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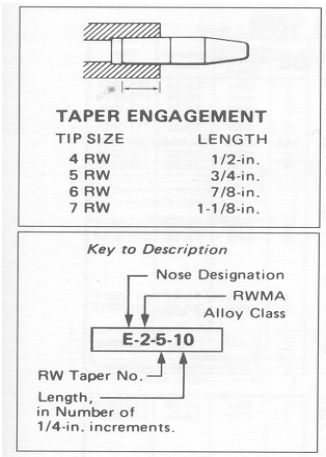
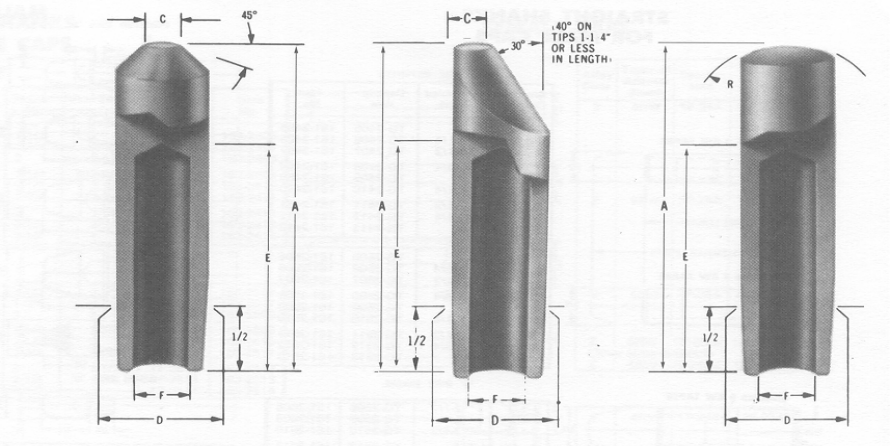
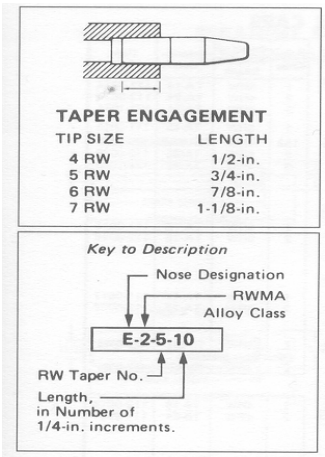


