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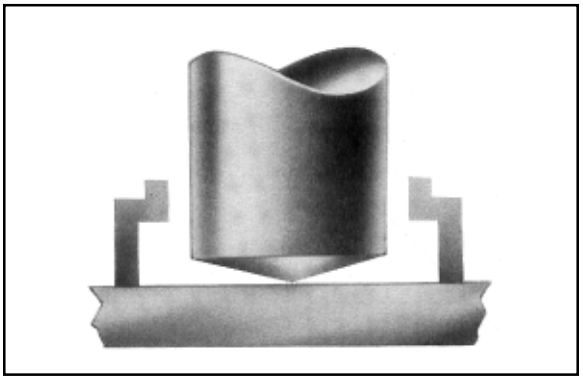
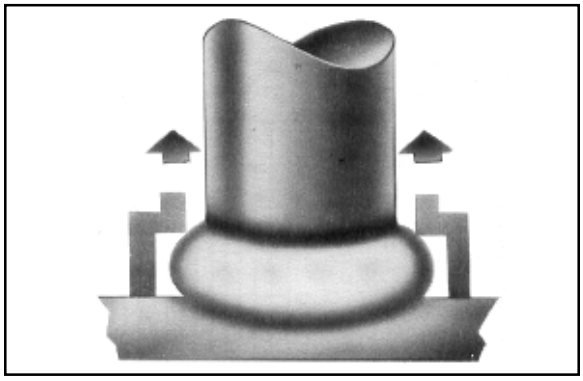
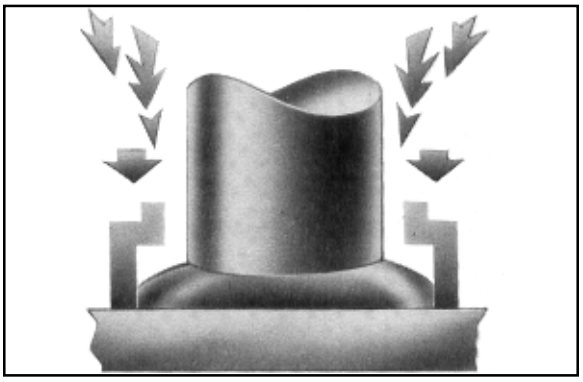
THE ARC STUD WELDING PROCESS



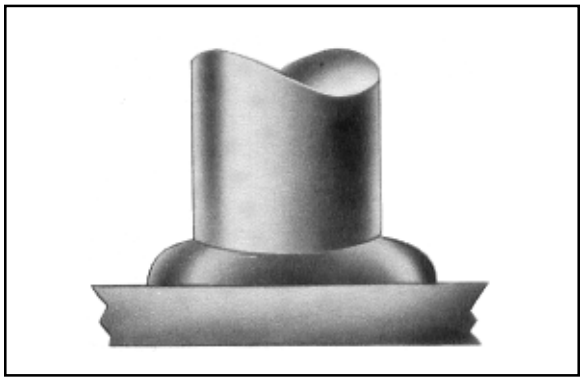
1. STUD AND CERAMIC FERRULE AGAINST THE WORK PLATE.



2. STUD LIFTS AND ARC IS DRAWN.



3. CONTROL TIMES OUT AND STUD PLUNGES INTO MOLTEN STEEL.



4. METAL SOLIDIFIES AND WELD IS COMPLETED IN MILLISECONDS.

ARC stud welding involves the same basic principles and metallurgical aspects as any other arc welding procedure. The weld gun lifts the stud a short distance from the base metal and initiates a controlled electric arc from the power source which melts the end of the stud and a portion of the base metal. The ceramic ferrule contains the molten metal into which the stud is thrust automatically and a high quality fusion weld is accomplished.

ARC stud welding is generally used to weld larger diameter studs to thick base metals. ARC studs may be almost any shape, however, they must have one end of the stud designed for ARC welding and must be made of weldable materials. Mild steel, stainless steel, and aluminum are applicable materials for ARC stud welding.

Arc Studs - General Information

Basic engineering specifications of the studs listed in this publication are listed below.

STUD DIMENSIONS

The length dimension (L) carried throughout these specifications is the overall length of the stud **Before Weld (BW)**. The "after weld" length will be shorter depending upon the size of the stud as shown in the following table:

STUD DIAMETER	APPROXIMATE REDUCTION
3/16" thru 1/2" 5/8" Thru 7/8" 1" and over	1/8" 3/16" 1/4"
1/8" wide rectangulars	1/8"

MATERIALS

All studs shown in this catalog are available in mild or stainless steel. Mild steels conform to the following maximum chemical analysis:

Carbon	0.23% Maximum	Phosphorous	0.040% Maximum
Manganese	0.090% Maximum	Sulphur	0.050% Maximum

STAINLESS STEELS: Stainless steels most commonly used are grade 18/8.
ALUMINUM: In stud welding, aluminum alloy 5356 is most commonly used.
SIZES: Sizes not specified may be made to order upon request.

THREADS

Threaded arc studs are rolled to UNC-2A standard. Other thread types are available upon request.

FLUX

All studs 1/4" diameter and above are solid fluxed. Non-fluxed studs or fluxed studs with diameters below 1/4" are available upon request. See also "Capacitor Discharge Studs".
Note: rectangular shaped studs shown in this catalog are not fluxed.

ANNEALING

Low carbon steel studs may be annealed to a Rockwell B maximum of 75 and Rockwell B maximum of 85 for stainless steel studs. Annealing is available as an option.

MECHANICAL PROPERTIES (as cold drawn)

STUD TYPE	MATERIAL	TENSILE (ULTIMATE)	REDUCTION IN AREA
PD, FT, FB, RB TP, CL, SH, NT	C-1010/C-1020 ASTM-A108	61,000 psi Min	50% Min.
R6, R7, R2	18-8 Stainless	70,000 psi Min.	
HA, SC	C-1010/C-1020 18-8 Stainless	65,000 psi Min. 70,000 psi Min.	50% Min.
	AWSD1.1 & ASTM-A108		
DA	Low Carbon/ASTM-A496	80,000 psi Min.	
CD	C-1010/C01020 ASTM-A108 18-8 Stainless	50,000 psi Min. 70,000 psi Min.	

Specifications For Construction Studs

Shear Connector

SHEAR CONNECTOR STUDS are designed to tie concrete to the steel beams and to resist shear loadings between the concrete slab and steel beam in composite construction. All orders for studs include required ferrules.

LENGTH: Length is before weld. Studs when welded to base metal will be approximately 3/16" shorter after weld and when welded thru-deck 3/8" shorter after weld. Lengths for shear connector studs are generally set by governing specifications. Consult your SWA representative for other lengths available for specific applications.

Mechanical Property Requirements

	Type B[2]
Tensile strength	65,000 psi min
Yield strength (0.2% offset)	51,000 psi min (350 MPa)
Elongation (% in 2 in.)	20% min
(% in 5x dia.)	15% min
Reduction of area	50% min

MATERIAL: Low carbon steel ASTM A108 stainless steel (except Type 303)

Headed Anchor

HEADED ANCHOR STUDS are used in all types of concrete connections. They can be welded on a flat surface or in the fillet, or on the heel of an angle. **When ordering, specify if studs are to be welded to flat surfaces or in fillet or to heel of angle**. All orders for studs include required ferrules.

LENGTH: Length is before weld. Stud diameters (D) 1/2" and below will be approximately 1/8" shorter after welding. 5/8" will be approximately 3/16" shorter after welding. Maximum length available for cold headed product is 10 3/16". Prices on hot formed studs over 10 3/16" available upon request.

Mechanical Property Requirements

	Type A[1]	Type B[2]
Tensile strength	61,000 psi min (420 MPa)	65,000 psi min (450 MPa)
Yield strength (0.2% offset)	49,000 psi min (340 MPa)	51,000 psi min (350 MPa)
Elongation (% in 2 in.)	17% min	20% min
(% in 5x dia.)	14% min	15% min
Reduction of area	50% min	50% min

MATERIAL: Low carbon steel ASTM A108 stainless steel (except Type 303)

Deformed Anchor

LENGTH: Length is before weld. Stud diameters (D) 1/2" and below will be approximately 1/8" shorter after welding. 5/8" and 3/4" will be approximately 3/16" shorter after welding.

MATERIAL: Low carbon steel ASTM: A-496

Mechanical Property Requirements for

	Type C[3]
Tensile strength	80,000 psi min (552 MPa)
Yield strength (0.2% offset) (0.5% offset)	70,000 psi min (485 MPa)

1 Type A studs shall be general purpose of any type and size used for purposes other than shear transfer in composite beam design and construction.

2 Type B studs shall be studs that are headed, bent, or of other configuration in 1/2 in. (12 mm), 5/8 in. (16mm), 3/4 in. (20 mm), 7/8 in. (22 mm) and 1 in. (25 mm) diameter that are used as an essential component in composite beam design and construction.

3 Type C studs are cold-worked deformed steel bars manufactured in accordance with specification ASTM A496 having a nominal diameter equivalent to the diameter of a plain wire having the same weight per foot as the deformed wire. ASTM A496 specifies a maximum diameter of 0.628 in. (16 mm) maximum. Any bar supplied above that diameter must have the same physical characteristics regarding deformations as required by ASTM A496.

Stud Tensile-Torque Strengths

The information shown here provides a simple method for obtaining wrench torque and tensile strength data for various thread pitch and weld bases. From this information you are able to find the yield strength of common weld base diameters, the yield strength of the various threaded sections, and the torque-tension relation at loads varying from minimum to maximum. This information was obtained from test results conducted by a leading torque wrench manufacturer, recommendations of several nut and bolt manufacturers and generally accepted formulas.

However, because of the variables affecting the torque-tension relation, steel strength, thread finish, lubrication, washer type, hardness and many other factors can cause variations.

Standard Arc Welding Studs – Tensile/Torque Strengths

Low-Carbon Steel – 61,000 psi Min. Tensile, 49,000 psi Min. Yield

Stud Thread Diameter	META sq. in.	Yield Load (lb) @ 50 000 psi	Ultimate Tensile Load (lb) @ 55 000psi	Yield Torque* @ 50 000 psi	Ultimate Torque* @ 55 000 psi
10-24 UNC	.017	852	1,060	32 in. lb	39 in. lb
10-32 UNF	.020	980	1,225	36 in. lb	45 in. lb
1/4-20 UNC	.032	1,558	1,933	6 ft lb	7.7 ft lb
1/4-28 UNF	.036	1,773	2,200	7 ft lb	8.8 ft lb
5/16-18 UNC	.052	2,567	3,185	12.7 ft lb	16.6 ft lb
5/16-24 UNF	.058	2,837	3,530	14.7 ft lb	18.8 ft lb
3/8-16 UNC	.078	3,797	4,710	23.5 ft lb	30 ft lb
3/8-24 UNF	.088	4,297	5,340	26 ft lb	33 ft lb
7/16-14 UNC	.106	5,208	6,465	37 ft lb	45 ft lb
7/16-20 UNF	.118	5,782	7,299	42 ft lb	52 ft lb
1/2-13 UNC	.142	6,953	8,660	57.8 ft lb	72 ft lb
1/2-20 UNF	.160	7,840	9,760	64.7 ft lb	81 ft lb
5/8-11 UNC	.226	11,075	13,785	115 ft lb	144 ft lb
5/8-18 UNF	.255	12,500	15,550	130 ft lb	161 ft lb
3/4-10 UNC	.334	16,366	20,375	210 ft lb	255 ft lb
3/4-16 UNF	.372	18,230	22,690	227 ft lb	283 ft lb
7/8-9 UNC	.462	22,640	28,120	330 ft lb	410 ft lb
7/8-14 UNF	.509	22,980	31,050	363 ft lb	452 ft lb
1-8 UNC	.606	29,694	36,900	494 ft lb	615 ft lb
1-14 UNF	.678	33,222	41,350	553 ft lb	688 ft lb

Stainless Steel – 75,000 psi Min. Ultimate, 30,000 PSI Min. Yield

Stud Thread Diameter	META sq. in.	Yield Load (lb) @ 30,000 psi	Ultimate Tensile Load (lb) @ 75,000psi	Yield Torque* @ 30,000 psi	Ultimate Torque* @ 75,000 psi
10-24 UNC	.0174	609	1,218	23.3 in. lb	45.7 in. lb
10-32 UNF	.0200	700	1,400	26.8 in. lb	53 in. lb
1/4-20 UNC	.0318	996	2,226	4.7 ft lb	9.2 ft lb
1/4-28 UNF	.0362	1,267	2,534	5.3 ft lb	10.5 ft lb
5/16-18 UNC	.0524	1,834	3,668	9.3 ft lb	19.1 ft lb
5/16-24 UNF	.0579	2,026	4,052	10.5 ft lb	21.1 ft lb
3/8-16 UNC	.0775	2,712	5,424	16.9 ft lb	33.9 ft lb
3/8-24 UNF	.0876	3,066	6,132	19 ft lb	38.3 ft lb
7/16-14 UNC	.1063	3,720	7,440	26.8 ft lb	54 ft lb
7/16-20 UNF	.1180	4,130	8,260	30 ft lb	60 ft lb
1/2-13 UNC	.1419	4,966	9,930	41 ft lb	82.8 ft lb
1/2-20 UNF	.1600	5,600	11,200	47 ft lb	93 ft lb
5/8-11 UNC	.226	6,743	15,820	83 ft lb	164.7 ft lb
5/8-18 UNF	.255	8,925	17,850	93 ft lb	185.7 ft lb
3/4-10 UNC	.334	11,690	23,380	146 ft lb	292 ft lb
3/4-16 UNF	.372	13,020	26,040	163 ft lb	326 ft lb
7/8-9 UNC	.462	16,170	32,340	236 ft lb	471 ft lb
7/8-14 UNF	.509	17,815	35,630	260 ft lb	520 ft lb
1-8 UNC	.606	21,210	42,420	353 ft lb	707 ft lb
1-14 UNF	.678	23,730	47,460	395 ft lb	791 ft lb

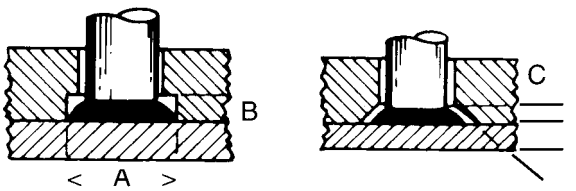
* Torque figures based on assumption that excessive deformation of thread has not taken relationship between torque/tension out of its proportional range.

In actual practice a stud should not be used at its yield load. A factor of safety must be applied. It is generally recommended that studs be used at no more than 60% of yield. However, factor of safety may vary up or down, depending on the particular application. The user will make this determination.

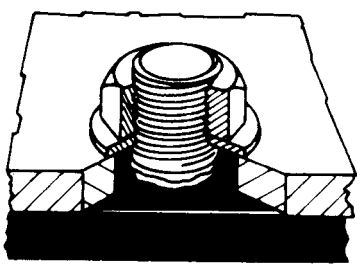
ACCOMODATING THE FILLET

When a stud is end-welded, a fillet forms around its base with the dimensions being closely controlled by the design of the ferrule. Since the diameter of the fillet is generally larger than the diameter of the stud, some consideration is required in the design of mating parts. Counter bore and counter sink methods are commonly used. Dimensions will vary with studs and ferrules. Additional methods of accommodating the fillet include oversized clearance holes, use of a gasket material around the fillet or use of a dog-type construction.

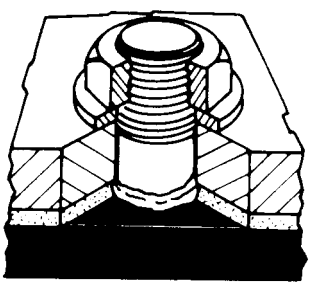
FILLET CLEARANCE FOR ELECTRIC-ARC WELDED FULL BASE STUDS



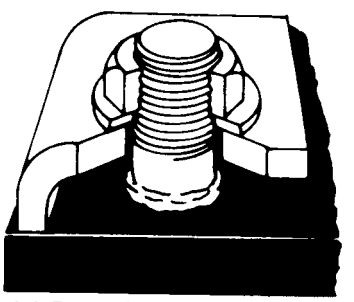
STUD SIZE (in.)	COUNTERBORE (in.)		90° COUNTERSINK (in.)
	A	B	C
1/4	0.437	0.125	0.125
5/16	0.500	0.125	0.125
3/8	0.593	0.125	0.125
7/16	0.656	0.187	0.125
1/2	0.750	0.187	0.187
5/8	0.875	0.218	0.187
3/4	1.125	0.312	0.187



(a) Oversize clearance hole



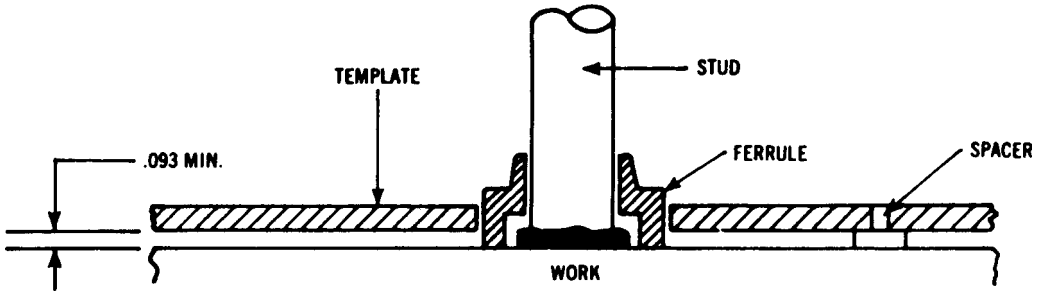
(b) Gasket material



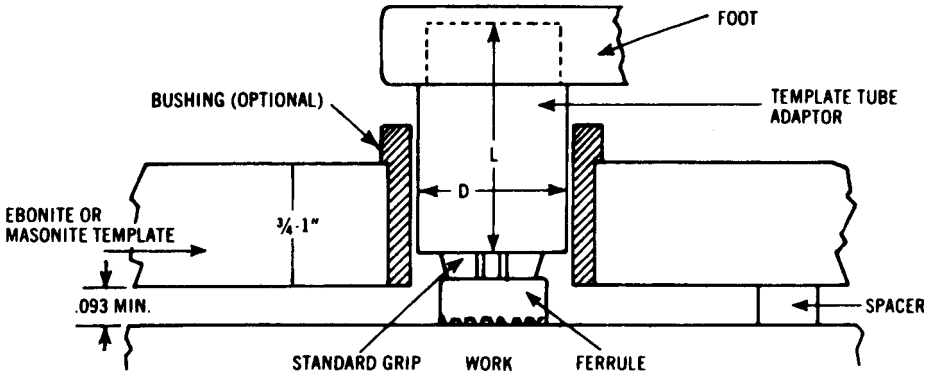
(c) Dog clamp

Reduced base studs are designed so that the weld fillet
does not exceed the maximum diameter of the fastener.
This design is not recommended if full thread diameter fastener strength is required.

