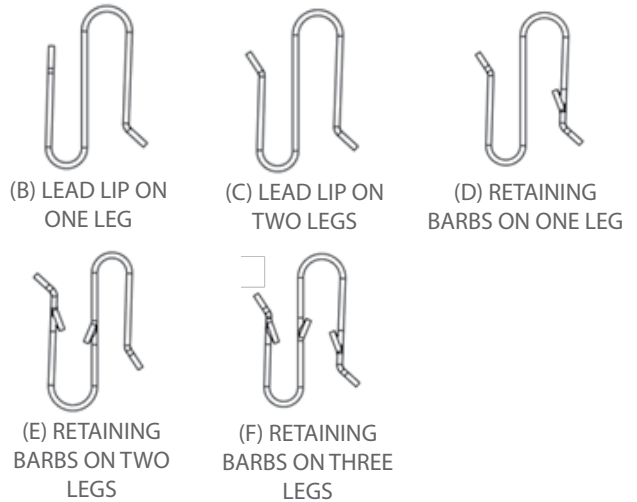


**APPLICATION INFORMATION**



- Used for attaching parallel panels in opposing directions
- Slide easily over metal, plastic or wooden panels providing firm, vibration-free assembly
- The spring steel "cushions" the joint, preventing chipping and other damage during shipping and handling
- Self-sufficient - requiring no holes, screws, welds, rivets or other secondary fastening devices
- Turned-up lead lips on one or both legs ease assembly over the panel edges
- Some are equipped with barbs for positive retention of the panel
- No tools required
- Insertion and retention performance is dependent on component attributes and material

**DESIGN VARIATIONS**



- Lead lips ease assembly
- Barbs increase retention

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On Panel  
Edges

## Panel Clips

### S-Clips

#### Imperial

Part Number	Legacy Part Number	Panel Thickness (F)	Panel Thickness (F2)	Width (b)	Length (l)	Material Thickness (s)	Design Variation
136821	C28173-025	0.040 - 0.080	0.120 - 0.136	0.500	0.545	0.025	B
136777	C22306-025	0.043 - 0.053	0.025 - 0.060	0.562	0.540	0.025	CD
137578	D44684-020	0.048 - 0.080	0.070 - 0.110	0.375	0.530	0.020	CF
136907	C52161-020	0.050 - 0.070	0.050 - 0.070	0.380	0.565	0.020	CE
136958	C58137-025	0.055 - 0.060	0.025 - 0.060	0.562	0.540	0.025	C
137572	D40991-020	0.055 - 0.065	0.080 - 0.110	0.375	0.530	0.020	BF
136901	C48766-020	0.070 - 0.080	0.070 - 0.110	0.375	0.530	0.020	CF
136918	C55113-020	0.090 - 0.130	0.090 - 0.130	0.375	0.530	0.020	CE
136920	C55638-020	0.161 - 0.170	0.090 - 0.130	0.375	0.520	0.020	CE

#### Metric

Part Number	Legacy Part Number	Panel Thickness (F)	Panel Thickness (F2)	Width (b)	Length (l)	Material Thickness (s)	Design Variation
137677	D98707-051M	1.25 - 2.00	1.80 - 2.80	9.55	13.45	0.51	BF
137009	C58675-064M	1.50 - 2.00	1.50 - 2.00	12.75	19.00	0.64	E
137830	D99044-043M	2.30 - 3.30	2.30 - 3.30	9.55	13.50	0.43	BF
136942	C57908-043M	2.50 - 2.80	2.50 - 2.80	9.53	22.36	0.43	CF

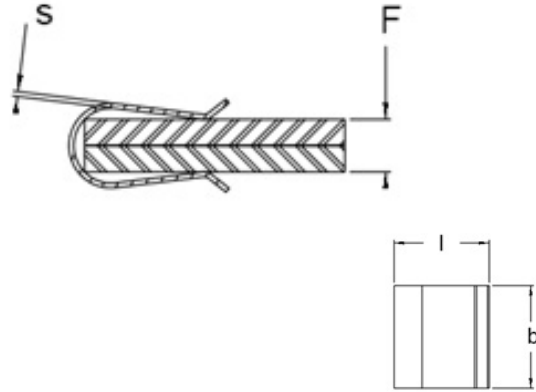
*Most parts manufactured in spring steel*



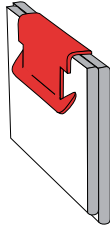
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## Panel Clips

### U-Clips



#### APPLICATION INFORMATION



- Used for attaching two panels together
- Slide easily over metal, plastic or wooden panels providing firm, vibration-free assembly
- Self-sufficient - requiring no holes, screws, welds, rivets or other secondary fastening devices
- Turned-up lead lips on one or both legs ease assembly over the panel edges
- Some are equipped with barbs for positive retention of the panel
- No tools required
- Insertion and retention performance is dependent on component attributes and material

#### DESIGN VARIATIONS



(C) SQUARE BACK



(D) BARB ONE LEG



(E) BARBS BOTH LEGS

- A - Straight legs, no lead lips
- B - One straight leg, one lead lip
- C - Square back to ease insertion
- D - Barb on one leg to increase retention
- E - Barbs on legs to increase retention



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On Panel Edges

## Panel Clips

### U-Clips

#### Imperial

Part Number	Legacy Part Number	Panel Thickness (F)	Width (b)	Length (l)	Material Thickness (s)	Design Variation
136804	C25341-014	0.035 - 0.045	0.380	0.200	0.014	ACE
136794	C23928-014	0.046 - 0.056	0.380	0.200	0.014	ACE
137537	D20285-017	0.050 - 0.100	0.500	0.340	0.017	BE
137549	D27091-014	0.115 - 0.185	0.500	0.420	0.014	E
137577	D43806-014	0.170 - 0.205	0.500	0.430	0.014	E
136895	C45931-014	0.245 - 0.255	0.500	0.360	0.014	CE
136933	C57065-014	0.270 - 0.320	0.500	0.265	0.014	CD
136924	C56147-014	0.320 - 0.340	0.500	0.270	0.014	CE

#### Metric

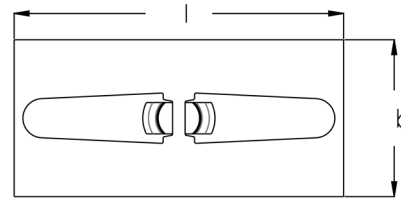
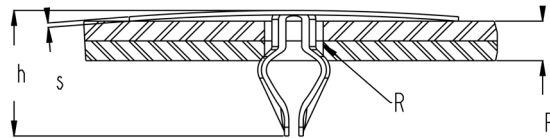
Part Number	Legacy Part Number	Panel Thickness (F)	Width (b)	Length (l)	Material Thickness (s)	Design Variation
011847	011847	0.75 - 2.00	13.00	4.70	0.30	-
013031	013031	1.00 - 2.20	20.00	8.75	0.50	-
054712	054712	1.00 - 2.50	10.00	9.70	0.40	-
013414	013414	1.50 - 3.50	20.00	13.00	0.60	-
013750	013750	3.00 - 4.50	25.00	12.00	0.45	-
053328	053328	4.00 - 5.00	12.70	8.70	0.50	-

*Most parts manufactured in spring steel*

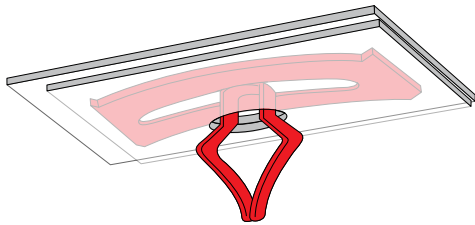


## Panel Clips

Dart Clips - Metal



### APPLICATION INFORMATION



- Used for attaching two panels together
- Can be applied from the front or the top of the panel, eliminating many blind or limited access fastening problems
- Require no screws or secondary fastening devices
- The spring tension secures the components between the base and knuckles of the clip
- No tools required
- The amount of clamping action depends on the material thickness and design of the clip





In Panel  
Holes

## Panel Clips

### Dart Clips - Metal

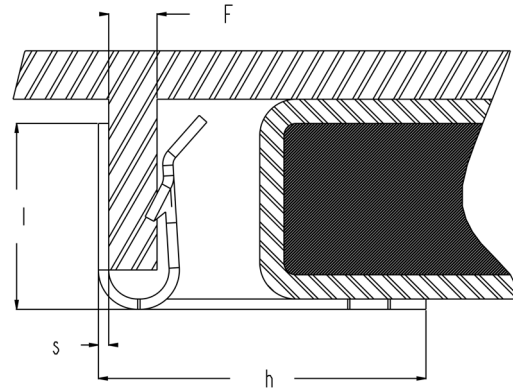
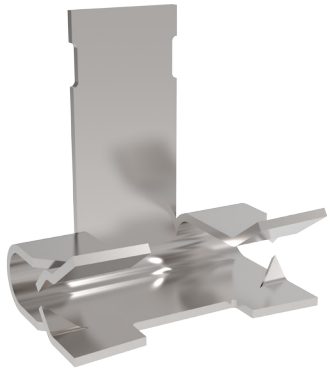
*Imperial*

Part Number	Legacy Part Number	Panel Range Thickness (F)	Hole Diameter (R)	Height (h)	Length (l)	Width (b)	Material Thickness (s)
136872	C40617-017	0.185 - 0.234	0.187 - 0.192	0.610	1.700	0.334	0.017
136767	C21116-020	0.185 - 0.234	0.187 - 0.192	0.610	1.700	0.340	0.020
138532	C22149-014	0.050 - 0.075	0.182 - 0.192	0.480	0.550	0.340	0.025
136764	C20341-025	0.224 - 0.244	0.307 - 0.317	0.640	0.750	0.310	0.025
137458	D04792-017	0.095 - 0.140	0.307 - 0.317	0.550	1.080	0.218	0.017

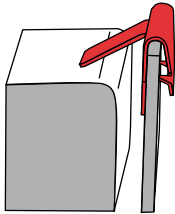
*Most parts manufactured in spring steel*



## Panel Clips U-Clips - Special

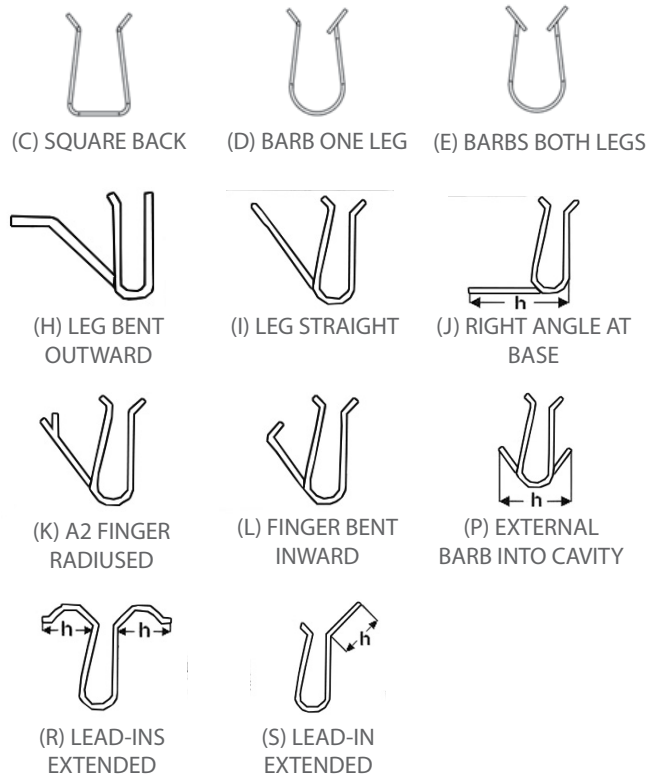


### APPLICATION INFORMATION



- Specially designed panel clips featuring a "U-shaped" clip that secures to one panel, and another feature that secures or interferes with an additional component
- Designed to solve specific applications
- Several design variations to consider
- ARaymond can create new designs if needed for specific applications
- No tools required
- The amount of clamping action depends on the material thickness and design of the clip

### DESIGN VARIATIONS



- A - Straight legs, no lead lips
- B - One straight leg, one lead lip
- C - Square back to ease insertion
- D - Barb on one leg to increase retention
- E - Barbs on legs to increase retention
- H, I, J, K - Alternative interference fit designs
- L - Snap fit interference design (can be serviceable)
- P - External barbs dig into cavity wall
- R, S - Extended lead lips trap two panels together





In Panel  
Holes

## Panel Clips

### U-Clips - Special

#### Imperial

Part Number	Legacy Part Number	Panel Thickness (F)	Leg Height (h)	Width	Length (l)	Material Thickness (s)	Design Variation
136892	C44140-014	0.025 - 0.035	0.350	0.500	0.460	0.014	BFI
136818	C28015-025	0.030 - 0.110	0.190	0.875	0.635	0.025	FI
136765	C20597-017	0.042 - 0.048	0.610	0.500	0.300	0.017	BFJ
136788	C23259-017	0.042 - 0.062	0.525	0.500	0.290	0.017	BFJ
136824	C29019-014	0.055 - 0.065	0.360	0.500	0.310	0.014	BFH
136877	C41412-017	0.070 - 0.090	0.525	0.500	0.290	0.017	BEJ
136771	C21527-014	0.075 - 0.105	0.315	0.500	0.410	0.014	FH
136915	C54150-017	0.120 - 0.125	0.545	0.500	0.260	0.017	FIJ
136808	C25672-017	0.125 - 0.140	0.545	0.500	0.260	0.017	BCFJ
136820	C28036-017	0.090 - 0.110	0.180	0.500	0.350	0.017	BFS
137552	D28601-014	0.067 - 0.077	0.196	0.500	0.350	0.014	EP
136986	C58521-028	0.080 - 0.080	0.080	0.437	1.125	0.028	P
137579	D47463-017	0.105 - 0.115	0.240	0.500	0.380	0.017	AP

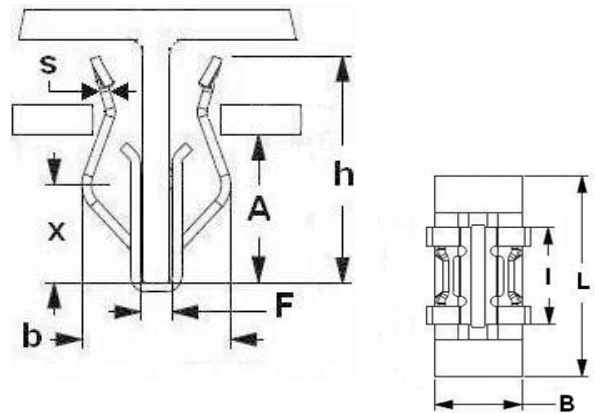
#### Metric

Part Number	Legacy Part Number	Panel Thickness (F)	Leg Height (h)	Width	Length (l)	Material Thickness (s)	Design Variation
137845	D99073-043M	0.78 - 1.04	9.44	12.70	8.28	0.43	BFI
137759	D98920-043M	1.82 - 1.95	3.00	25.40	10.50	0.43	FJ
137664	D98672-064M	1.10 - 3.10	1.00	18.00	17.50	0.64	CR
137007	C58664-064M	2.65 - 2.75	3.00	21.00	18.50	0.64	CEGR
136959	C58172-064M	3.45 - 3.55	0.08	12.70	17.80	0.64	CERZ

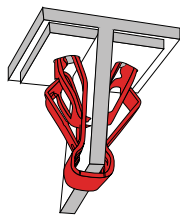
*Most parts manufactured in spring steel*



