



GENERAL INFORMATION

DRIL-FLEX®

Self-Drilling Structural Screws

PRODUCT DESCRIPTION

Dril-Flex Structural Drill Screws are dual heat treated self-drilling tapping screws that provide the strength, ductility and resistance to embrittlement required for critical applications.

GENERAL APPLICATIONS AND USES

- Steel-to-steel connections
- Aluminum-to-aluminum connections
- Aluminum-to-steel connections
- Wood-to-steel connections

FEATURES AND BENEFITS

- + High-hardness point and lead threads for drilling and tapping
- + Lower-hardness load bearing area provides increased resistance to Hydrogen-Assisted Stress Corrosion Cracking when compared to case hardened fasteners
- + Stalgard and Stalgard SUB Coatings provide enhanced galvanic compatibility in dissimilar metal applications
- + Fasteners coated with Stalgard SUB finish typically show no red rust or other base metal corrosion on significant surfaces after 2000 hours of 5% neutral salt spray exposure (per ASTM B117)
- + Fasteners coated with Stalgard finish typically show no red rust or other base metal corrosion on significant surfaces after 1000 hours of 5% neutral salt spray exposure (per ASTM B117)

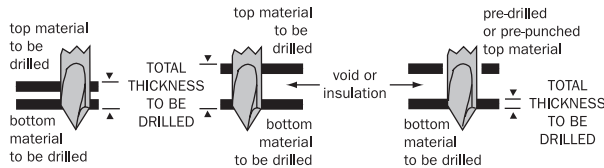
APPROVALS AND LISTINGS

- International Code Council, Evaluation Service (ICC-ES), ESR-3332
- International Code Council, Evaluation Service (ICC-ES), ESR-4367
- Code compliant with the International Building Code/International Residential Code: 2018 IBC/IRC, 2015 IBC/IRC, 2012 IBC/IRC and 2009 IBC/IRC
- Tested in accordance with ICC-ES AC118 for use in Steel-to-Steel Connections
- Tested in accordance with ICC-ES AC500 for attaching Miscellaneous Building Materials to Steel

GUIDE SPECIFICATIONS

05 05 23 – Metal Fastenings, 09 22 16.23 – Fasteners. Fasteners shall be Dril-Flex as supplied by Elco Construction Products, Towson, MD. Fasteners shall be installed with published instructions and the Authority Having Jurisdiction.

**Point Size Selection
Maximum Combined Material Thickness By Point Type**



Maximum Recommended Installation RPM

Diameter	RPM
#10	2500
#12	
#12**	1800
1/4"	
5/16"	1200

** Applies to #12 diameter screws with point type 5

Nominal Sheet Metal Sizes

Gauge	Decimal (in.)
18	0.048
16	0.060
14	0.075
12	0.105

Nominal Screw Sizes

Thread Dia.	Decimal (in.)
#10	.190
#12	.216
1/4"	.250
5/16"	.3125

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ANCHOR MATERIALS

- Alloy Steel

HEAT TREAT

- Dual Hardened - Load Bearing Area meets SAE J429 Grade 5 and ASTM A449 Type 1 specifications

HEAD STYLES

- Hex Washer Head (HWH)
- Pan Head (PPH)
- Wafer Head (PWH)
- Undercut Flat Head (PUFH)

DIAMETER

- #10, #12
- 1/4", 5/16"

POINT DRILL TYPE

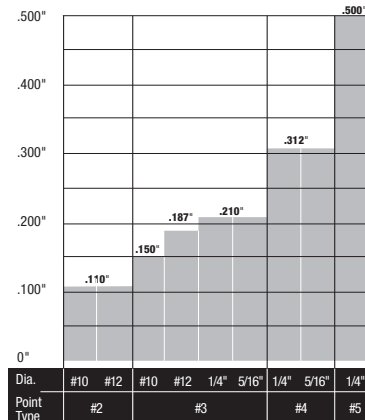
- #2, #3, #4, #5

FINISH

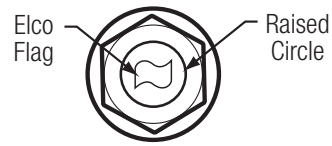
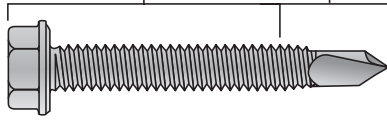
- Stalgard SUB coating (HWH)
- Stalgard coating

CODE LISTED ICC-ES ESR-3332 STEEL-TO-STEEL	CODE LISTED ICC-ES ESR-4367 WOOD-TO-STEEL
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**Drilling and Tapping Capacity
(Maximum Material Thickness)***



SAE Grade 5 properties in "Load-Bearing Area" of fastener
 Hardened point and tapping threads



PERFORMANCE DATA

Fastener Strengths^{1,2,3,4,5,6,7}

Description	Tension (lbf)			Shear (lbf)			Minimum Torsional Strength (in-lbs)
	Ultimate	ASD	LRFD	Ultimate	ASD	LRFD	
#10-16	2,275	760	1,140	1,460	485	730	61
#10-24	2,610	870	1,305	1,080	360	540	65
#12-14	3,215	1,070	1,610	1,990	665	995	92
#12-14 (PUFH)	2,630	875	1,315	2,090	695	1,045	92
#12-24	4,175	1,390	2,090	2,500	835	1,250	100
1/4"-14	4,360	1,455	2,180	2,690	895	1,345	150
1/4"-20	4,620	1,540	2,310	2,615	870	1,310	156
5/16"-18	8,070	2,690	4,035	4,565	1,520	2,285	425
5/16"-24	8,755	2,920	4,380	5,470	1,825	2,735	425