Template Design For Stud Locating



This method of templating is recommended for use with all ferrules. The template is usually a steel plate 3/32" to 3/16" thick. Spacers are required to allow the gases to escape during the welding cycle. The ferrule can be held by a standard ferrule grip or where clearance is prohibitive, a tube type set-up can be used. The recommended hole sizes on the template to locate the ferrules should equal the maximum outside diameter of the ferrule plus 1/32". Holes may be drilled or bored at required locations. See stud specification sheets for ferrule detail.



STUD SIZE	D	L
1/2" and under	1.250	2.000
5/8" and under	1.562	2.500
7/8" and larger	2.125	2.500

This method of templating is recommended for use with all stud styles. The design makes it possible to accurately hold angular alignment of the studs as well as stud location. The template should be made of ebonite or masonite of a thickness sufficient to afford good alignment. Bushings may be used to insure greater accuracy and extend the life of the template. Standard copper ferrule grips are used with the tube adapter. This permits standardization of templates since it is only necessary to change the copper ferrule grip to weld studs of different diameters. The hole diameter of the bushing or template should be approximately .010 larger than the maximum outside diameter of the template tub adapter.

RECOMMENDED MINIMUM PLATE THICKNESS OF STEEL AND ALUMINUM FOR ELECTRIC-ARC STUD WELDING

Base Dia. of Stud (in)	STEEL WITHOUT BACKUP (in.)	STEEL WITHOUT BACKUP (gage)	ALUMINUM WITHOUT BACKUP (in.)	ALUMINUM WITH BACKUP (in.)
0.187	0.0359	20	0.125	0.125
0.250	0.0478	18	0.125	0.125
0.312	0.0598	16	0.187	0.125
0.375	0.0747	14	0.187	0.187
0.437	0.0897	13	0.250	0.187
0.500	0.1196	11	0.250	0.250
0.625	0.148	9	0.250	
0.750	0.187			
0.875	0.250			
1.000	0.375			

Weight Chart

ESTIMATED WEIGHTS OF THREADED STUDS IN POUNDS PER 1000 PIECES

LENGTH"	1/4 dia.	5/16 dia.	3/8 dia.	7/16 dia.	1/2 dia.	5/8 dia.	3/4 dia.	7/8 dia.
3/4	8.3	12.8	18.8	25.5	34.5			
1	11.0	17.0	25.0	34.0	46.0	70.0		
1 1/4	13.8	21.3	31.3	42.5	57.5	87.5	133.8	
1 1/2	16.5	25.5	37.5	51.0	69.0	105.0	160.5	243.8
1 3/4	19.3	29.8	43.8	59.5	80.5	122.5	187.3	284.4
2	22.0	34.0	50.0	68.0	92.0	140.0	214.0	325.0
2 1/4	24.8	38.3	56.3	76.5	103.5	157.5	240.8	365.6
2 1/2	27.5	42.5	62.5	85.0	115.0	175.0	267.5	406.3
2 3/4	30.3	46.8	68.8	93.5	126.5	192.5	294.3	446.9
3	33.0	51.0	75.0	102.0	138.0	210.0	321.0	487.5
3 1/4	35.8	55.3	81.3	110.5	149.5	227.5	347.8	528.1
3 1/2	38.5	59.5	87.5	119.0	161.0	245.0	374.5	568.8
3 3/4	41.3	63.8	93.8	127.5	172.5	262.5	401.3	609.4
4	44.0	68.0	100.0	136.0	184.0	280.0	428.0	650.0
4 1/4	46.8	72.3	106.3	144.5	195.5	297.5	454.8	690.6
4 1/2	49.5	76.5	112.5	153.0	207.0	315.0	481.5	731.3
4 3/4	52.3	80.8	118.8	161.5	218.5	332.5	508.3	771.9
5	55.0	85.0	125.0	170.0	230.0	350.0	535.0	812.5
Each Add'l Inch	11.0	17.0	25.0	34.0	46.0	70.0	107.0	162.5
Ferrule	2.0	2.5	3.0	3.5	4.0	5.0	10.0	12.0

ESTIMATED WEIGHTS OF NO-THREAD STUDS IN POUNDS PER 1000 PIECES

LENGTH"	3/16 dia.	1/4 dia.	5/16 dia.	3/8 dia.	7/16 dia.	1/2 dia.	5/8 dia.	3/4 dia.	7/8 dia.
3/4	6.0	10.5	16.4	23.5	31.9	41.7			
1	8.0	14.0	21.8	31.3	42.5	55.6	86.6		
1 1/4	10.0	17.5	27.3	39.1	53.1	69.5	108.3	156.0	
1 1/2	12.0	21.0	32.7	47.0	63.8	83.4	129.9	187.2	254.0
1 3/4	14.0	24.5	38.2	54.8	74.4	97.3	151.6	218.4	297.5
2	16.0	28.0	43.6	62.6	85.0	111.2	173.2	249.6	340.0
2 1/4	18.0	31.5	49.1	70.4	95.6	125.1	194.9	280.8	382.5
2 1/2	20.0	35.0	54.5	78.3	106.3	139.0	216.5	312.0	425.0
2 3/4	22.0	38.5	60.0	86.1	116.9	152.9	238.2	343.2	467.5
3	24.0	42.0	65.4	93.9	127.5	166.8	259.8	374.4	510.0
3 1/4	26.0	45.5	70.9	101.7	138.1	180.7	281.5	405.6	552.5
3 1/2	28.0	49.0	76.3	117.4	148.8	194.6	303.1	436.8	595.0
3 3/4	30.0	52.5	81.8	125.2	159.4	208.5	324.8	468.0	637.5
4	32.0	56.0	87.2	128.6	170.0	222.4	346.4	499.2	680.0
4 1/4	34.0	59.5	92.7	133.0	180.6	236.3	368.1	530.4	722.5
4 1/2	36.0	63.0	98.1	140.9	191.3	250.2	389.7	561.6	765.0
4 3/4	38.0	66.5	103.6	148.7	201.9	264.1	411.4	592.8	807.5
5	40.0	70.0	109.0	156.5	212.5	278.0	433.0	624.0	850.0
Each Add'l Inch	8.0	14.0	21.8	31.3	42.5	55.6	86.6	124.8	170.0
Ferrule	3.0	3.5	4.0	5.0	6.0	7.5	9.0	27.0	37.0

Procedures For Stud Welding Shear Connectors, Headed Anchors and Deformed Bar Anchors

In order to achieve optimum results in any shear connector or headed anchor weld, it is imperative that the following procedures be followed:

1. **Top Flange of Beam**
   The top flange of all beams or plates to be welded should be free of paint, excessive rust or mill scale, dirt, moisture and all other foreign materials. These materials are contaminants to any welding process, but especially stud welding due to the short duration of the weld cycle.

2. **Structural Ground**
   It is always recommended that the welding ground be attached to a spot on a beam that has been ground clean. Poor or inadequate ground connections can result in a loss of weld current and, therefore, affect weld quality.

3. **Power Requirement for Operating Power Source**
   Consult the power source manual or manufacturer for the recommended incoming power requirements prior to energizing the power source. This includes proper fuse selection, and primary cable size and length for the power source being used. Inadequate incoming primary power or incorrect conductor size or length can contribute to a reduction in the required weld current.

4. **Welding Current**
   It is essential to have the correct weld current for each application. The normal ranges are listed below. When excessive cable lengths are used, the result will be a reduction in weld current. This can contribute to weld inconsistency or even weld failure. Always use 4/0 cables in the welding circuit, when excessive length is required. The amount of cable totally depends upon the power source being used. It may be necessary in some cases to parallel cable when long runs are necessary.

1/4" = 350 to 450 amps	**5/8" = 1100 to 1400 amps**
3/8" = 525 to 700 amps	**3/4" = 1450 to 1750 amps**
1/2" = 750 to 925 amps	**7/8" = 1700 to 1950 amps**
	1” = 2000 to 2200 amps

5. Weld Setting

Exact weld settings cannot be given because no two jobs are the same. Actual settings will depend upon jobs site conditions. Listed below are approximate settings.

Stud Base Diameter			Welding Downhand				Welding Overhead				Welding to a Vertical Surface			
in.	mm	Area, in.[a]	Welding Current A	Weld Time, Seconds	Lift, in.	Plunge, in.	Welding Current A	Weld Time, Seconds	Lift, in.	Plunge, in.	Welding Current A	Weld Time, Seconds	Lift, in.	Plunge, in.
1/4	6.4	0.0491	450	.17	0.062	0.125	450	.17	0.062	0.125	450	.17	0.062	0.125
5/16	7.9	0.0767	500	.25	0.062	0.125	500	.25	0.062	0.125	500	.25	0.062	0.125
3/8	9.5	0.1105	550	.33	0.062	0.125	550	.33	0.062	0.125	600	.33	0.062	0.125
7/16	11.1	0.1503	675	.42	0.062	0.125	675	.42	0.062	0.125	750	.33	0.062	0.125
1/2	12.7	0.1964	800	.55	0.062	0.125	800	.55	0.062	0.125	875	.46	0.062	0.125
5/8	15.9	0.3068	1200	.67	0.093	0.187	1200	.67	0.062	0.187	1275	.60	0.062	0.187
3/4	19.1	0.4418	1500	.84	0.093	0.187	1500	.84	0.062	0.187	Consult SWA technical support			
7/8	22.2	0.6013	1700	1.00	0.125	0.250	1700	1.00	0.062	0.250	Consult SWA technical support			
1	25.4	0.7854	1900	1.40	0.125	0.250	2050	1.20	0.062	0.250	Consult SWA technical support			

Gun lift should be measured with a stud and ferrule in place and the gun compressed as if to weld, using an insulated piece of material, such as a piece of wood.

Weld current should also be checked by using an amp meter and should be checked periodically due to cable heating which can cause a reduction in weld current.

NOTE: For 3/4" weld thru deck application settings, consult your local Stud Welding Associates representative.

6. Testing of Welded Studs

At least two studs should be bent in any direction to a 30 degree angle from weld position striking with a hammer or bending with a pipe. For deformed bar anchors, bend around a pin the diameter that is equal to twice the diameter of the specimen. If a failure occurs, re-adjust settings and repeat test. Once the set-up has been approved, production may be started. It is a good idea to test two or three studs every half hour to assure that the set-up has not changed. This can be accomplished by bending several studs to a 15 degree angle from weld position. If a failure does not occur, the welds should be considered good. It is not necessary to straighten a stud that is bent. Testing should be carried out at the beginning of each day, after any change in operator, or if the set-up is changed in any way.

7. Visual Inspection

Visual inspection should show a full 360 degree weld fillet, although not necessarily the same fillet height around the circumference of the stud. An under cut at the weld interface will be cause for rejection. If the fillet is something less than 360 degrees complete the fillet by hand welding. The studs should then be tested by bending 15 degrees from their original axis either by striking with a hammer or placing a pipe over the stud and manually or mechanically bending the stud. If a failure does not occur, the weld should be considered good. If the weld fails, the studs should be replaced. (See AWS D1.1, Section 7.8.1)

8. General Information

A) Keep ferrules dry; wet ferrules cannot be used.

B) Keep studs dry; rusty studs cause welding problems and premature chuck failure

C) Do not weld when the temperature of the base material is below 0 degrees F per AWS D1.1, Section 7.5.4.

D) Do not attempt to weld through more than 2 thicknesses of galvanized decking.

E) Do not weld where water is present on the weld surface.

F) Do not weld through dirt, sand or other foreign material.

G) Beam flanges should be free of paint, rust and any other foreign material.

H) If welding thru deck, deck must be tight against beam flange.

I) Weld studs in the center of beam flange whenever possible to eliminate arc blow.

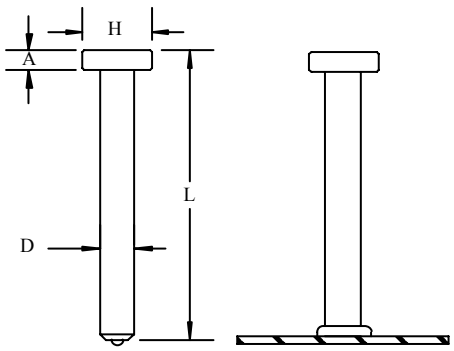
J) Hold gun perpendicular to base material.

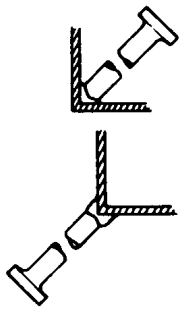
K) Test weld set-up at the start of each day and every half hour.

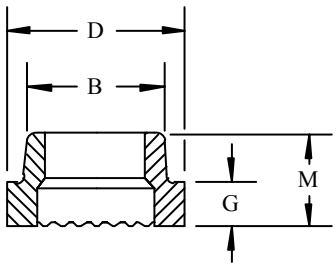
9. Certification

Certification of personnel for stud welding applications is available from SWA personnel upon request.

HA HEADED ANCHOR







For welding to fillet or heel of angle consult a Stud Welding Associates representative for ferrule part number.

STUD SPECIFICATIONS / FERRULE SPECIFICATIONS

D	H	A	No.	D	B	G	M
1/4	.500	.187	FF-025	.454	.380	.234	.390
3/8	.750	.281	FF-037	.640	.505	.234	.390
1/2	1.000	.281	FF-050	.795	.650	.250	.438
5/8	1.250	.312	FF-062	1.030	.785	.328	.516

Description D" L"	Part Number	Weight (lbs.) Per 1000	Pieces Per Standard Box
1/4 x 1 1/8	HA0250112	24	2000
1/4 x 2 11/16	HA0250268	43	1000
1/4 x 4 1/8	HA0250412	65	1000
3/8 x 1 3/8	HA0370137	69	1000
3/8 x 1 5/8	HA0370162	75	500
3/8 x 2 1/8	HA0370212	93	500
3/8 x 2 5/8	HA0370262	108	500
3/8 x 3 1/8	HA0370312	126	500
3/8 x 4 1/8	HA0370412	155	250
3/8 x 6 1/8	HA0370612	218	250

Description D" L"	Weight (lbs.) Per 1000	Part Number	Pieces Per Standard Box
1/2 x 1 1/8	114	HA0500112	500
1/2 x 1 5/8	130	HA0500162	500
1/2 x 2 1/8	170	HA0500212	250
1/2 x 2 5/8	197	HA0500262	250
1/2 x 3 1/8	226	HA0500312	250
1/2 x 3 5/8	259	HA0500362	250
1/2 x 4 1/8	292	HA0500412	250
1/2 x 5 5/16	341	HA0500531	200
1/2 x 6 1/8	393	HA0500612	150
1/2 x 8 1/8	504	HA0500812	100
1/2 x 10 1/8	680	HA05001012	75
5/8 x 1 7/16	208	HA0620143	250
5/8 x 2 11/16	315	HA0620268	200
5/8 x 3 3/16	360	HA0620318	200
5/8 x 4 3/16	450	HA0620418	100
5/8 x 5 3/16	560	HA0620518	100
5/8 x 6 9/16	652	HA0620656	100
5/8 x 8 3/16	793	HA0620818	75
5/8 x 10 3/16	1036	HA06201018	75

All Stud Welding Associates Headed Anchor Studs meet AWS specifications D1.1. International specifications BS5950, BS5400, DIN/ISO also available. Test reports available on request.

HEADED ANCHOR STUDS are used in all types of concrete connections. They can be welded to a flat surface, or in the fillet, or on the heel of an angle.
FERRULES: All orders for studs include required ferrules.

LENGTH: Length is before weld. Stud diameters (D) 1/2" and below will be approximately 1/8" shorter after welding.
5/8" will be approximately 3/16" shorter after welding.
Made to order lengths available upon request.

MATERIAL: Low carbon steel. ASTM A108, 1010-1020

HA studs are also available in stainless steel.

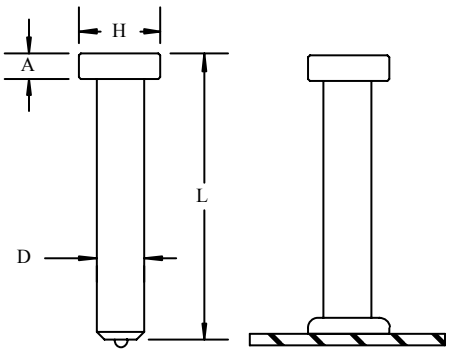
1 Type A studs shall be general purpose of any type and size used for purposes other than shear transfer in composite beam design and construction.

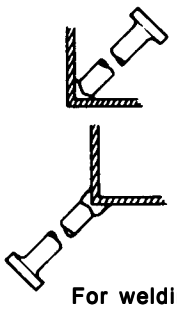
2 Type B studs shall be studs that are headed, bent, or of other configuration in 1/2 in. (12.7 mm), 5/8 in. (15.9 mm), 3/4 in. (19 mm), 7/8 in. (22.2 mm) and 1 in. (25.4 mm) diameter that are used as an essential component in composite beam design and construction.