## Trim Clips Standard

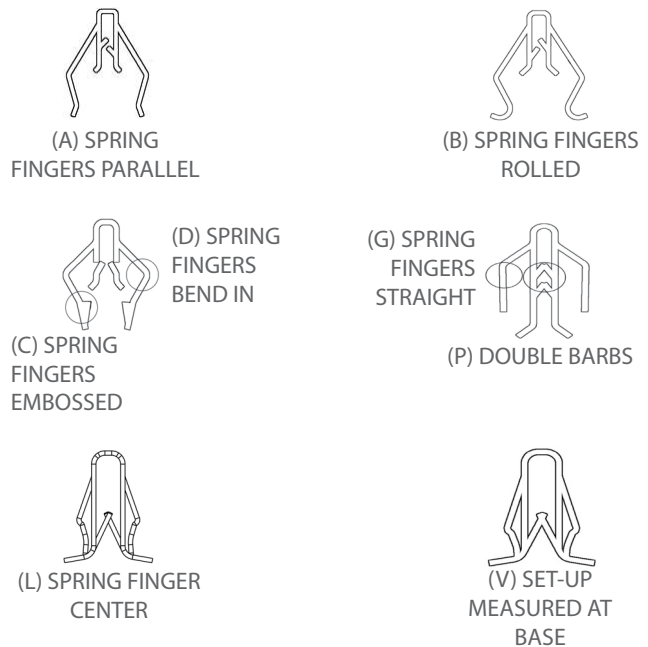


### APPLICATION INFORMATION



- Designed for use over rectangular studs or integrally molded blades, ribs, etc. on trim strips, access plates or any light application where removability is a factor
  - The self-equalizing retaining legs are formed into a dart-type configuration for easy mounting and assure a snug, rattle-free installation
  - Will yield to deliberate removal force applied to the trim or plate
  - Parts are hidden - provides for unblemished exposed panel surfaces
  - Easily installed - snap together in seconds without tools
  - Serviceable - parts disassemble easily and reliably
- Note: Excessive removal can cause some degradation to mating panels*
- Ideal for trim applications, close-out applications, vending, ATM, specialty furniture applications
  - Insertion and retention performance is dependent on component attributes and material

### DESIGN VARIATIONS



- A, B, C, D, G, L - Alternative spring finger designs
- P - Additional barb to increase retention
- V - Alternative panel configuration

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In Panel  
Holes

## Trim Clips Standard

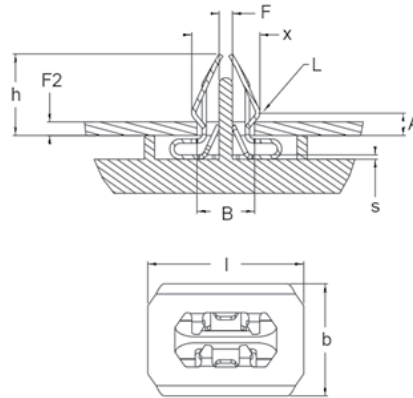
*Metric*

Part Number	Legacy Part Number	Rib Thickness (F)	Slot Width (B)	Set-Up Height (A)	Slot Length (L)	Height (H)	Material Thickness (s)	Design Variation
137706	D98786-051M	0.90 - 1.10	5.70 - 6.20	6.00 - 7.00	20.00	14.70	0.51	G
137989	D99299-043M	1.10 - 1.10	5.30 - 5.70	5.60 - 5.60	20.00	7.80	0.43	B
137668	D98676-056M	1.12 - 1.38	5.70 - 6.20	12.25 - 12.25	12.00	18.20	0.56	B
135203	D98646-043M	1.17 - 1.43	6.20 - 6.70	6.10 - 6.10	11.00	9.50	0.43	D
136953	C58005-036M	1.25 - 1.75	5.20 - 5.60	6.00 - 7.00	25.40	13.00	0.36	B
137654	D98648-051M	1.37 - 1.77	8.00 - 8.50	12.13 - 12.13	20.00	16.50	0.51	D
135257	D98901-051M	1.40 - 1.60	5.70 - 6.20	7.50 - 8.50	20.00	14.70	0.51	GP
137718	D98810-051M	1.40 - 1.80	8.00 - 8.50	11.60 - 12.80	16.00	16.50	0.51	B
137681	D98721-051M	1.60 - 2.00	8.00 - 8.50	7.75 - 8.75	20.00	15.10	0.51	C
137653	D98640-051M	1.70 - 2.10	8.00 - 8.50	11.60 - 12.80	16.00	16.55	0.51	B
137636	D98568-056M	1.70 - 2.10	8.00 - 8.50	12.13 - 12.13	16.00	16.50	0.56	A
137991	D99302-064M	1.13 - 1.37	5.75 - 6.25	4.00 - 4.00	21.00	15.50	0.64	LV
135205	D99301-064M	1.13 - 1.37	5.75 - 6.25	4.50 - 4.50	21.00	15.50	0.64	LV

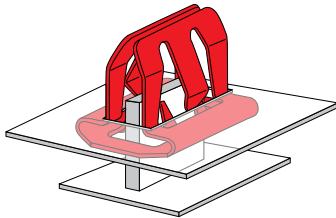
*Most parts manufactured in spring steel*



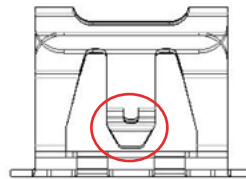
Trim Clips  
High-Strength



APPLICATION INFORMATION



DESIGN VARIATIONS



(C) NON-SERVICEABLE TABS

- Designed for use over rectangular studs or integrally molded blades, ribs, etc. when panels are subjected to stronger or cyclical loading
- Part snaps into the substrate, hole first, then accepts a stud
- The self-equalizing retaining legs are formed into a dart-type configuration for easy mounting and assure a snug, rattle-free installation
- Will yield to deliberate removal force applied to the trim or plate
- Parts are hidden - provides for unblemished exposed panel surfaces
- Can be used to allow panels to withstand disassembly with light to moderate loads
- Easily installed - snap together in seconds without tools
- Removable and reusable
- Serviceable - parts disassemble easily and reliably
- *Note: Excessive removal can cause some degradation to mating panels*
- Ideal for trim applications, close-out applications, vending, ATM, specialty furniture applications
- Insertion and retention performance is dependent on component attributes and material



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In Panel  
Holes

## Trim Clips

### High-Strength

*Imperial*

Part Number	Legacy Part Number	Panel Thickness(F)	Panel Thickness (F2)	Slot Width (B)	Slot Length (L)	Set-Up Height (A)	Height (h)	Material Thickness (s)	Design Variation
137933	D99214-064M	1.10 - 1.30	0.80 - 3.00	5.75 - 6.03	20.00	6.05 - 7.05	15.50	0.64	-
137887	D99142-064M	1.75 - 2.00	0.70 - 0.90	5.75 - 6.03	20.00	6.05 - 7.05	15.50	0.64	C
137798	D98991-064M	1.90 - 2.10	0.70 - 1.20	7.75 - 8.03	25.40	4.70 - 5.70	15.50	0.64	-
137797	D98988-064M	1.90 - 2.10	1.40 - 1.60	7.75 - 8.03	25.40	5.60 - 6.60	15.50	0.64	-
137789	D98976-064M	1.90 - 2.10	2.90 - 3.30	7.95 - 8.35	25.40	7.35 - 8.35	15.50	0.64	-
137799	D98992-064M	1.90 - 2.10	2.30 - 2.80	8.25 - 8.75	22.00	4.70 - 5.70	15.50	0.64	-

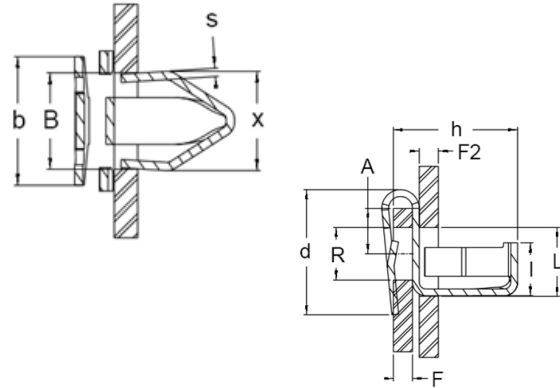
*Most parts manufactured in spring steel*





In Panel  
Holes

## Trim Clips Right Angle



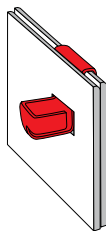
### Metric

Part Number	Legacy Part Number	Panel Thickness (F)	Throat Distance (A)	Panel Thickness (F2)	Slot Width (B)	Slot Length (L)	Height (h)	Material Thickness (s)
137656	D98652-071M	0.80 - 2.00	4.50 - 5.00	0.80 - 2.00	7.10 - 7.30	12.00	16.12	0.71

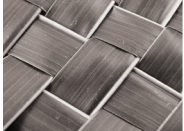
Most parts manufactured in spring steel



### APPLICATION INFORMATION



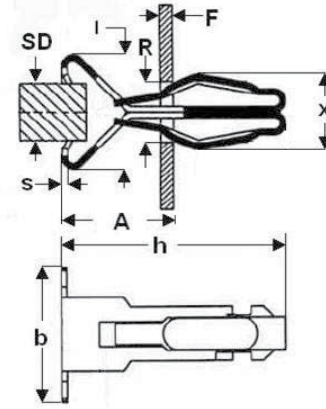
- Used to attach two parallel sheet metal surfaces
- Clips onto the edge of one panel and into a hole on the other
- The self-equalizing retaining legs are formed into a dart-type configuration for easy mounting and assure a snug, rattle-free installation
- Easily installed - snap together in seconds without tools
- Serviceable - parts disassemble easily and reliably
- *Note: Excessive removal can cause some degradation to mating panels*
- Ideal for trim applications, close-out applications, vending, ATM, specialty furniture applications
- Insertion and retention performance is dependent on component attributes and material



In Panel  
Holes

## Trim Clips

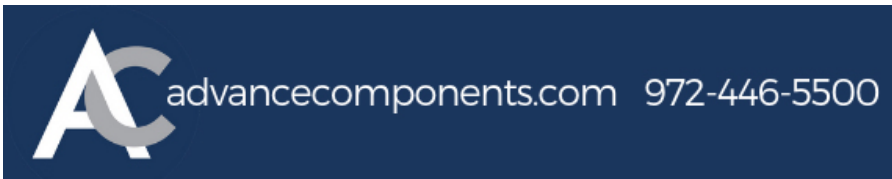
### Dart Style - Round Holes



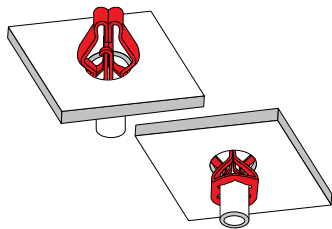
Imperial

Part Number	Legacy Part Number	Stud Diameter (SD)	Panel Thickness (F)	Hole Diameter (R)	Set-Up Height (A)	Height (h)	Material Thickness (s)	Design Variation
137957	D99256-071M	4.65 - 4.85	2.40 - 2.60	7.25 - 7.75	13.50 - 16.00	26.50	0.71	A
137686	D98728-045M	7.00 - 7.30	2.40 - 2.60	7.25 - 7.75	13.50 - 16.00	26.50	0.45	B
137714	D98801-071M	7.00 - 7.30	2.40 - 2.60	7.25 - 7.75	13.50 - 16.00	26.50	0.71	B
137740	D98872-045M	7.17 - 7.26	2.40 - 2.60	7.25 - 7.75	13.50 - 16.00	26.50	0.45	A

*Most parts manufactured in spring steel*



### APPLICATION INFORMATION



- Used in applications where the substrate is some distance from the mating panel
- Designed for attachment into round holes
- The self-equalizing retaining legs are formed into a dart-type configuration for easy mounting and assure a snug, rattle-free installation
- Parts are hidden - provides for unblemished exposed panel surfaces
- Easily installed - snap together in seconds without tools
- Serviceable - parts disassemble easily and reliably
- *Note: Excessive removal can cause some degradation to mating panels*
- Ideal for trim applications, close-out applications, vending, ATM, specialty furniture applications
- Insertion and retention performance is dependent on component attributes and material

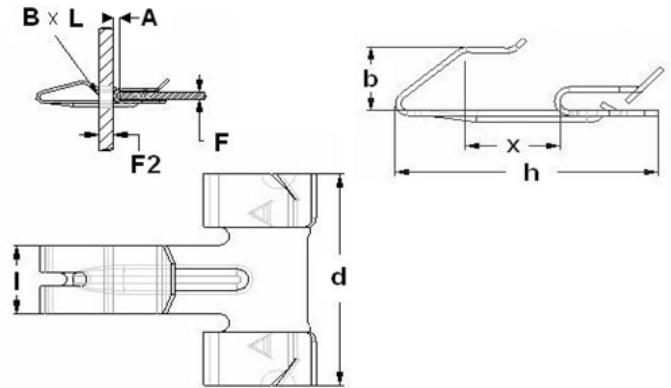




In Panel  
Holes

## Trim Clips

Dart Style - Square Holes

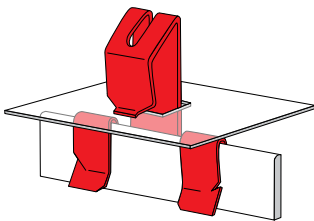


Metric

Part Number	Legacy Part Number	Rib Thickness (F)	Panel Thickness (F2)	Slot Width (B)	Set-Up Height (A)	Dart Width (I)	Height (h)	Width (d)	Design Variation
137751	D98910-051M	0.90 - 1.10	2.75 - 3.25	6.15 - 6.65	10.70	9.00	19.20	24.00	G
135215	D98826-051M	1.20 - 1.50	2.40 - 2.60	3.90 - 4.10	3.55	6.35	23.00	19.75	
137669	D98680-043M	1.40 - 1.60	2.00 - 2.50	5.90 - 6.10	3.00	15.00	25.00	15.00	AB
138000	D99311-051M	2.40 - 2.60	3.00 - 3.00	11.75 - 12.25	7.80	22.00	36.00	22.00	

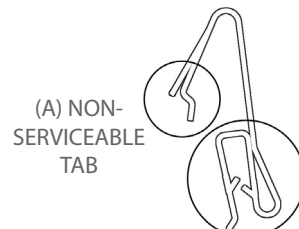
Most parts manufactured in spring steel  
*Note: Hole length (L) must be greater than dart length (I)*

### APPLICATION INFORMATION



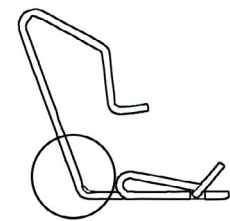
- Used in applications where the edge of the substrate is some distance from the face of the mating panel
- Often used to allow a wire path between the two panels

### DESIGN VARIATIONS



(A) NON-SERVICEABLE TAB

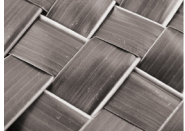
(B) DOUBLE BEND AT BASE



(G) SPRING FINGERS ALIGNED

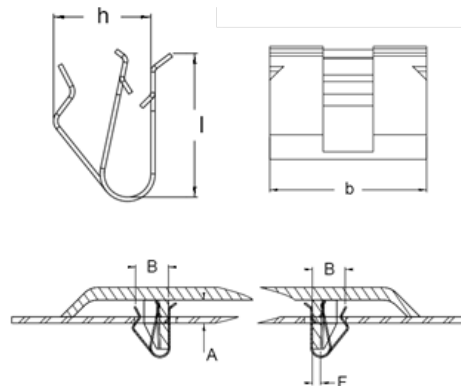


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In Panel  
Holes

## Trim Clips Single-Sided



### Imperial

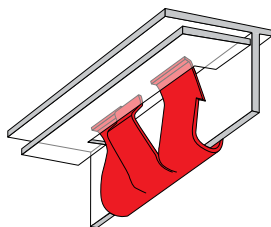
Part Number	Legacy Part Number	Rib Thickness (F)	Set-Up Height (A)	Slot Width (B)	Width (b)	Length (l)	Height (h)	Material Thickness (s)	Design
136910	C53121-012	0.040 - 0.052	0.225 - 0.255	0.170 - 0.190	0.500	0.380	0.245	0.011	Standard
136769	C21449-014	0.040 - 0.090	0.240 - 0.260	0.145 - 0.165	0.500	0.340	0.220	0.014	Standard
140745	C44725-014	0.045 - 0.055	0.120 - 0.140	0.075 - 0.090	0.375	0.210	0.140	0.014	Standard
136774	C22112-020	0.070 - 0.080	0.285 - 0.305	0.185 - 0.225	0.180	0.520	0.280	0.020	Alternate
136815	C27946-017	0.070 - 0.080	0.445 - 0.465	0.250 - 0.290	0.500	0.595	0.343	0.017	Alternate