1. Ultimate strengths are based on laboratory tests.
2. Allowable (ASD) strengths are based on a safety factor, Ω , of 3.0 in accordance with ICC-ES AC118 and AISI S100-16.
3. Design (LRFD) strengths are based on a resistance factor, ϕ , of 0.50 in accordance with ICC-ES AC118 and AISI S100-16.
4. For ASD tension connections, the lower of the ASD tension strength, ASD pull-out strength and ASD pull-over strength must be used for design.
5. For LRFD tension connections, the lower of the LRFD tension strength, LRFD pull-out strength and LRFD pull-over strength must be used for design.
6. For ASD shear connections, the lower of the ASD Shear (Bearing) Capacity and the ASD Fastener Shear Strength must be used for design.
7. For LRFD shear connections, the lower of the LRFD Shear (Bearing) Capacity and the LRFD Fastener Shear Strength must be used for design.

Ultimate Shear (Bearing) Capacity of Screw Connections in Steel, lbf^{1,2}

Diameter	Point Type	Steel						
		18-18 Ga.	18-14 Ga.	16-16 Ga.	14-14 Ga.	1/8" - 3/16"	3/16" - 1/4"	1/4" - 12 Ga.
#10-16	#3	925	1,195	1,140	-	-	-	-
#10-16 (PPH)	#2	865	865	1,210	-	-	-	-
#10-24 (PWH)	#3	880	1,545	1,445	-	-	-	-
#12-14	#2/#3	895	1,460	1,290	1,255	-	-	-
12-14 (PUFH)	#3	880	1,648	1,304	1,688	-	-	-
#12-24	#5	785	1,650	1,285	1,750	1,705	1,985	1,620
1/4"-14	#3	950	1,595	1,310	1,665	1,610	-	-
1/4"-20	#4/#5	975	1,330	1,350	1,700	1,460	1,570	1,395
5/16"-18	#3	1,025	1,585	1,410	2,245	-	-	-
5/16"-24	#4	-	-	-	-	3,400	2,485	2,240

1. Ultimate strengths are based on laboratory tests.
2. Ultimate load capacities must be reduced by a minimum safety factor to determine allowable loads (ASD) or by a load resistance factor to determine strength design capacities (LRFD).



Allowable (ASD) Shear (Bearing) Capacity of Screw Connections in Steel, lbf^{1,2,3,4,5,6}

Diameter	Point Type	Steel						
		18-18 Ga.	18-14 Ga.	16-16 Ga.	14-14 Ga.	1/8" - 3/16"	3/16" - 1/4"	1/4" - 1/2 Ga.
#10-16	#3	370	395	455	-	-	-	-
#10-16 (PPH)	#2	290	290	405	-	-	-	-
#10-24 (PWH)	#3	320 ^[10]	570 ^[10]	535 ^[7,8,9]	-	-	-	-
#12-14	#2/#3	355	575	515	495	-	-	-
12-14 (PUFH)	#3	325 ^[10]	610 ^[10]	480 ^[7,8,9]	625 ^[7,8]	-	-	-
#12-24	#5	290 ^[10]	610 ^[10]	475 ^[7,8,9]	645 ^[7,8]	630 ^[7,8,9]	735 ^[7,8,9]	600 ^[7,8,9]
1/4"-14	#3	375	625	520	660	640	-	-
1/4"-20	#4/#5	385 ^[7,8]	525 ^[7,8]	535 ^[8]	670 ^[8]	595 ^[8]	625 ^[8]	555 ^[8]
5/16"-18	#3	410	620	560	890	-	-	-
5/16"-24	#4	-	-	-	-	1,345	985	885

1. Allowable (ASD) strengths are based on a safety factor Ω , determined in accordance with AISI S100-16.
2. Values are based on steel members with a minimum tensile strength of $F_u = 45$ ksi.
3. Allowable (ASD) Shear (Bearing) capacities for other member thicknesses may be determined by interpolating within the table.
4. For ASD shear connections, the lower of the ASD Shear (Bearing) Capacity and the ASD Fastener Shear Strength must be used for design.
5. Unless otherwise noted, for steel with a minimum tensile strength $F_u \geq 58$ ksi, multiply tabulated values by 1.29 and for steel with a minimum tensile strength $F_u \geq 65$ ksi steel, multiply tabulated values by 1.44.
6. The first number is the thickness of steel in contact with the screw head, the second number is the thickness of the steel not in contact with the screw head.
7. For steel with a minimum tensile strength $F_u \geq 55$ ksi, multiply tabulated values by 1.22.
8. For steel with a minimum tensile strength $F_u \geq 52$ ksi, multiply tabulated values by 1.15.
9. For steel with a minimum tensile strength $F_u \geq 58$ ksi, multiply tabulated values by 1.29.
10. Increasing values for higher steel tensile strength per Note 5 is not allowed.

