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Hydraulic Force Gauge

Productivity: A hydraulic force gauge is an inexpensive way to measure force.

Fundamentally, spot welding is only a function of three simple variables: Current (a.k.a. “heat”), Time, and Force. Force is equally as important as your welding Current and Time. As your material thickness increases, you need greater clamping force.

A force gauge is a handheld tool used for calibrating your weld force. Paper Certifications are typically available for additional cost.

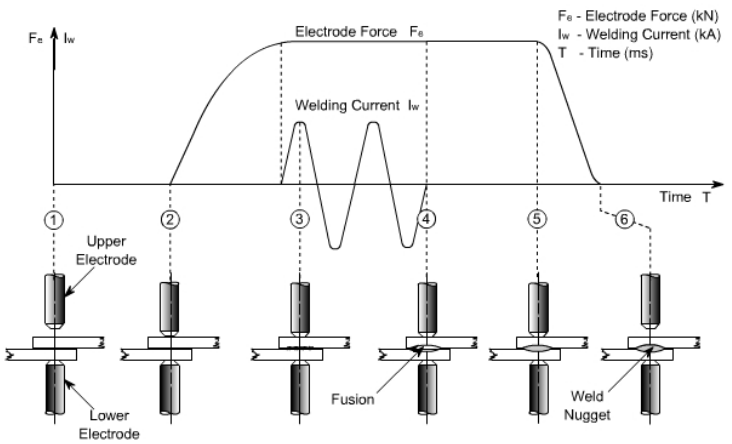
OPTIMUM CONDITIONS
SCHEDULES FOR SPOT WELDING LOW CARBON STEEL—SAE 1010

DATA COMMON TO ALL CLASSES OF SPOT WELDS					WELDING SET-UP FOR BEST QUALITY—CLASS A WELDS					WELDING SET-UP FOR MEDIUM QUALITY—CLASS B WELDS					WELDING SET-UP FOR GOOD QUALITY—CLASS C WELDS				
Thickness of Each of the Two Work Pieces inches	Electrode Diam. & Shape Min. D inches	Max. d inches	Min. Weld Spacing (Note 4) inches	Min. Contacting Overlap (Note 6) inches	Weld Time (Note 7) Cycles	Electrode Force Pounds	Welding Current Amps.	Diam. of Fused Zone Dw inches	Average Tensile Shear Strength ±14% Pounds	Weld Time (Note 7) Cycles	Electrode Force Pounds	Welding Current Amps.	Diam. of Fused Zone Dw inches	Average Tensile Shear Strength ±17% Pounds	Weld Time (Note 7) Cycles	Electrode Force Pounds	Welding Current Amps.	Diam. of Fused Zone Dw inches	Average Tensile Shear Strength ±20% Pounds
.010	1/2	1/8	1/4	3/8	4	200	4000	.13	235	5	130	3700	.12	200	15	65	3000	.11	160
.021	1/2	3/16	3/8	7/16	6	300	6100	.17	530	10	200	5100	.16	480	22	100	3800	.14	390
.031	1/2	3/16	1/2	7/16	8	400	8000	.21	980	15	275	6300	.20	850	29	135	4700	.18	790
.040	5/8	1/4	3/4	1/2	10	500	9200	.23	1305	21	360	7500	.22	1230	38	180	5600	.21	1180
.050	5/8	1/4	7/8	9/16	12	650	10300	.25	1820	24	410	8000	.23	1700	42	205	6100	.22	1600
.062	5/8	1/4	1	5/8	14	800	11600	.27	2350	29	500	9000	.26	2150	48	250	6800	.25	2050
.078	5/8	5/16	1-1/8	11/16	21	1100	13300	.31	3225	36	650	10400	.30	3025	58	325	7900	.28	2900
.094	5/8	5/16	1-1/4	3/4	25	1300	14700	.34	4100	44	790	11400	.33	3900	66	390	8800	.31	3750
.109	7/8	3/8	1-5/16	13/16	29	1600	16100	.37	5300	50	960	12300	.36	5050	72	480	9500	.35	4850
.125	7/8	3/8	1-1/2	7/8	30	1800	17500	.40	6900	60	1140	12900	.39	6500	78	570	10000	.37	6150

NOTES:
1. Low Carbon Steel as hot rolled, pickled, and slightly oiled with an ultimate strength of 42,000 to 45,000 PSI Similar to SAE 1005—SAE 1010.
2. Electrode Material is CMW* 3.
3. Surface of steel is lightly oiled but free from grease, scale or dirt.
4. Minimum weld spacing is that distance for which no increase in welding current is necessary to compensate for the shunted current effect in adjacent welds.
5. Radius Face electrodes may be used
   0.010 to 0.031 — 2" Radius
   0.031 to 0.078 — 3" Radius
   0.078 to 0.125 — 4" Radius
6.
7. Weld time is indicated in cycles of 60 cycle frequency.
8. Tensile shear strength values are based on recommended test sample sizes:

Direction of Force	Thickness	Width	Length
	.000" to .029"	5/8"	3"
	.030" to .058"	1"	4"
	.059" to .115"	1-1/2"	5"
	.116" to .190"	2"	6"

9. Tolerance for machining of electrode diameter "d" is ±.015" of specified dimension.
10. Electrode force does not provide for force to press ill-fitting parts together.



Cyl. Diam. In.	Cyl. Area Sq. In.	PRESSURE, PSI., GAGE							
		30	40	50	60	70	80	90	100
1	0.7854	24	31	39	47	55	63	71	79
2	3.1416	94	126	157	188	220	251	283	314
2.5	4.91	147	196	245	295	344	393	442	491
3	7.07	212	283	353	424	495	565	636	707
3.5	9.62	289	385	481	577	673	770	866	962
4	12.57	377	503	628	754	880	1,005	1,131	1,257
4.5	15.90	477	636	795	954	1,113	1,272	1,431	1,590
5	19.64	589	785	982	1,178	1,374	1,571	1,767	1,963
6	28.27	848	1,131	1,414	1,696	1,979	2,262	2,545	2,827
7	38.49	1,155	1,539	1,924	2,309	2,694	3,079	3,464	3,848
8	50.27	1,508	2,011	2,513	3,016	3,519	4,021	4,524	5,027
9	63.62	1,909	2,545	3,181	3,817	4,453	5,089	5,726	6,362
10	78.54	2,356	3,142	3,927	4,712	5,498	6,283	7,069	7,854
12	113.10	3,393	4,524	5,655	6,786	7,917	9,048	10,179	11,310
14	153.94	4,618	6,158	7,697	9,236	10,776	12,315	13,854	15,394
16	201.06	6,032	8,042	10,053	12,064	14,074	16,085	18,096	20,106
18	254.47	7,634	10,179	12,723	15,268	17,813	20,358	22,902	25,447
20	314.16	9,425	12,566	15,708	18,850	21,991	25,133	28,274	31,416

For Hydraulic pressures, multiply pressure per sq. in. and resultant pressures by 10.