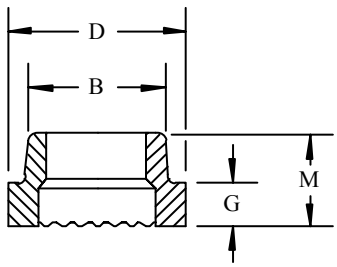
Mechanical Property Requirements

	Type A[1]	Type B[2]
Tensile strength	61,000 psi min (420 MPa)	65,000 psi min (450 MPa)
Yield strength (0.2% offset)	49,000 psi min (340 MPa)	51,000 psi min (350 MPa)
Elongation (% in 2 in.)	17% min	20% min
(% in 5x dia.)	14% min	15% min
Reduction of area	50% min	50% min

SC SHEAR CONNECTOR







For welding to fillet or heel of angle consult a Stud Welding Associates representative for ferrule part number.

3/4" DIAMETER SHEAR CONNECTORS

Stud Specifications			Ferrule Specifications					
D	H	A	Type	No.	D	B	G	M
3/4	1 1/4	3/8	Flat Surface	FF-075	1.215	1.030	.469	.656
			Weld Through Deck	FW-075	1.325	1.210	.406	.600

Standard Length"	Part Number	Weight (lbs.) Per 1000	Pieces Per Standard Box
2.20	SC0750220	356	250
3 3/16	SC0750318	486	125
3 3/8	SC0750337	509	125
3 7/8	SC0750387	572	100
4 3/16	SC0750418	611	100
4 3/8	SC0750437	640	100
4 7/8	SC0750487	707	75
5 3/16	SC0750518	736	60
5 3/8	SC0750537	759	60
5 7/8	SC0750587	832	60
6 3/16	SC0750618	861	60
7 3/16	SC0750718	987	50
8 3/16	SC0750818	1112	60
9 3/16	SC0750918	1240	50
10 3/16	SC0751018	1373	50

7/8" DIAMETER SHEAR CONNECTORS

Stud Specifications			Ferrule Specifications					
D	H	A	Type	No.	D	B	G	M
7/8	1 3/8	3/8	Flat Surface	FF-087	1.408	1.210	.545	.732

Standard Length	Part Number	Weight (lbs.) Per 1000	Pieces Per Standard Box
3 3/16	SC0870318	640	100
3 11/16	SC0870368	726	100
4 3/16	SC0870418	811	75
5 3/16	SC0870518	981	60
6 3/16	SC0870618	1153	60
7 3/16	SC0870718	1322	50
8 3/16	SC0870818	1473	45
9 3/16	SC0870918	1642	40
10 3/16	SC0871018	1800	40

Mechanical Property Requirements

	Type A[1]	Type B[2]
Tensile strength	61,000 psi min (420 MPa)	65,000 psi min (450 MPa)
Yield strength (0.2% offset)	49,000 psi min (340 MPa)	51,000 psi min (350 MPa)
Elongation (% in 2 in.)	17% min	20% min
(% in 5x dia.)	14% min	15% min
Reduction of area	50% min	50% min

All Stud Welding Associates Shear Connector Studs meet AWS specifications D1.1. International specifications BS5950, BS5400, DIN/ISO also available. Test reports available on request.

SHEAR CONNECTOR STUDS are designed to tie the concrete to the steel beams and to resist shear loadings between the concrete slab and steel beam in composite construction.

FERRULES: All orders for studs include required ferrules. Specify thru deck or flat ferrules.

LENGTH: Length is before weld. Stud when welded to base metal will be approximately 3/16" shorter after weld and when welded thru-deck 3/8" shorter after weld. Lengths for shear connector studs are generally set by governing specifications. Consult your SWA representative for other lengths available for specific applications. **Made to order lengths available upon request.**

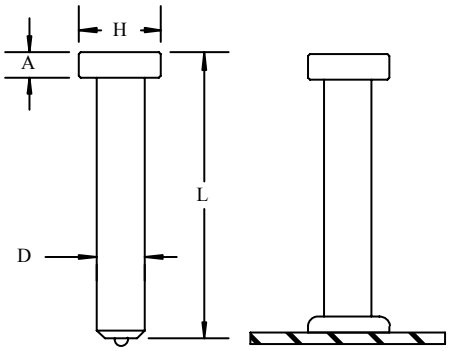
MATERIAL: Low carbon steel. ASTM A108, 1010-1020.

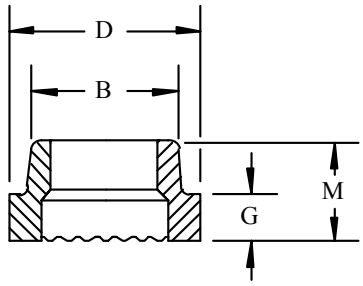
SC studs are also available in stainless steel.

1 Type A studs shall be general purpose of any type and size used for purposes other than shear transfer in composite beam design and construction.

2 Type B studs shall be studs that are headed, bent, or of other configuration in 1/2 in. (12.7 mm), 5/8 in. (15.9 mm), 3/4 in. (19 mm), 7/8 in. (22.2 mm) and 1 in. (25.4 mm) diameter that are used as an essential component in composite beam design and construction.

SC SHEAR CONNECTOR





For welding to fillet or heel of angle consult a Stud Welding Associates representative for ferrule part number.

1" DIAMETER SHEAR CONNECTORS

Stud Specifications			Ferrule Specifications					
D	H	A	Type	No.	D	B	G	M
1	1 5/8	1/2	Flat Surface	FF-100	1.620	1.416	.633	.835

Standard Length"	Part Number	Weight (lbs.) Per 1000	Pieces Per Standard Box
4 1/4	SC1000425	1133	75
5 1/4	SC1000525	1383	60
6 1/4	SC1000625	1600	60
8 1/4	SC1000825	2050	40
9 1/4	SC1000925	2225	40
10 1/4	SC1001025	2475	35

All Stud Welding Associates Shear Connector Studs meet AWS specifications D1.1. International specifications BS5950, BS5400, DIN/ISO also available. Test reports available on request.

SHEAR CONNECTOR STUDS are designed to effectively tie the concrete to the steel beams and to resist shear loadings between the concrete slab and steel beam in composite construction.
FERRULES: All orders for studs include required ferrules.

LENGTH: Length is before weld. Stud will be approximately 1/4" shorter after welding. Lengths for shear connector studs are generally set by governing specifications. Consult your SWA representative for other lengths available for specific applications. **Made to order lengths available upon request.**

MATERIAL: Low carbon steel ASTM 108, 1010-1020.

STAINLESS STEELS: SC studs are also available in stainless steel.

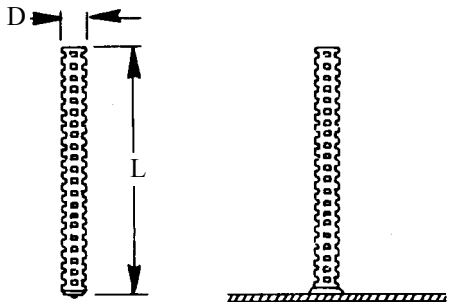
Mechanical Property Requirements

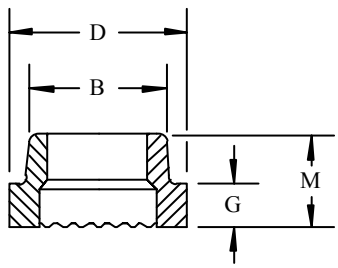
	Type A[1]	Type B[2]
Tensile strength	61,000 psi min (420 MPa)	65,000 psi min (450 MPa)
Yield strength (0.2% offset)	49,000 psi min (340 MPa)	51,000 psi min (350 MPa)
Elongation (% in 2 in.)	17% min	20% min
(% in 5x dia.)	14% min	15% min
Reduction of area	50% min	50% min

1 Type A studs shall be general purpose of any type and size used for purposes other than shear transfer in composite beam design and construction.

2 Type B studs shall be studs that are headed, bent, or of other configuration in 1/2 in. (12.7 mm), 5/8 in. (15.9mm), 3/4 in. (19 mm), 7/8 in. (22.2 mm) and 1 in. (25.4 mm) diameter that are used as an essential component in composite beam design and construction.

DA DEFORMED BAR ANCHOR





	STUD SPECIFICATIONS				FERRULE SPECIFICATIONS				
Description D" L"	Parts Number	Weight (lbs.) Per 1000	Pieces Per Standard Box	D	No.	B	D	G	M
3/8 x 10 1/8	DA0371012	288	1000	3/8	FF-037	.505	.640	.234	.390
3/8 x 12 1/8	DA0371212	344	1000						
3/8 x 18 1/8	DA0371812	515	700						
3/8 x 24 1/8	DA0372412	685	700						
3/8 x 30 1/8	DA0373012	897	700						
3/8 x 36 1/8	DA0373612	1029	700						
3/8 x 48 1/8	DA0374812	1394	700						
1/2 x 8 1/8	DA0500812	451	100	1/2	FF-050	.650	.795	.250	.438
1/2 x 10 1/8	DA0501012	529	700						
1/2 x 12 1/8	DA0501212	680	700						
1/2 x 18 1/8	DA0501812	972	350						
1/2 x 24 1/8	DA0502412	1292	350						
1/2 x 30 1/8	DA0503012	1560	350						
1/2 x 36 1/8	DA0503612	1879	350						
1/2 x 42 1/8	DA0504212	2174	350						
1/2 x 48 1/8	DA0504812	2502	350						
5/8 x 12 3/16	DA0621218	997	500	5/8	FF-062	.785	1.030	.328	.516
5/8 x 18 3/16	DA0621818	1633	250						
5/8 x 24 3/16	DA0622418	2136	250						
5/8 x 30 3/16	DA0623018	2666	250						
5/8 x 36 3/16	DA0623618	3196	250						
5/8 x 42 3/16	DA0624218	3482	250						
5/8 x 48 3/16	DA0624818	3962	250						
3/4 x 12 3/16	DA0751218	1525	250	3/4	FF-075	1.215	1.030	.469	.656
3/4 x 18 3/16	DA0751818	2276	125						
3/4 x 24 3/16	DA0752418	3027	125						
3/4 x 30 3/16	DA0753018	3778	125						
3/4 x 36 3/16	DA0753618	4529	125						

All Stud Welding Associates Deformed Bar Anchor Studs meet AWS specifications D1.1. Test reports available on request.

DEFORMED BAR ANCHORS are designed for weld and bearing plates in concrete connections.
FERRULES: All orders for studs include required ferrules.

LENGTH: Length is before weld. Stud diameters (D) 1/2" and smaller will be approximately 1/8" shorter after welding. 5/8" and larger will be approximately 3/16" shorter after welding. **Made to order lengths available upon request.**

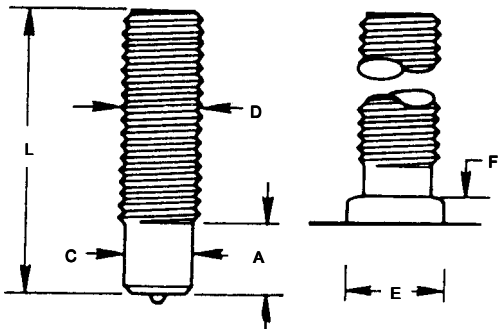
MATERIAL: Low carbon steel ASTM: A-496

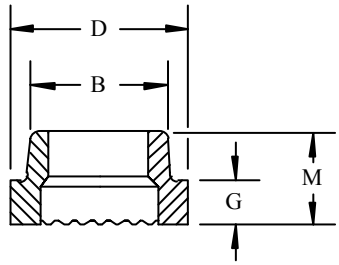
Mechanical Property Requirements

	Type C[3]
Tensile strength	80,000 psi min (552 MPa)
Yield strength (0.2% offset)	–
(0.5% offset)	70,000 psi min (485MPa)
Elongation (% in 2 in.)	–
Reduction of area	–

3 Type C studs are cold-worked deformed steel bars manufactured in accordance with specification ASTM A496 having a nominal diameter equivalent to the diameter of a plain wire having the same weight per foot as the deformed wire. ASTM A496 specifies a maximum diameter of 0.628 in. (16 mm) maximum. Any bar supplied above that diameter must have the same physical characteristics regarding deformations as required by ASTM A496

PT Partial Thread Stud





STUD SPECIFICATIONS						FERRULE SPECIFICATIONS				
				FILLET DIMENSIONS						
D	Min. L.	C	A	E	F	No.	D	B	G	M
1/4 - 20	5/8	.215	3/8	5/16	3/32	FP-025	.455	.385	.125	.250
5/16 - 18	43/64	.275	3/8	13/32	7/64	FP-031	.535	.445	.125	.250
3/8 - 16	27/32	.330	3/8	15/32	7/64	FP-037	.590	.505	.139	.264
7/16 - 14	15/16	.387	7/16	17/32	1/8	FP-043	.675	.585	.173	.329
1/2 - 13	11/32	.444	1/2	19/32	5/32	FP-050	.740	.650	.206	.362
5/8 - 11	113/64	.562	5/8	3/4	3/16	FP-062	.910	.785	.277	.433
3/4 - 10	17/16	.680	51/64	59/64	1/4	FP-075	1.150	1.030	.339	.526
7/8 - 9	139/64	.798	55/64	13/64	5/16	FP-087	1.330	1.210	.406	.593
1 - 8	151/64	.915	59/64	13/16	11/32	FP-100	1.526	1.406	.474	.661

PARTIAL THREAD STUDS are designed for a wide variety of applications where maximum strength and economy are required.

MATERIAL: Low carbon steel ASTM A 108 1010-1020. Stainless steel 18-8

HOW TO ORDER

Specify diameter, thread size, before weld (BW) length, type of material.

EXAMPLE

1/2-13 x 1-1/8" (BW) Partial Thread (PT), mild steel

HOW TO DETERMINE BEFORE WELD (BW) LENGTH

First establish the standing length of the stud after weld (AW).

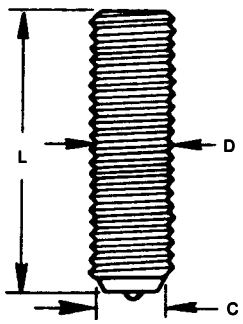
Based on the diameter of the stud include the following additional length before weld (BW).

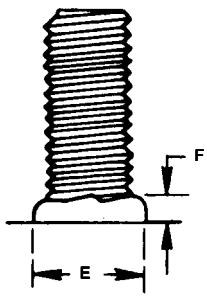
Diameters up through 9/16" add 1/8"

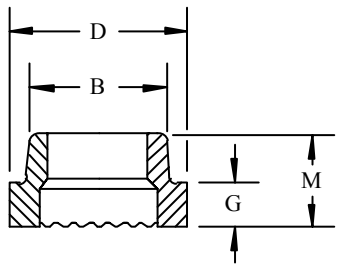
Diameters from 5/8" through 7/8" add 3/16"

Diameters 1" through 1-1/4" add 1/4"

FT FULL THREAD STUD







STUD SPECIFICATIONS					FERRULE SPECIFICATIONS				
			FILLET DIMENSIONS						
D	Min. L.	C	E	F	No.	D	B	G	M
10 - 24	25/32	.187	9/32	3/32	FF-019	.390	.305	.234	.390
1/4 - 20	25/32	.187	23/64	7/64	FF-025	.454	.380	.234	.390
5/16 - 18	25/32	.187	7/16	7/64	FF-031	.578	.445	.234	.390
3/8 - 16	25/32	.187	1/2	1/8	FF-037	.640	.505	.234	.390
7/16 - 14	25/32	.187	37/64	9/64	FF-043	.703	.585	.234	.422
1/2 - 13	13/16	.187	11/16	5/32	FF-050	.795	.650	.250	.438
5/8 - 11	31/32	.187	51/64	3/16	FF-062	1.030	.785	.328	.516
3/4 - 10	1 15/64	.187	15/16	1/4	FF-075	1.215	1.030	.469	.656
7/8 - 9	1 1/2	.375	1 3/32	5/16	FF-087	1.408	1.210	.545	.732
1 - 8	1 17/32	.375	1 15/64	3/8	FF-100	1.615	1.406	.633	.820

FULL THREAD STUDS are designed for where close run-down of the nut is required.

MATERIAL: Low carbon steel ASTM A 108 1010-1020. Stainless steel 18-8

HOW TO ORDER

Specify diameter, thread size, before weld (BW) length, type of material.

EXAMPLE

1/2-13 x 1-1/8" (BW) Full Thread (FT), mild steel.

HOW TO DETERMINE BEFORE WELD (BW) LENGTH

First establish the standing length of the stud after weld (AW).

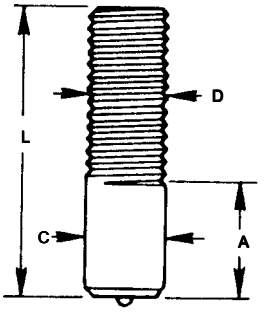
Based on the diameter of the stud include the following additional length before weld (BW).

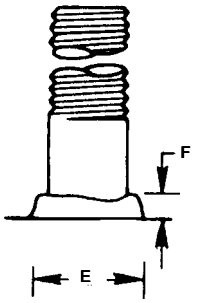
Diameters up through 9/16" add 1/8"

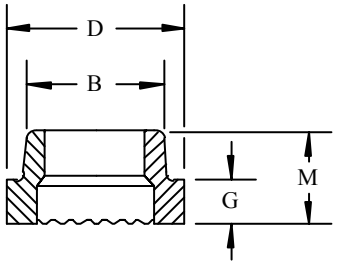
Diameters from 5/8" through 7/8" add 3/16"

Diameters 1" through 1-1/4" add 1/4"

FB FULL BASE THREADED STUD







STUD SPECIFICATIONS						FERRULE SPECIFICATIONS				
				FILLET DIMENSIONS						
D	Min. L.	C	A	E	F	No.	D	B	G	M
1/4 - 20	25/32	1/4	.187	23/64	7/64	FF-025	.455	.380	.234	.390
5/16 - 18	25/32	5/16	.250	7/16	7/64	FF-031	.578	.445	.234	.390
3/8 - 16	25/32	3/8	.265	1/2	1/8	FF-037	.640	.505	.234	.390
7/16 - 14	25/32	7/16	.281	19/32	9/64	FF-043	.703	.585	.234	.422
1/2 - 13	13/16	1/2	.296	11/16	5/32	FF-050	.795	.650	.250	.438
5/8 - 11	31/32	5/8	.359	7/8	3/16	FF-062	1.030	.785	.328	.516
3/4 - 10	1 15/64	3/4	.500	1 1/16	1/4	FF-075	1.215	1.030	.469	656
7/8 - 9	1 1/2	7/8	.625	1 1/8	5/16	FF-087	1.408	1.210	.545	.732
1 - 8	1 41/64	1	.750	1 3/8	3/8	FF-100	1.610	1.406	.633	.820

FULL BASE STUDS are used where additional shear strength is required at the weld.