### Metric

Part Number	Legacy Part Number	Rib Thickness (F)	Set-Up Height (A)	Slot Width (B)	Width (b)	Length (l)	Height (h)	Material Thickness (s)	Design Variation
137588	D57067-043M	1.00 - 1.50	5.50 - 5.70	4.60 - 5.00	12.70	9.60	6.35	0.43	Standard

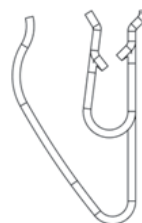
Most parts manufactured in spring steel

### APPLICATION INFORMATION



- Used in tandem with other single-sided trim clips to engage an edge of a cavity
- Easily installed - snap together in seconds without tools

### DESIGN



ALTERNATE DESIGN



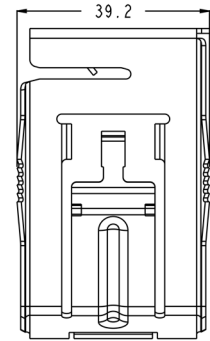
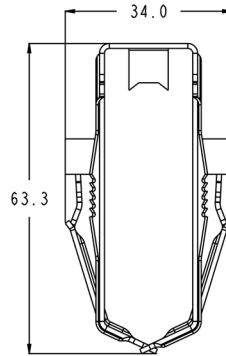
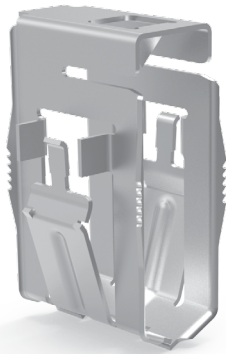
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In Panel  
Holes

## Solar Clips

PowAR Snap® 90B with Grounding



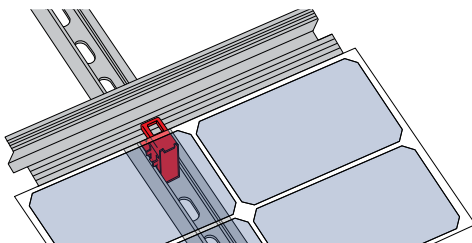
Part Number	Dimensions (mm)	Weight (g)	Material	Surface Treatment	Module Frame Thickness	Module Minimum Lip Length
237390001	39.2x63.3x34	50	SAE 1050-1065 Steel	Hot dip galvanized 60 microns thick	1.5 - 2.2mm	16mm

### Removal Tool

Part Number	Design	Description	Material	Surface Treatment
229959000		Side Removal	1018 Steel HRPO	Black Oxide
227130000		Back Removal	1018 Steel HRPO	Black Oxide

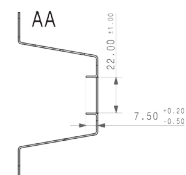
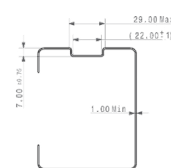
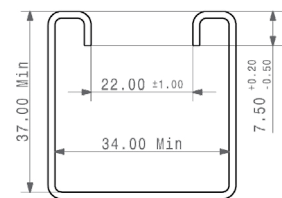
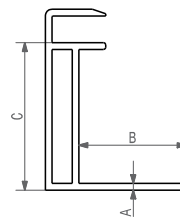


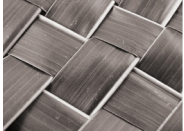
### APPLICATION INFORMATION



- Attaches and grounds solar module to strut or rail
- Simply slides onto the module frame and snaps into channeled strut or aluminum rail
- Used on ground mount and roof mount applications on framed portrait and landscape modules
- UL Recognized to sections 17, 18, 19, 21 and 22 (Structural, Bonding and Corrosion)
- Tool free: low mounting effort
- Anti-theft - disassembly requires removal tool

### RAIL SPECIFICATIONS

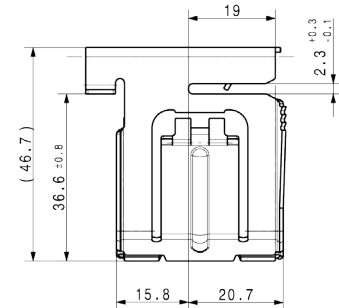
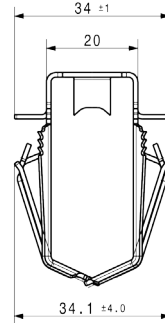
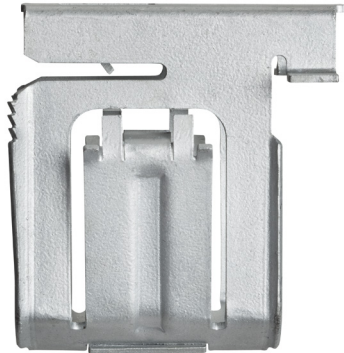




In Panel  
Holes

## Solar Clips

PowAR Snap® S with Grounding



Part Number	Dimensions (mm)	Weight (g)	Material	Surface Treatment	Module Frame Thickness	Module Minimum Lip Length
233147001	44x48x34	33.40	SAE 1070-ASTM AISI	Inorganic zinc-rich basecoat with aluminum-rich organic topcoat	1.5 - 2.2mm	16mm

### Removal Tool

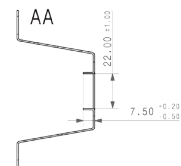
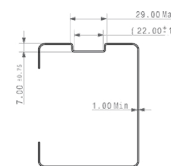
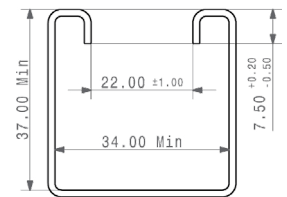
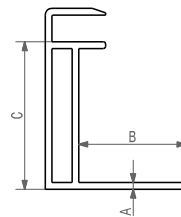
Part Number	Design	Description	Material	Surface Treatment
237942001		Slide Removal (Roof top)	Metal Assembly	-
235216001		Back Removal (Ground Mount)	1018 Steel HRPO	Black Oxide

### APPLICATION INFORMATION



- Attaches and grounds solar module to strut or rail
- Simply slides onto the module frame and snaps into channeled strut or aluminum rail
- Conforms to UL 2703 sections 17, 18, 19, 21 and 22 (Structural, Bonding and Corrosion)
- ETL Recognized
- Tool free: low mounting effort

### RAIL SPECIFICATIONS



Examples of shapes for the rail



Examples of shapes for the rail



# ASSEMBLING Panels & Trim



IN Panel Holes

## Plastic Push-Rivets



Plastic Push-Rivets



p.84-85



IN Panel Holes

## Push-Pins



Push-Pins



p.86



IN Panel Holes

## Fir Tree Fasteners



Fir Tree Fasteners

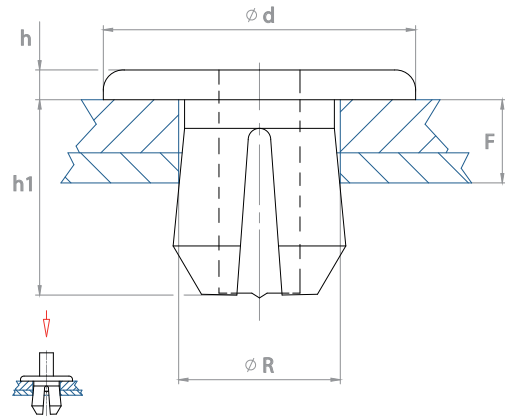


p.87

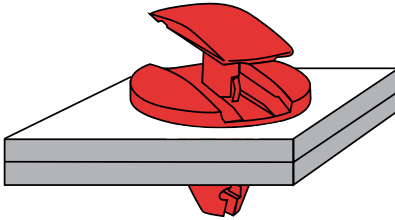


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## Plastic Push-Rivets



### APPLICATION INFORMATION



- Used to attach two panels together
- The button or plunger is pushed into the center of the dart shaped pin, causing the legs to expand behind the mating panel
- Leg expansion provides a strong joint
- The pin ensures a high pull-out resistance
- Easy push to lock system
- Many of these parts are serviceable



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In Panel  
Holes

## Plastic Push-Rivets

*Imperial*

Part Number	Legacy Part Number	Panel Thickness (F)	Hole Diameter (R)	Head Diameter (d)	Height (h1)	Head Height (h)
018610	018610	0.80 - 7.00	7.80 - 8.80	17.00	13.00	4.50
201793	201793	2.00 - 7.50	8.10 - 8.30	20.50	13.00	3.00
202493	202493	3.00 - 10.00	6.35 - 7.00	22.00	14.00	2.60
018795	018795	3.00 - 8.00	4.55 - 5.15	15.00	11.50	3.00
013011	013011	4.00 - 7.00	7.90 - 8.70	16.00	12.00	2.00
207926	207926	4.30 - 4.70	14.90 - 15.20	22.00	13.70	4.50
017489	017489	4.40 - 4.80	12.00 - 12.20	18.00	10.00	6.00
020074	020074	4.50 - 5.00	9.90 - 10.10	17.80	11.50	5.00
015269	015269	6.00 - 8.50	7.00 - 7.20	15.00	17.00	6.00
208580	208580	7.50 - 8.50	14.00 - 14.20	22.00	20.00	4.00
137076	C62381AA	28.50 - 29.50	11.50 - 12.00	30.00	50.20	15.00

*For material information see page 7*



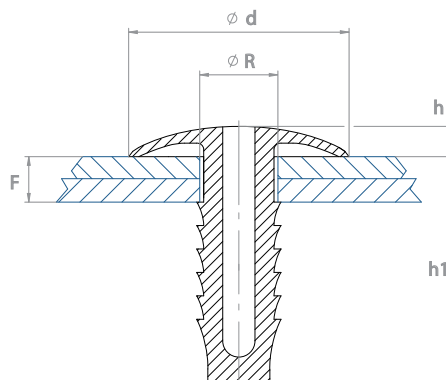
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In Panel  
Holes

## Push-Pins



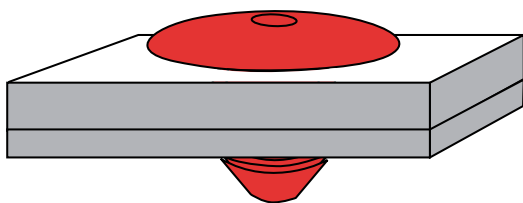
Metric

Part Number	Legacy Part Number	Panel Thickness (F)	Hole Diameter (R)	Head Diameter (d)	Height (h1)	Head Height (h)
137038	C61546AG-028	0.035 - 0.100	0.182 - 0.192	0.420	0.475	0.100
137044	C61782AA-060	0.060 - 0.100	0.182 - 0.192	0.445	0.595	0.062
137040	C61622AG-130	0.130 - 0.180	0.182 - 0.192	0.420	0.555	0.100
137043	C61758AG-170	0.170 - 0.234	0.182 - 0.192	0.445	0.595	0.062
137035	C61375AG-170	0.170 - 0.234	0.182 - 0.192	0.420	0.595	0.050

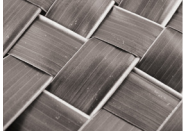
For material information see page 7



### APPLICATION INFORMATION

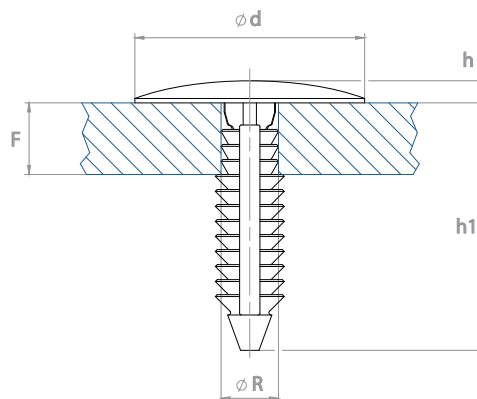


- Used for light retention in panels
- No tools required
- Corrosion-proof, shock and vibration resistant
- Not suitable for high shear forces
- Ideally suited for simplified assembly or products shipped knocked-down for consumer assembly



In Panel  
Holes

## Fir Tree Fasteners



Imperial

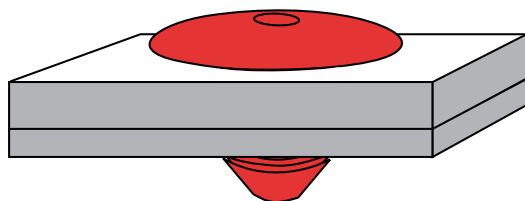
Part Number	Legacy Part Number	Panel Thickness (F)	Hole Diameter (R)	Head Diameter (d)	Height (h1)	Head Height (h)
137109	C62571AA	1.50 - 12.70	9.50 - 10.40	21.15	20.25	3.66
137298	C63100AA	2.54 - 6.64	6.20 - 6.50	17.78	15.53	2.50

For material information see page 7



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### APPLICATION INFORMATION



- Holds two panels together without the need for screws or other secondary fastening devices
- The barbed feature easily digs into the panel with minimal force
- Assembled into holes or cavities
- No tools required

ASSEMBLING  
Cables & Tubes



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## Cable Ties



ON / TO Cables or Tubes



Standard



p. 90



Tube Mount



p.91

## Cable Ties



ON Studs



Stud Mount



p.92

## Cable Ties



ON Panel Edges



Edge Mount



p.93

## Cable Ties



IN Panel Holes



Plug Mount



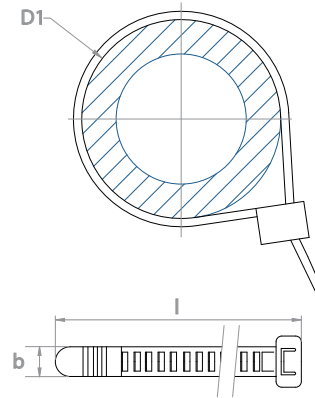
p.94-95





On / To Cables  
or Tubes

## Cable Ties Standard

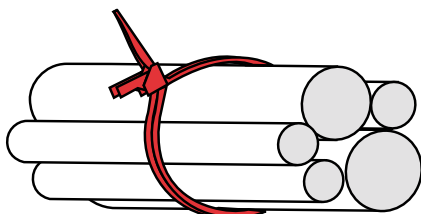


Metric

Part Number	Max Tube Diameter (D1)	Cable Strap Width (b)	Cable Strap Length (l)
056799	3.00 - 26.00	4.50	120.00
013427	4.00 - 20.00	4.50	87.00
056889	5.00 - 35.00	4.50	160.00
013428	6.00 - 30.00	6.00	128.70
013429	6.00 - 60.00	6.00	218.70
056686	10.00 - 32.00	3.60	139.00
056767	10.00 - 45.00	4.80	178.00
056476	10.00 - 50.00	3.60	200.00
056792	10.00 - 65.00	4.80	250.00
056766	20.00 - 115.00	4.80	430.00
056688	20.00 - 80.00	3.60	290.00
056689	30.00 - 103.00	3.60	370.00
013430	60.00 - 135.00	6.00	459.00