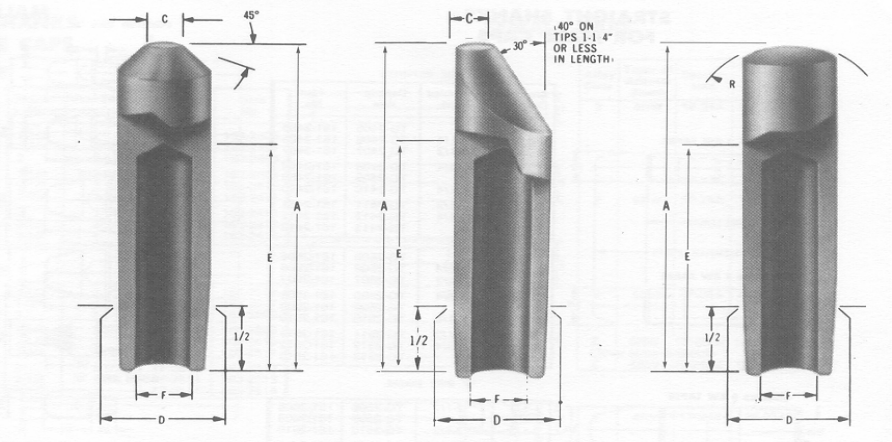


"A" POINTED — "B" DOME — "C" FLAT

A Overall Length	C Welding Face Dia.	D Gauging Dia.	E Water Hole Depth	F Water Hole Dia.	B Nose Length	RWMA CLASS 1 Description	RWMA CLASS 2 Description	B Nose Length	RWMA CLASS 1 Description	RWMA CLASS 2 Description	C Welding Face Dia.	RWMA CLASS 1 Description	RWMA CLASS 2 Description
No. 4 RW TAPER - .482" DIAMETER													
1	3/16	.463	1/2	9/32	3/8	A-1404	A-2404	1/4	B-1404	B-2404	.482	C-1404	C-2404
1-1/4	3/16	.463	3/4	9/32	3/4	A-1405	A-2405	1/4	B-1405	B-2405	.482	C-1405	C-2405
1-1/2	3/16	.463	1	9/32	3/4	A-1406	A-2406	1/4	B-1406	B-2406	.482	C-1406	C-2406
1-3/4	3/16	.463	1-1/4	9/32	3/4	A-1407	A-2407	1/4	B-1407	B-2407	.482	C-1407	C-2407
2	3/16	.463	1-1/2	9/32	3/4	A-1408	A-2408	1/4	B-1408	B-2408	.482	C-1408	C-2408
2-1/4	3/16	.463	1-3/4	9/32	3/4	A-1409	A-2409	1/4	B-1409	B-2409	.482	C-1409	C-2409
2-1/2	3/16	.463	2	9/32	3/4	A-1410	A-2410	1/4	B-1410	B-2410	.482	C-1410	C-2410
2-3/4	3/16	.463	2-1/4	9/32	3/4	A-1411	A-2411	1/4	B-1411	B-2411	.482	C-1411	C-2411
3	3/16	.463	2-1/2	9/32	3/4	A-1412	A-2412	1/4	B-1412	B-2412	.482	C-1412	C-2412
3-1/4	3/16	.463	2-3/4	9/32	3/4	A-1413	A-2413	1/4	B-1413	B-2413	.482	C-1413	C-2413
3-1/2	3/16	.463	3	9/32	3/4	A-1414	A-2414	1/4	B-1414	B-2414	.482	C-1414	C-2414
3-3/4	3/16	.463	3-1/4	9/32	3/4	A-1415	A-2415	1/4	B-1415	B-2415	.482	C-1415	C-2415
4	3/16	.463	3-1/2	9/32	3/4	A-1416	A-2416	1/4	B-1416	B-2416	.482	C-1416	C-2416
No. 5 RW TAPER - 5/8" DIAMETER													
1-1/4	1/4	.613	3/4	3/8	1/2	A-1505	A-2505	3/8	B-1505	B-2505	5/8	C-1505	C-2505
1-1/2	1/4	.613	3/4	3/8	7/8	A-1506	A-2506	3/8	B-1506	B-2506	5/8	C-1506	C-2506