Design (LRFD) Shear (Bearing) Capacity of Screw Connections in Steel, lbf^{1,2,3,4,5,6}

Diameter	Point Type	Steel Thickness (Lapped Sheets/ Bars)						
		18-18 Ga.	18-14 Ga.	16-16 Ga.	14-14 Ga.	1/8" - 3/16"	3/16" - 1/4"	1/4" - 1/2 Ga.
#10-16	#3	590	630	725	-	-	-	-
#10-16 (PPH)	#2	435	435	605	-	-	-	-
#10-24 (PWH)	#3	515	915	855	-	-	-	-
#12-14	#2/#3	570	915	820	795	-	-	-
12-14 (PUFH)	#3	520 ^[10]	975 ^[10]	770 ^[7,8,9]	1,000 ^[7,8]	-	-	-
#12-24	#5	465 ^[10]	976 ^[10]	760 ^[7,8,9]	1,035 ^[7,8]	1,010 ^[7,8,9]	1,175 ^[7,8,9]	960 ^[7,8,9]
1/4"-14	#3	605	1,000	835	1,060	1,020	-	-
1/4"-20	#4/#5	615 ^[7,8]	840 ^[7,8]	850 ^[8]	1,070 ^[8]	950 ^[8]	1,000 ^[8]	885 ^[8]
5/16"-18	#3	655	995	895	1,425	-	-	-
5/16"-24	#4	-	-	-	-	2,155	1,575	1,420

1. Design (LRFD) strengths are based on a safety factor ϕ , determined in accordance with AISI S100-16.
2. Values are based on steel members with a minimum tensile strength of $F_u = 45$ ksi.
3. Design (LRFD) Shear (Bearing) capacities for other member thicknesses may be determined by interpolating within the table.
4. For LRFD shear connections, the lower of the LRFD Shear (Bearing) Capacity and the LRFD Fastener Shear Strength must be used for design.
5. Unless otherwise noted, for steel with a minimum tensile strength $F_u \geq 58$ ksi, multiply tabulated values by 1.29 and for steel with a minimum tensile strength $F_u \geq 65$ ksi steel, multiply tabulated values by 1.44.
6. The first number is the thickness of steel in contact with the screw head, the second number is the thickness of the steel not in contact with the screw head.
7. For steel with a minimum tensile strength $F_u \geq 55$ ksi, multiply tabulated values by 1.22.
8. For steel with a minimum tensile strength $F_u \geq 52$ ksi, multiply tabulated values by 1.15.
9. For steel with a minimum tensile strength $F_u \geq 58$ ksi, multiply tabulated values by 1.29.

Ultimate Tension Pull-Out Capacity of Screw Connections in Steel, lbf^{1,2}

Diameter	Point Type	Thickness of Steel Not in Contact with Screw Head							
		18 Ga.	16 Ga.	14 Ga.	12 Ga.	1/8"	3/16"	1/4"	5/16"
#10-16	#2/#3	335	485	585	955	1,135	-	-	-
#10-24	#3	330	505	675	1,125	1,480	-	-	-
#12-14	#2/#3	335	510	585	790	1,380	1,795	-	-
#12-24	#5	-	-	605	1,030	1,370	2,410	2,760	2,760
1/4"-14	#3	340	515	630	825	1,515	2,430	-	-
1/4"-20	#4/#5	-	555	705	1,145	1,410	2,575	2,810	3,255
5/16"-18	#3	-	-	-	1,400	1,915	-	-	-
5/16"-24	#4	-	-	-	1,290	1,725	2,620	3,565	4,270

1. Ultimate strengths are based on laboratory tests.
2. Ultimate load capacities must be reduced by a minimum safety factor to determine allowable loads (ASD) or by a load resistance factor to determine strength design capacities (LRFD).

Allowable Tension Pull-Out Capacity of Screw Connections in Steel, lbf^{1,2,3,4,5}

Diameter	Point Type	Thickness of Steel Not in Contact with Screw Head							
		18 Ga.	16 Ga.	14 Ga.	12 Ga.	1/8"	3/16"	1/4"	5/16"
#10-16	#2/#3	135	195	235	305	295	-	-	-
#10-24	#3	120 ⁽⁶⁾	185 ⁽⁷⁾	250 ⁽⁶⁾	415 ⁽⁶⁾	545 ⁽⁷⁾	-	-	-
#12-14	#2/#3	130	205	265	330	510	665	-	-
#12-24	#5	95 ⁽⁶⁾	165 ⁽⁷⁾	225 ⁽⁶⁾	380 ⁽⁶⁾	505 ⁽⁷⁾	890 ⁽⁶⁾	1,020	1,020
1/4"-14	#3	130	205	255	340	560	900	-	-
1/4"-20	#4/#5	-	205 ⁽⁶⁾	260 ⁽⁶⁾	425 ⁽⁶⁾	525 ⁽⁷⁾	915 ⁽⁷⁾	1,045	1,205
5/16"-18	#3	-	-	-	520	705	-	-	-
5/16"-24	#4	-	-	-	460	635	725	1,190	1,425

1. Allowable (ASD) strengths are based on a safety factor, Ω , determined in accordance with AISI S100-16.
2. Values are based on steel members with a minimum tensile strength of $F_u = 45$ ksi.
3. Allowable (ASD) pull-over capacities for other member thicknesses may be determined by interpolating within the table.
4. For ASD tension connections, the lower of the ASD tension strength, ASD pull-out strength and ASD pull-over strength must be used for design.
5. Unless otherwise noted, for steel with a minimum tensile strength $F_u \geq 58$ ksi, multiply tabulated values by 1.29 and for steel with a minimum tensile strength $F_u \geq 65$ ksi steel, multiply tabulated values by 1.44.
6. For steel with a minimum tensile strength $F_u \geq 52$ ksi, multiply tabulated values by 1.15.
7. For steel with a minimum tensile strength $F_u \geq 58$ ksi, multiply tabulated values by 1.29.
8. Increasing values for higher steel tensile strength per Note 5 is not allowed.