For material information see page 7

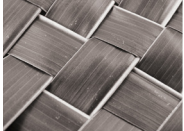
### APPLICATION INFORMATION



- Used to secure wires together

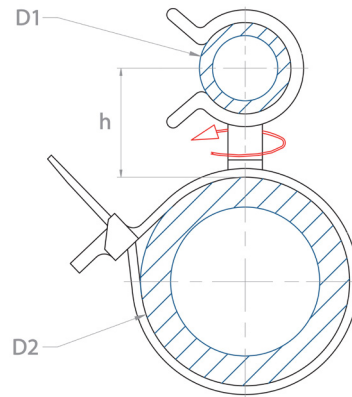


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On / To Cables  
or Tubes

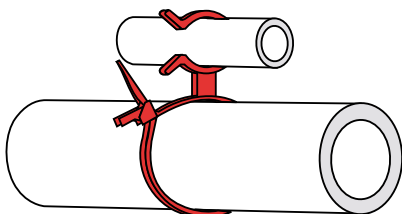
## Cable Ties Tube Mount



Metric

Part Number	Tube Diameter (D1)	Cable Strap Diameter (D2)	Distance (h)	Design Variations
168750	6.00 - 6.50	8.00 - 50.00	14.00	
082646	7.80 - 8.50	8.00 - 33.00	13.95	
081717	8.00 - 9.00	8.00 - 20.00	18.50	
168869	8.00 - 9.00	8.00 - 50.00	17.20	
168797	9.50 - 10.50	8.00 - 33.00	16.00	
168853	9.50 - 10.50	8.00 - 50.00	17.30	
168803	11.00 - 13.00	8.00 - 33.00	16.80	
214116	12.60 - 13.20	8.00 - 33.00	17.10	
168752	15.00 - 16.00	8.00 - 50.00	18.30	
168804	15.00 - 16.00	8.00 - 33.00	18.30	
082282	16.00 - 18.00	8.00 - 33.00	19.25	
168751	18.00 - 20.00	8.00 - 20.00	21.00	
168781	18.00 - 20.00	8.00 - 33.00	19.70	
081190	22.00 - 24.00	8.00 - 33.00	23.50	
202609	28.00 - 30.00	8.00 - 33.00	25.75	

### APPLICATION INFORMATION



- Used to assemble a bundle at any orientation to a tube
- Swivel system helps to orientate the bundle

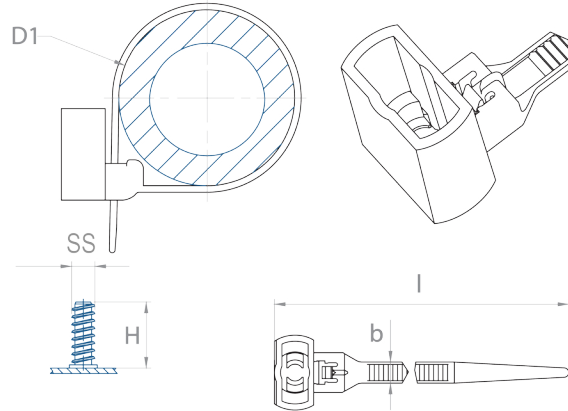


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On Studs

## Cable Ties Stud Mount



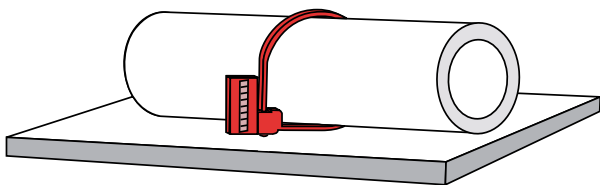
Metric

Part Number	Tube Diameter (D1)	Stud Size (SS)	Stud Height (H)	Strap Width (b)	Strap Length (l)	Design Variations
201614	1.50 - 40.00	M6x1.0	12.00	4.50	175.50	1
202587	2.00 - 40.00	M8x1.25	14.20	4.80	183.50	2
020494	2.00 - 25.00	M8x1.25	14.50	4.50	135.00	2
203449	2.00 - 40.00	M5x1.6	14.20	4.50	171.30	3

For material information see page 7

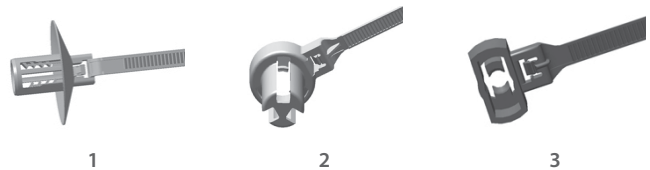


### APPLICATION INFORMATION

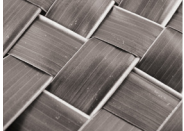


- Cable tie integrating a female clip to attach onto a stud
- Attaches wire bundles onto a stud or onto a panel with a welded stud

### DESIGN VARIATIONS

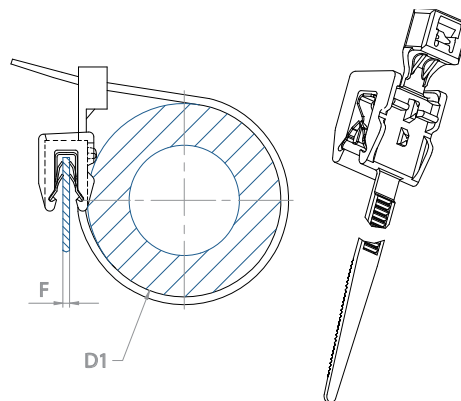






On Panel  
Edges

## Cable Ties Edge Mount



Metric

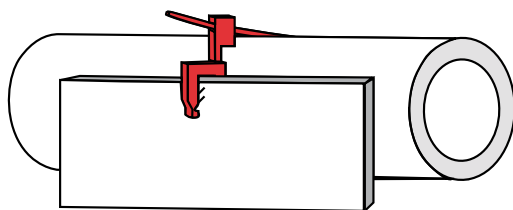
Part Number	Tube Diameter (D1)	Panel Thickness (F)	Strap Width	Strap Length
082651	1.50 - 43.00	1.50 - 3.50	4.60	191.00
082652	1.50 - 43.00	1.50 - 3.50	4.50	180.00
082653	1.50 - 43.00	1.50 - 3.50	4.50	186.00

For material information see page 7



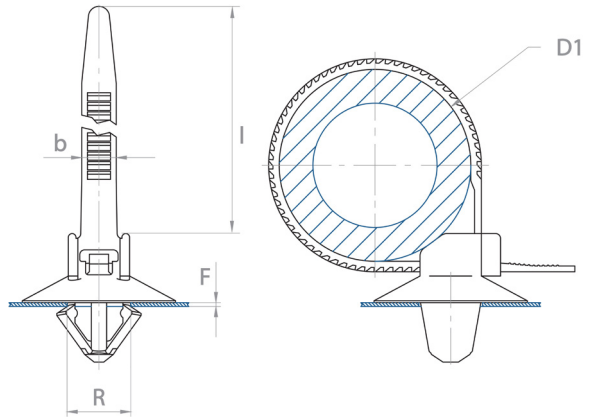
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### APPLICATION INFORMATION

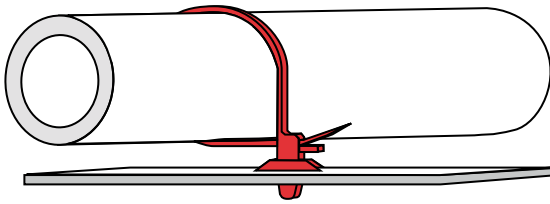


- Cable tie integrating a clip for panel edge attachments
- Panel clip is integrated with a spring steel clip for improved performance and retention
- Available in different variations
- Some parts include a swivel system and/or re-openable lock

## Cable Ties Plug Mount



### APPLICATION INFORMATION



- Cable tie integrating an anchoring system
- Attaches a bundle onto a panel
- Available in different anchoring systems to suit different hole depths

### DESIGN VARIATIONS





In Panel  
Holes

## Cable Ties

### Plug Mount

*Metric*

Part Number	Panel Thickness (F)	Tube Diameter (D1)	Hole Diameter (R)	Strap Length (L)	Strap Width (b)	Design Variations
216956	0.60 - 3.00	0.50 - 25.00	5.40 - 5.40	114.00	3.80	A
108408	0.70 - 3.00	3.00 - 40.00	6.50 - 6.70	180.00	8.50	A
168821	0.80 - 6.00	8.00 - 33.00	6.50 - 6.70	140.00	4.50	A
056350	0.50 - 3.00	3.00 - 40.00	6.55 - 6.90	182.40	4.70	A
164460	0.70 - 4.00	1.00 - 40.00	6.10 - 6.50	170.00	4.80	A
164448	0.70 - 4.00	1.00 - 40.00	6.10 - 6.50	170.00	4.80	A
205246	0.80 - 1.30	0.50 - 25.00	6.50 - 6.70	113.60	3.60	B
014832	0.80 - 1.80	3.00 - 24.00	6.50 - 6.70	110.00	4.20	B
208025	0.80 - 2.80	2.00 - 30.00	6.10 - 6.50	130.00	9.00	B
175057	0.70 - 1.80	2.00 - 40.00	6.50 - 6.70	155.00	4.80	B
175200	0.60 - 3.00	1.00 - 40.00	6.20 - 7.20	170.00	4.80	B

*For material information see page 7*



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ASSEMBLING  
Cables & Tubes



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ON Studs

## Cable Clips



Stud Mount



p.98-99



ON Panel Edges

## Cable Clips



Edge Mount - Plastic



p. 100-101



Edge Mount - Metal (Bundle)



p.102



Edge Mount - Metal (Tube)



p.103



IN Panel Holes

## Cable Clips



Plug Mount - Plastic



p. 104-105



Plug Mount - Metal (Dart)



p.106



Heel Toe - Metal



p.107



ON / TO Cables or Tubes

## Cable Clips



Tube Mount - Plastic



p.108



ON Flat Surfaces

## Cable Clips



Adhesive Mount - Plastic

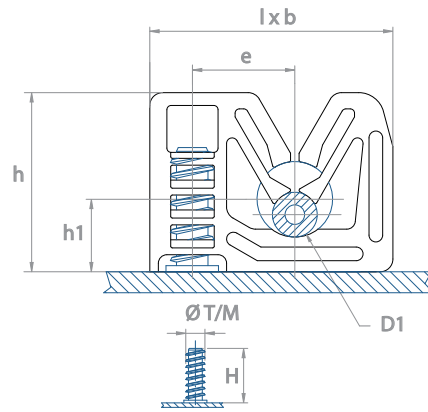
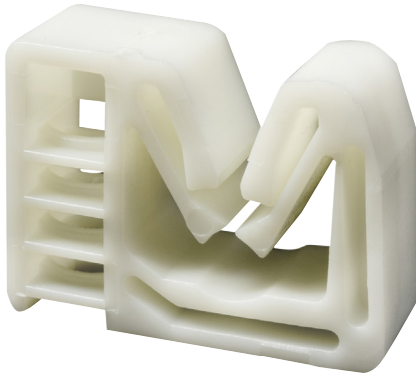


p.109



On Studs

## Cable Clips - Plastic Stud Mount - Single



Metric

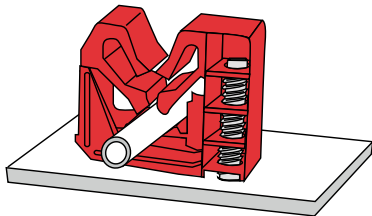
Part Number	Screw Size (T/M)	Tube Diameter (D1)	Screw Height (H)	Width (b)	Length (l)	Tube Height (h1)	Height (h)	Distance (e)	Design Variations
054799	M6x1.0	4.60 - 6.00	14.00 - 19.00	10.00	28.50	8.25	21.00	12.00	-
108060	M6x1.0	5.00 - 8.00	14.00 - 18.00	10.00	25.00	12.00	20.50	13.50	A
055999	M8x1.25	6.00 - 8.00	13.00 - 17.00	16.00	31.25	8.00	19.00	15.00	-
206941	M6x1.0	10.00 - 10.00	14.00 - 18.00	10.00	29.50	9.00	21.50	12.50	-
055689	M6x1.0	15.00 - 19.00	24.00 - 18.00	12.00	53.00	9.00	25.00	31.00	A

For material information see page 7



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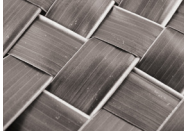
### APPLICATION INFORMATION



- Used to attach one tube/wire to a panel with metric studs
- Attaches by pushing onto the stud

### DESIGN VARIATIONS

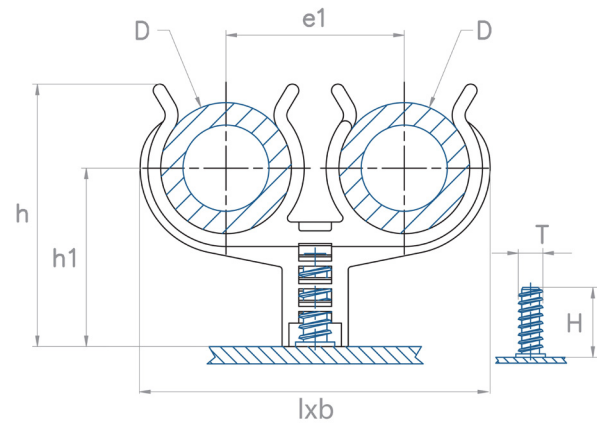




On Studs



## Cable Clips - Plastic Stud Mount - Double



Metric

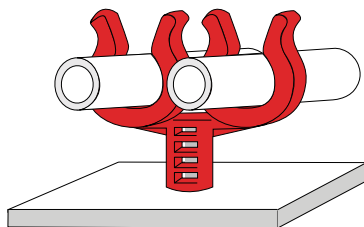
Part Number	Screw Size (T)	Tube Diameter (D1)	Screw Height (H)	Width (b)	Length (l)	Tube Height (h1)	Height (h)	Distance (e1)
055465	M6x1.0	16.00 - 18.00	7.00 - 10.00	21.50	41.00	21.70	31.50	21.00
200439	M6x1.0	10.00 - 10.00	14.00 - 14.00	12.00	42.50	13.00	22.00	16.00

For material information see page 7



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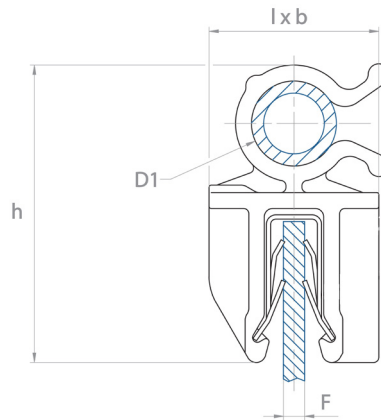
### APPLICATION INFORMATION



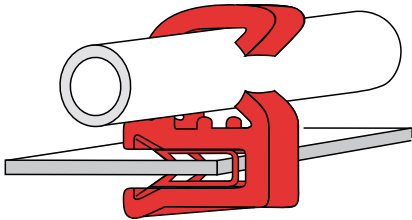
- Used to attach multiple tubes/wires to a panel with metric studs
- Attaches by pushing onto the stud



## Cable Clips - Plastic Edge Mount



### APPLICATION INFORMATION



- Attaches one or more wires to a panel edge
- Panel clip is integrated with a spring steel clip for improved performance and retention
- Available in different variations

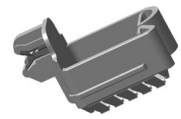
### DESIGN VARIATIONS



1



2



3



4



5



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On Panel  
Edges

## Cable Clips - Plastic Edge Mount

*Metric*

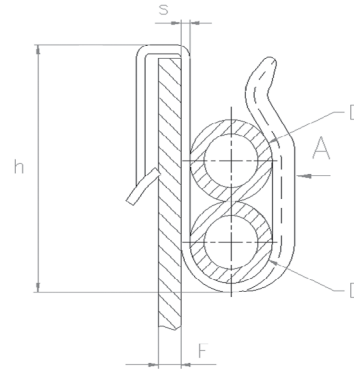
Part Number	Panel Thickness (F)	Tube Capacity	Tube Diameter (D1)	Length (l)	Width (b)	Height (h)	Design Variations
205203	2.00 - 4.00	Single	8.00 - 8.00	16.00	15.00	28.00	1
132068	1.50 - 2.50	Multi	3.00 - 13.00	25.10	13.00	23.90	2
081401	2.00 - 2.50	Multi	6.00 - 14.00	31.50	15.00	22.50	2
061576	1.00 - 2.50	Multi	3.00 - 25.00	37.00	29.00	48.00	3
082047	1.00 - 2.00	Multi	3.00 - 5.00	40.00	13.90	25.20	4
061585	1.00 - 2.50	Multi	3.00 - 25.00	38.00	23.00	36.00	5