1-3/4	1/4	.613	1	3/8	7/8	A-1507	A-2507	3/8	B-1507	B-2507	5/8	C-1507	C-2507
2	1/4	.613	1-1/4	3/8	7/8	A-1508	A-2508	3/8	B-1508	B-2508	5/8	C-1508	C-2508
2-1/4	1/4	.613	1-1/2	3/8	7/8	A-1509	A-2509	3/8	B-1509	B-2509	5/8	C-1509	C-2509
2-1/2	1/4	.613	1-3/4	3/8	7/8	A-1510	A-2510	3/8	B-1510	B-2510	5/8	C-1510	C-2510
2-3/4	1/4	.613	2	3/8	7/8	A-1511	A-2511	3/8	B-1511	B-2511	5/8	C-1511	C-2511
3	1/4	.613	2-1/4	3/8	7/8	A-1512	A-2512	3/8	B-1512	B-2512	5/8	C-1512	C-2512
3-1/4	1/4	.613	2-1/2	3/8	7/8	A-1513	A-2513	3/8	B-1513	B-2513	5/8	C-1513	C-2513
3-1/2	1/4	.613	2-3/4	3/8	7/8	A-1514	A-2514	3/8	B-1514	B-2514	5/8	C-1514	C-2514
3-3/4	1/4	.613	3	3/8	7/8	A-1515	A-2515	3/8	B-1515	B-2515	5/8	C-1515	C-2515
4	1/4	.613	3-1/4	3/8	7/8	A-1516	A-2516	3/8	B-1516	B-2516	5/8	C-1516	C-2516
No. 6 RW TAPER - 3/4" DIAMETER													
2	9/32	.731	1-1/4	7/16	1	A-1608	A-2608	3/8	B-1608	B-2608	3/4	C-1608	C-2608
2-1/2	9/32	.731	1-3/4	7/16	1	A-1610	A-2610	3/8	B-1610	B-2610	3/4	C-1610	C-2610
3	9/32	.731	2-1/4	7/16	1	A-1612	A-2612	3/8	B-1612	B-2612	3/4	C-1612	C-2612
3-1/2	9/32	.731	2-3/4	7/16	1	A-1614	A-2614	3/8	B-1614	B-2614	3/4	C-1614	C-2614
4	9/32	.731	3-1/4	7/16	1	A-1616	A-2616	3/8	B-1616	B-2616	3/4	C-1616	C-2616
No. 7 RW TAPER - 7/8" DIAMETER													
2	5/16	.844	1-1/4	1/2	1-1/8	A-1708	A-2708	3/8	B-1708	B-2708	7/8	C-1708	C-2708
2-1/2	5/16	.844	1-3/4	1/2	1-1/8	A-1710	A-2710	3/8	B-1710	B-2710	7/8	C-1710	C-2710
3	5/16	.844	2-1/4	1/2	1-1/8	A-1712	A-2712	3/8	B-1712	B-2712	7/8	C-1712	C-2712
3-1/2	5/16	.844	2-3/4	1/2	1-1/8	A-1714	A-2714	3/8	B-1714	B-2714	7/8	C-1714	C-2714
4	5/16	.844	3-1/2	1/2	1-1/8	A-1716	A-2716	3/8	B-1716	B-2716	7/8	C-1716	C-2716