Design Tension Pull-Out Capacity of Screw Connections in Steel, lbf^{1,2,3,4,5}

Diameter	Point Type	Thickness of Steel Not in Contact with Screw Head							
		18 Ga.	16 Ga.	14 Ga.	12 Ga.	1/8"	3/16"	1/4"	5/16"
#10-16	#2/#3	215	310	380	490	475	-	-	-
#10-24	#3	194 ⁽⁶⁾	295 ⁽⁷⁾	400 ⁽⁶⁾	665 ⁽⁶⁾	875 ⁽⁷⁾	-	-	-
#12-14	#2/#3	210	330	425	525	815	1,065	-	-
#12-24	#5	155 ⁽⁶⁾	265 ⁽⁷⁾	360 ⁽⁶⁾	610 ⁽⁶⁾	810 ⁽⁷⁾	1,425 ⁽⁶⁾	1,630	1,630
1/4"-14	#3	210	330	410	550	550	895	-	-
1/4"-20	#4/#5	-	325 ⁽⁶⁾	415 ⁽⁶⁾	675 ⁽⁶⁾	840 ⁽⁷⁾	1,460 ⁽⁷⁾	1,670	1,930
5/16"-18	#3	-	-	-	830	1,130	-	-	-
5/16"-24	#4	-	-	-	735	1,020	1,160	1,905	2,280

1. Design (LRFD) strengths are based on a resistance factor, ϕ , determined in accordance with AISI S100-16.
2. Values are based on steel members with a minimum tensile strength of $F_u = 45$ ksi.
3. Design (LRFD) pull-out capacities for other member thicknesses may be determined by interpolating within the table.
4. For LRFD tension connections, the lower of the LRFD tension strength, LRFD pull-out strength and LRFD pull-over strength must be used for design.
5. Unless otherwise noted, for steel with a minimum tensile strength $F_u \geq 58$ ksi, multiply tabulated values by 1.29 and for steel with a minimum tensile strength $F_u \geq 65$ ksi steel, multiply tabulated values by 1.44.
6. For steel with a minimum tensile strength $F_u \geq 52$ ksi, multiply tabulated values by 1.15.
7. For steel with a minimum tensile strength $F_u \geq 58$ ksi, multiply tabulated values by 1.29.
8. Increasing values for higher steel tensile strength per Note 5 is not allowed.

Ultimate Pull-Over Capacity of Screw Connections in Steel, lbf^{1,3}

Fastener Description		Minimum Thickness of Steel in Contact with Screw Head							
		18 Ga.	16 Ga.	14 Ga.	12 Ga.	1/8"	3/16"	1/4"	5/16"
#10-16	Phillips Pan Head	1,155 ⁽²⁾	1,200	1,200	1,200	1,200	-	-	-
#10-16	5/16" Hex Washer Head	1,245	1,200	1,200	1,200	1,200	-	-	-
#10-24	Phillips Wafer Head	1,650 ⁽²⁾	1,615 ⁽²⁾	1,935 ⁽²⁾	1,935 ⁽²⁾	1,935 ⁽²⁾	-	-	-
#12-14	5/16" Hex Washer Head	1,290	1,610	2,015	1,835	1,835	1,835	-	-
#12-14	Phillips Undercut Flat Head	1,060 ⁽²⁾	1,455 ⁽²⁾	1,845 ⁽²⁾	2,160 ⁽²⁾	2,160 ⁽²⁾	2,160 ⁽²⁾	-	-
#12-24	5/16" Hex Washer Head	1,290	1,610	2,015	1,835	1,835	1,835	1,835	1,835
1/4"-14	3/8" Hex Washer Head	1,555	1,945	2,430	2,815	2,815	2,815	-	-
1/4"-20	3/8" Hex Washer Head	-	1,945	2,430	2,815	2,815	2,815	2,815	2,815
5/16"-18	3/8" Hex Washer Head	-	-	-	3,045	3,045	-	-	-
5/16"-24	3/8" Hex Washer Head	-	-	-	3,045	3,045	3,045	3,045	3,045

1. Unless otherwise noted, ultimate strengths are based on calculations in accordance with AISI S100-16, or on the calculated shear strength of the integral washer.
2. Ultimate strengths are based on laboratory testing.
3. Ultimate load capacities must be reduced by a minimum safety factor to determine allowable loads (ASD) or by a load resistance factor to determine strength design capacities (LRFD).