*For material information see page 7*



On Panel  
Edges

## Cable Clips - Metal Edge Mount - Bundle



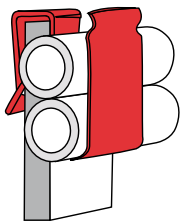
Imperial

Part Number	Legacy Part Number	Panel Thickness (F)	Tube Diameter (D)	Max # of Tubes	Height (h)	Width	Material Thickness (s)
136888	C43641-017	0.031 - 0.082	0.120 - 0.130	9	0.710	0.375	0.017
136880	C41892-017	0.032 - 0.052	0.185 - 0.195	2	0.710	0.375	0.017
136896	C46088-017	0.040 - 0.080	0.245 - 0.255	1	0.800	0.565	0.017
137604	D98281-017	0.054 - 0.089	0.085 - 0.095	7	0.695	0.375	0.017
136893	C45065-017	0.060 - 0.089	0.151 - 0.161	3	0.670	0.375	0.017
136797	C24837-017	0.115 - 0.135	0.120 - 0.130	9	0.720	0.375	0.017

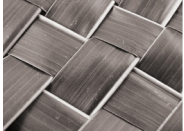
*Most parts manufactured in spring steel*

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### APPLICATION INFORMATION

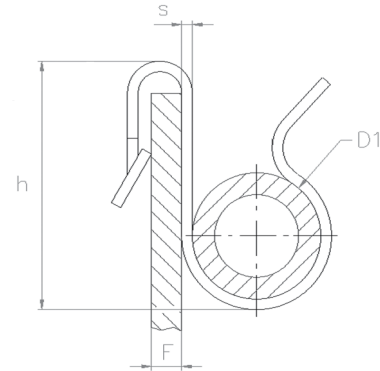


- Secures hoses and wire bundles by self-retaining to adjacent panels via barbs
- Simply snap onto panel edge and install cables or wires to the serviceable wire retention feature



On Panel  
Edges

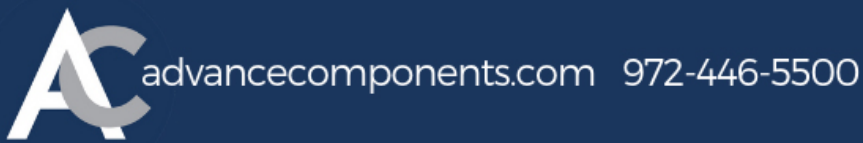
## Cable Clips - Metal Edge Mount - Tube



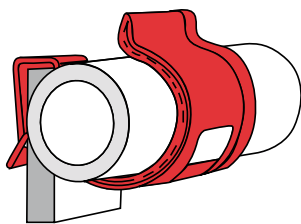
Metric

Part Number	Legacy Part Number	Panel Thickness (F)	Tube Diameter (D1)	Height (h)	Width	Material Thickness (s)
055127	055127	2.00 - 7.00	6.00 - 9.00	18.00	12.00	0.60
055129	055129	2.00 - 7.00	10.00 - 14.00	19.00	12.00	0.60
055131	055131	2.00 - 7.00	15.00 - 21.00	24.40	12.50	0.60
055133	055133	2.00 - 7.00	22.00 - 32.00	67.50	12.00	0.60
136991	C58548-051M	3.00 - 4.00	9.00 - 10.50	23.10	15.88	0.51
055128	055128	7.00 - 12.00	6.00 - 9.00	20.00	12.00	0.60
055130	055130	7.00 - 12.00	10.00 - 14.00	25.00	12.00	0.60
055132	055132	7.00 - 12.00	15.00 - 21.00	61.00	12.00	0.60
055134	055134	7.00 - 12.00	22.00 - 32.00	79.00	12.00	0.60

Most parts manufactured in spring steel



### APPLICATION INFORMATION

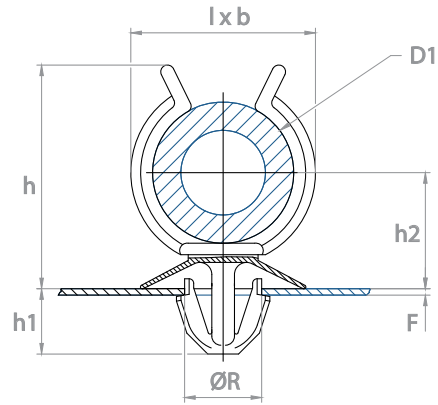


- Secures wire and tube by self-retaining to adjacent panel via barbs
- Simply snap onto panel edge and install cable or tube to the serviceable wire retention feature
- Designed to hold one cable, tube or wire



In Panel  
Holes

## Cable Clips - Plastic Plug Mount - Single Tube



Metric

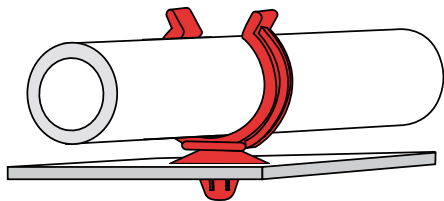
Part Number	Panel Thickness (F)	Tube Diameter (D1)	Hole Diameter (R)	Width (b)	Length (l)	Height (h)	Dart Height (h1)	Tube Height (h2)	Design Variation
018441	0.70 - 1.30	5.00 - 5.00	8.90 - 9.10	13.00	9.40	10.30	7.80	7.20	-
016048	0.70 - 2.00	7.50 - 7.80	6.00 - 6.20	10.00	10.50	15.80	8.80	8.15	-
132033	0.70 - 2.00	9.00 - 12.00	8.10 - 8.30	10.00	15.70	18.50	9.00	11.00	-
018890	2.40 - 2.60	15.50 - 16.10	6.50 - 6.70	20.00	25.50	20.90	9.30	11.00	Locking
054478	0.70 - 2.00	17.00 - 21.00	6.45 - 6.70	12.00	24.00	38.50	6.50	15.15	-
108130	0.70 - 2.00	21.00 - 23.00	6.50 - 7.00	20.00	25.00	31.00	6.00	17.00	-
016850	0.70 - 3.20	23.00 - 24.00	5.00 - 5.20	10.00	30.00	35.00	9.45	19.00	-

For material information see page 7



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### APPLICATION INFORMATION

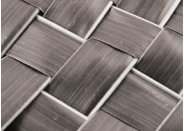


### DESIGN VARIATION



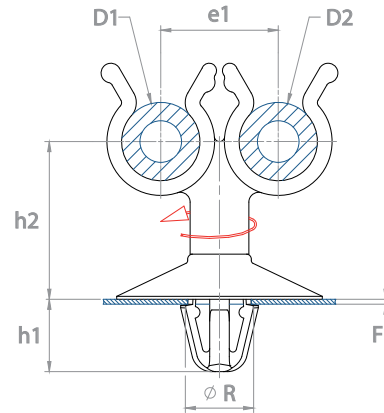
LOCKING

- Attaches tube/wire to a panel with holes
- Swivel system available on some parts
- Different anchoring systems available to suit different hole depths and panel thicknesses



In Panel  
Holes

## Cable Clips - Plastic Plug Mount - Multiple Tube



Metric

Part Number	Panel Thickness (F)	Tube Diameter (D)	Hole Diameter (R)	Height	Dart Height (h1)	Tube Height (h2)	Design Variations
016608	0.80 - 4.00	4.00 - 6.00	6.50 - 6.70	12.40	9.30	7.20	2AFU
201143	0.70 - 2.00	13.50 - 13.50	6.40 - 6.70	23.00	8.50	11.00	2AD
017363	0.50 - 3.00	16.00 - 18.00	6.35 - 6.70	31.00	6.70	18.00	2DV

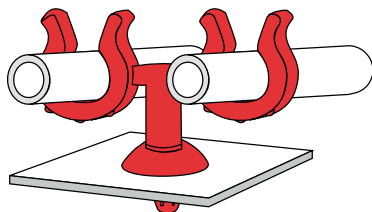
For material information see page 7



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Cable Clips

### APPLICATION INFORMATION



- Attaches multiple tubes/wires to a panel with a hole
- Swivel system available on some parts

### DESIGN VARIATIONS



2AFU



2AD

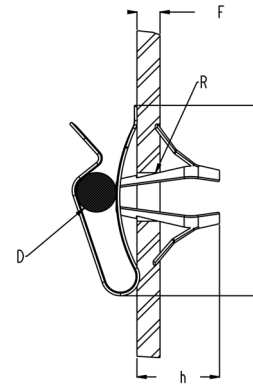


2DV



In Panel  
Holes

## Cable Clips - Metal Plug Mount - Dart



Metric

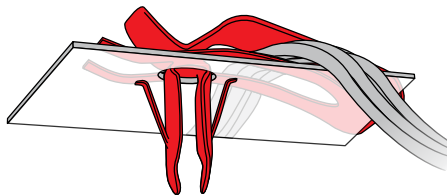
Part Number	Legacy Part Number	Panel Thickness (F)	Tube Diameter (D)	Hole Diameter (R)	Width	Length (l)	Dart Height (h)
137543	D22999-017	0.80 - 1.00	2.80 - 12.70	6.20 - 6.50	14.30	27.45	13.00

*Most parts manufactured in spring steel*

Cable Clips

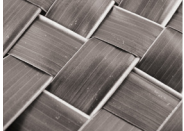


### APPLICATION INFORMATION



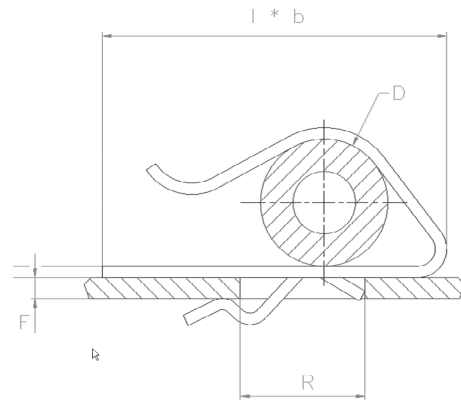
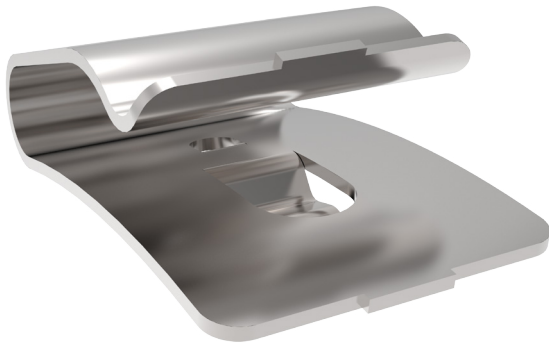
- Used to retain cables/tubes to a panel with a hole
- Part is assembled through a hole or a slot in the panel via a dart feature
- Designed to accommodate one single tube or multiple smaller tubes, wires, and/or cables





In Panel  
Holes

## Cable Clips - Metal Heel Toe



Imperial

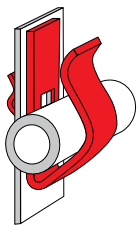
Part Number	Legacy Part Number	Panel Thickness (F)	Tube Diameter (D)	Hole Diameter (R)	Width (b)	Length (L)
136923	C55966-022	0.054 - 0.066	0.187 - 0.250	0.245 - 0.255	0.50	0.77

Most parts manufactured in spring steel



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### APPLICATION INFORMATION

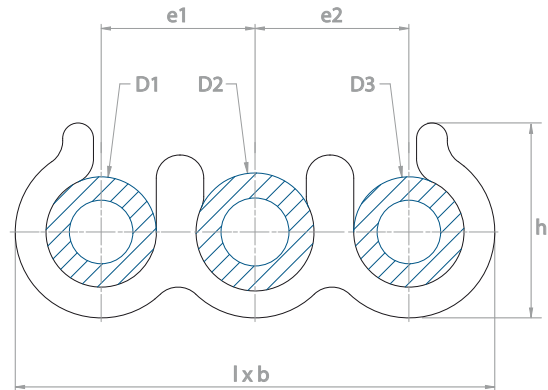


- Used to secure tubes/wires to a panel with a hole
- Part is simply positioned in the mounting hole and then pressure pushed on the back of the clip forces it forward until the "heel" snaps into a locked position
- Depending on the design of the part they can either hold one single tube or multiple smaller tubes, wires, and/or cables



On Cables  
or Tubes

## Cable Clips - Plastic Tube Mount



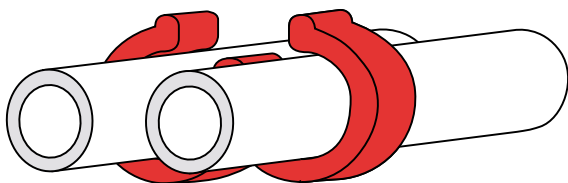
### Metric

Part Number	Tube Diameter (D1, D2, D3)	Distance (e1, e2)	Part Width (b)	Part Length (l)	Part Height (h)	# of Tubes
202339	4.75 - 5.20	6.30	12.00	13.00	8.00	2
053760	6.00 - 7.00	7.70	8.00	16.80	9.00	2
054477	7.75 - 8.25	10.00	8.00	21.50	12.00	2
012738	9.75 - 10.25	12.10	10.00	26.50	15.50	2
175000	7.75 - 8.25	12.00	8.00	35.00	14.00	3
020040	8.00 - 10.00	15.50	12.00	45.00	16.50	3
018556	9.75 - 10.25	11.50	15.00	36.00	14.70	3

For material information see page 7



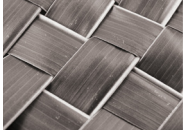
### APPLICATION INFORMATION



- Holds two wires/tubes together with a distance between them

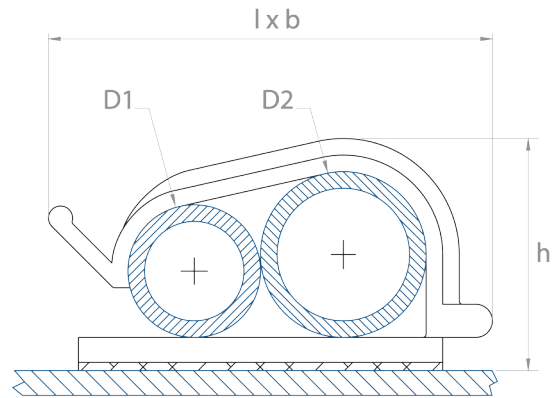
### DESIGN VARIATIONS





On Flat  
Surfaces

## Cable Clips - Plastic Adhesive Mount



Metric

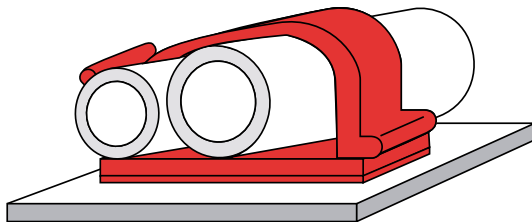
Part Number	Tube Diameter (D1)	Tube Diameter (D2)	Length (l)	Width (b)	Height (h)
108011	8.00	10.00	27.00	22.00	15.00

For material information see page 7



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### APPLICATION INFORMATION



- Used to attach several tubes/wires to a flat panel surface
- Made with pre-assembled high-quality adhesive tape
- Ensure the surface is clean and dry, remove the protective film and position the clip

# Assembling Cables & Tubes



## Adaptors



ON Panel Edges



Edge Mount

**NEW**



p.112

## Adaptors



IN Panel Holes



Plug In

**NEW**



p.113



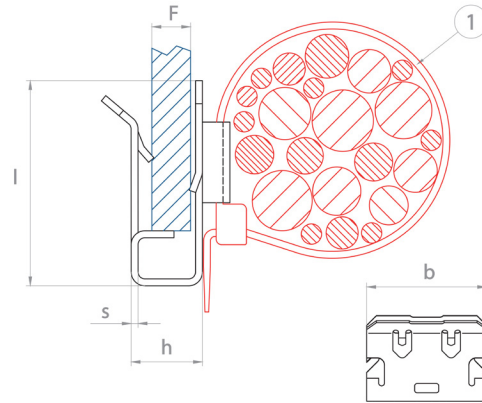
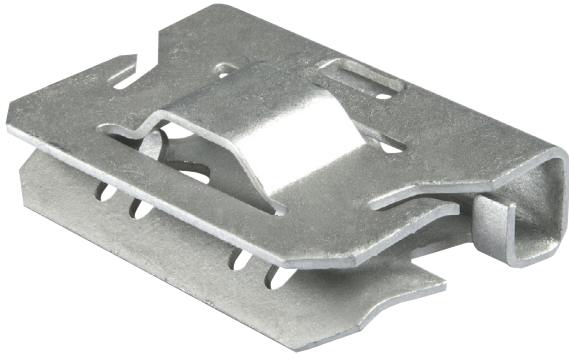
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On Panel  
Edges

