A Guide To Selecting
The Right Spot Welder
For Your Job

An Electrastart Ltd Application Note

Auckland New Zealand

How to Choose the Right Spot Welder for Your Job

There are 4 steps to take:

1. **Material.**
   What is the material to be spot welded?
   How thick is the material?

2. **Selection of Welding Current Required.**
   Using chart 1 as a guide, find the amount of welding current required – in KA (thousands of Amps). Also keep in mind the Notes associated with this chart.

   Note that the chart relates to 2 identical thicknesses being welded together. If your job has more than 2 pieces at once, please consult an appropriate engineer for guidance.

   The charts following chart 1 provide more detailed information for specific materials

3. **Machine Style.**
   Decide on style of machine. Will you take the work to the spot welder, or the spot welder to the work?

   Take the work to the spot welder: the operator can comfortably manoeuvre the material between the jaws of the spot welder. So, either a floor standing pedestal machine or a bench mounted machine is appropriate.

   Take the spot welder to the work: the work is too large and heavy to be manoeuvred by the operator e.g., a 3-metre diameter ducting cowl, or an industrial door frame. A suspension gun, suspended either from the ceiling or overhead boom, is the solution. A spring balancer takes the weight of the gun, so the operator has merely to manoeuvre it into position.

4. **Machine Model – Relating Max. Welding Current to TECNA Spot Welder Models**
   Having found the welding current required for your job and decided on the style of spot welder that suits your application, using chart 10, select the appropriate Tecna model which provides the power levels required for your application.

   Remember that every spot welder, irrespective of style, has a controller that allows to operator to turn the weld power level down, well below the machine's maximum capability. Choosing a model with more capacity than needed for the immediate job, allows for expansion of capacity later.

Table of Charts

Acknowledgement: The author gratefully acknowledges Tecna S.p.A. and the American Welding Society for data provided in this paper.

Selection of Power Levels Required

The following figures are derived from American Welding Society manuals and applications guides from TECNA S.p.A.

Please Note:

This chart is indicative only and ignores a number of factors that could influence the final selection for a given application. In particular, squeeze pressure, throat depth and weld spacing are not considered. In the case of projection welding, the figures are for each projection.

When selecting the weld current required, it is strongly recommended that it be increased by at least 25%, to allow for mains variations and any other variable that may affect the job.

In the case of spot welders with adjustable throat depth, take these current figures as applying to minimum throat depth, and increase the current figure required by at least 33% for maximum throat depth.

CHART 1

Welding Current KA (1000's Amps)	Mild Steel. mm each piece	Stainless Steel. mm each piece	Aluminium. mm each piece	Steel Wire mesh. Dia each wire	Projection welding M.S. mm
2		0.2		3.2	
3		0.4			
4	0.25	0.5		4.8	
5		0.6		6.35	0.5
6		0.8		8.0	0.75
7	0.5	1.0			
8	0.75			10.0	1.0
9	1.0	1.2			
10	1.25	1.4		11.0	1.5
12	1.5	1.8		12.5	2.0
14	2.0	2.0			2.5
16	2.5	2.5			3.0
18	2.8	3.0	0.5		
20	3.2				
25			0.75		
30			1.0		
35			1.5		
40			2.0		
45					
50			2.5		
55					
60			3.0		

ALUMINIUM SPOT WELDING

Welding Class A

Chart 2

Thickness	Electrode Force	Welding Current	Welding Time	Electrodes		Obtained Nugget
a mm	daN	kA	Cycles	D mm	R mm	d1 mm
0.5	180	18	5	16	50	3.5
0.75	230	24	6	16	50	4.0
1.0	250	30	7	16	50	4.5
1.5	320	35	9	19	100	5.5
2.0	400	40	10	19	100	6.5
2.5	520	49	11	19	100	7.5
3.0	600	58	12	25	100	8.5

Welding Class B

Chart 3

Thickness	Electrode Force	Welding Current	Welding Time	Electrodes		Obtained Nugget
a mm	daN	kA	Cycles	D mm	R mm	d1 mm
0.5	140	16	6	16	50	3.0
0.75	160	18	7	16	50	3.5
1.0	180	21	8	16	50	4.0
1.5	240	25	10	19	50	5.0
2.0	280	29	12	19	50	6.0
2.5	340	33	13	19	50	7.0
3.0	370	36	14	25	50	8.0