Allowable (ASD) Pull-Over Capacity of Screw Connections in Steel, lbf^{1,2,3,5,6}

Fastener Description		Minimum Thickness of Steel in Contact with Screw Head							
		18 Ga.	16 Ga.	14 Ga.	12 Ga.	1/8"	3/16"	1/4"	5/16"
#10-16	Phillips Pan Head	385	480	480	480	480	-	-	-
#10-16	5/16" Hex Washer Head	415	480	480	480	480	-	-	-
#10-24	Phillips Wafer Head	610	595 ⁽⁴⁾	715 ⁽⁴⁾	715 ⁽⁴⁾	715 ⁽⁴⁾	-	-	-
#12-14	5/16" Hex Washer Head	430	535	670	735	735	735	-	-
#12-14	Phillips Undercut Flat Head	390	535 ⁽⁴⁾	680 ⁽⁴⁾	795 ⁽⁴⁾	795 ⁽⁴⁾	795 ⁽⁴⁾	-	-
#12-24	5/16" Hex Washer Head	430	535	670	735	735	735	735	735
1/4"-14	3/8" Hex Washer Head	520	650	810	1,125	1,125	1,125	-	-
1/4"-20	3/8" Hex Washer Head	-	650	810	1,125	1,125	1,125	1,125	1,125
5/16"-18	3/8" Hex Washer Head	-	-	-	1,170	1,170	-	-	-
5/16"-24	3/8" Hex Washer Head	-	-	-	1,325	1,325	1,325	1,325	1,325

1. Allowable (ASD) strengths are based on a safety factor, Ω , determined in accordance with AISI S100-16.
2. Values are based on steel members with a minimum tensile strength of $F_u = 45$ ksi.
3. Unless otherwise noted, increasing values for higher steel tensile strength per Note 4 is not allowed.
4. For steel with a minimum tensile strength $F_u \geq 52$ ksi, multiply tabulated values by 1.15.
5. Allowable (ASD) pull-over capacities for other member thicknesses may be determined by interpolating within the table.
6. For ASD tension connections, the lower of the ASD tension strength, ASD pull-out strength and ASD pull-over strength must be used for design.

Design (LRFD) Pull-Over Capacity of Screw Connections in Steel, lbf^{1,2,3,5,6}

Fastener Description		Minimum Thickness of Steel in Contact with Screw Head							
		18 Ga.	16 Ga.	14 Ga.	12 Ga.	1/8"	3/16"	1/4"	5/16"
#10-16	Phillips Pan Head	580	725	780	780	780	-	-	-
#10-16	5/16" Hex Washer Head	620	780	780	780	780	-	-	-
#10-24	Phillips Wafer Head	975	955 ⁽⁴⁾	1,140 ⁽⁴⁾	1,140 ⁽⁴⁾	1,140 ⁽⁴⁾	-	-	-
#12-14	5/16" Hex Washer Head	645	805	1,005	1,190	1,190	1,190	-	-
#12-14	Phillips Undercut Flat Head	625	860 ⁽⁴⁾	1,090 ⁽⁴⁾	1,275 ⁽⁴⁾	1,275 ⁽⁴⁾	1,275 ⁽⁴⁾	-	-
#12-24	5/16" Hex Washer Head	645	805	1,005	1,190	1,190	1,190	1,190	1,190
1/4"-14	3/8" Hex Washer Head	780	970	1,215	1,700	1,830	1,830	-	-
1/4"-20	3/8" Hex Washer Head	-	970	1,215	1,700	1,830	1,830	1,830	1,830
5/16"-18	3/8" Hex Washer Head	-	-	-	1,870	1,870	1,870	-	-
5/16"-24	3/8" Hex Washer Head	-	-	-	2,120	2,120	2,120	2,120	2,120

1. Design (LRFD) strengths are based on a resistance factor, ϕ , determined in accordance with AISI S100-16.
2. Values are based on steel members with a minimum tensile strength of $F_u = 45$ ksi.
3. Unless otherwise noted, increasing values for higher steel tensile strength per Note 4 is not allowed.
4. For steel with a minimum tensile strength $F_u \geq 52$ ksi, multiply tabulated values by 1.15.
5. Design (LRFD) pull-over capacities for other member thicknesses may be determined by interpolating within the table.
6. For LRFD tension connections, the lower of the LRFD tension strength, LRFD pull-out strength and LRFD pull-over strength must be used for design.

Ultimate, Allowable (ASD) and Design (LRFD) Shear (Bearing) Capacity of Screw Connections in Aluminum, lbf^{1,2,3,4,5,6}

Diameter	Point Type	6063-T5 Aluminum					
		1/8"-1/8"			1/8"-1/4"		
		Ultimate	ASD	LRFD	Ultimate	ASD	LRFD
#10-16	#2/#3	1,205	400	600	-	-	-
#12-14	#2/#3	1,475	490	740	2,040	680	1,020
1/4"-14	#3	1,640	545	820	2,365	790	1,185
1/4"-20	#4	1,645	550	825	2,400	800	1,200
5/16"-18	#3	1,750	585	875	2,470	825	1,235
5/16"-24	#4	1,520	505	760	2,355	785	1,175

1. Ultimate strengths are based on laboratory tests. Allowable (ASD) and Design (LRFD) capacities are based on a Safety Factor, $\Omega=3.0$, and a resistance factor, $\phi=0.5$, respectively.
2. Clearance holes were provided in the top sheet of aluminum. Clearance holes shall be 13/64, 15/64, 17/64, and 21/64 for #10, #12, 1/4-inch, and 5/16-inch diameter fasteners, respectively.
3. Allowable (ASD) and Design (LRFD) capacities are based on aluminum members with a minimum tensile strength of $F_u = 22$ ksi.
4. For ASD shear connections, the lower of the ASD shear (bearing) strength and ASD fastener shear strength must be used for design.
5. For LRFD shear connections, the lower of the LRFD shear (bearing) strength and LRFD fastener shear strength must be used for design.
6. For aluminum with an ultimate tensile strength, $F_u \geq 27$ ksi, allowable and design capacities may be increased by a factor of 1.20.