Electrodes

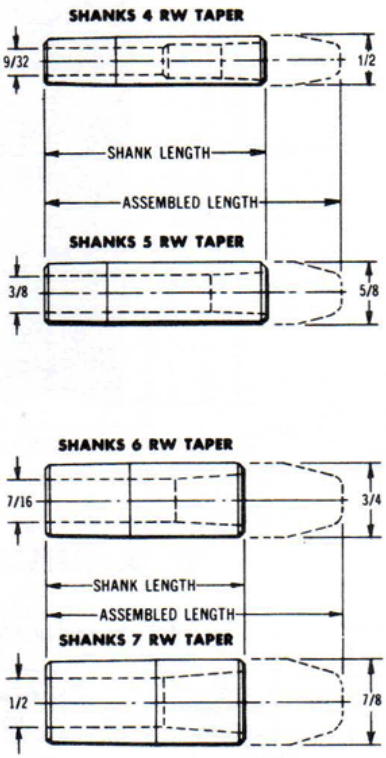




					"E" POINTED		"D" DOME		"F" FLAT		
					RWMA CLASS		RWMA CLASS		RWMA CLASS		
					1	2	1	2	1	1	2
A Overall Length	C Welding Face Dia.	D Gauging Dia.	E Water Hole Depth	F Water Hole Dia.	B Nose Length	Description	Description	B Nose Length	Description	Description	C Welding Face Dia.	Description	Description
No. 4 RW TAPER - .482" DIAMETER													
1	3/16	.463	1/2	9/32	3/8	A-1404	A-2404	1/4	B-1404	B-2404	.482	C-1404	C-2404
1-1/4	3/16	.463	3/4	9/32	3/4	A-1405	A-2405	1/4	B-1405	B-2405	.482	C-1405	C-2405
1-1/2	3/16	.463	1	9/32	3/4	A-1406	A-2406	1/4	B-1406	B-2406	.482	C-1406	C-2406
1-3/4	3/16	.463	1-1/4	9/32	3/4	A-1407	A-2407	1/4	B-1407	B-2407	.482	C-1407	C-2407
2	3/16	.463	1-1/2	9/32	3/4	A-1408	A-2408	1/4	B-1408	B-2408	.482	C-1408	C-2408
2-1/4	3/16	.463	1-3/4	9/32	3/4	A-1409	A-2409	1/4	B-1409	B-2409	.482	C-1409	C-2409
2-1/2	3/16	.463	2	9/32	3/4	A-1410	A-2410	1/4	B-1410	B-2410	.482	C-1410	C-2410
2-3/4	3/16	.463	2-1/4	9/32	3/4	A-1411	A-2411	1/4	B-1411	B-2411	.482	C-1411	C-2411
3	3/16	.463	2-1/2	9/32	3/4	A-1412	A-2412	1/4	B-1412	B-2412	.482	C-1412	C-2412
3-1/4	3/16	.463	2-3/4	9/32	3/4	A-1413	A-2413	1/4	B-1413	B-2413	.482	C-1413	C-2413
3-1/2	3/16	.463	3	9/32	3/4	A-1414	A-2414	1/4	B-1414	B-2414	.482	C-1414	C-2414
3-3/4	3/16	.463	3-1/4	9/32	3/4	A-1415	A-2415	1/4	B-1415	B-2415	.482	C-1415	C-2415
4	3/16	.463	3-1/2	9/32	3/4	A-1416	A-2416	1/4	B-1416	B-2416	.482	C-1416	C-2416
No. 5 RW TAPER - 5/8" DIAMETER													
1-1/4	1/4	.613	3/4	3/8	1/2	A-1505	A-2505	3/8	B-1505	B-2505	5/8	C-1505	C-2505
1-1/2	1/4	.613	3/4	3/8	7/8	A-1506	A-2506	3/8	B-1506	B-2506	5/8	C-1506	C-2506
1-3/4	1/4	.613	1	3/8	7/8	A-1507	A-2507	3/8	B-1507	B-2507	5/8	C-1507	C-2507
2	1/4	.613	1-1/4	3/8	7/8	A-1508	A-2508	3/8	B-1508	B-2508	5/8	C-1508	C-2508
2-1/4	1/4	.613	1-1/2	3/8	7/8	A-1509	A-2509	3/8	B-1509	B-2509	5/8	C-1509	C-2509
2-1/2	1/4	.613	1-3/4	3/8	7/8	A-1510	A-2510	3/8	B-1510	B-2510	5/8	C-1510	C-2510
2-3/4	1/4	.613	2	3/8	7/8	A-1511	A-2511	3/8	B-1511	B-2511	5/8	C-1511	C-2511
3	1/4	.613	2-1/4	3/8	7/8	A-1512	A-2512	3/8	B-1512	B-2512	5/8	C-1512	C-2512
3-1/4	1/4	.613	2-1/2	3/8	7/8	A-1513	A-2513	3/8	B-1513	B-2513	5/8	C-1513	C-2513
3-1/2	1/4	.613	2-3/4	3/8	7/8	A-1514	A-2514	3/8	B-1514	B-2514	5/8	C-1514	C-2514
3-3/4	1/4	.613	3	3/8	7/8	A-1515	A-2515	3/8	B-1515	B-2515	5/8	C-1515	C-2515
4	1/4	.613	3-1/4	3/8	7/8	A-1516	A-2516	3/8	B-1516	B-2516	5/8	C-1516	C-2516
No. 6 RW TAPER - 3/4" DIAMETER													
2	9/32	.731	1-1/4	7/16	1	A-1608	A-2608	3/8	B-1608	B-2608	3/4	C-1608	C-2608
2-1/2	9/32	.731	1-3/4	7/16	1	A-1610	A-2610	3/8	B-1610	B-2610	3/4	C-1610	C-2610
3	9/32	.731	2-1/4	7/16	1	A-1612	A-2612	3/8	B-1612	B-2612	3/4	C-1612	C-2612
3-1/2	9/32	.731	2-3/4	7/16	1	A-1614	A-2614	3/8	B-1614	B-2614	3/4	C-1614	C-2614
4	9/32	.731	3-1/4	7/16	1	A-1616	A-2616	3/8	B-1616	B-2616	3/4	C-1616	C-2616
No. 7 RW TAPER - 7/8" DIAMETER													
2	5/16	.844	1-1/4	1/2	1-1/8	A-1708	A-2708	3/8	B-1708	B-2708	7/8	C-1708	C-2708
2-1/2	5/16	.844	1-3/4	1/2	1-1/8	A-1710	A-2710	3/8	B-1710	B-2710	7/8	C-1710	C-2710
3	5/16	.844	2-1/4	1/2	1-1/8	A-1712	A-2712	3/8	B-1712	B-2712	7/8	C-1712	C-2712
3-1/2	5/16	.844	2-3/4	1/2	1-1/8	A-1714	A-2714	3/8	B-1714	B-2714	7/8	C-1714	C-2714
4	5/16	.844	3-1/2	1/2	1-1/8	A-1716	A-2716	3/8	B-1716	B-2716	7/8	C-1716	C-2716