MATERIAL: Low carbon steel ASTM A 108 1010-1020. Stainless steel 18-8

HOW TO ORDER

Specify diameter, thread size, before weld (BW) length, type of material.

EXAMPLE

1/2-13 x 1-1/8" (BW) Full Base (FB), mild steel.

HOW TO DETERMINE BEFORE WELD (BW) LENGTH

First establish the standing length of the stud after weld (AW).

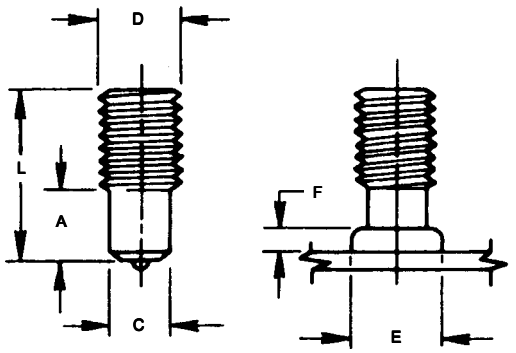
Based on the diameter of the stud include the following additional length before weld (BW).

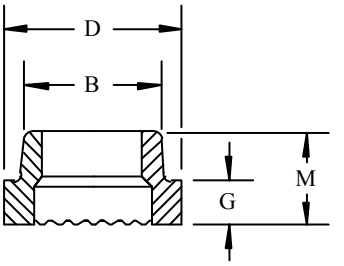
Diameters up through 9/16" add 1/8"

Diameters from 5/8" through 7/8" add 3/16"

Diameters 1" through 1-1/4" add 1/4"

RB REDUCED BASE STUD





STUD SPECIFICATIONS						FERRULE SPECIFICATIONS					
				FILLET DIMENSIONS							
D	Min. L.	C	A	E	F	No.	D	B	G	M	A
1/4 - 20	3/4	.187	.187	17/64	1/8	FB-025	.455	.380	.240	.380	.260
5/16 - 18	3/4	.272	.187	5/16	1/8	FB-031	.578	.445	.315	.455	.322
3/8 - 16	3/4	.312	.375	27/64	1/8	FM-037	.590	.505	.125	.250	.420
1/2 - 13	1	.437	.437	9/16	5/32	FM-050	.740	.650	.125	.281	.555
5/8 - 11	1 1/4	.500	.547	39/64	11/64	FM-062	.875	.785	.174	.300	.620
3/4 - 10	1 1/2	.620	.797	49/64	9/32	FM-075	1.030	.945	.235	405	.765
7/8 - 9	1 1/2	.745	.922	15/16	21/64	FF-075	1.235	1.030	.469	.656	.935
1 - 8	1 3/4	.875	1.078	1 1/16	11/32	FF-087	1.430	1.210	.520	.715	1.060

REDUCED BASE STUDS are designed for small clearance holes and where close run-down of nuts are essential.

MATERIAL: Low carbon steel ASTM A 108 1010-1020. Stainless steel 18-8

* Specified reduced base dimensions are industry standards.

Alternate reduced base dimensions can be manufactured to specifications.

HOW TO ORDER

Specify diameter, thread size, before weld (BW) length, type of material.

EXAMPLE

3/8-16 x 1" (BW) Reduce Base (RB), mild steel.

HOW TO DETERMINE BEFORE WELD (BW) LENGTH

First establish the standing length of the stud after weld (AW).

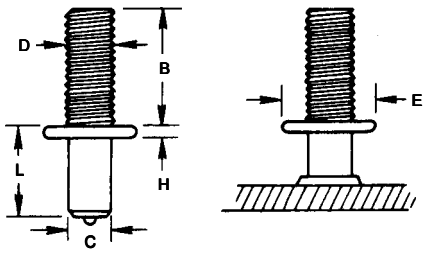
Based on the diameter of the stud include the following additional length before weld (BW).

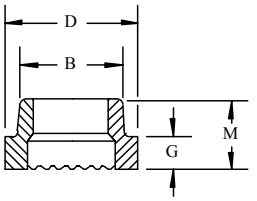
Diameters up through 9/16" add 1/8"

Diameters from 5/8" through 7/8" add 3/16"

Diameters 1" through 1-1/4" add 1/4"

CK COLLAR STUDS





COLLAR STUDS are used to provide a spacer between the parent metal and the part secured on threaded extension.

HOW TO ORDER

Specify base diameter, before weld (BW) length to the top of the collar, thread size and length, type of material.

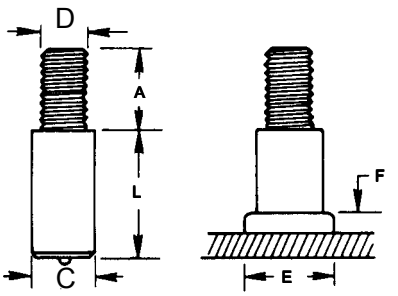
EXAMPLE

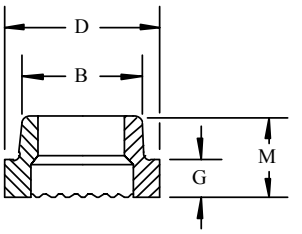
.330 x 1-1/2" (BW) with a 3/8 -16 x 3/4" thread extension, collar stud (CK), mild steel.

STUD SPECIFICATIONS						FERRULE SPECIFICATIONS				
D	Std. B	Min. L.	C	E	H	No.	D	B	G	M
1/4 - 20	5/8	3/8	.214	1/2	3/32	FK-025	.875	.785	.145	.255
5/16 - 18	5/8	3/8	.273	5/8	3/32	FK-031	.875	.785	.145	.255
3/8 - 16	5/8	3/8	.331	5/8	3/32	FK-037	.875	.785	.145	.255
1/2 - 13	3/4	1/2	.446	3/4	3/32	FK-050	1.200	1.040	.135	.290

MATERIAL: Low carbon steel ASTM A 108 1010-1020. Stainless steel 18-8

SB SHOULDER STUDS





SHOULDER STUDS are used to provide a spacer between the parent material and the finished part.

HOW TO ORDER

Specify base diameter, before weld (BW) length of the base, thread size and length, type of material.

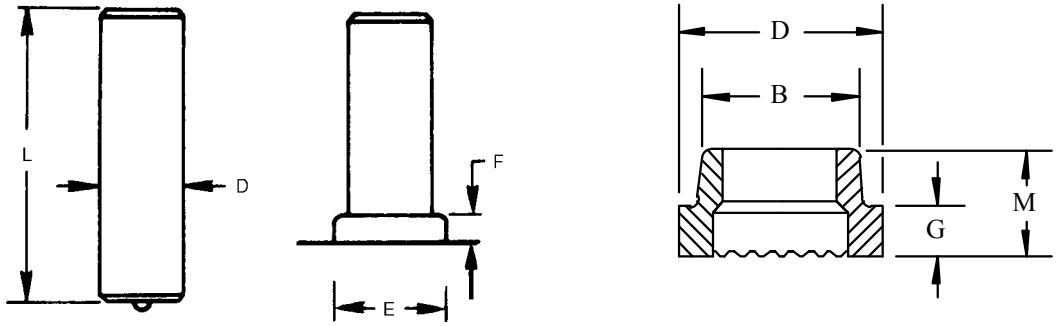
EXAMPLE

1/2" base diameter, 1-1/8" before weld (BW) length, with a 3/8-16" x 3/4" thread extension (SB), stainless steel.

STUD SPECIFICATIONS					FERRULE SPECIFICATIONS				
D	C	Min. L.	E	F	No.	D	B	G	M
1/4 - 20	3/8	3/8	1/2	1/8	FF-037	.640	.505	.234	.390
5/16 - 18	7/16	3/8	19/32	9/64	FF-043	.703	.585	.234	.422
3/8 - 16	1/2	3/8	11/16	5/32	FF-050	.795	.650	.250	.438
1/2 - 13	5/8	1/2	7/8	3/16	FF-062	1.030	.785	.328	.516

MATERIAL: Low carbon steel ASTM A 108 1010-1020. Stainless steel 18-8

NT No Thread Studs



STUD SPECIFICATIONS				FERRULE SPECIFICATIONS				
		FILLET DIMENSIONS						
D	Min. L.	E	F	No.	D	B	G	M
3/16	25/32	9/32	3/32	FF-019	.390	.305	.234	.390
1/4	25/32	23/64	7/64	FF-025	.455	.385	.234	.390
5/16	25/32	7/16	7/64	FF-031	.578	.445	.234	.390
3/8	25/32	1/2	1/8	FF-037	.640	.505	.234	.390
7/16	25/32	19/32	9/64	FF-043	.703	.585	.234	.422
1/2	13/16	11/16	5/32	FF-050	.795	.650	.250	.438
5/8	31/32	7/8	3/16	FF-062	1.030	.785	.328	.516
3/4	1 15/64	1 1/64	1/4	FF-075	1.215	1.030	.469	.656
7/8	1 1/2	1 1/8	5/16	FF-087	1.408	1.210	.545	.732
1	1 41/64	1 3/8	3/8	FF-100	1.610	1.406	.633	.820

MATERIAL: Low carbon steel ASTM A 108 1010-1020. Stainless steel 18-8

HOW TO ORDER

Specify base diameter, before weld (BW) length, tap size and depth, type of material.

EXAMPLE

3/8 x 1-1/2" (BW) No Thread (NT), stainless steel.

HOW TO DETERMINE BEFORE WELD (BW) LENGTH

First establish the standing length of the stud after weld (AW).

Based on the diameter of the stud include the following additional length before weld (BW).

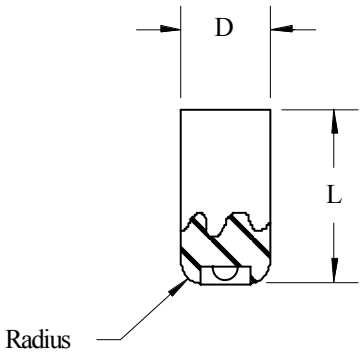
Diameters up through 9/16" add 1/8"

Diameters from 5/8" through 7/8" add 3/16"

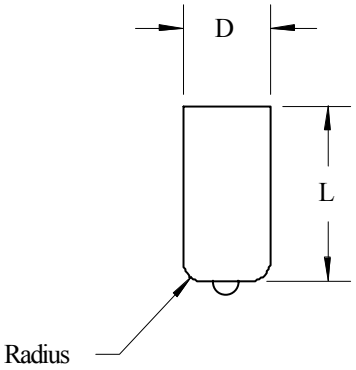
Diameters 1" through 1-1/4" add 1/4"

BT BOILER TUBE PINS

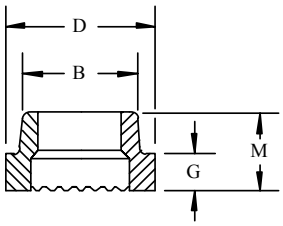
CONCAVE
(relining)



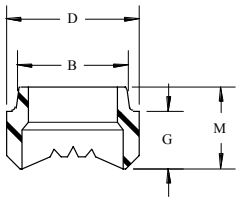
CONVEX
(new lining/relining)



FERRULE



BOILER TUBE FERRULE



STUD SPECIFICATIONS	
DIMENSION	**LENGTH**
3/8”	Specify, before weld
1/2”	Specify, before weld

FERRULE SPECIFICATIONS				
NO.	**B**	**D**	**G**	**M**
FF037	.505	.640	.240	.390
FF050	.650	.795	.265	.445
*FR037	.505	.640	.240	.390
**FR050	.650	.795	.366	.563

BOILER TUBE HEAT TRANSFER PINS are designed for power, or waste boiler/incinerator lining and re-lining.

Specify if auto feed quality is required.

MATERIAL: Low carbon steel ASTM A 108. Stainless steel 430, 302, 304

* 3/8” Radius (.750)

** 1/2” Radius (.812)

Pipe diameter equals radius x 2.

HOW TO ORDER

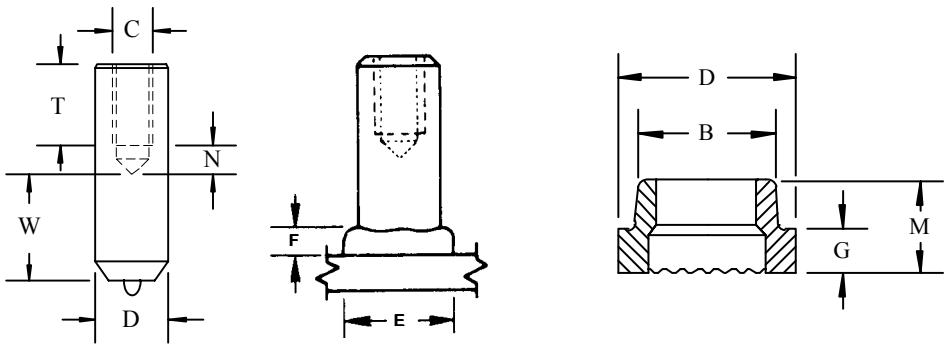
Specify base diameter, before weld (BW) length, type of material.

EXAMPLE

3/8” x 3/4" (BW) Boiler Tube (BT), stainless steel 430.

TS

Tapped Stud



STUD SPECIFICATIONS								FERRULE SPECIFICATIONS				
					Fillet Dimension							
D	C	T	N	W	E	F		No.	D	B	G	M
1/4	#8-32	0.250	0.125	0.125	0.359	0.109		FF-025	.454	.380	.234	.390
5/16	#10-24	0.281	0.156	0.140	0.437	0.109		FF-031	.578	.445	.234	.390
3/8	1/4-20	0.375	0.203	0.140	0.500	0.125		FF-037	.640	.505	.234	.390
7/16	5/16-18	0.468	0.234	0.156	0.596	0.140		FF-043	.703	.585	.234	.422
1/2	3/8-16	0.562	0.265	0.156	0.687	0.156		FF-050	.795	.650	.250	.438
5/8	1/2-13	0.750	0.319	0.218	0.921	0.187		FF-062	1.030	.785	.328	.516
3/4	5/8-11	0.937	0.406	0.250	1.062	0.250		FF-075	1.215	1.030	.469	.656
7/8	3/4-10	1.125	0.453	0.281	1.125	0.312		FF-087	1.408	1.210	.545	.732
1	7/8-9	1.312	0.531	0.280	1.375	0.375		FF-100	1.620	1.406	.633	.820

MATERIAL: Low carbon steel ASTM A 108 1010-1020. Stainless steel 18-8
C= Maximum tap diameter
T= Minimum tap depth
N= Thread lead clearance
W= Minimum weld base length
Standard Threads: Studs have internal UNC Threads, also available in UNF Threads
ALSO AVAILABLE IN REDUCED BASE

HOW TO ORDER

Specify base diameter, finished length before weld (BW) length, tap size, tap depth and type of material.

EXAMPLE

5/8 x 1-1/4" (BW) Tapped Stud (TS) with a 3/8-16 x 7/16 tap, mild steel.

HOW TO DETERMINE BEFORE WELD (BW) LENGTH

First establish the standing length of the stud after weld (AW).

Based on the diameter of the stud include the following additional length before weld (BW).

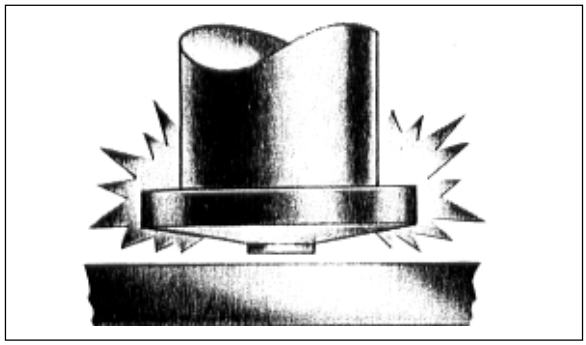
Diameters up through 9/16" add 1/8"

Diameters from 5/8" through 7/8" add 3/16"

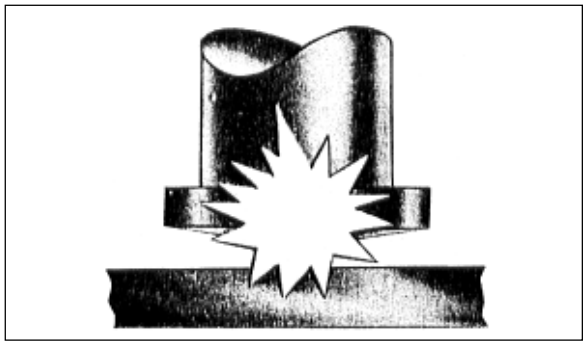
Diameters 1" through 1-1/4" add 1/4"

The Process

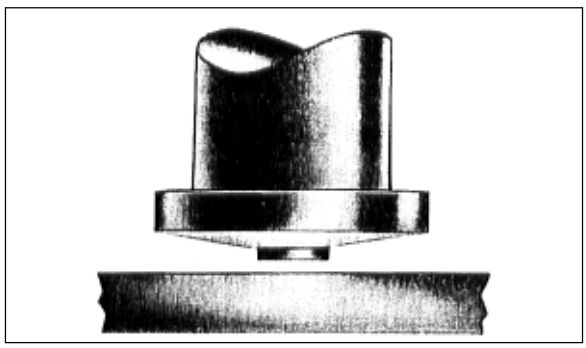
The Capacitor Discharge (CD) Stud Welding process



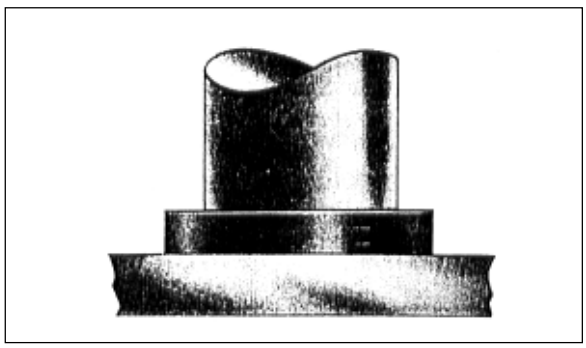
1. STUD AGAINST WORK.