Ultimate, Allowable (ASD) and Design (LRFD) Tension Pull-Out Capacity of Screw Connections in Aluminum, lbf^{1,2,3,4,5,6,7}

Diameter	Point Type	6063-T5 Aluminum								
		1/8"			1/4"			3/8"		
		Ultimate	ASD	LRFD	Ultimate	ASD	LRFD	Ultimate	ASD	LRFD
#10-16	#2/#3	630	210	315	-	-	-	-	-	-
#12-14	#2/#3	770	255	385	1,875	625	940	-	-	-
1/4"-14	#3	825	275	410	1,990	665	995	-	-	-
1/4"-20	#4	735	245	370	1,705	570	850	3,045	1,015	1,525
5/16"-18	#3	920	305	460	2,435	810	1,220	-	-	-
5/16"-24	#4	855	285	430	2,105	700	1,055	-	-	-

1. Ultimate strengths are based on laboratory tests. Allowable (ASD) and Design (LRFD) capacities are based on a Safety Factor, $\Omega=3.0$, and a resistance factor, $\phi=0.5$, respectively.
2. Clearance holes were provided in the top sheet of aluminum. Clearance holes shall be 13/64", 15/64", 17/64", and 21/64" for #10, #12, 1/4-inch, and 5/16-inch diameter fasteners, respectively.
3. Allowable (ASD) and Design (LRFD) capacities are based on aluminum members with a minimum tensile strength of $F_u = 22$ ksi.
4. For ASD tension connections, the lower of the ASD tension strength, ASD pull-out strength and ASD pull-over strength must be used for design.
5. For LRFD tension connections, the lower of the LRFD tension strength, LRFD pull-out strength and LRFD pull-over strength must be used for design.
6. Allowable (ASD) and Design (LRFD) capacities for other member thicknesses may be determined by interpolating within the table.
7. For aluminum with an ultimate tensile strength, $F_u \geq 27$ ksi, allowable and design capacities may be increased by a factor of 1.20.

Ultimate Pull-Over Capacity of Screw Connections in Aluminum, Ibf^{1,2}

Screw Description		Minimum Thickness of Aluminum or Framing Member in Contact with Screw Head								
		1/32"			1/16"			1/8"		
		6063-T5	6063-T6	6061-T6	6063-T5	6063-T6	6061-T6	6063-T5	6063-T6	6061-T6
10 - 16	HWH	225	350	495	505	790	1,105	1,225	1,910	2,680
10 - 16	PPH	205	325	455	470	735	1,030	1,155	1,805	2,525
12 - 14	HWH	230	365	510	520	810	1,140	1,255	1,960	2,745
12 - 24	HWH	230	365	510	520	810	1,140	1,255	1,960	2,745
1/4 - 14	HWH	275	430	605	605	945	1,325	1,425	2,225	3,115
1/4 - 20	HWH	275	430	605	605	945	1,325	1,425	2,225	3,115

1. Ultimate strengths are based on calculations in accordance with ICC-ES AC491 and the Aluminum Design Manual, AA ADM1-2015.
2. Ultimate load capacities must be reduced by a minimum safety factor to determine allowable loads (ASD) or by a load resistance factor to determine strength design capacities (LRFD).

Allowable (ASD) Pull-Over Capacity of Screw Connections in Aluminum, Ibf^{1,2,3,4,5,6}

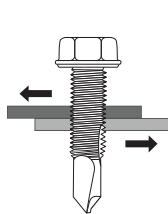
Screw Description		Minimum Thickness of Aluminum or Framing Member in Contact with Screw Head								
		1/32"			1/16"			1/8"		
		6063-T5	6063-T6	6061-T6	6063-T5	6063-T6	6061-T6	6063-T5	6063-T6	6061-T6
10 - 16	HWH	75	120	165	170	265	370	410	640	895
10 - 16	PPH	70	110	150	155	245	345	385	600	840
12 - 14	HWH	80	120	170	175	270	380	420	655	915
12 - 24	HWH	80	120	170	175	270	380	420	655	915
1/4 - 14	HWH	90	145	200	200	315	440	475	740	1,040
1/4 - 20	HWH	90	145	200	200	315	440	475	740	1,040

1. Allowable strengths are based on a safety factor, $\Omega = 3.00$, determined in accordance with ICC-ES AC491 and the Aluminum Design Manual, AA ADM1-2015.
2. Values are based on aluminum members with the following minimum yield strengths: 6063-T5, $F_y = 16$ ksi; 6063-T6, $F_y = 25$ ksi; 6061-T6, $F_y = 35$ ksi.
3. Allowable (ASD) pull-over capacities for other member thicknesses may be determined by interpolating within the table.
4. For aluminum with the following yield strengths: 6063-T5, $F_y = 21$ ksi; 6063-T6, $F_y = 31$ ksi; 6061-T6, $F_y = 40$ ksi; multiply tabulated values by 1.31, 1.24, 1.14 respectively.
5. Tabulated pull-over capacities are applicable to aluminum that has been self drilled by the screw fastener and for pre-drilled aluminum members with clearance holes sizes of 0.201, 0.228 and 0.266 for #10, #12 and 1/4" screws, respectively.
6. For ASD tension connections, the lower of the ASD tension strength, ASD pull-out strength and ASD pull-over strength must be used for design.

