



## SECTION 1

# STUD WELDING – INTRODUCTION

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# Stud Welding: Introduction

## INTRODUCTION

### Stud Welding - General

Stud Welding is a general term for joining a metal stud or similar metallic part to a work piece. Welding can be done by a number of welding processes including Arc, Resistance, Friction and Percussion.

Of these processes, STUD ARC WELDING utilizes equipment and techniques unique to stud welding. The other processes use conventionally designed equipment with special tooling for stud welding.

The process technically known as STUD ARC WELDING is generally known as "STUD WELDING". STUD ARC WELDING methods, processes, equipment, weld studs, accessories and related products are covered in this product literature"

### Stud Arc Welding

Stud Arc Welding is an arc welding process in which a stud or similar metal part can be end-joined to a work piece instantaneously. This process involves the same basic principles and metallurgical aspects as any other arc welding procedure.

**Process Overview** - The stud is placed (with a hand tool, weld gun or weld head) against the base metal, through the control of the stud welding equipment and the design of the stud; an arc is drawn which melts the base of the stud and a proportionate area of the base metal, the stud is then forced into the molten pool and held in place until the metals re-solidify. This high quality fusion weld is completed in milliseconds.

**Stud Arc Welding Methods** - The two stud welding methods are called Arc and Capacitor Discharge (usually "CD" for brevity). The difference between these two methods involves the Power Source used to provide the welding current / energy and the stud design.

The equipment required to STUD ARC WELD is composed of a direct current power supply, a weld gun or weld head and the weld cables.

### Advantages

The major advantages of STUD ARC WELDING are:

- **Cost savings** - reduced labor time, materials and secondary operations
- **Weld strength** - weld is typically stronger than the stud and base material
- **Process** - single sided and split second cycle time
- **Base metal** - minimal heating and warpage
- **Base metal** - attachment to very thin metals
- **Base metal** - no reverse side marking (CD and SC Process)



# Stud Welding: Introduction

## STUD ARC WELDING – CHARACTERISTICS OF EACH METHOD

General Characteristics Of Each Method		
Characteristic	CD Stud Welding	Arc Stud Welding
Source of Weld Power:	Rapid discharge of stored energy from bank of capacitors	Transformer-Rectifier
		Inverter
		Motor/Engine-Generator
		Storage Battery
Power Source Input Voltages:	110 Volt AC, Single Phase	230 Volt AC, Three Phase *
	100 - 240 Volt AC, Single Phase (variable input)	380 Volt AC, Three Phase
	220 Volt AC, Single Phase	400 Volt AC, Three Phase
		460 Volt AC, Three Phase *
		575 Volt AC, Three Phase
		100 - 600 Volt AC, Three Phase (variable input)
		* Limited single phase based power sources
Typical Weld Tools:	Hand Held Weld Gun **	
	Mounted Weld Head **	
** Auto feed options are available for both weld tools		
Typical Stud Diameters:	.080 - .312"	.138 - 1.0"
Maximum Diameter:	.460"	2.0"
Shielding:	Shielding is not typically needed	Shielding is typically needed in the form of ceramic ferrule (most common) or gas
Welding Position:	Down Hand	
	Side Hand (limited to 7/8" diameter)	
	Over Head (limited to 7/8" diameter)	
Specific Process for each Method:	Contact	Arc or Drawn Arc
	Gap	Short Cycle (with or w/o gas)
	Drawn Arc	



# Stud Welding: Introduction

## PROCESS SELECTION GUIDE - PART 1

Factors To Be Considered	CD Processes		Arc Processes	
	Contact /Gap	Drawn Arc	Std. Arc	Short Cycle
<b>Stud Shape:</b>				
Round	A	A	A	A
Square	A	A	A	A
Rectangular	A	A	A	A
Other	A	A	A	A
<b>Stud Weld Base Diameter:</b>				
.060 - .125" Diameter	A	A	N	L
.125 - .250" Diameter	A	A	L	A
.250 - .430" Diameter	A	A	A	A
.430 - 1.00" Diameter	N	N	A	L
1.00 - 2.00" Diameter	N	N	B	N
Up to 0.05 inch squared	A	A	L	A
Over 0.05 inch squared	N	N	A	L
<b>Stud Material:</b>				
Carbon Steel	A	A	A	A
Stainless Steel	A	A	A	A
Alloy Steel	L	L	A / B	A / B
Aluminum	A	B	B	L
Brass	A	A	N	N
<b>Base Material:</b>				
Carbon Steel	A	A	A	A
Stainless Steel	A	A	A	A
Alloy Steel	A	L	A / B	A / B
Aluminum	A	B	B	L
Brass	A	A	N	N

<b>Legend:</b>	A - Applicable without special procedures, equipment, etc.
	B - Applicable with special techniques or on special applications.
	L - Limited application
	N - Not recommended

(continued on next page)



# Stud Welding: Introduction

## PROCESS SELECTION GUIDE - PART 2

Factors To Be Considered	CD Processes		Arc Processes	
	Contact /Gap	Drawn Arc	Std. Arc	Short Cycle
<b>Base Metal Thickness:</b>				
Under .015"	A	B	N	N
.016 - .030"	A	A	L	B
.031 - .062"	A	A	L	A
.063 - .125"	A	A	B	A
Over .126"	A	A	A	A

<b>Shielding:</b>				
Ceramic Ferrule	N	N	A	N
Gas	L	L	L	A

<b>Stud Type / Design:</b>				
Arc	N	N	A	L
CD (Capacitor Discharge)	A	A	L	A
SC (Short Cycle)	N	N	B	A

<b>Design Criteria:</b>				
Heat Effect on Material(s)	A	A	B	B
Weld Flash Clearance	A	A	B	B
Reverse Side Marking	A	A	N	L
Strength of Stud Rules	A	A	A	A
Strength Base Metal Rules	A	A	A	A

<b>Legend:</b>	A - Applicable without special procedures, equipment, etc.
	B - Applicable with special techniques or on special applications.
	L - Limited application
	N - Not recommended



# Stud Welding: Introduction

## PROCESS & STUD TYPE COMBINATION GUIDE

Stud Type / Style	CD Processes		Arc Processes	
	Contact /Gap	Drawn Arc	Std. Arc	Short Cycle
<b>Arc Weld Studs:</b>				
Concrete Anchors	N	N	A	N
Threaded	N	N	A	C
No Thread	N	N	A	C
TuffStudds	N	N	A	N
Debarking	N	N	A	N
Rectangular	N	N	A	C
Refractory *	N	N	A	N
* Some Refractory Anchors are suitable for hand welding only				
<b>CD Weld Studs:</b>				
All CD Styles	A	A	C	A **
** For smaller weld base diameters, results may not be acceptable for application requirements				
<b>Insulation Pins:</b>				
CD Weld Pins	A	A	C	A
CD Power Tip Weld Pins	A	A	B	A
Double Pointed Weld Pins	N	N	A	B
CD Cupped Head Weld Pins	A	N	N	N
<b>Short Cycle Weld Studs:</b>				
All SC Styles	N	A	N	A **
** For smaller weld base diameters, results may not be acceptable for application requirements				

<b>Legend:</b>	A - Excellent results
	B - Good results
	C - Results are often not acceptable for application requirements
	N - Not recommended and or suitable for the process

For assistance in determining the best stud welding equipment options to meet the current and potential applications of your business, please contact Sunbelt Stud Welding.