2. STORED ENERGY DISCHARGED THROUGH SPECIAL WELD 'TIMING' TIP AND STUD STARTS DOWNWARD.



3. STUD FORCED INTO MOLTEN METAL.



2. METAL SOLIDIFIES AND WELD IS COMPLETED IN MILLISECONDS.

Capacitor Discharge (CD) stud welding involves the same basic principles and metallurgical aspects as any other arc welding procedure.

When the weld gun is activated, a special precision weld tip initiates a controlled electric arc from the welder capacitor bank which melts the end of the stud and a portion of the base metal.

The stud is held in place as the molten metal solidifies instantly accomplishing a high quality fusion weld.

CD stud welding is generally used to weld smaller diameter studs to thin base metals, especially where reverse side marking is not permissible. Since the entire weld cycle is completed in milliseconds, welds can be made to thin material without pronounced distortion, burn-through or reverse side discolortation. As long as one end of the stud is designed for CD welding, CD studs can be manufactured in almost any shape.

CD stud welding is compatible with just about any weldable material, and permits the welding of dissimilar metals.

General Information

	CAPACITOR DISCHARGE	ARC
MATERIAL:	Low carbon steel, 18-8 stainless, and 6061, and 5000 series aluminum. Brass and other grades of stainless steel are also available.	Low carbon steel and 18-8 stainless. Aluminum, monel, inconel, and other grades of stainless steel are available.
PLATING:	Copper plating is standard. Nickel, zinc, and other platings are available.	Zinc to ASTM-B 633 (formerly A 164) and other platings are available. Non-weldable plating is removed from the weld end to avoid contamination of the weld.
ANNEALING:	All low carbon steel and stainless steel studs are annealed where required.	Low carbon steel can be annealed to a maximum of 75 Rockwell B and a stainless steel to a maximum of 90 Rockwell B.
THREADS:	UNC-2A is standard for external threads prior to plating and UNC-2B for internal threads. Metric and other thread sizes are available.	
WELD BASE:	Flanged, mini-flanged, and non-flanges are available.	1/4" diameter and over have solid flux. Diameters under 1/4" are standard pointed, and flux is optional.
STUD LENGTH:	CD studs have no appreciable length reduction after welding.	Arc Stud length reduction varies with stud diameter. Consult chart below.
FERRULES:	Does not apply to CD.	All orders include ferrules when they are required.

Sizes not specified can be made to order on request.

ARC STUD LENGTH REDUCTION AFTER WELD

STUD DIAMETER	APPROXIMATE REDUCTION
3/16" thru 1/2"	1/8"
5/8" Thru 7/8"	3/16"
1" and over	1/4"
1/8" wide rectangulars	1/8"

CD Stud/Base Metal Combination Welding Capabilities

	STUD MATERIAL			
BASE WELD SURFACE MATERIAL	**MILD STEEL** 1008, 1010	**STAINLESS** 304, 305	**ALUMINUM** 5356, 6061	**BRASS** 70-30, 65-35
MILD STEEL 1006 through 1030	Excellent	Excellent	_	Excellent
MEDIUM CARBON STEEL 1030 through 1050	Good*	Good*	_	Good*
GALVANIZED SHEET DUCT OR DECKING	Excellent	Excellent	_	_
STRUCTURAL STEEL	Excellent	Excellent	_	Excellent
STAINLESS STEEL 405, 410, 430, and 330 Series, except 303	Excellent	Excellent	_	Excellent
LEAD FREE BRASS, ELECTROLYTIC COPPER, LEAD-FREE ROLLED COPPER	Excellent	Excellent	_	Excellent
MOST ALUMINUM ALLOYS OF THE 1100, 3000, 5000, and 6000 series**	_	_	Excellent	_
DIE-CAST ZINC ALLOYS	Good*	Good*	Excellent	Good*

***Good:** Generally full strength results, depending upon the combination of stud size and base metal.

** Other Materials, such as 7000 Series aluminum, titanium alloys, Inconel, etc., can be welded under specified conditions.

CD Stud Reverse-Side Marking Limitations

The charts on the following page will be of help in determining the best combination of stud weld base size and base metal thickness. The terms on the chart are defined as follows:

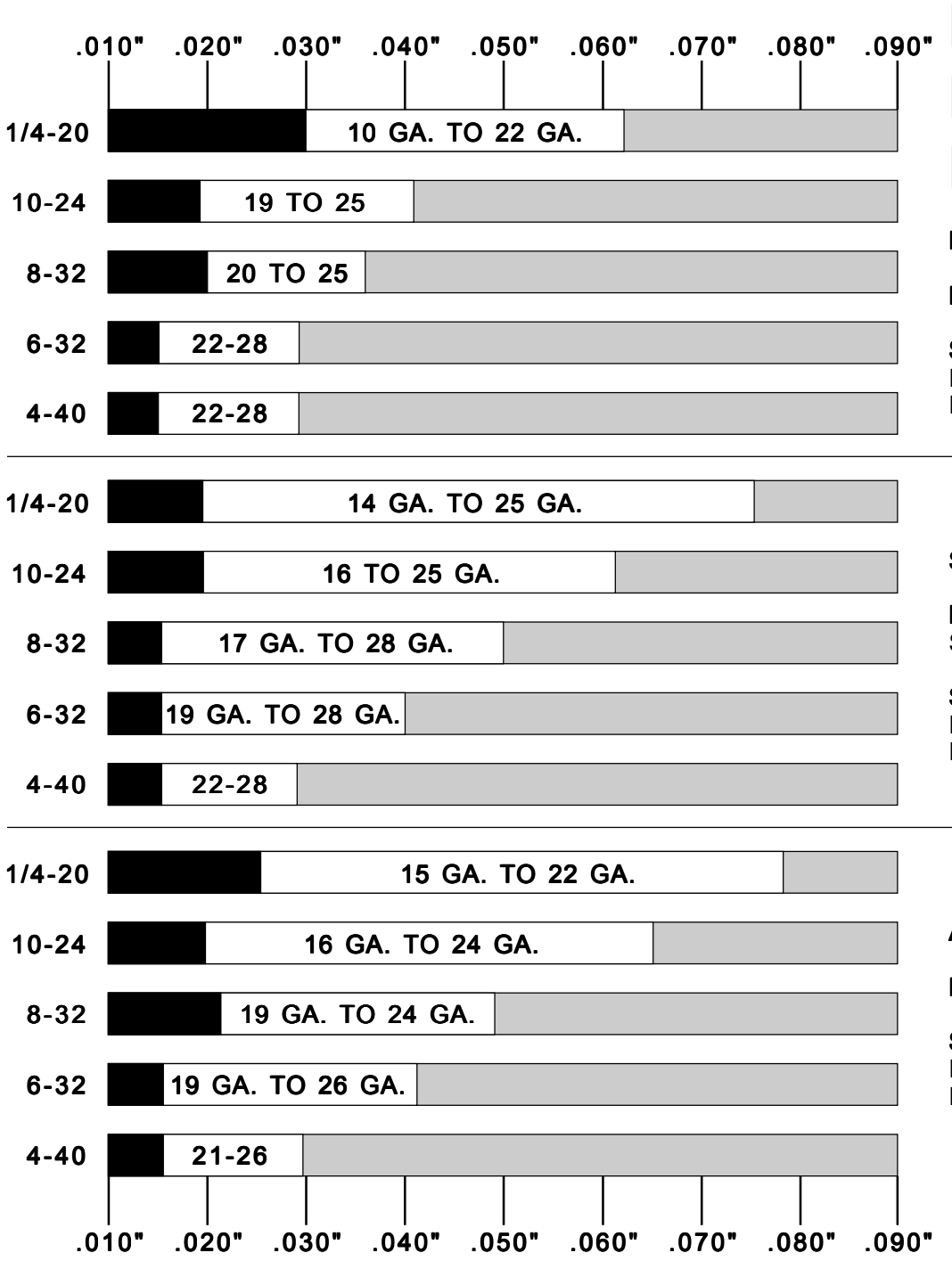
EXCELLENT No marking, excellent weld

ACCEPTABLE Visible markings, excellent weld

UNACCEPTABLE Unacceptable marking, base metal failure

It should be noted that these charts are based on optimum conditions. Even under optimum conditions, it is difficult to determine the precise point at which reverse-side marking will appear. Therefore, these charts should be used only as a guide.

How To Find The Optimum Combination Of Stud Size And Base Metal Thickness In Order To Prevent Reverse-Side Marking



Unacceptable

Acceptable

Excellent

MILD STEEL

Base Metal: Mild Steel

Stud: Mild Steel, Flanged or Small Flanged

STAINLESS STEEL

Base Metal: Stainless Steel

Stud: Stainless Steel, Flanged or Small Flanged

ALUMINUM

Base Metal: Aluminum

Stud: Aluminum, Flanged or Small Flanged

NOTE: Stud tip size can influence the degree of reverse-side marking

CD Stud Load Strengths

STUD MATERIAL	STUD SIZE	MAXIMUM FASTENING TORQUE (INCH LBS.)*	ULTIMATE TENSILE LOAD (LBS.)	MAXIMUM SHEAR LOAD (LBS.)
Low-Carbon,	6-32	6	500	375
Copper-Flashed	8-32	12	765	575
Steel	10-24	14	960	720
	1/4-20	43	1750	1300
	5/16-18	72	2900	2200
	3/8-16	106	4300	3250
Stainless	6-32	10	790	590
Steel	8-32	20	1260	940
	10-24	23	1530	1150
	1/4-20	75	2880	2160
	5/16-18	126	3750	5350
	3/8-16	186	4850	7150
Aluminum	6-32	6.5	350	160
Alloy	8-32	13	560	229
6061	10-24	19	670	310
	1/4-20	40	1240	679
	5/16-18	70.5	2025	1210
	3/8-16	100	2985	1750
Brass	6-32	8	600	390
70-30 (260)	8-32	16	860	560
65-35 (268)	10-24	18.5	1040	680
	1/4-20	61	1950	1275
	5/16-18	102	3280	2140
	3/8-16	150	4800	3160

***** These values should develop fastener tension to slightly less than yield point.

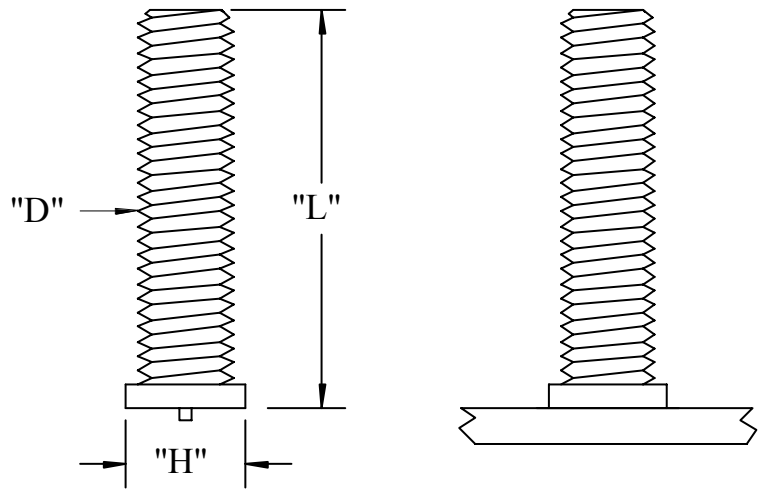
CD Studs Weight Charts (Flanged-Steel)

ESTIMATED WEIGHTS OF THREADED STUDS IN POUNDS PER 1000 PIECES						
LENGTH	**4-40**	**6-32**	**8-32**	**10-24**	**1/4-20**	**5/16-18**
1/4	.69	1.00	1.39	1.79	3.08	4.90
3/8	.94	1.38	1.93	2.50	4.37	6.98
1/2	1.18	1.76	2.49	3.21	5.66	9.06
5/8	1.43	2.13	3.04	3.93	6.95	11.13
3/4	1.67	2.51	3.60	4.64	8.24	13.21
7/8	1.92	2.89	4.15	5.35	9.52	15.29
1	2.16	3.26	4.71	6.07	10.81	17.36
1-1/4	2.65	4.02	5.82	7.50	13.39	21.52
1-1/2	3.15	4.77	6.93	8.92	15.96	25.67
1-3/4	3.64	5.52	8.04	10.35	18.54	29.83
2	4.13	6.27	9.15	11.78	21.12	33.98
2-1/4	4.62	7.03	10.26	13.21	23.69	38.14
2-1/2	5.11	7.78	11.37	14.63	26.27	42.29
EACH ADD'L INCH	1.96	3.01	4.44	5.71	10.31	16.62

ESTIMATED WEIGHTS OF NON-THREADED STUDS IN POUNDS PER 1000 PIECES						
LENGTH	**3/32**	**1/8**	**5-32**	**3/16**	**1/4**	**5/16**
1/4	.68	1.06	1.59	2.24	3.87	5.97
3/8	.92	1.50	2.27	3.21	5.61	8.68
1/2	1.16	1.93	2.94	4.19	7.35	11.39
5/8	1.40	2.37	3.62	5.16	9.09	14.11
3/4	1.64	2.80	4.30	6.14	10.84	16.82
7/8	1.88	3.24	4.98	7.12	12.56	19.53
1	2.12	3.67	5.65	8.09	14.32	22.25
1-1/4	2.60	4.54	7.01	10.04	17.81	27.67
1-1/2	3.08	5.41	8.36	11.99	21.69	33.10
1-3/4	3.56	6.28	9.72	13.95	24.78	38.52
2	4.04	7.15	11.07	15.90	28.25	43.95
2-1/4	4.52	8.02	12.43	17.85	31.75	49.37
2-1/2	5.00	8.89	13.78	19.80	35.23	54.80
EACH ADD'L INCH	1.96	3.48	5.42	7.81	13.94	21.70

Mini- Flanged Capacitor Discharge

Weld Stud



Material: Mild steel, stainless steel, aluminum, brass.

Plating: All mild steel studs are copper plated.
Nickel plating available.

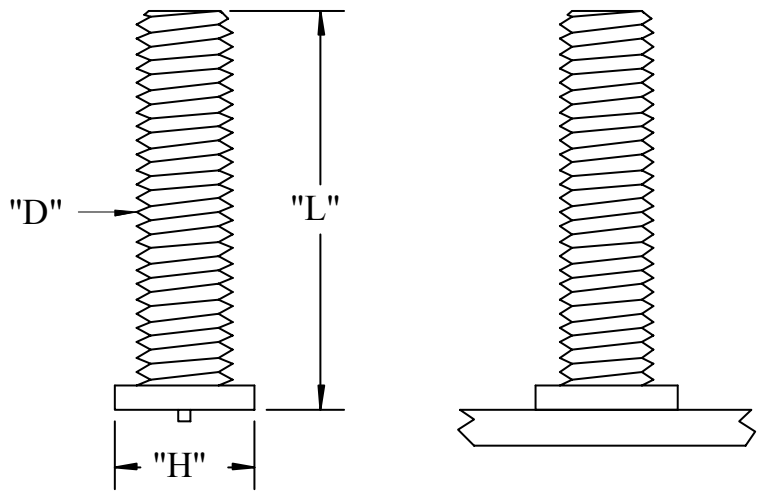
Annealing: Available on request.

* Minimum length of stud with relationship to diameter.

STUD		
D	H	*MIN L
4-40	.142	.250
6-32	.168	.250
8-32	.194	.250
10-32	.220	.250
10-24	.220	.250
1/4-20	.280	.375
5/16-18	.342	.500
3/8-16	.437	.750

Flanged Capacitor Discharge

Weld Stud



Material: Mild steel, stainless steel, aluminum, brass.

Plating: All mild steel studs are copper plated.

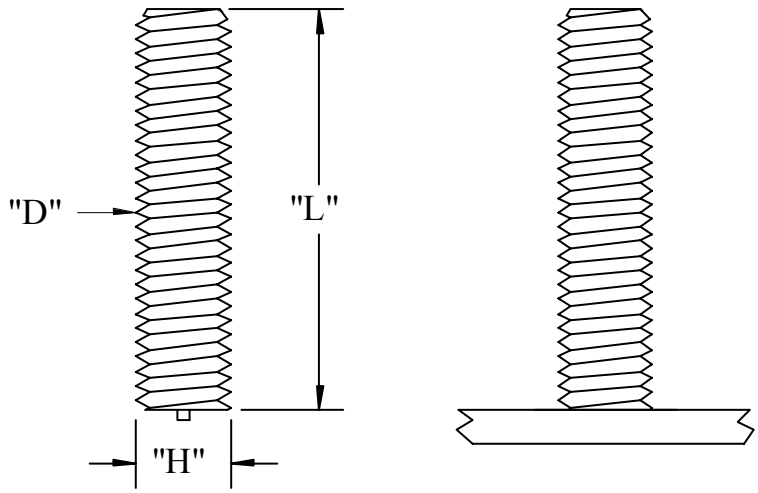
Annealing: Available on request.

* Minimum length of stud with relationship to diameter.

STUD		
D	H	*MIN L
2-56	.125	.250
4-40	.175	.250
6-32	.200	.250
8-32	.220	.250
10-32	.250	.250
10-24	.250	.250
1/4-20	.312	.375
5/16-18	.375	.500
3/8-16	.490	.750

Non-Flanged Capacitor Discharge

Weld Stud



Material: Mild steel, stainless steel, aluminum, brass.

Plating: All mild steel studs are copper plated.