## Adaptors

### Edge Mount for Cable Ties

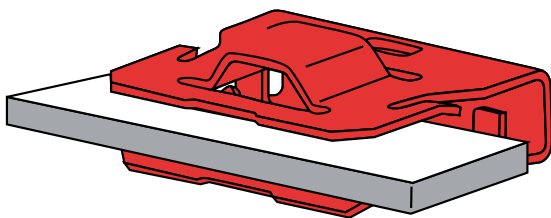


#### Metric

Part Number	Panel Thickness (F)	Width (b)	Length (l)	Height (h)	Strap Width (1)	Material Thickness (s)	Design Variations
019752	0.80 - 1.20	16.00	15.70	2.40	5	0.50	-
017890	1.50 - 4.50	25.00	17.80	6.20	5.8	0.60	-
208738	1.50 - 4.00	15.00	14.20	6.00	5	0.50	-
019408	1.00 - 3.00	18.00	15.30	13.00	5	0.50	1
053748	3.00 - 10.00	16.00	52.00	14.50	9	1.00	U

Most parts manufactured in spring steel

#### APPLICATION INFORMATION



- Multi-purpose base fits onto a panel edge
- Installs by hand or gently with a hammer
- Suitable for cable ties, studs or ARaymond plastic clips
- Barbed design securely attaches to panel

#### DESIGN VARIATIONS



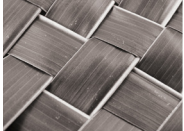
1



U

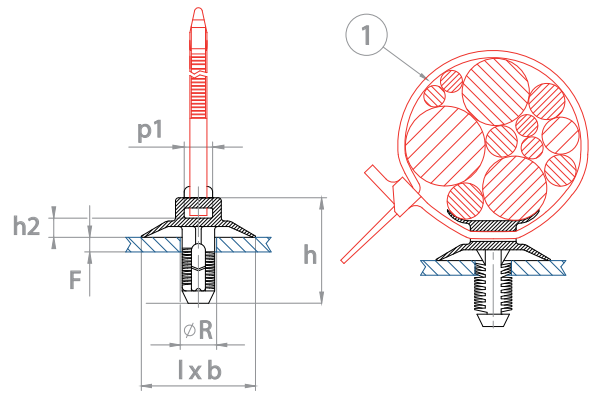
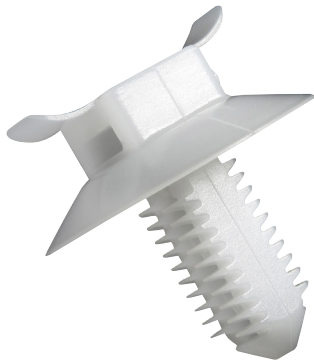


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In Panel  
Holes

## Adaptors Plug In

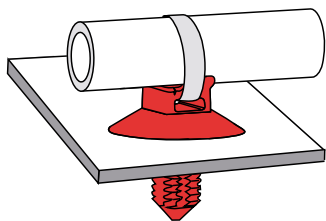


Metric

Part Number	Panel Thickness (F)	Hole Diameter (R)	Strap Width (p1)	Length (l)	Width (b)	Height (h)	Height 2 (h2)	Design Variations
017160	0.80 - 10.00	6.30 - 6.70	5.00	20.00	20.00	7.00	3.40	Fir tree
013888	4.50 - 6.00	11.00 - 11.20	9.20	18.00	18.00	14.50	8.50	Rivet
055969	0.50 - 4.00	7.00 - 7.20	9.50	31.00	13.00	17.60	5.50	Rivet
014130	2.50 - 2.60	6.40 - 6.60	6.60	11.00	10.00	5.00	8.50	Dart

For material information see page 7

### APPLICATION INFORMATION



- Used to attach a cable tie to a plug inserted into a hole
- Suitable for standard or re-openable cable ties

### DESIGN VARIATIONS



FIR TREE



RIVET



DART

# PROTECTING & FINISHING Panels



## Metal Spring Rings

Metal Spring Rings **NEW**



IN Panel Holes



p.  
116-117

## Caps

Caps **NEW**



IN Panel Holes



p.118

## Grommets

Grommets **NEW**



IN Panel Holes



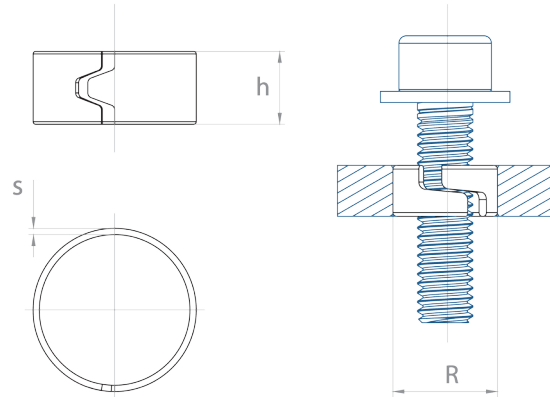
p.119



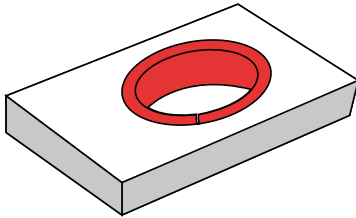
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## Metal Spring Rings \*\*New\*\*



### APPLICATION INFORMATION



- Prevents soft panels (plastic) from creeping when fastened
- Inserted into the panel hole before screw installed
- Can be pre-assembled into the hole (self-retaining through spring tension)
- Choose spring height according to panel thickness
- For use with flat head screws (and washer, if necessary)





In Panel  
Holes

## Metal Spring Rings \*\*New\*\*

*Metric*

Part Number	Hole Diameter (R)	Ring Height (h)	Spring Thickness (s)
202527	7.20	3.10	0.50
131473	8.60	4.00	1.20
130037	8.70	3.00	1.00
204303	9.50	5.10	0.80
202105	10.00	3.00	1.00
215481	10.10	4.00	1.00
204803	10.10	4.70	0.80
207073	9.80	3.00	0.50
129754	9.80	5.50	0.50
202515	15.40	3.00	1.00
210701	16.00	5.00	1.00

*Most parts manufactured in spring steel*

Protect & Finish

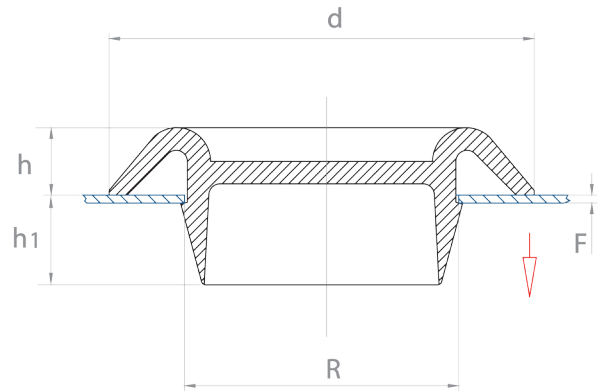


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In Panel Holes

## Caps \*\*New\*\*

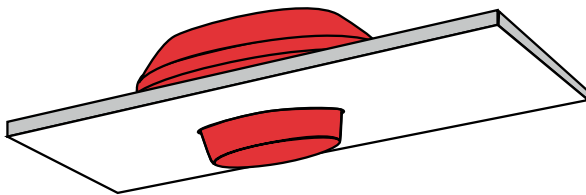


Metric

Part Number	Panel Thickness (F)	Hole Diameter (R)	Head Diameter (d)	Depth (h1)	Head Thickness (h)
053054	0.50 - 1.50	12.00	19.00	4.00	3.00
052213	0.50 - 2.50	18.00	30.00	5.00	4.00
053296	0.50 - 3.00	20.50	29.60	2.40	3.70
175155	0.60	6.50	10.50	2.80	2.20
053188	0.60 - 2.00	28.00	39.50	5.20	4.80
207249	3.00 - 4.00	22.00 - 24.00	31.40	6.80	6.10
112019	3.00	24.50 - 25.00	34.00	7.00	3.00

For material information see page 7

### APPLICATION INFORMATION



- Seals round holes
- Prevents water and dust intrusion
- Caps for oblong holes are also available, contact us

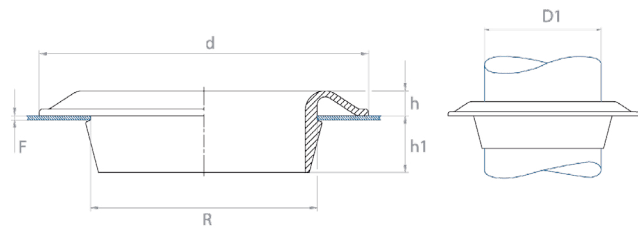


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In Panel Holes

## Grommets **\*\*New\*\***

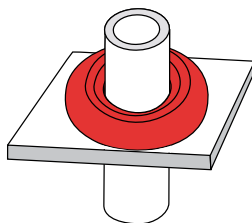


Metric

Part Number	Tube Diameter (D1)	Panel Thickness (F)	Hole Diameter (R)	Head Diameter (d)	Head Thickness (h1)	Depth (h)
015509	7.20 - 7.80	0.50 - 1.50	10.00 - 10.20	17.00	4.00	3.00
017960	25.00	0.50 - 2.00	28.00	40.00	6.00	4.00
056750	12.00	0.50 - 2.50	16.00	26.00	4.90	4.30
017289	7.00	0.50 - 2.00	28.00 - 28.30	39.00	5.20	4.80
208071	14.00	0.50 - 2.00	28.00 - 28.30	39.00	5.20	4.80
056873	4.80 - 5.05	1.00 - 1.50	40.05 - 40.25	53.00	5.00	5.00
206858	18.00	1.20 - 1.20	30.00	49.70	4.40	12.00

For material information see page 7

### APPLICATION INFORMATION



- Prevents wires and tubes from being damaged when passing through a panel hole
- Also prevents water and dust intrusion when adjusted to fit the wire/tube diameter
- Grommets for oblong holes are also available, contact us

# CONNECTING Grounding Clips



## Grounding Wire Connectors



ON Panel Edges



For Electric Wires with Sheath **NEW**



p.122

## Lugged Grounding Connectors



ON Panel Edges



For Electric Wires with Lugs **NEW**



p.123

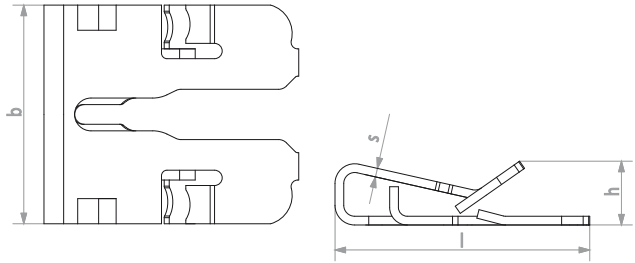


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On Panel  
Edges

## Grounding Wire Connectors **\*\*New\*\*** For Electric Wires with Sheath

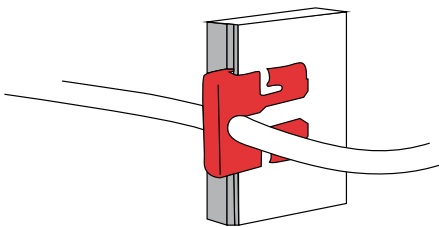


Metric

Part Number	Panel Thickness (F)	Wire Type	Length (l)	Width (b)	Height (h)	Material Thickness (s)
220492	1.20 - 2.50	H07V-K6	23.30	20.00	5.84	0.80

*Most parts manufactured in spring steel*

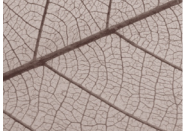
### APPLICATION INFORMATION



- For use on aluminum panel frames (example: framed solar modules)
- Ensures conductivity between an aluminum edge and a grounding wire type H07V-K6
- One single action cuts the wire sheath, connects the wire and attaches it to the frame
- For use with ARaymond installation tool, reference #222717000

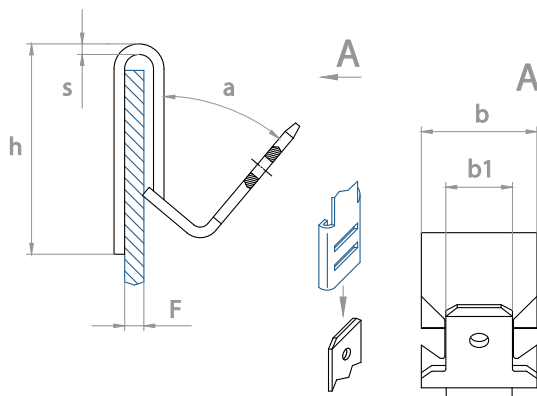


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On Panel  
Edges

## Lugged Grounding Connectors **\*\*New\*\*** For Electric Wires with Lugs

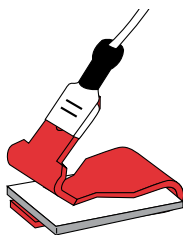


Metric

Part Number	Panel Thickness (F)	Height (h)	Width (b)	Lug Width (b1)	Lug Quantity	Lug Angle (a)	Material Thickness (s)
055625	0.30 - 0.50	9.00	10.00	6.30	1	40.00	0.50
214634	0.40 - 1.50	16.00	11.00	6.30	1	40.00	0.80
014354	1.00 - 2.00	16.00	11.00	6.30	1	40.00	0.80
019765	1.00 - 2.00	16.00	16.00	6.30	2	40.00	0.80

*Most parts manufactured in spring steel*

### APPLICATION INFORMATION



- Used for grounding metal panels
- Ensures conductivity between a metal edge and a grounding wire with a lug connector
- Inserts onto panel edge by hand or with a mallet
- Sharp teeth ensure good pull off resistance and a good connection through the surface treatment of panel



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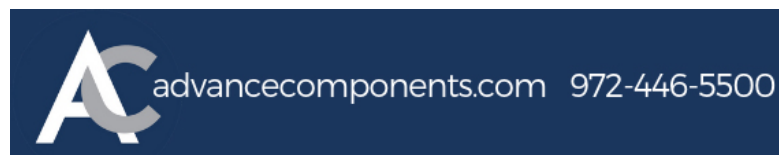
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Note: Part numbers in red indicate the part has been replaced by a newer version of the legacy part. The original form, fit and function of the part has been retained.



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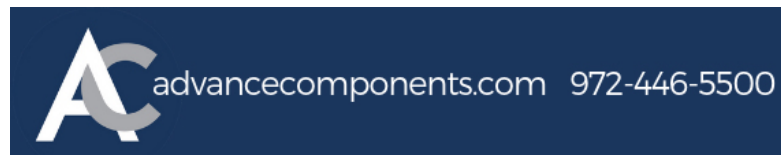
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# GENERAL TERMS & CONDITIONS

A. RAYMOND TINNERMAN ("Supplier") GENERAL TERMS AND CONDITIONS  
(Effective April 28, 2014)

## 1. General.

1.1. General Application and Applicable These General Terms and Conditions apply to all proposals and quotations submitted by Supplier, to all purchase orders received by Supplier, and to all supplies and services provided by Supplier («Supplies»), except as otherwise specifically provided in a document issued by Supplier.

1.2. Scope of Contract. This contract or any contract resulting herefrom consists only of these General Terms and Conditions and those provisions in other documents which are referred to herein or are attached hereto or in a document provided or signed by Supplier and referencing the transaction (all of which constitute the «Contract»). Such other written documents may include any document signed by Supplier and Customer, an order acceptance or confirmation by Supplier, specifications and other technical documents provided by Supplier, and do not include advertising and marketing materials.