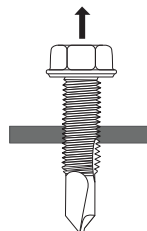
Design (LRFD) Pull-Over Capacity of Screw Connections in Aluminum, Ibf^{1,2,3,4,5,6}

Screw Description		Minimum Thickness of Aluminum or Framing Member in Contact with Screw Head								
		1/32"			1/16"			1/8"		
		6063-T5	6063-T6	6061-T6	6063-T5	6063-T6	6061-T6	6063-T5	6063-T6	6061-T6
10 - 16	HWH	115	175	250	255	395	555	615	955	1,340
10 - 16	PPH	105	165	230	235	370	515	580	905	1,265
12 - 14	HWH	115	185	255	260	405	570	630	980	1,375
12 - 24	HWH	115	185	255	260	405	570	630	980	1,375
1/4 - 14	HWH	140	215	305	305	475	665	715	1,115	1,560
1/4 - 20	HWH	140	215	305	305	475	665	715	1,115	1,560

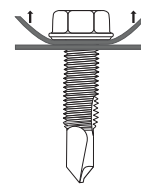
1. Design (LRFD) strengths are based on a resistance factor, $\phi = 0.50$, determined in accordance with ICC-ES AC491 and the Aluminum Design Manual, AA ADM1-2015.
2. Values are based on aluminum members with the following minimum yield strengths: 6063-T5, $F_y = 16$ ksi; 6063-T6, $F_y = 25$ ksi; 6061-T6, $F_y = 35$ ksi.
3. Design (LRFD) pull-over capacities for other member thicknesses may be determined by interpolating within the table.
4. For aluminum with the following yield strengths: 6063-T5, $F_y = 21$ ksi; 6063-T6, $F_y = 31$ ksi; 6061-T6, $F_y = 40$ ksi; multiply tabulated values by 1.31, 1.24, 1.14 respectively.
5. Tabulated pull-over capacities are applicable to aluminum that has been self drilled by the screw fastener and for pre-drilled aluminum members with clearance holes sizes of 0.201, 0.228 and 0.266 for #10, #12 and 1/4" screws, respectively.
6. For LRFD tension connections, the lower of the LRFD tension strength, LRFD pull-out strength and LRFD pull-over strength must be used for design.