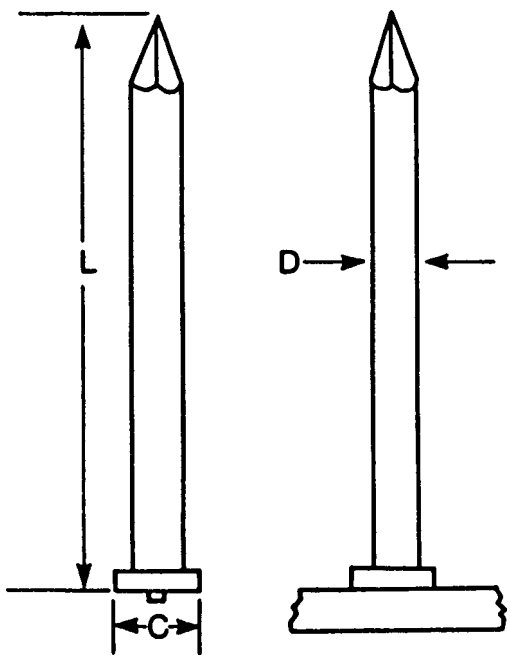
Annealing: Available on request.

* Minimum length of stud with relationship to diameter.

STUD		
D	H	*MIN L
4-40	.115	.250
6-32	.140	.250
8-32	.167	.250
10-32	.190	.250
10-24	.190	.250
1/4-20	.250	.375
5/16-18	.312	.500
3/8-16	.375	.750

Weld Pins

STANDARD CD



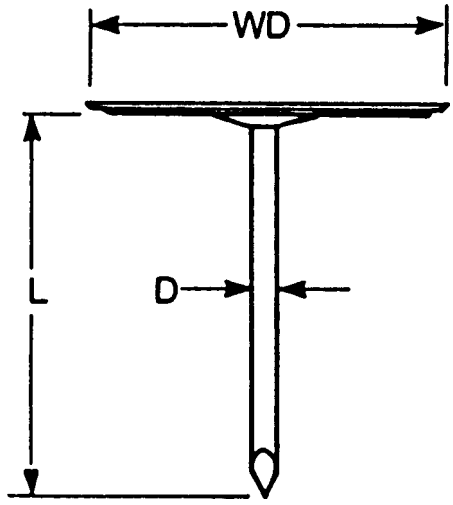
Material: Mild steel, stainless steel, aluminum.

Plating: Copper plating standard on mild steel pins.

Washers: Self-locking washers are available in a variety of sizes and materials up to 2 1/2" square.

PINS		
D	C	LENGTH
12ga. .105	.180	as required
10ga. .135	.195	as required

Cuphead Pin



PINS				
TYPE	D	W D	MIN L	MAX L
CL10	.135	1.500	3/8”	No Max
CL12	.105	1.500	3/8”	No Max
CS12	.105	1.187	3/8”	No Max
CS14	.080	1.187	3/16”	2"

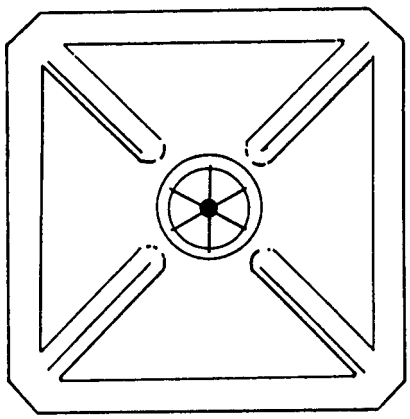
	PIN	WASHER
MATERIAL	LOW CARBON STEEL C-0.23% max P-0.04% max Mn-0.60% max S-0.05% max	LOW CARBON STEEL C-0.23% max P-0.04% max Mn-0.60% max S-0.05% max
MECHANICAL PROPERTIES	Values available upon request	Values available upon request

Washer is beveled to prevent cutting of insulation material.

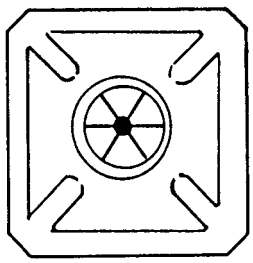
Stainless steel - not standard, but available upon request.

Paper speed clips available for welding through foil faced insulation.

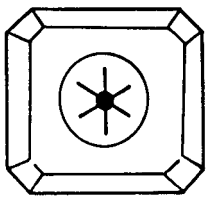
Self Locking Washers



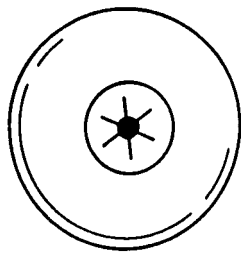
2 1/2" Square



1 1/2" Square



1 1/8" x 1 1/4"



1 1/2" Round

INSULATION SELF LOCKING WASHERS				
SELF LOCKING WASHERS	2 1/2" Square	1 1/2" Square	1 1/8" x 1 1/4"	1 1/2" Round
SIZE/INCHES	2 1/2" x 2 1/2"	1 1/2" x 1 1/2"	1 1/4" x 1 1/8"	1 1/2" Diameter
MATERIAL THICKNESS	.018	.015	.015	.015
MATERIAL FINISH/PLATING	Galv.	Galv.	Galv.	Galv.
EDGES/FLAT OR BEVEL	Bevel	Bevel	Bevel	Flat
OTHER MATERIALS AVAILABLE	Alum., SS	Alum., SS	Alum., SS	Alum., SS
PACKED PER CARTON	1,000	3,000	1,000, 5,000	1,000, 5,000
SHIPPING WEIGHT/1,000	35 lbs.	12 1/2" lbs.	6 lbs.	8 lbs.

Self Locking Washers are for use with weld pins, insulation and lacing anchors. Multi-lanced hole design provides superior self-locking feature. All standard hole sizes are available.

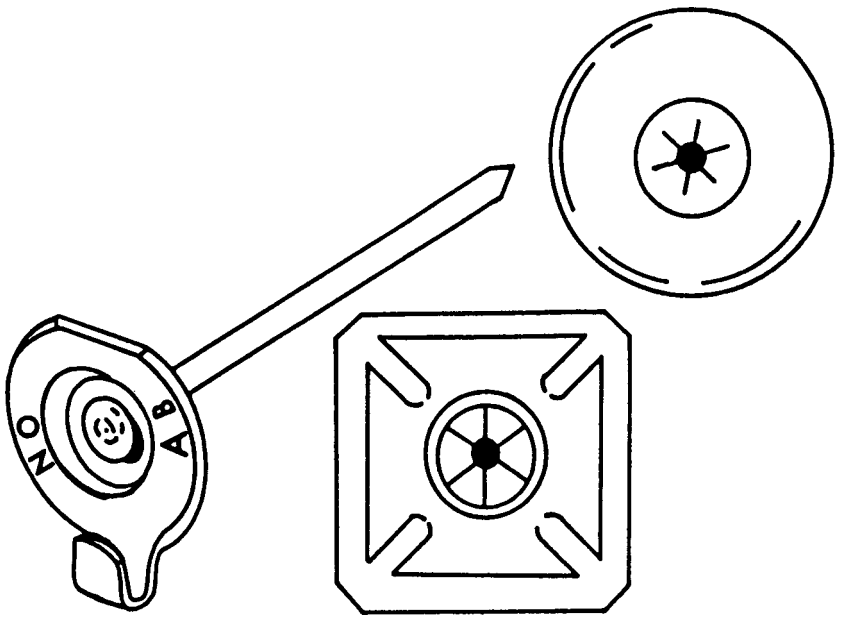
Self Locking Washers meet GSA, military specifications and other federal specifications.

All self locking washers are made from tempered carbon steel and plated under closely controlled conditions for maximum corrosion resistance.

Special hole sizes and materials are available upon request.

INSULATION HANGERS

INSULATION LACING ANCHOR



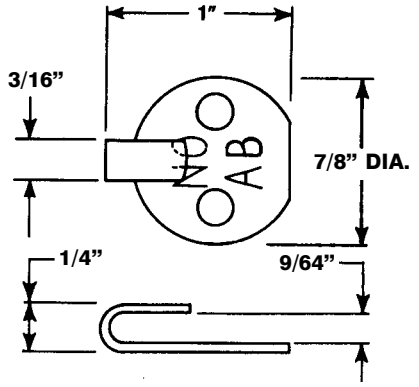
MATERIAL	SPINDLE	SELF LOCKING WASHER	LENGTHS
Cadmium plated steel and stainless steel	12 gauge (.106" diameter)	Different sizes and types available	2 1/2" and 4 1/2"

CADMIUM PLATED STEEL		STAINLESS STEEL	
Length	Weight/M	Length	Weight/M
2 1/2"	19 lbs.	2 1/2"	19 lbs.
4 1/2"	24 lbs.	4 1/2"	24 lbs

INSULATION HANGERS
LACING ANCHORS

SERIES 80 LACING HOOK

LA HOOK 80



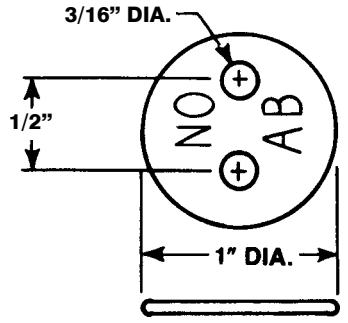
SIZE: One size as shown.

MATERIAL: Mild Steel - Cadmium plated, or Stainless Steel.

NO-AB: Furnished stamped NO AB to indicate non-asbestos material.

L100 LACING WASHER

LA L100



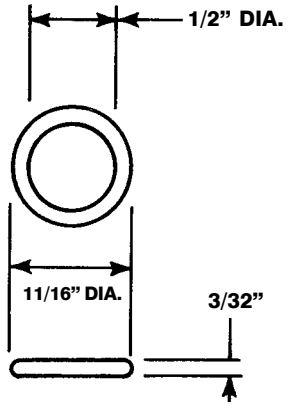
SIZE: One size as shown.

MATERIAL: Aluminum or Stainless Steel.

NO-AB: Available stamped NO AB to indicate non-asbestos material.

LACING RING

LA RING

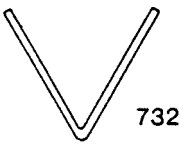


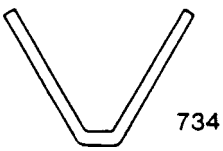
SIZE: One size as shown.

MATERIAL: Zinc alloy - bright Zinc plated.

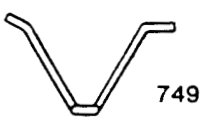
REFRACTORY ANCHORS

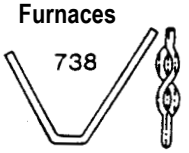
STD MATERIALS	PRIME USE	REFRACTORY MATERIAL	TEMPERATURE RANGE	STUD VS HAND WELD	MAJOR INDUSTRY USERS
304 SS MS	Stacks, Ducts, Process Heaters	Lightweight Castable	Below 1500°F	Hand Weld	Heat Treating Glass Making Pulp/Paper

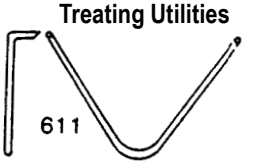


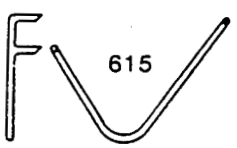


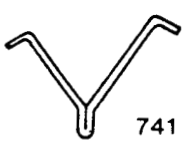
304 SS 310 SS	Stacks, Incinerators, Reformers, Pelletizing Furnaces	Low to Medium Density Castable	Below 1800°F	Hand Weld	Primary Metals Iron/Steel, Heat Treating Utilities

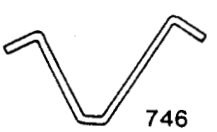


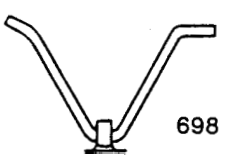




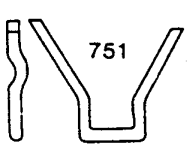


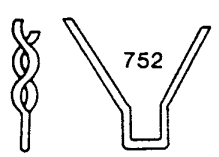


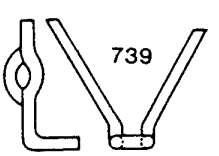


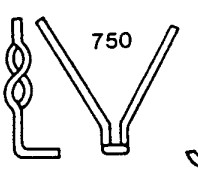


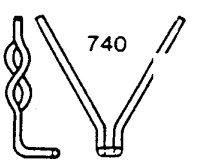
304 SS 310 SS 330 SS	Open Hearth Furnaces, Catalytic Crackers, Rotary Kilns, Transfer Lines	Medium to High Density Castable	Over 2000°F	Hand Weld	Iron/Steel Petro/Chemical Cement Primary Metals

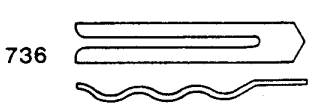


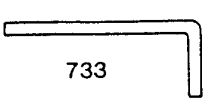


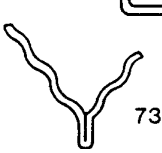


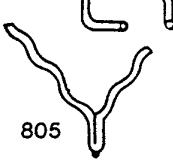




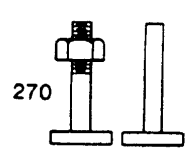


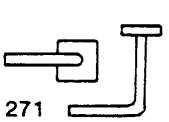


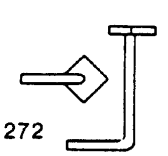


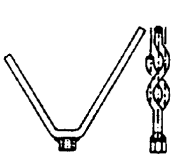


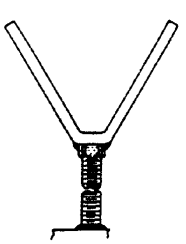
304 SS 310 SS 316 SS 330 SS 601 Inconel	Rotary Kilns, Furnace Arches, Furnace Roofs, Reactor Bottoms	High Density Castable (Dual Component Linings)	Over 2000°F	Hand Weld	Cement Iron/Steel Petro/Chemical Utilities

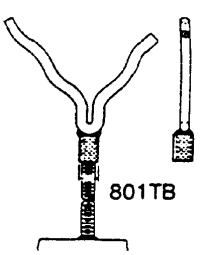


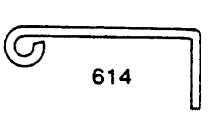


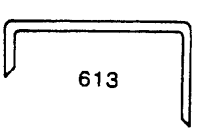


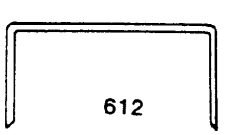


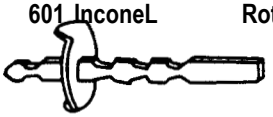
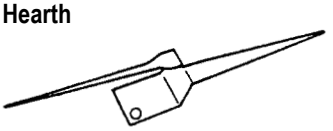
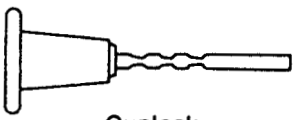
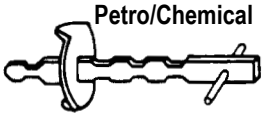


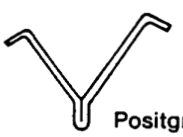
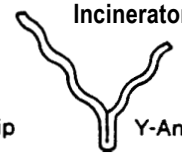
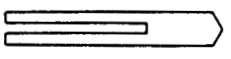
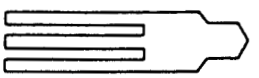
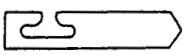


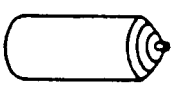
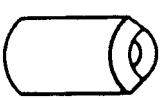
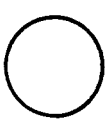
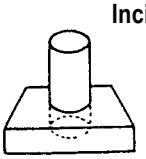


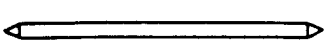




STD MATERIALS	PRIME USE	REFRACTORY MATERIAL	TEMPERATURE RANGE	STUD VS HAND WELD	MAJOR INDUSTRY USERS
304 SS 310 SS 601 InconeL	Heat Treat Furnaces, Carbottom Furnaces, Rotary Hearth	Fibre Blanket Fibre Modules	900° to 2250°F	Stud Welded	Iron/ Steel Heat Treating Petro/Chemical
 Insultwist		 Spear-Lok		 Cuplock	 Brick Clip	

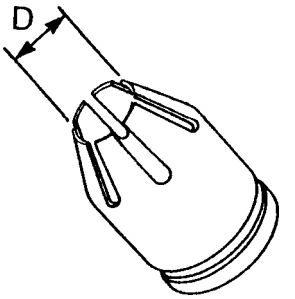
304 SS 310 SS	Open Hearth Furnaces, Catalytic Crackers, Rotary Kilns, Stacks, Incinerators	Low to High Density Castable	1200° to 2000°F	Stud Welded	Iron/Steel Cement Petro/Chemical Utilities
 Positgrip	 Y-Anchor	 Surelock	 2 Tine Pin	 3 Tine Pin	 T-Slotted

	Utility Boilers	Low Density	1200° to 1800°F	Stud Weld	Utilities Pulp/Paper Incinerators
(Convex)  B.T.P. (Concave)		 Ball Stud		 Wear Bar	

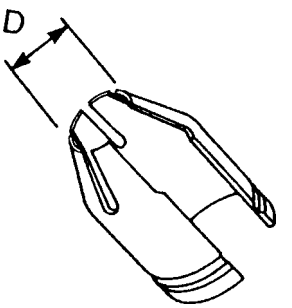
MS 304 SS 310 SS	Stacks Heat Treating	Low Temperature Ceramic Fibre	600° to 1200°F	Stud Weld	Heat Treating Construction
		Double Pointed 10GA Pin 12GA Pin		Power Point Pin 	

ARC FERRULE GRIPS

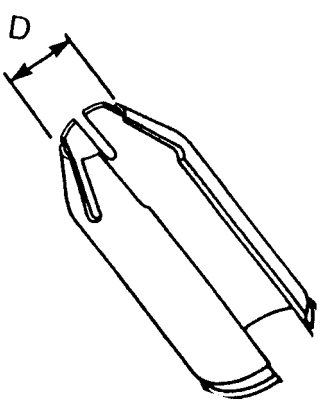
STANDARD FERRULE GRIPS (1" LONG)			
STUD SIZE	**FOOT SIZE**	**GRIP DIA. (D)**	**PART NO.**
3/16	SMALL	.305	GN-019
1/4	SMALL	.380	GN-025
5/16	SMALL	.445	GN-031
3/8	SMALL	.505	GN-037
7/16	SMALL	.585	GN-043
1/2	SMALL	.650	GN-050
5/8	MEDIUM	.785	GN-062
3/4	MEDIUM	1.030	GN-075
7/8	LARGE	1.203	GN-087
1	LARGE	1.406	GN-100