## 2. Formation, Integration and Modification.

2.1. Formation. The Contract supersedes all previous quotations and agreements pertaining to the provision of the Supplies. Delivery to Supplier of Customer's acceptance of a Supplier's quotation (according to its terms), Supplier's actions in reliance on Customer's oral acceptance of a written or oral quotation, or Customer's receipt of the Supplies, will constitute Customer's acceptance and a binding contract under the terms of the Contract. Notice of such acceptance may be furnished to Customer in the form of an acknowledgment, shipment, or other form of express approval. An order submitted by Customer orally or in a purchase order or other writing (whether or not it contains terms or conditions modifying, adding to, repugnant to, or inconsistent with these Terms and Conditions), may be accepted, approved or filled by Supplier in writing, but any resulting contract and the liabilities or obligations of Supplier shall be determined solely by the Contract, and (unless the Supplier otherwise advises Customer in writing) notice is hereby given that Supplier objects to any such terms or conditions in Customer's purchase order or other writing. Supplier shall not be deemed to have in any way enlarged or modified its liabilities or obligations under the Contract by filling such order or by failing to further object to Customer's terms or conditions.

2.2. Integration and Modification. The Contract is a final, complete and exclusive statement of the Contract of the parties. THE SUPPLIER IS WILLING TO NEGOTIATE WRITTEN CHANGES TO THESE TERMS AND CONDITIONS SIGNED BY SUPPLIER, BUT SUPPLIER RESERVES THE RIGHT TO MAKE AN ADJUSTMENT IN THE PRICE OF THE SUPPLIES TO COVER SUPPLIER'S ESTIMATED COST OF SUCH CHANGES. No modifications, limitations, waivers or discharge of the Contract or any of its terms shall bind Supplier unless in writing and signed by Supplier's authorized employee at its home office. No agent, employee, or representative of Supplier has any authority to bind Supplier to any affirmation, waiver, representation or warranty concerning the Supplies, not contained in the Contract. Unless an affirmation, waiver, representation, or warranty is expressly included within the Contract, it is not a part of the basis of the Contract and it is not enforceable. Notwithstanding anything to the contrary in this Contract, no modifications, limitation, waiver or discharge of any provision of the Contract shall affect Customer's liabilities to Supplier accrued prior thereto. Supplier may correct unilaterally any mathematical and typographical errors in the Contract. Typed provisions of the Contract take precedence over printed provisions. A course of performance, course of dealing, or custom in the trade shall not modify or waive any right of Supplier.

2.3. Third Parties. The Contract is only for the benefit of the parties, except all disclaimers and limitations applicable to Supplier are assignable by Supplier for the benefit of Supplier's agents, employees, contractors, and suppliers, except as may be specifically provided in the Contract. If any other provisions of the Contract are determined to apply to third parties, all other provisions including limitations, waivers, and disclaimers shall also apply.

2.4. Cancellation. Customer may not cancel the Contract unless agreed to by the Supplier in advance in writing. Customer shall indemnify the Supplier for all expenses incurred (for example only, for specific equipment, engineering costs, labor costs and provisions of supplies, tools) and for all direct and indirect consequences resulting therefrom. Moreover, any deposit made shall be non-refundable.

2.5. Work Preparatory to Contract. All proposals, samples, prototypes, plans and other materials or information furnished by the Supplier in bidding, negotiating and performing the Contract, are confidential and the property of Supplier, whether or not marked «Confidential», and shall not be shown or disclosed to any other bidder, and shall not be shown or disclosed to any third party or used by Customer except as may be necessary for the selection or use of the Supplies. They shall be returned by Customer to Supplier if an order is not given to Supplier.

2.6. Supplier's Property. Customer shall reimburse Supplier for Supplier's costs in the design, manufacture, maintenance, repair and replacement of equipment and tooling dedicated to the production of Supplies. All designs, modifications, and adaptations of equipment and processes shall belong to Supplier. Supplier may, at its option, destroy any such equipment or tooling at any time after two years from the last order from Customer for the Supplies, provided it first supplies Customer with 30 days written notice and an opportunity to purchase it for its fair value.

2.7. Open Orders and Fixed Orders. Any Contract that does not fix the quantity or amount to be supplied shall be an «Open Order». If Customer orders under an Open Order less than 80% or more than 120% the quantity or amount estimated for a given period, there shall be an equitable adjustment in the purchase price, delivery times, and other terms to compensate Supplier for its additional costs such as but not limited to overtime, amortization of additional capital equipment, shift premiums, subcontracting, and idle facilities. A "Fixed Order" specifies firm quantities, prices, and delivery periods.

2.8. Status of Parties. Customer and Supplier acknowledge that: they are merchants in respect to the Supplies; they have had an opportunity to review the Contract; and the provisions of the Contract are reasonable when considered as a whole.

2.9. Brand Protection. Customer may not resell the Supplies under any brand name other than the brand name under which the Supplies are provided by Supplier. Supplier may sell any stock of Supplier or materials produced or obtained to perform the Contract if Customer fails to purchase them from Supplier.

## 3. General Express Warranties.

A. Supplier warrants to Customer only, subject to the disclaimers and limitations of the Contract that Supplies to the extent manufactured by Supplier shall be free from failure due to defects in materials and workmanship which are discovered within the period of three months from the delivery to Customer. Because the Supplies may be subject to a wide variety of use, installation, maintenance and cleaning, the warranty is only against such defects and not against any other failures such as, but not limited to, those due to wear and tear, normal maintenance and perishable items which are excluded from this warranty against defects.

B. Supplier warrants to Customer that the Supplies will be as described in the Contract in all material respects, subject to the limitations stated herein and Supplier's published and internal standards; however, Supplier retains the right to change the dimensions, composition, design, performance, color and appearance of the Supplies without liability if, in its judgment, the change is nonmaterial. Supplier may, in its discretion, also rely on any generally accepted industry standards.

C. Supplier's warranties shall apply only if the Supplies: (i) have been installed, maintained, and used in conformity with instructions furnished by Supplier from time to time, if any, and otherwise in conformity with the highest industry practices; (ii) have been subjected to normal use for the purpose for which Supplies were designed; (iii) have not been subjected to misuse, negligence, or accident; and, (iv) have not been altered or repaired by persons other than Supplier in any respect which, in the judgment of Supplier, adversely affects the condition or operation of the Supplies.

D. Customer shall create, maintain, and make available to Supplier, permanent records of the installation, maintenance, use and disposition of the Supplies.

4. Disclaimer and Limitation of Express Warranties. There are no express warranties other than those contained in the Contract. Any representations as to performance and other matters, except as contained in the Contract, were for illustrative purposes only and do not constitute a warranty. Whether or not the Supplies are to be used exclusively by Customer, there shall be no third party beneficiaries to the express warranties contained herein. Supplier does not warrant any portion of the Supplies not conceived, designed, developed, or manufactured by Supplier (whether or not specified by Customer), but Supplier shall assign to Customer upon request all assignable warranties of Supplier's suppliers related to such Supplies. Supplier is not responsible for any errors or omissions or for any loss or damage resulting from reliance on catalogues, brochures, price lists or other information provided to Customer from the Supplier, including, without limitation, any descriptions, shipping specifications, illustrations, representations as to quality or capabilities, or any other information. Such information provided by the Supplier is intended for general information only. Supplier does not warrant that it or the Supplies are in compliance with any entity, organization or industry standards, guidelines, or procedures unless specifically contained in the Contract.

5. Disclaimer of Implied Warranties. THE SUPPLIER DISCLAIMS ALL IMPLIED WARRANTIES (OTHER THAN GOOD TITLE) INCLUDING BUT NOT LIMITED TO THOSE OF FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, AND NON-INFRINGEMENT. There are no warranties which extend beyond those express warranties contained in the Contract. Customer affirms that it has not relied upon the Supplier's skill nor judgment to select or furnish Supplies for any particular purpose beyond the specific express warranties in the Contract. Customer has the responsibility to determine whether the Supplies are fit for Customer's intended purpose. Supplies provided by Supplier (including but not limited to goods, design, plans, drawings, and specifications) are based on information provided by Customer. Supplier may rely entirely on information provided by Customer and is under no obligation to verify such information or take any actions to obtain explanatory or supplemental information from Customer or third parties. Customer's approval of any goods, designs, plans, drawings, specifications, and/or prototypes constitutes Customer's acceptance and waiver of any responsibility for a failure to consider information provided by Customer. Any modifications of goods, designs, plans, drawings, specifications, prototypes and other work of Supplier after approval by Customer shall be at Customer's expense at Supplier's normal rates for services and materials. Supplier does not warrant the Supplies as furnished will comply with the requirements of any safety or environmental code or regulation of any federal, state, municipality or other jurisdiction beyond the specific express

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warranties in the Contract. Customer has the responsibility for using the Supplies under normal conditions and in compliance with all laws including but not limited to those relating to hazardous materials, environment and safety.

## 6. Delivery and Packaging.

A. Shipping dates are estimates based on Supplier's present engineering and manufacturing capacity and scheduling, and may be revised by Supplier upon receipt or scheduling of Customer's order. All shipping dates are approximate and shall be computed from the date of entry of the order on Supplier's books. All shipping dates are further subject to Supplier's prompt receipt from Customer of a written purchase order or acceptance, letter of credit, down payment, and other conditions as specified in the Contract, and of all drawings, information and approvals necessary to provide the Supplies and to grant any credit proposed in the Contract.

B. Supplier shall deliver the Supplies by tendering the Supplies on its docks for placement in the possession of a carrier. Supplier shall, without liability, make such contract for their transportation as Supplier decides having regard for the nature of the Supplies and other circumstances. Supplier will generally follow Customer's shipping instructions, but may make reasonable changes thereto without liability and at Customer's cost. On Customer's request, Supplier shall obtain and send to Customer documents necessary to enable Customer to obtain insurance. The Supplier is not responsible to prepay transportation or insurance costs. Customer shall pay all handling and other charges incidental to transportation. Customer is responsible for making any claim against the carrier and other handlers of the Supplies after delivery.

C. Supplier shall package the Supplies in accordance with Supplier's standard practices. Supplier has no responsibility to collect to dispose of any packaging.

D. Whether or not Supplier prepays shipping charges, risk of loss passes to Customer upon tender of the Supplies to a carrier. Supplier's breach of the Contract shall not affect the passing of the risk of loss to Customer notwithstanding any provision of law to the contrary.

## 7. Delay of Shipment or Performance Excused for Various Reasons.

A. If shipment of any item or other performance by Supplier is delayed at the request of or due to the fault of Customer, the Supplier may at its option hold the item at the place of manufacture at the risk and expense of Customer from the time it is ready for shipment. In the event of any such delay in shipment, full and final payment for an item shall be due and payable 30 days after Customer is notified that the item is ready for shipment. If the Supplier is unwilling to accommodate Customer by holding such item, Customer shall accept shipment immediately.

B. All inspection, delivery, and other dates for Supplier's performance are estimates only. In addition, the Supplier shall not be in default because of its delay or failure to deliver or perform under the Contract resulting, in whole or in part, from: (i) any foreign or domestic embargoes, seizures, acts of God, insurrections, war, or the adoption or enactment of any law, ordinance, regulation, ruling or order; (ii) shortages of raw materials or labor; (iii) the lack of usual means of transportation, fires, floods, explosions, strikes or other work actions, or any other accidents, contingencies, or events, at the Supplier's or its supplier's plant or elsewhere (whether or not beyond the Supplier's control) which directly or indirectly interfere with, or render substantially more burdensome, Supplier's production, delivery, or performance; (iv) delays by Customer in inspecting and acceptance, in furnishing requested specifications, materials, tooling or information, in making payments, or otherwise. If one or more deliveries hereunder is delayed by reason of any one or more of such occurrences for a period of 30 days, the Supplier may, at its option, terminate the Contract as to the undelivered supplies or waive such delay and establish a new delivery schedule.

C. Whenever the Supplier's supply of the Supplies, materials or means of production is insufficient to meet the estimated delivery schedule or in the event of any occurrence mentioned above in Subsections A and B, the Supplier, in its sole discretion, may allocate its supply to its own use or other customers.

D. This Section shall be effective even as to events described in Subsections A, B and C which exist on the date of a quotation or of contract formation.

## 8. Inspection, Testing and Rejection.

A. All drawings, specifications, technical documentation, samples, prototypes and Supplies shall be deemed approved and/or accepted by Customer if Customer does not provide a written objection and/or rejection within seven days of receipt or other reasonable time established by Supplier. Customer shall have seven days after receipt of the item to inspect and either accept or provide notice of objection and/or rejection. If it is rejected, notice must be given to the Supplier so that it will arrive no later than 10 days after receipt of the item by Customer. Failure to so act shall constitute an irrevocable acceptance by Customer of the item. Any objection and/or rejection by Customer must be in writing and state with specificity all defects and non-conformities upon which Customer will rely to support its rejection. ALL DEFECTS AND NON-CONFORMITIES WHICH ARE NOT SO SPECIFIED ARE WAIVED. If Customer rejects any tender of the Supplies and if requested by Supplier, Customer shall return them to the Supplier, express, collect, within three days after such request. A failure to so return shall constitute an irrevocable acceptance. No attempted revocation of acceptance shall be effective, and Customer shall be limited to any available remedies specifically provided in the Contract. There shall be no limitation on the period of time in which Supplier may cure any non-conformity or breach, provided it continues to make reasonable efforts to cure.

B. If the Contract requires, or Supplier requests in writing, inspection or testing prior to shipment, and upon notification by Supplier that the Supplies are ready for inspection or testing, Customer shall provide at the place of manufacturer or other location selected by Supplier, at its own expense, one or more qualified and authorized employees to inspect and/or test the Supplies, check them for general compliance with the Contract, and authorize shipment. If Customer fails to do so within seven days, then the Supplier may, in its own discretion, determine that Customer has waived the right of inspection, testing and/or acceptance prior to shipment and ship the Supplies. Correction of defects or non-conformities, which would likely have been discovered by Customer's inspection and/or testing and are otherwise covered by Supplier's warranty, will be at Customer's expense.

9. **Installation.** Customer assumes all risk of using the Supplies in its location and in connection with other equipment. Supplier has no responsibility to determine the adequacy of the foundation, utilities, skills of Customer's staff, or any other matters. If a standard foundation drawing is supplied, it may include only plan and elevation views. Due to many variations in soil type, adjacent equipment, workmanship foundation depth, etc. any foundation drawing is a suggestion only. The foundation (whether or not constructed with Supplier's drawing) is not warranted and Supplier shall not be responsible for any defects in the foundation or consequences which may result from an inadequate foundation.

## 10. Proprietary Information.

A. Any design, invention or other information developed by Supplier in the performance of the Contract shall remain the property of Supplier, whether or not Supplier charges for design, research, development, testing, or similar services. Any patentable features developed by Supplier shall be the property of Supplier and Supplier shall be under no obligation to refrain from using in its business any information, manufacturing processes or unpatented disclosures which may pass to it from Customer in the performance of the Contract, except as provided in subsection A.

B. Supplier is not obligated to furnish detailed or shop working drawings, engineering calculations, computer programs, or other information for any Supplies or part thereof.

C. Customer shall treat as confidential any business proposal from Supplier and all technology which shall be made available, directly or indirectly to Customer by Supplier and by Supplier's licensors, including but not limited to drawings, schematics, specifications, bills of material, test results, analysis, recommendations, models, and designs, and Customer shall use such business proposals and technology only to evaluate its business relationship with Supplier and to enable Customer to perform under the Contract. Customer shall not disclose, or authorize or instruct Supplier to disclose, any confidential or proprietary information of Supplier to any third party that is not bound by contract to at least the same duty of confidentiality to Supplier as is Customer. In addition, only those employees and contractors of Customer having a need-to-know and bound by contract by the same confidentiality provisions as Customer may be given access to such technology. Customer shall maintain, for Supplier's inspection, written records which shall include the names and address of such employees and contractors granted such access. Customer shall indemnify Supplier from all expenses and damages related to the improper use or disclosure by Customer or its employees and contractors. Business proposals and technology of Supplier may be protected by patent, copyright, trademark and other law. No license or other right to business proposals or technology of Supplier is granted.