Lap Shear



Tension Pull-Out

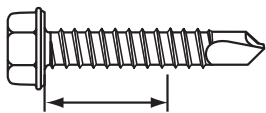


Tension Pull-Over

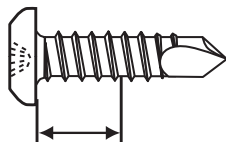
ORDERING INFORMATION
Dril-Flex

Cat. No.	Description (Diameter- TPI x Nominal Length)	Point Type	Finish	Maximum Load-Bearing Length ¹ (in.)	Minimum Protrusion Length ²	Nominal Head Diameter ³ (in.)	Nominal Head Height ⁴ (in.)	Qty / Carton
#10 Diameter, 5/16" Hex Washer Head								
EAF430	#10 - 16 x 3/4"	#3	Stalgard SUB	0.250	1/2"	0.400	0.14	6,000
EAF460	#10 - 16 x 1-1/2"	#3	Stalgard SUB	1.000	1/2"	0.400	0.14	2,500
EAF470	#10 - 16 x 2"	#3	Stalgard SUB	1.500	1/2"	0.415	0.17	2,000
EAF480	#10 - 16 x 2-1/2"	#3	Stalgard SUB	2.000	1/2"	0.400	0.14	1,500
#10 Diameter, #2 Phillips Pan Head								
EDX445	#10 - 16 x 3/4"	#2	Stalgard	0.344	13/32"	0.365	0.13	6,000
#10 Diameter, #2 Phillips Wafer Head								
EBL530	#10 - 24 x 1-1/4"	#3	Stalgard	0.781	15/32"	0.470	0.05	5,000
#12 Diameter, 5/16" Hex Washer Head								
EAF621	#12 - 14 x 7/8"	#3	Stalgard SUB	0.375	1/2"	0.415	0.18	5,000
EAF641	#12 - 14 x 1"	#3	Stalgard SUB	0.500	1/2"	0.415	0.18	4,000
EAF661	#12 - 14 x 1-1/4"	#3	Stalgard SUB	0.750	1/2"	0.415	0.18	2,500
EAF681	#12 - 14 x 1-1/2"	#3	Stalgard SUB	1.000	1/2"	0.415	0.18	2,500
EAF755	#12 - 24 x 1-3/4"	#5	Stalgard SUB	0.813	15/16"	0.415	0.18	2,500
EAF690	#12 - 14 x 2"	#3	Stalgard SUB	1.500	1/2"	0.415	0.18	2,000
EAF715	#12 - 14 x 3"	#2	Stalgard SUB	2.375	5/8"	0.500	0.19	1,000
#12 Diameter, #3 Phillips Undercut Flat Head								
EBL215	#12 - 14 x 1"	#3	Stalgard	0.500	1/2"	0.415	0.09	4,000
EBL220	#12 - 14 x 1-1/4"	#3	Stalgard	0.750	1/2"	0.415	0.09	3,000
EBL223	#12 - 14 x 1-1/2"	#3	Stalgard	1.000	1/2"	0.415	0.09	2,500
1/4" Diameter, 3/8" Hex Washer Head								
EAF816	1/4" - 14 x 1"	#3	Stalgard SUB	0.438	9/16"	0.500	0.23	3,000
EAF865	1/4" - 20 x 1-1/8"	#4	Stalgard SUB	0.438	11/16"	0.500	0.23	2,500
EAF841	1/4" - 14 x 1-1/2"	#3	Stalgard SUB	0.938	9/16"	0.500	0.23	2,000
EAF876	1/4" - 20 x 1-1/2"	#4	Stalgard SUB	0.813	11/16"	0.500	0.23	2,000
EAF888	1/4" - 20 x 1-3/4"	#5	Stalgard SUB	0.813	15/16"	0.500	0.23	1,000
EAF846	1/4" - 14 x 2"	#3	Stalgard SUB	1.438	9/16"	0.500	0.23	1,500
EAF886	1/4" - 20 x 2"	#4	Stalgard SUB	1.313	11/16"	0.500	0.23	1,500
EAF890	1/4" - 20 x 2-1/2"	#4	Stalgard SUB	1.813	11/16"	0.500	0.23	1,000
EAF900 ⁽⁵⁾	1/4" - 20 x 3-3/8"	#4	Stalgard SUB	2.625	3/4"	0.500	0.23	500
EAF910 ⁽⁵⁾	1/4" - 20 x 4"	#4	Stalgard SUB	3.250	3/4"	0.500	0.23	500
1/4" Diameter, #3 Phillips Undercut Flat Head								
EBL330 ⁽⁵⁾	1/4" - 20 x 3"	#4	Stalgard	2.250	3/4"	0.460	0.10	500
EBL340 ⁽⁵⁾	1/4" - 20 x 4"	#4	Stalgard	3.250	3/4"	0.460	0.10	500
5/16" Diameter, 3/8" Hex Washer Head								
EAF940	5/16" - 18 x 1-1/2"	#3	Stalgard SUB	0.813	11/16"	0.600	0.27	1,000
EAF960	5/16" - 24 x 1-1/2"	#4	Stalgard SUB	0.750	3/4"	0.600	0.27	1,000
EAF970	5/16" - 24 x 2"	#4	Stalgard SUB	1.250	3/4"	0.600	0.27	1,000

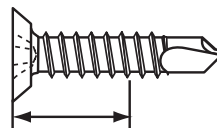
1. The Maximum Load Bearing Length is calculated by subtracting the Minimum Protrusion Length from the Nominal Length of the fastener.
2. Minimum Protrusion Length is the length that allows the higher hardness tip and lead threads to protrude out of the back side of the supporting material.
3. Nominal head diameter is the diameter of the integral washer on hex washer head fasteners.
4. Nominal head height includes the thickness of the integral washer on hex washer head fasteners.
5. Partially Threaded Fastener with a thread length of 2.00".

Load Bearing Area


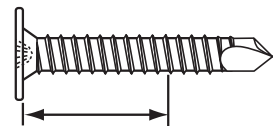
Hex Washer Head



Pan Head



Undercut Flat Head



Wafer head

Screwguns

Cat. No.	Description	Screw Diameter
DW268	2,500 RPM VSR VERSA-CLUTCH™ Screwgun	#10
DW267	2,000 RPM VSR VERSA-CLUTCH™ Screwgun	#12 & 1/4"
DW269	1,000 RPM VSR VERSA-CLUTCH™ Screwgun	5/16"
DCF622M2	20V MAX* XR® VERSA-CLUTCH™ Adjustable Torque Screwgun Kit	#10-1/4"



For 20V MAX Maximum initial battery voltage measured without a workload is 20 volts. Nominal voltage is 18.
 Dril-Flex Fasteners must be installed perpendicular to the work surface using a maximum 2500 RPM screw gun with a torque sensing nose piece.
 Guidance on installation RPM of particular screw diameters can be found on page 1.
Impact tools are not recommended for the installation of Dril-Flex fasteners.

Accessories

Cat. No.	Description
DW2046	2" Bit Tip Holder
DWA1PH2IR2	#2 Phillips Bit Tip (2 Pack)
DWA1PH3IR2	#3 Phillips Bit Tip (2 Pack)
DW2219IR	5/16" Impact Ready® Nut Driver
DW2223IR	3/8" Impact Ready® Nut Driver
DWA2SLS30	Screwdriving Set
DWA2FTS25IR	Screwdriving Set