LOW CARBON STEEL SPOT WELDING

Chart 4

Welding Class A

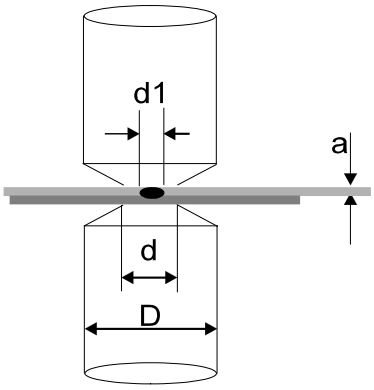
Thickness	Spots-Minimum Distance	Minimum Overlap	Electrode	Electrode	Electrode Force	Welding Current	Welding Time	Obtained Nugget
a mm	mm	mm	D min mm	d max mm	daN	KA	Cycles	d1 mm
0.25	6	9.5	9.5	3	90	4	4	3
0.5	9.5	11	9.5	4.5	136	7	5	4
0.75	12.5	11	9.5	4.5	181	8	7	5
1.0	19.5	12.5	13	6.5	225	9.5	8	5.5
1.25	22.5	15	13	6.5	294	10.5	10	6
1.5	27	16	13	6.5	362	12	12	6.5
2.0	35	18	16	8	498	14	18	7.3
2.5	42	19	16	8	590	15.5	22	8.3
2.8	48	21	16	9	725	17.5	24	9
3.2	50	23	22	9	820	19	25	10

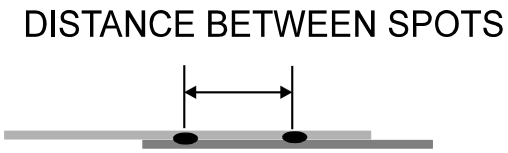
Chart 5

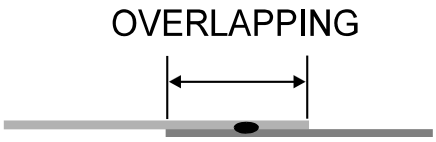
Welding Class B

Thickness	Spots-Minimum Distance	Minimum Overlap	Electrode	Electrode	Electrode Force	Welding Current	Welding Time	Obtained Nugget
mm	mm	mm	D min mm	d max mm	daN	KA	Cycles	d1 mm
0.25	6	9.5	9.5	3	60	3.6	5	3
0.5	9.5	11	9.5	4.5	90	5	8	4
0.75	12.5	11	9.5	4.5	120	6.4	13	5
1.0	19.5	12.5	13	6.5	160	7.5	18	5.5
1.25	22.5	15	13	6.5	200	8.3	20	6

1.5	27	16	13	6.5	240	9	24	6.5
2.0	35	18	16	8	324	10.5	30	7.3
2.5	42	19	16	8	370	11.5	37	8.3
2.8	48	21	16	9	470	12.5	42	9
3.2	50	23	22	9	550	13.5	50	10
4.0	68	32	25	11	640	14.4	75	11.5







STAINLESS STEEL 18/8 SPOT WELDING

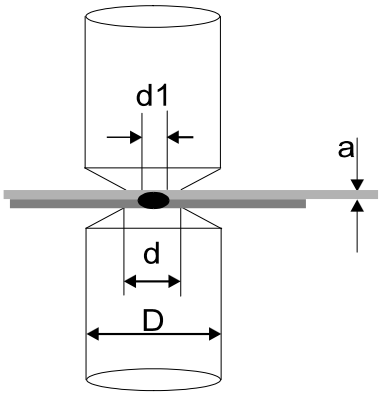
Chart 6

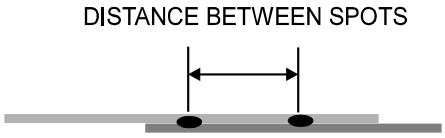
Thickness	Spots Minimum distance	Minimum Overlap	Electrode	Electrode	Electrode force	Welding Current	Welding Current	Weld Time	Obtained Nugget
a mm	mm	mm	D min mm	d max mm	daN	KA *	KA **	cycles	d1 mm
0.2	5	5	5	2.5	90	2	2	3	1.4
0.3	6	6	6	3	120	2.1	2	3	1.4
0.4	8	6	6	3	150	3	2.5	4	2.2
0.5	8	8	6	4	180	4	3.2	4	2.5
0.6	11	10	10	4	235	5	4.1	4	3
0.8	12	10	10	5	295	6	4.8	4	3.3

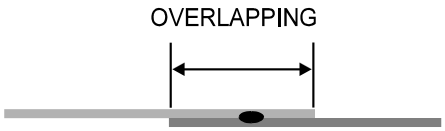
1.0	16	11	10	5	410	7.8	6.3	4	4
1.2	20	12	12.5	6	545	9.5	7.5	7	4.8
1.4	22	14	12.5	6	620	10.3	8.3	9	5.3
1.6	25	16	12.5	6	680	11	9	9	5.6
1.8	28	16	16	6	770	12.3	10	10	6.3
2.0	32	18	16	7	860	14	11	12	7
2.5	35	20	19	8	1090	15.7	12.7	13	7.2
3.0	50	22	19	10	1500	18	15.5	17	7.65

* For stainless steel with tensile strength up to 100Kg/mm^2

** For stainless steel with tensile strength over 100Kg/mm^2







PROJECTION WELDING OF LOW CARBON STEEL

Chart 7

Projection Dimensions

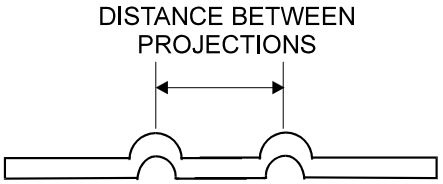
Thickness	Projection		Min. Dist Between Projections	Minimum Overlapping
a mm	Diameter d mm	height h mm	mm	mm
0.5	2.3	0.6	10	7
0.75	2.3	0.6	10	
1.0	2.7	0.8	13	10
1.5	3.8	1	19	13
2.0	4.6	1.2	22	13
2.5	6	1.4	30	19
3.0	6.8	1.4	40	21