## 11. Prices and Payment.

A. Prices contained in Supplier's published price lists, if any, are subject to change without notice. Prices contained in individual written quotations or proposals are firm only for a period of 30 days from the date of the quotation. Beyond the 30-day period the prices are subject to change, and Customer should inquire of Supplier as to their validity and request a written confirmation or revision. Prices do not include taxes and Customer shall pay all applicable sales or other taxes levied with respect to Supplies (and replacements) and the Contract, unless exempt therefrom. All prices are in United States dollars and must be paid in U.S. dollars at the location specified in Supplier's invoice. Customer shall pay all government fees levied on the installation and inspection of the Supplies. Customer shall pay upon receipt all invoices rendered by Supplier for any such items Supplier may pay.

B. The Contract is for a shipment contract and the Supplies shall be delivered F.O.B. Supplier's dock.

C. Supplier may unilaterally increase prices to cover increased costs (plus reasonable overhead and profit) of design, materials, manufacturing, and other performance by Supplier, required by changes requested by Customer to the Supplies, schedule, or any other performance by Supplier after the date of any quotation. Supplier is not obligated to perform any such changes, but Customer shall pay Supplier for such changes if Supplier complies with such requested changes.

D. Except as otherwise provided in the Contract, Supplier shall not be responsible for any freight, transportation, insurance, shipping, storage, handling, demurrage or similar charges arising out of the performance of the Contract. If such charges are specifically included in the price, any increase in rates for such services becoming effective after the date the price is quoted to Customer shall be added to the price.

E. If, at any time, reasonable grounds for insecurity arise with respect to Customer's performance of its payment or other obligations hereunder, Supplier may demand immediate payment in full or a documentary letter of credit approved by a U.S. bank acceptable to Supplier or other financial security for such payment or other obligations. In addition, all amounts owed by Customer to Supplier shall be accelerated and payable immediately if Customer fails to make any payment on time and as otherwise required or if Customer sells or

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transfers the line of business for which the Supplies are purchased or is a participant in a merger.

F. All export and import permits and licenses and the payment of all export and import duties and customs fees shall be the responsibility of Supplier, if Supplier is obligated by the Contract to deliver the Supplies within the United States. All export and import duties, fees, permits, licenses, etc. for Supplies to be delivered outside of the United States shall be the responsibility of Customer.

G. Invoices may be rendered separately for each shipment (including any early shipment) made by Supplier. Customer shall pay all invoices net 30 days after the date of shipment. Supplier may change any payment term to Customer on seven days written notice.

H. Supplier may elect to deliver the Supplies in installments. Each installment of Supplies to be delivered is to be considered as a separate sale and Customer shall pay timely the price for each installment which is delivered. Any Supplies indicated as back-ordered now or in the future shall be considered an installment delivery. A failure to pay for an installment within the time for payment is a material anticipatory breach of other installments by Customer.

I. All amounts not paid to Supplier when due shall incur a carrying charge of 1.5% per month to the extent allowed by law and otherwise at the highest written contract rate allowed by law.

J. All amounts due on installation or other event which requires the action or cooperation of Customer which Customer fails to supply timely shall become due upon such failure.

K. If the Contract permits or requires the use of a letter of credit, the letter of credit must be a documentary letter of credit assignable, irrevocable, confirmed by a United States bank in Michigan acceptable to Supplier, payable in installments, and requiring payment to Supplier on submission of Supplier's invoice and a bill of lading. Customer shall pay all costs related to the letter of credit.

L. Supplier may offset or recoup any amounts owed by Supplier or an affiliate of Supplier to Customer or an affiliate of Customer against any amounts owed by Customer or an affiliate of Customer to Supplier or an affiliate of Supplier. Customer waives any right of offset or recoupment and shall pay all amounts owed to Supplier when due regardless of any claim of Customer regarding warranties or other issues.

M. Supplier may allocate payments from Customer among outstanding invoices in Supplier's discretion.

**12. Parts, Service and Training Performed by Supplier.** All warranty and non-warranty parts, labor, service, software, and training, if any, provided by the Supplier or its agents and contractors (including those provided under purchase orders subsequent to the Contract) related to the Supplies are subject to all limitations and disclaimers of warranties and remedies provided in the Contract. Customer shall pay Supplier for all non-warranty work in advance or upon such other terms as may be agreed. The Supplier may have access to the Supplies during or after installation of the Supplies. The Supplier is not under any duty to inspect the Supplies for any defects or any improper use or modification of the Supplies nor to correct or advise Customer of any such condition, use or modification, which is observed. Any notification which may be given is voluntary and subject to all limitations and disclaimers in the Contract.

## **13. Remedy and Limitation of Supplier's Liability.**

A. Defective or non-conforming Supplies or parts thereof discovered during the express warranty period shall be corrected, repaired, or replaced by Supplier without any additional charge and shipped to Customer, FOB Supplier's plant, for reinstallation by Customer at its cost, subject to the terms hereof. The warranty obligation of Supplier is limited to the correction, repair or replacement at Supplier's plant of any part of the Supplies which Customer shall, within the warranty period, return to Supplier, with transportation charges prepaid by Customer, and which Supplier shall determine upon examination to be defective or not in conformity with the express warranties contained herein. Supplies cannot be deemed defective or non-conforming if Supplier cannot duplicate the alleged failure. If the alleged failure can be duplicated by Supplier, Supplier will discuss the potential causes with Customer, and then determine whether the failure is due to a non-conformity or defect attributable to Supplier. In lieu of correction, repair or replacement, if Supplier elects, Supplier may, upon return of such Supplies and making a determination of nonconformity or defect, keep the Supplies and refund the purchase price. Customer's remedies shall be limited (even in the event of Supplier's default of its warranty obligations or a failure of a term to meet its intended purpose) exclusively to those provided in this Section. Customer waives any causes of action or theories of liability including, but not limited to, those arising under contract, tort, strict liability, product liability, statutes, or otherwise, except as specifically provided by the UCC as modified and limited herein. The correction, replacement or repair of Supplies by the Supplier does not give rise to any new warranty, and the warranty period provided for herein shall not be extended by the length of any period from the date the defective or non-conforming Supplies are received by the Supplier until the date repaired or replacement Supplies are delivered to Customer.

B. Customer must contact Supplier requesting warranty coverage plus a return authorization number and other instructions for the return of Supplies to Supplier or other instructions. If requested by Supplier, Customer shall issue a new purchase order or amendment to Supplier for replacement parts, subject to Supplier issuing a credit memo if Customer's claim for warranty coverage is approved. Customer must comply with Supplier's return instructions (including return of the Supplies) within 30 days or the claim shall be deemed conclusively to have been abandoned. Customer is responsible for properly tagging, identifying, and packing returned Supplies. Supplies returned without compliance with the above procedures shall be returned to the sender at sender's cost.

C. Customer shall defend and indemnify Supplier from all liability for claims, damages, losses, and expenses incurred: (a) as a result of the use or disclosure of Supplier's confidential or proprietary information (except in the performance of the Contract) by Customer or its contractors; and (b) as a result of the advice furnished by Supplier to, and relied on by, Customer's contractors to the extent the liability exceeds any liability as limited by the Contract had the advice been furnished to, and relied on by, Customer.

D. Supplier shall not be liable for any costs related to a recall, service campaign, or similar action without its prior written consent. Supplier's maximum obligation in any such activity (including the provision of replacement Supplies and all other costs) shall not exceed 3% of the Supplier's average annual rates of the specific good.

E. Any amounts to be paid as stipulated damages under the Contract shall be in full satisfaction of Supplier's liability.

F. Under no circumstance shall Supplier's liability exceed Customer's uninsured loss. Customer waives any right of subrogation.

G. Supplier shall not be liable for any action taken pursuant to a good faith exercise of any of its rights under the Contract or law.

**14. Consequential, Incidental, and Other Damages.** CUSTOMER AND THIRD PARTIES SHALL NOT BE ENTITLED TO ANY CONSEQUENTIAL, PUNITIVE, EXEMPLARY, OR INCIDENTAL DAMAGES, AS DEFINED IN THE UCC OR OTHERWISE. This limitation shall be enforced regardless of whether Supplier has defaulted in its warranty or other obligations or the limited warranty is held to fail of its essential purpose. Any legal inability to limit or restrict the right of Customer or a third party to such damages shall not affect the right of Supplier to indemnification hereunder, and under no circumstance shall Customer recover more than the purchase price.

## **15. Indemnification.**

A. Customer shall indemnify the Supplier from any and all third party claims, damages, and expenses (including reasonable attorney fees) under theories of tort, product liability, negligence (ordinary or gross), warranty, contract, statute, or otherwise arising out of the use, storage, sale, processing or other disposition of the Supplies, supplies or materials used in connection with the Supplies, or parts manufactured with the Supplies, if the action or inaction of Customer or its employees, customers or agents, or Customer's design specifications, were a material or proximate cause of injuries or damages giving rise to claims against the Supplier.

B. Customer shall use and shall require its employees to use all safety devices and guards furnished with or intended to be used with the Supplies, and to follow proper safe operating procedures in accordance with general industry standards and as set forth in manuals and instruction information furnished by Supplier. If Customer fails to comply with the obligations set forth in this subsection, Customer shall indemnify and save Supplier harmless from any liability or obligation incurred by Supplier to persons injured directly or indirectly in connection with the operation of the Supplies and all warranties of Supplier shall become automatically void. Customer shall notify Supplier promptly, and in any event within 30 days, of any accident or malfunction involving Supplies which results in personal injury or damage to property and shall cooperate fully with Supplier in investigating to determine the cause of such accident or malfunction, including allowing Supplier access to the Supplies and Customer's reports regarding the Supplies for Supplier's inspection. If Customer fails to provide such notice and cooperation to Supplier, Customer shall indemnify Supplier from any claims arising from such accident or malfunction whether or not the Supplies are non-conforming or defective.

**16. Customer's Property.** Customer shall insure all materials, fixtures, tooling, and other property delivered to Supplier against all risks and waives subrogation in the event of loss of or damage to such property or personal injury arising from the use of storage of such property.

**17. Security Interest.** In addition to any security interest granted by the UCC or other law, Customer hereby grants a security interest to the Supplier in all Supplies and documents related thereto and proceeds and products therefrom to secure all obligations of Customer to the Supplier, whether or not arising under the Contract. Supplier may file a financing statement and at Supplier's request, Customer shall sign financing statements, evidencing the security interest, and Supplier may file a copy of the Contract or portion thereof as a financing statement. Customer grants Supplier an irrevocable power of attorney to sign Customer's name to a financing statement if necessary or convenient to perfect Supplier's security interest. Customer shall provide a landlord's waiver of any lien rights at the premises to which the Supplies are to be installed. In case of a default by Customer, Supplier may peaceably enter the premises of Customer and others and take other actions to repossess or render inoperable all Supplies in which it has a security interest. In case of a default by Customer, Customer hereby irrevocably appoints the Supplier as its agent to obtain possession of the Supplies and documents related thereto. Supplier may install and activate procedures or devices to make the Supplies or Software non-operative upon Customer's default. The Supplies shall be and remain strictly personal property and retain their character as such, no matter whether on permanent foundation or in whatever manner affixed or attached to building or structure, or for what purpose the Supplies may be used. Customer shall maintain the Supplies in a segregated area and not co-mingle any Supplies which are not fully paid. Customer shall not sell, exchange, transfer, convey, mortgage, pledge, hypothecate, or grant a security interest in any Supplies which are the subject to the Contract if payment therefor shall not have been made in full to Supplier. Customer shall immediately advise Supplier in writing of any damage to, change in location of, or seizure of, any of the Supplies the price of which have not been paid to Supplier.

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**18. United States Government Regulations.** Customer shall not engage in any transaction with respect to the Supplies, by way of resale, lease, shipment or otherwise, which violates any statute or regulation of the United States of America.

**19. Limitations of Actions.** Any proceeding by Customer for breach of the Contract or any other right against Supplier arising from or in connection with the payment cannot be filed nor maintained unless: (i) it is commenced within one year after the cause for action has accrued; (ii) Customer has given timely written notice to Supplier of its claim as provided herein; and (iii) Customer pays all amounts due to Supplier or deposits the unpaid portion of the purchase price with the tribunal pending final adjudication. An action for breach of the Contract shall accrue no later than shipment of the Supplies to Customer whether or not installation or other post shipment services are required by the Contract.

**20. Amicable Resolution of Disputes.** No litigation may be commenced (other than for injunctive relief) by a party unless it first proposes a meeting of management and technical personnel of the parties to resolve the dispute. The proposed discussions shall be at the location of the other party on dates selected by the other party from alternatives provided by the complaining party. Each party may invite an independent expert to attend the discussions to offer opinions on relevant technical matters to assist the parties.

**21. Mediation.** For all disputes, differences or questions which cannot be amicably solved, the parties shall attempt to resolve them by mediated negotiation with the assistance of a neutral person, a mediator. The parties shall appoint the mediator within 15 days from the date when either party gives written notice of its willingness to use such procedure.

**22. Arbitration.**

A. Every dispute arising out of, or relating in any manner to, this Agreement which cannot be resolved through the negotiations of the parties or mediation shall, on written notice by any party, be submitted to final and binding arbitration by three arbitrators under the Rules of Commercial Arbitration of the American Arbitration Association ("AAA") in effect at the time, at the AAA regional office in Michigan. The arbitration panel shall have full authority to grant all forms of relief including all prejudgment remedies and equitable relief. As used in this Agreement, "any dispute" includes, but is not limited to, claims for breach of contract, breach of the covenant of good faith and fair dealing, torts of any kind (including, but not limited to, fraud, intentional and/or negligent infliction of emotional distress, defamation, invasion of privacy, interference with business relations, assault, battery, negligence of any kind, intentional conduct of any kind, and any other tort not specifically listed), and all statutory claims. The scope of the obligation to arbitrate includes claims against officers, directors, agents and employees, claims arising under any federal or state law or regulation, and claims by employees, agents, shareholders, partners, lenders, heirs, personal representatives, spouses, other family members, successors and assigns. The arbitration panel shall be bound by the terms of this Agreement.

The arbitrators shall have no authority to award punitive or exemplary damages against either party, or to amend or modify this Agreement.

B. Either party may apply to a court of record in the jurisdiction adopted by this Agreement for interim relief prior to the appointment and acceptance of an arbitration panel. The Commercial Arbitration Rules shall be supplemented by the Expedited Procedures (Rules E-1, et. seq.) for all claims regardless of amount. Notice may be given personally, by fax, or courier service to the last known addresses of the parties.

C. All final and interim orders and awards of the arbitrator or arbitration panel shall be final and enforceable by any court of record having jurisdiction. The parties shall bear their own expenses of the arbitration, unless the arbitrators otherwise award. The prevailing party in the arbitration, as determined by the arbitration panel, shall have the right to recover costs and reasonable attorney fees. This arbitration will be the sole and exclusive remedy for any such controversy or claim. A demand for arbitration must be filed by a party within one (1) year after the party discovers the conduct, act, event or occurrence first giving rise to the claim, but no later than two (2) years after the conduct, act, event or occurrence first giving rise to the claim occurs, or the right to any remedy will be deemed forever waived and lost.

D. The parties shall provide to each other all relevant documents as may be requested by a party, and each party shall submit for discovery deposition one knowledgeable party representative. All other discovery must be approved by the arbitration panel.

**23. Choice of Law.** This Contract shall be governed, construed and enforced under the law of contracts of the State of Michigan, including the Uniform Commercial Code in force on the initial date of the Contract ("UCC"), to the extent applicable and otherwise by the common law of contracts. The U.N. Convention on the International Sales of Goods shall not apply. The courts of Michigan shall have exclusive jurisdiction over the parties and the disputes arising under or related to the Contract, unless such exclusivity is waived by Supplier. Any declaration of unenforceability of a provision shall be as narrow as possible and shall not affect the enforceability of the other provisions. At the request of Supplier, a tribunal with jurisdiction may reform a provision of the Contract, to the extent minimally required for enforcement.

**24. Assignment.** No right or interest in the Contract may be assigned by Customer without the prior written consent of Supplier. Any assignment attempted by Customer shall be void and ineffective for all purposes unless made in conformity with this section.

## DISCLAIMER

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