SPLIT FERRULE GRIPS (1" LONG)			
STUD SIZE	**FOOT SIZE**	**GRIP DIA. (D)**	**PART NO.**
3/16	SMALL	.305	GC-019
1/4	SMALL	.380	GC-025
5/16	SMALL	.445	GC-031
3/8	SMALL	.505	GC-037
7/16	SMALL	.585	GC-043
1/2	SMALL	.650	GC-050
5/8	MEDIUM	.785	GC-062
3/4	MEDIUM	1.030	GC-075
7/8	LARGE	1.203	GC-087
1	LARGE	1.406	GC-100



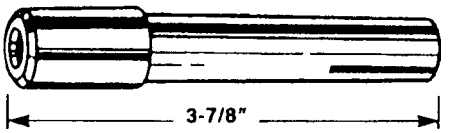
LONG SPLIT FERRULE GRIPS (2" LONG)			
STUD SIZE	**FOOT SIZE**	**GRIP DIA. (D)**	**PART NO.**
1/4	SMALL	.380	GD-025
5/16	SMALL	.445	GD-031
3/8	SMALL	.505	GD-037
7/16	SMALL	.585	GD-043
1/2	SMALL	.650	GD-050
5/8	MEDIUM	.785	GD-062
3/4	MEDIUM	1.030	GD-075



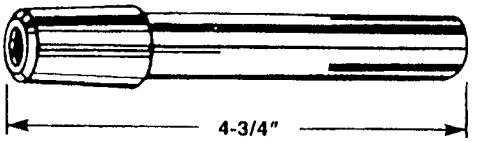
**** All measurements in inches***

ARC CHUCKS

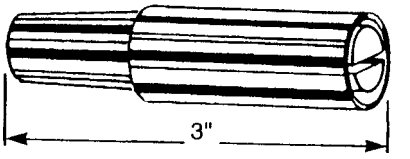
LONG ADJUSTABLE CHUCKS (3 7/8")	
STUD DIA.	**PART NO.**
#6	CM-013
#8	CM-015
#10	CM-018
1/4	CM-025
5/16	CM-031
3/8	CM-037
7/16	CM-043
1/2	CM-050
5/8	CM-062
3/4	CM-075



EXTRA LONG ADJUSTABLE CHUCKS (4 3/4")	
STUD DIA.	**PART NO.**
#6	CL-013
#8	CL-015
#10	CL-018
1/4	CL-025
5/16	CL-031
3/8	CL-037
7/16	CL-043
1/2	CL-050
5/8	CL-062
3/4	CL-075



RECTANGULAR CHUCKS	
STUD SIZE	**PART NO.**
1/8 x 1/4	CR-CA
1/8 x 3/8	CR-CB
1/8 x 5/8	CR-CC
1/8 x 7/8	CR-CH
1/8 x 1	CR-CE



**** All measurements in inches***

ARC CHUCKS

3/8" DIA. HEADED ANCHOR CHUCKS	
PART NO.	**DESCRIPTION**
CH-037	COMPLETE ASS'Y
CH-037-1	SLEEVE ONLY
CH-037-2	BASE ONLY
CH-037-3	STOP SCREW
SCREWS	10-32 x 3/8

1/2" DIA. HEADED ANCHOR CHUCKS	
PART NO.	**DESCRIPTION**
CH-050	COMPLETE ASS'Y
CH-050-1	SLEEVE ONLY
CH-050-2	BASE ONLY
CH-050-3	STOP SCREW
SCREWS	10-32 x 3/8

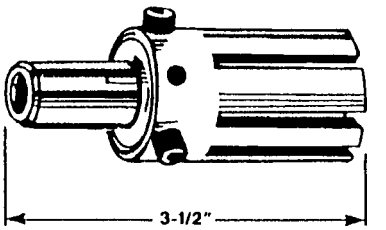
5/8" & 3/4" DIA. HEADED ANCHOR CHUCKS	
PART NO.	**DESCRIPTION**
CH-075	COMPLETE ASS'Y
CH-075-1	SLEEVE ONLY
CH-075-2	BASE ONLY
CH-075-3	STOP SCREW
SCREWS	10-32 x 3/8

7/8" DIA. HEADED ANCHOR CHUCKS	
PART NO.	**DESCRIPTION**
CH-087	COMPLETE ASS'Y
CH-087-1	SLEEVE ONLY
CH-087-2	BASE ONLY
CH-087-3	STOP SCREW
SCREWS	10-32 x 3/8

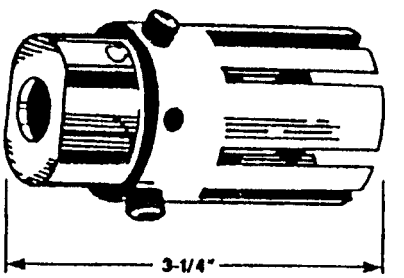
1" SHEAR CONNECTOR CHUCKS	
PART NO.	**DESCRIPTION**
CH-100	COMPLETE ASS'Y
CH-100-1	SLEEVE ONLY
CH-100-2	BASE ONLY
CH-100-3	STOP SCREW
SCREWS	10-32 x 3/8

**** All measurements in inches***

3/8" - 1/2" DIA. HEADED ANCHOR CHUCKS

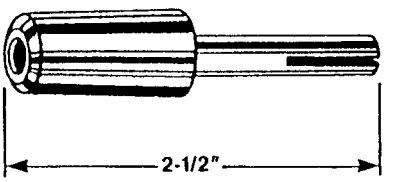


5/8" - 1" DIA. HEADED ANCHOR CHUCKS

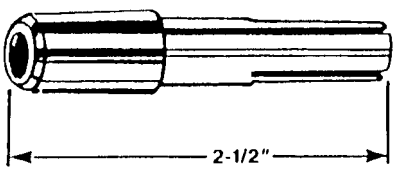


ARC CHUCKS

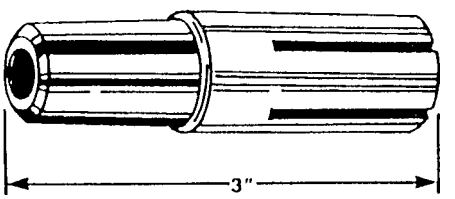
STANDARD ADJUSTABLE CHUCKS	
STUD DIA.	**PART NO.**
12 GA.	CN-10
1/8	CN-012
10 GA. & #6	CN-013
#8	CN-015
#10	CN-018
1/4	CN-025
5/16	CN-031
3/8	CN-037
7/16	CN-043
1/2	CN-050
9/16	CN-056
5/8	CN-062
.680	CN-068
3/4	CN-075
7/8	CN-087
1	CN-100



**** All measurements in inches***



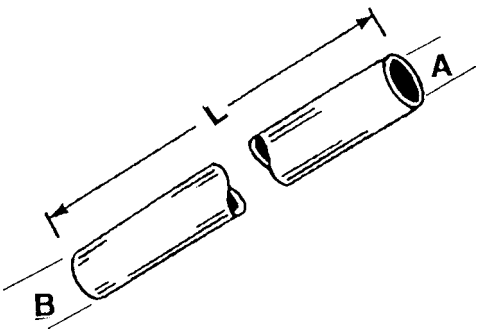
METRIC ADJUSTABLE CHUCKS	
STUD DIA.	**PART NO.**
2MM (.079)	CN-002M
4MM (.157)	CN-004M
6MM (.236)	CN-006M
8MM (.314)	CN-008M
10MM (.390)	CN-010M
12MM (.472)	CN-012M
14MM (.551)	CN-014M
16MM (.629)	CN-016M
18MM (.708)	CN-018M
20MM (.787)	CN-020M



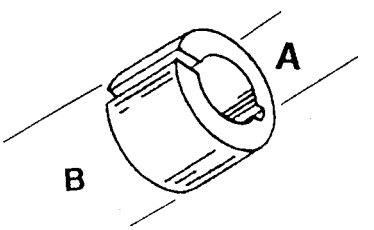
**** All measurements in inches***

ARC ACCESSORIES

FERRULE TUBING				
STUD SIZE	PART NO.	A	B	L
#8	MP-015	.291	.360	36"
#10	MP-018	.305	.375	36"
1/4	MP-025	.380	.500	36"
5/16	MP-031	.445	.562	36"
3/8	MP-037	.505	.625	36"
7/16	MP-043	.585	.687	36"
1/2	MP-050	.650	.750	36"
5/8	MP-062	.785	.906	36"
3/4	MP-075	1.030	1.156	36"



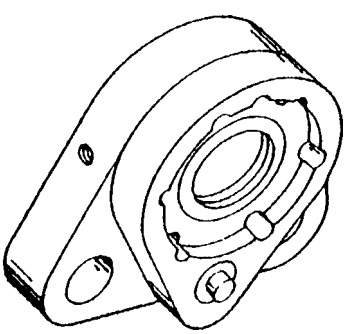
FERRULE TUBE BUSHING			
STUD SIZE	PART NO.	A	B
#8	MB-015	.360	.875
#10	MB-018	.375	.875
1/4	MB-025	.500	.875
5/16	MB-031	.562	.875
3/8	MB-037	.625	.875
1/2	MB-043	.750	.875
5/8	MB-062	.906	1.156



**** All measurements in inches***

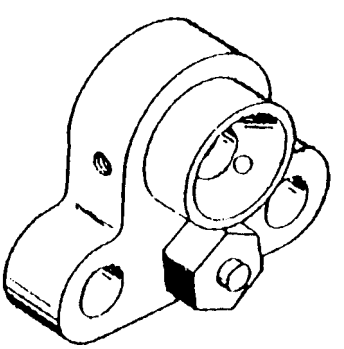
GAS ADAPTOR FEET FOR ALUMINUM WELDING

USE WITH FERRULE



PART NO. BG-1

USE WITHOUT FERRULE

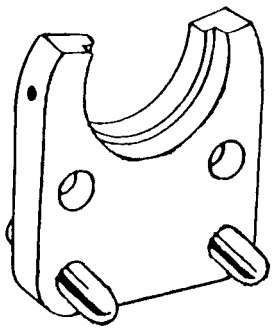


PART NO. BG-2

ARC FEET

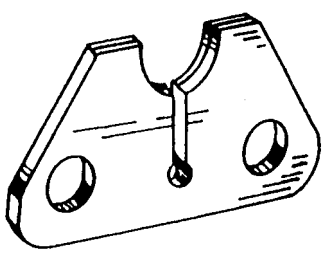
BI-POD FEET		
STUD SIZE	PART NO. SPLIT	PART NO. CLOSED
1/8-1/2	BP-1C	BP-1N
5/8-3/4	BP-2C	BP-2N
7/8-1	BP-3C	BP-3N

NOTE* SPECIFY GUN TYPE

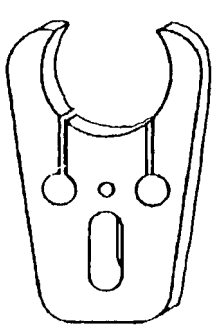


TWIN LEG FERRULE FOOT PLATE	
STUD SIZE	PART NO.
1/4	QN-025
5/16	QN-031
3/8	QN-037
1/2	QN-050
5/8	QN-062
3/4	QN-075
7/8	QN-087
1	QN-100

NOTE* SPECIFY GUN TYPE

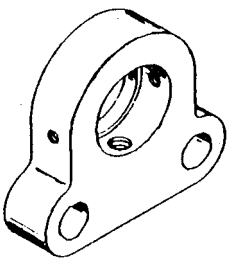


SINGLE LEG FERRULE FOOT PLATE	
STUD SIZE	PART NO.
1/4	QM-025
3/8	QM-037
1/2	QM-050
5/8	QM-062
3/4	QM-075
7/8	QM-087

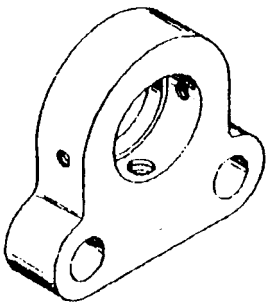


**** All measurements in inches***

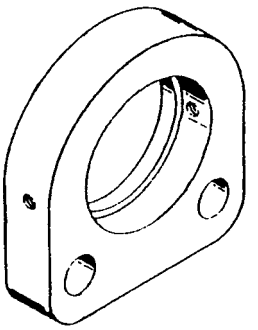
ARC FEET



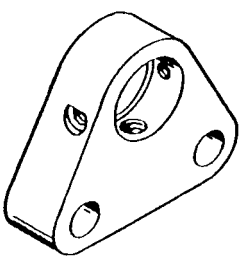
SMALL
STYLE A



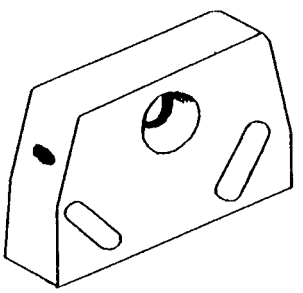
MEDIUM
STYLE B



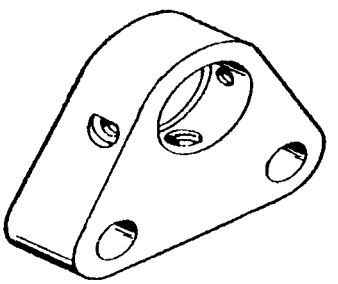
LARGE
STYLE C



NELSON NS-30
STYLE D



BANTAM A-38
STYLE E

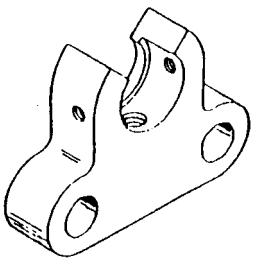


CD FOOT
STYLE F

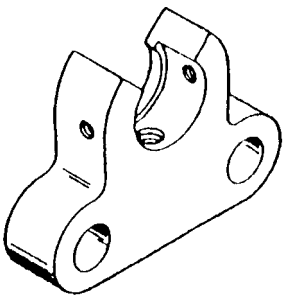
STANDARD CLOSED FEET			
GUN TYPE	**STUD SIZE**	**STYLE**	**PART NO.**
PRO-WELD INT.	1/8-1/2	A	B-1N
NELSON NS-20	1/8-1/2	A	B-1N
NELSON NS-30	1/8-1/2	D	B-6N
PRO-WELD INT.	5/8-3/4	B	B-2N
NELSON NS-20	5/8-3/4	B	B-2N
NELSON NS-30	5/8-3/4	D	B-7N
PRO-WELD INT.	7/8-1	C	B-3N
NELSON NS-20	7/8-1	C	B-3N
BANTAM A-58	1/8-1/2	E	B-4N
BANTAM A-58	5/8-3/4	E	B-5N
PRO-WELD INT.	1/8-3/8	F	028-833

**** All measurements in inches***

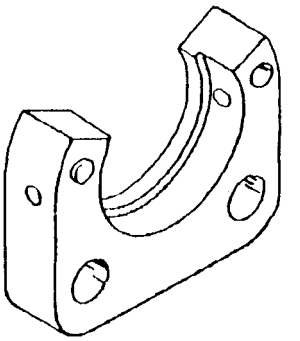
ARC FEET



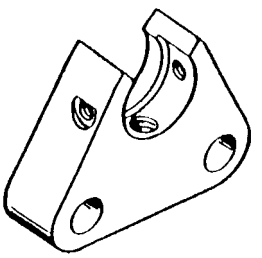
SMALL
STYLE A



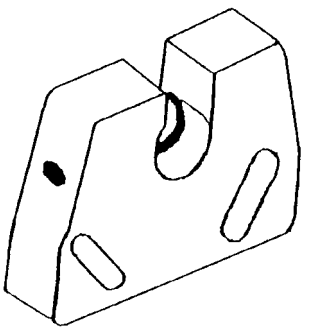
MEDIUM
STYLE B



LARGE
STYLE C



NELSON NS-30
STYLE D

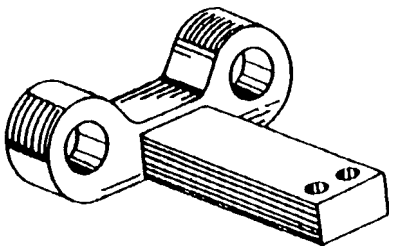


BANTAM A-58
STYLE E

STANDARD SPLIT FEET			
GUN TYPE	**STUD SIZE**	**STYLE**	**PART NO.**
PRO-WELD	1/8-1/2	A	B-1C
NELSON NS-20	1/8-1/2	A	B-1C
NELSON NS-30	1/8-1/2	D	B-6C
PRO-WELD	5/8-3/4	B	B-2C
NELSON NS-20	5/8-3/4	B	B-2C
NELSON NS-30	5/8-3/4	D	B-7C
PRO-WELD	7/8-1	C	B-3C
NELSON NS-20	7/8-1	C	B-3C
BANTAM A-58	1/8-1/2	E	B-4C
BANTAM A-58	5/8-3/4	E	B-5C

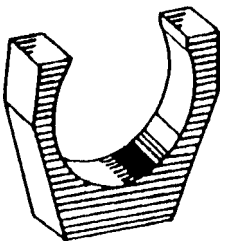
**** All measurements in inches***

ARC WELD THRU DECK FOOT ASSEMBLY



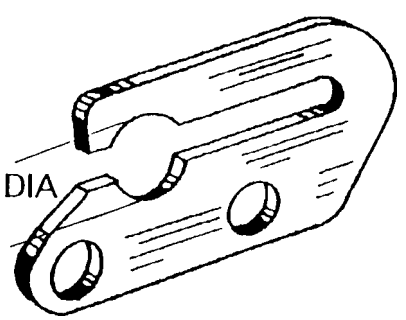
WELD THRU DECK FOOT ASSEMBLY	
PART NO.	**DESCRIPTION**
B-0021	FOOT ASSEMBLY
B-0021-1	FOOT ONLY
B-0021-2	EXT. BAR
SCREWS	1/4-20 x 1"