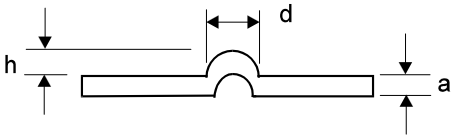
Chart 8

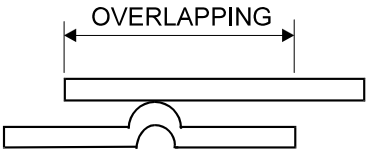
Welding Parameters

Thick-ness	Single Projection			1-3 Projections (data for each projection)			3 or more Projections (data for each projection)		
a mm	Time Cycles*	Current kA **	Force daN	Time Cycles*	Current kA **	Force daN	Time Cycles*	Current kA **	Force daN
0.5	3	4.4	68	5	3.85	68	5	2.9	36
0.75	3	5.5	88	5	4.45	68	7	3.3	45
1.0	4	8.0	150	8	6.0	90	12	4.3	70
1.5	8	10.3	250	16	7.65	166	20	5.4	150
2.0	12	11.85	365	24	8.85	240	29	6.4	215
2.5	15	14.1	550	30	10.6	370	40	8.3	330
3.0	18	14.85	680	37	11.3	450	50	9.2	400

Based on 50Hz supply mains ** Starting Value.







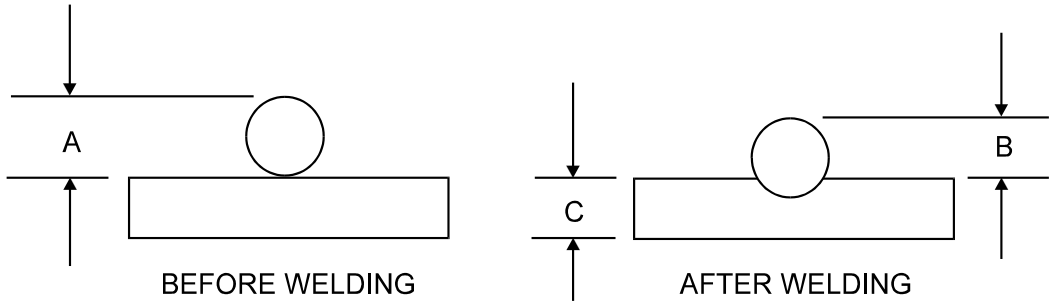
DIMENSIONS RELATING TO CHART 7

CROSSED RODS WELDING OF COLD DRAWN LOW CARBON STEEL

Chart 9

Rod Diameter	Welding Time	Set-down 15%		Set-down 30%	
A		Electrode Force	Welding Current	Electrode Force	Welding Current
mm	Cycles	daN	kA	daN	kA
1.6	4	45	0.6	68	0.8
3.2	8	56	1.8	117	2.6
4.8	14	160	3.3	270	5
6.35	19	260	4.5	380	6.7
8	25	415	6.2	650	9.3
10	33	495	7.4	925	11.8
11	42	630	9.3	1300	13.8
12.5	50	765	10.3	1530	15.8

N.B. In some instances, when welding reinforced concrete rods, larger diameter wire may be welded with these parameters.



$$\text{SET-DOWN} = \frac{A - B}{A} \times 100 \quad \%$$

Chart 10 Relating Maximum Welding Current to TECNA Spot Welder models

Maximum Welding Current KA	Portable & Suspension Gun	Bench Top Linear Action	Bench Top Linear Inverter	Pedestal Rocker Action, Pneumatic	Pedestal Rocker Action, Manual Pedal	Pedestal Linear Action	Pedestal Linear Inverter
2.5	7600, 7660						
6.55	7902, 7911,7903,7913						
9.6				4647	4642		
10				4645	4640	8002	
12		2101		4646,4649	4641,4644	8004	
14				4661		8001,8006	
14.5		2102		4648,	4643	4667	
15.5						4665	
16.5	3321,3324					4663,4668,8009,8211	
17.5		2103	2112	4660		8003	
20	3020,3120,3122	2122				8005+8031,8212,8213,8206	
21	3322,3323,3124,3126,3024	2123	2114	4662			
23	3328	2124	2115				
27	3327,3054,3056,3032	2131	2117,2118			8005,8007+8032,8207	
28		2125					
30	3040,3060,3161	2126,2133				8208	
32	3166,3168	2132				8201,8209	8121,8122,8123
35		2134,2135				8007,8202	
38		2141					
40		2136,2143				8203	
44		2142				6103,8204	
46		2144					
48							
52						8214	
64							6124,6125,6126
88							6127,6128,6129