ARC WELD THRU DECK FERRULE HOLDER



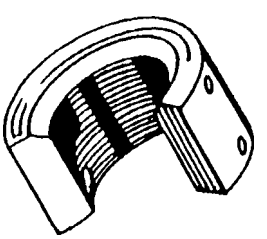
WELD THRU DECK FERRULE HOLDER	
PART NO.	**DESCRIPTION**
B-0060-1	3/4” WTD & 7/8” FLAT
B-0060-2	3/4” FLAT
B-0060-3	5/8” FLAT
B-0060-4	1" FLAT & 7/8” WTD
B-0060-5	1/2" FLAT
SCREWS	10-32 x 1/2”

ARC REFRACTORY FERRULE FOOT PLATE



REFRACTORY FERRULE FOOT PLATE	
PART NO.	**STUD DIA.**
QY-025	3/16 - 1/4

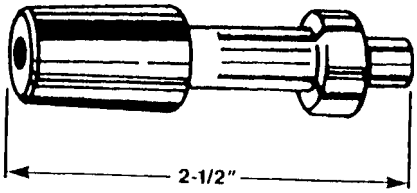
ARC HEAVY DUTY FERRULE GRIP

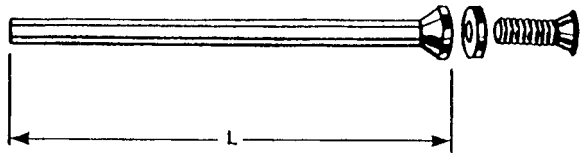


HEAVY DUTY FERRULE GRIP	
PART NO.	**STUD DIA.**
GH-050	1/2
GH-062	5/8
GH-075	3/4
GH-087	7/8

**** All measurements in inches***

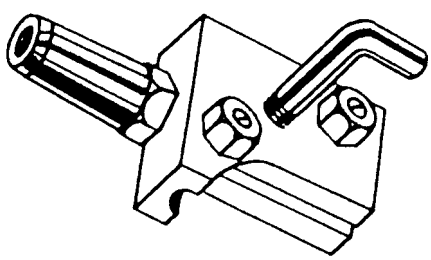
ARC ACCESSORIES





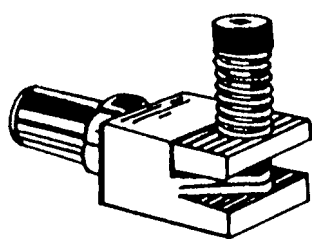
MALE CHUCKS	
STUD DIA.	**PART NO.**
8-32	CX-008-32
10-32	CX-010-24
1/4-20	CX-025-20
5/16-18	CX-031-18
3/8-16	CX-037-16
1/2-13	CX-050-13
5/8-11	CX-062-11
3/4-10	CX-075-10
1/4	CX-025
3/8	CX-037
1/2	CX-050
5/8	CX-062

STANDARD ADJUSTABLE LEGS		
LENGTH	**DIA.**	**PART NO.**
7	5/16	L-03107
9	5/16	L-03109
14	5/16	L-03114
12	3/8	L-03712
14	3/8	L-03714
18	3/8	L-03718
24	3/8	L-03724
27	3/8	L-03727
32	3/8	L-03732
36	3/8	L-03736
48	3/8	L-03748
5/16 LEG WASHER		LW-031
3/8 LEG WASHER		LW-037
5/16 LEG SCREW		LS-031
3/8 LEG SCREW		LS-037



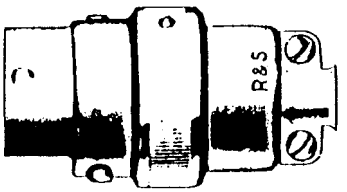
BENT STUD CHUCKS		
STUD DIA.	**BEND**	**PART NO.**
3/8	90°	CB-037-90
3/8	45°	CB-037-45
1/2	90°	CB-050-90
1/2	45°	CB-050-45
5/8	90°	CB-062-90
5/8	45°	CB-062-45
3/4	90°	CB-075-90
3/4	45°	CB-075-45

Y ANCHOR CHUCKS	
ANCHOR SIZE	**PART NO.**
3/16	CY-018
1/4	CY-025

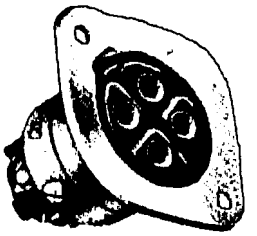


**** All measurements in inches***

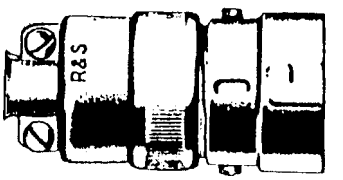
CONTROL CABLE CONNECTOR



MALE



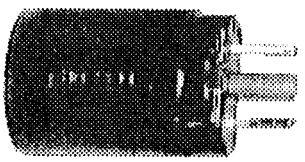
PANEL MOUNT



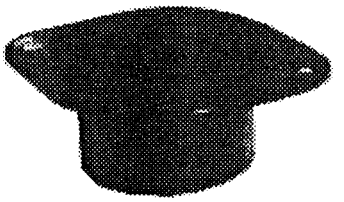
FEMALE

CONTROL CABLE CONNECTOR	
PART NO.	**DESCRIPTION**
107-0014	MALE 4 POLE CONNECTOR
107-0015	FEMALE 4 POLE CONNECTOR
107-0001	PANEL MOUNT CONNECTOR

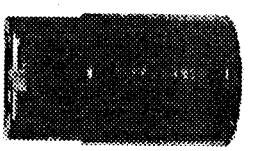
NELSON STYLE 2 WIRE CONNECTOR



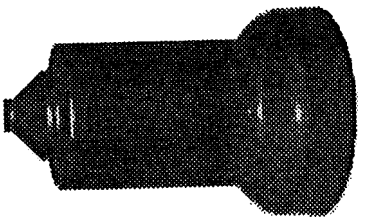
MALE



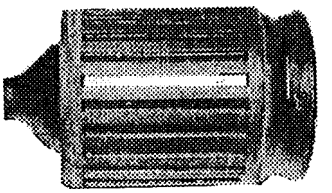
PANEL MOUNT



FEMALE



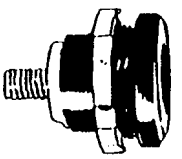
MALE COVER

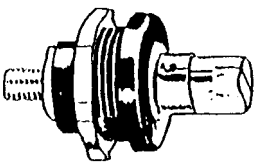


FEMALE COVER

NELSON STYLE 2 WIRE CONNECTOR	
PART NO.	**DESCRIPTION**
107-0016	2 WIRE MALE CONNECTOR
107-0017	2 WIRE FEMALE CONNECTOR
107-0018	2 WIRE PANEL MOUNT CONNECTOR
107-0016C	MALE RUBBER COVER
107-0017C	FEMALE RUBBER COVER

PANEL MOUNT CAMLOK CONNECTOR



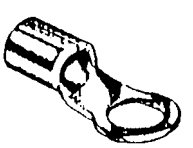


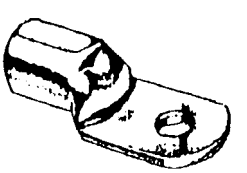
PANEL MOUNT CAMLOK CONNECTOR	
PART NO.	**DESCRIPTION**
107-0003	MALE PANEL MOUNT
107-0002	FEMALE PANEL MOUNT

ACCESSORIES

ACCESSORIES	
PART NO.	**DESCRIPTION**
102-0041	ALLEN WRENCH SET
102-0042	CHUCK EJECTOR KEY

WELD CABLE LUGS

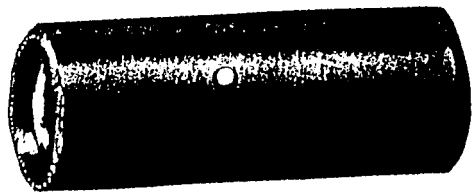




ACCESSORIES	
PART NO.	**DESCRIPTION**
123-0003	#4 W/ #10 HOLE
123-0001	#1 W/ #10 HOLE
123-0006	#1 W/ 1/4 HOLE
123-0002	#1 W/ 3/8 HOLE
123-0008	1/0 W/ 3/8 HOLE
123-0009	1/0 W/ 1/2 HOLE
123-0010	4/0 W/ 1/2 HOLE

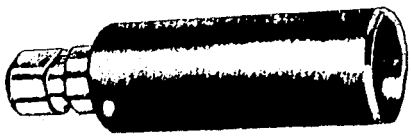
**** All measurements in inches***

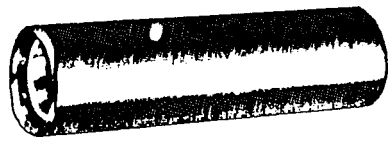
HEAVY DUTY HI TEMP CAMLOK



HEAVY DUTY HI TEMP CAMLOK	
PART NO.	**DESCRIPTION**
107-0006	4/0 MALE HI TEMP
107-0007	4/0 FEMALE HI TEMP

LIGHT DUTY CAMLOK CONNECTOR

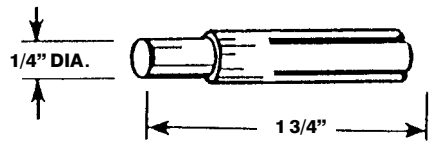




LIGHT DUTY CAMLOK CONNECTOR	
PART NO.	**DESCRIPTION**
107-0010	1/0 MALE FIBER SHELL
107-0011	1/0 FEMALE FIBER SHELL
107-0012	4/0 MALE FIBER SHELL
107-0013	4/0 FEMALE FIBER SHELL

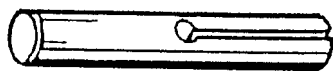
CAPACITOR DISCHARGE ACCESSORIES

COLLET INSERTS (For Weld Studs)



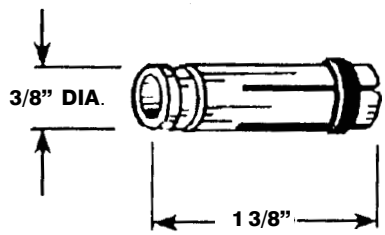
COLLET INSERTS (For Weld Studs)	
STUD DIA. X DEPTH"	PART NO.
#4 X 1/4	CI-010-025
#4 X 3/8	CI-010-037
#4 X 1/2	CI-010-050
#4 X 1	CI-010-100
#6 X 1/4	CI-013-025
#6 X 3/8	CI-013-037
#6 X 1/2	CI-013-050
#6 X 1	CI-013-100
#8 X 1/4	CI-015-025
#8 X 3/8	CI-015-037
#8 X 1/2	CI-015-050
#8 X 1	CI-015-100
#10 X 1/4	CI-018-025
#10 X 3/8	CI-018-037
#10 X 1/2	CI-018-050
#10 X 3/4	CI-018-075
#10 X 1	CI-018-100
1/4 X 1/4	CI-025-025
1/4 X 3/8	CI-025-037
1/4 X 1/2	CI-025-050
1/4 X 3/4	CI-025-075
1/4 X 1	CI-025-100
5/16 X 3/8	CI-031-037
5/16 X 1/2	CI-031-050
5/16 X 5/8	CI-031-062
5/16 X 3/4	CI-031-075
5/16 X 1	CI-031-100
3/8 X 1/2	CI-037-050
3/8 X 3/4	CI-037-075
3/8 X 1	CI-037-100

COLLET INSERTS (For Weld Pins)



COLLET INSERTS	
STUD DIA. X DEPTH"	PART NO.
12GA X 1/2	CIP-010-050
12GA X 3/4	CIP-010-075
12GA X 1	CIP-010-100
10GA X 1/2	CIP-013-050
10GA X 3/4	CIP-013-075
10GA X 1	CIP-013-100

B COLLETS

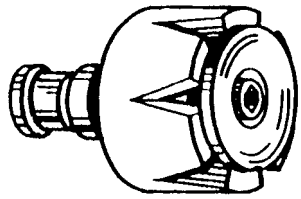


B COLLETS	
STUD DIA. X DEPTH"	PART NO.
14GA	CDB-008
12GA & #4	CDB-010
1/8	CDB-012
10GA & #6	CDB-013
#8	CDB-015
#10	CDB-018
.215	CDB-021
1/4	CDB-025
5/16	CDB-031
3/8	CDB-037

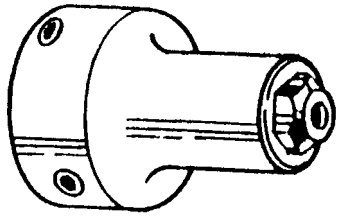
**** All measurements in inches***

CAPACITOR DISCHARGE ACCESSORIES

MAGNETIC CHUCK	
PART NO.	**DESCRIPTION**
035-031	COMPLETE ASSEMBLY
017-633	MAGNET ONLY
029-615	CONDUCTOR PLATE
039-609	INSUL. TUBE
039-610	INSUL. DISC.
SCREW	10-32 X 7/8”



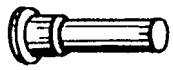
B COLLET PROTECTORS	
PART NO.	**DESCRIPTION**
028-837	14 GA. & 12 GA.
028-838	10 GA.
028-836	BODY ONLY
028-834	12 GA. INSERT
028-835	10 GA. INSERT



B STOPS	
PART NO.	**STUD LENGTH”**
033-781	1/4
033-782	3/8
033-783	1/2
033-784	5/8
033-785	3/4
033-775	7/8
033-776	1
033-777	1 1/8
033-778	1 1/4
033-779	1 3/8 (SHORT BUTTON STOP)
033-780	UNIVERSAL

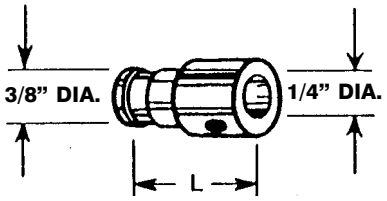
SHORT BUTTON STOP

UNIVERSAL B STOP

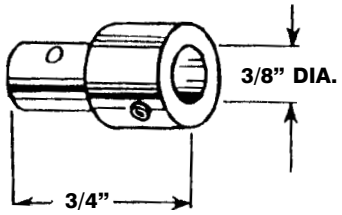


**** All measurements in inches***

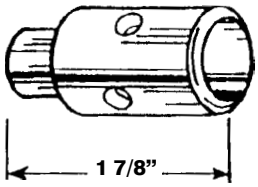
CAPACITOR DISCHARGE ACCESSORIES



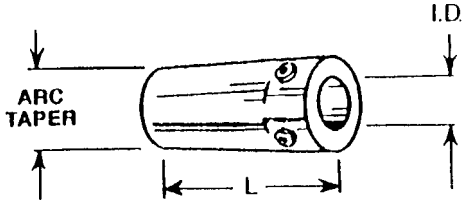
B-CI ADAPTOR	
PART NO.	DESCRIPTION
044-082	7/8" LONG
033-746	1 9/16" LONG



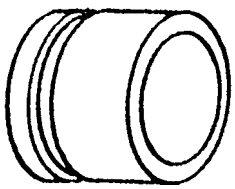
A-B ADAPTOR
PART NO.
039-467



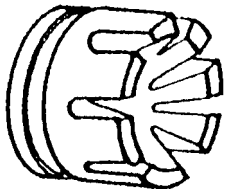
B-N ADAPTOR
PART NO.
039-468



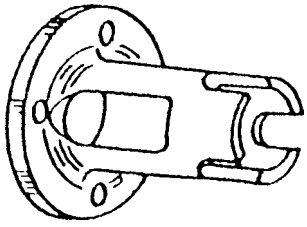
ADAPTORS	
PART NO.	I.D."
044-083	(3/8 ID) N-B
044-084	(1/4 ID) N-CI



STANDARD SPARK SHIELD	
PART NO.	DESCRIPTION
033-764	1/4 GA - #6
033-765	#8-3/8



VENTED SPARK SHIELDS	
PART NO.	DESCRIPTION
033-769	14 GA - 10 GA.
033-769L	#6-3/8

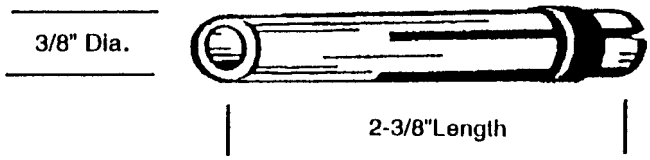


TEMPLATE TUBE ADAPTOR	
TEMPLATE I.D."	PART NO.
1 DIA.	039-839
1 1/4 DIA.	039-840

**** All measurements in inches***

CAPACITOR DISCHARGE ACCESSORIES

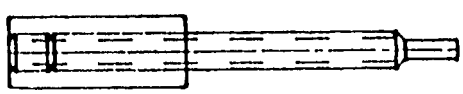
NELSON STYLE COLLETS



NELSON STYLE COLLETS	
PART NO.	**STUD SIZE"**
CDBN-013	#6
CDBN-015	#8
CDBN-018	#10
CDBN-025	1/4
CDBN-031	5/16

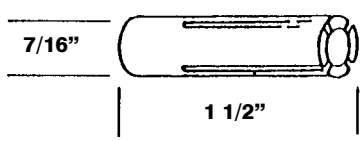
NOTE* METRIC SIZES ADD $2.00

ADJUSTABLE STOPS FOR ABOVE



ADUSTABLE STOPS FOR ABOVE	
PART NO.	**STUD LENGTH"**
500-017017	1/4 TO 5/8
500-017018	3/4 TO 1 1/8
500-017019	1 1/4 TO 1 5/8
500-017020	1 3/4 TO 2 1/8
500-017025	INSULATOR ONLY

KSM/ERICO AIR COLLETS



KSM/ERICO AIR COLLETS	
PART NO.	**STUD DIA."**
016-412	#4 (.112)
016-415	#6 (.138)
016-416	#8 (.164)
016-684	#10 (.189)
016-418	1/4 (.250)

**** All measurements in inches***