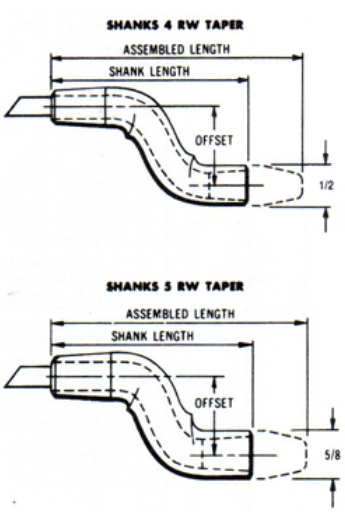
Electrodes

STRAIGHT SHANKS FOR MALE CAPS



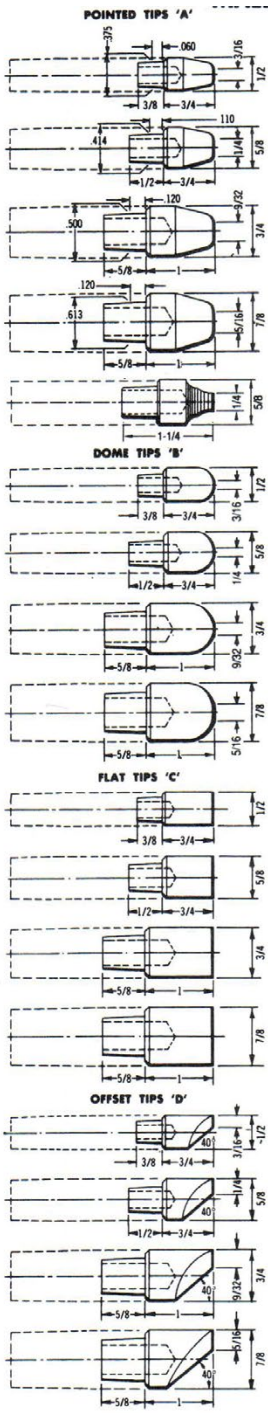
Shank Length	Assembled Length	Descripton	Item Number
1-1/4	2	TG-2405	161-2405
1-1/2	2-1/4	TG-2406	161-2406
1-3/4	2-1/2	TG-2407	161-2407
2	2-3/4	TG-2408	161-2408
2-1/4	3	TG-2409	161-2409
2-1/2	3-1/4	TG-2410	161-2410
2-3/4	3-1/2	TG-2411	161-2411
3	3-3/4	TG-2412	161-2412
3-1/4	4	TG-2413	161-2413
1-1/4	2	TG-2505	161-2505
1-1/2	2-1/4	TG-2506	161-2506
1-3/4	2-1/2	TG-2507	161-2507
2	2-3/4	TG-2508	161-2508
2-1/4	3	TG-2509	161-2509
2-1/2	3-1/4	TG-2510	161-2510
2-3/4	3-1/2	TG-2511	161-2511
3	3-3/4	TG-2512	161-2512
3-1/4	4	TG-2513	161-2513
1-1/2	2-1/2	TG-2606	161-2606
2	3	TG-2608	161-2608
2-1/2	3-1/2	TG-2610	161-2610
3	4	TG-2612	161-2612
1-1/2	2-1/2	TG-2706	161-2706
2	3	TG-2708	161-2708
2-1/2	3-1/2	TG-2710	161-2710
3	4	TG-2712	161-2712

BENT SHANKS FOR MALE CAPS



Shank Length	Offset	Length	Descrip-tion	Item Number
2-1/2	1/2	3-1/4	TG-2410-08	162-2410
2-1/2	3/4	3-1/4	TG-2410-12	162-2420
2-1/2	1	3-1/4	TG-2410-16	162-2430
3	1/2	3-3/4	TG-2412-8	162-2450
3	1-1/4	3-3/4	TG-2412-20	162-2460
3-1/4	1	4	TG-2413-16	162-2470
3-1/4	1-1/4	4	TG-2413-20	162-2480
2-1/4	1/4	3	TG-2509-4	162-2505
2-1/2	1/2	3-1/4	TG-2510-8	162-2510
2-1/2	3/4	3-1/4	TG-2510-12	162-2520
2-1/2	1	3-1/4	TG-2510-16	162-2530
3	1/2	3-1/4	TG-2512-8	162-2550
3	1-1/4	3-1/4	TG-2512-20	162-2560
3-1/4	1	4	TG-2513-16	162-2570
3-1/4	1-1/4	4	TG-2513-20	162-2580

MALE CAPS

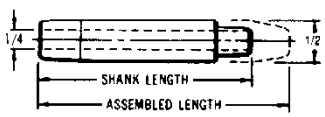


Alloy Class	Taper of Adapter Shank	Descrip-tion	Item Number
1	4RW	TA-14	111-0014
2	4RW	TA-24	112-0024
3	4RW	TA-34	122-1034
1	5RW	TA-15	111-0015
1&2	5RW	TA-25Z	126-0025
2	5RW	TA-25	112-0025
3	5RW	TA-35	122-1035
1	6RW	TA-16	111-0016
2	6RW	TA-26	112-0026
1	7RW	TA-17	111-0017
2	7RW	TA-27	112-0027
Z	5RW	TS-25Z	127-0025
Other sizes available			
Z	4RW	TS24Z	127-0024
1	4RW	TB-14	113-0014
2	4RW	TB-24	114-0024
1	5RW	TB-15	113-0015
2	5RW	TB-25	114-0025
1	6RW	TB-16	113-0016
2	6RW	TB-26	114-0026
1	7RW	TB-17	113-0017
2	7RW	TB-27	114-0027
1	4RW	TC-14	115-0014
2	4RW	TC-24	116-0024
3	4RW	TC-34	122-3034
1	5RW	TC-15	115-0015
2	5RW	TC-25	116-0025
3	5RW	TC-35	122-3035
1	6RW	TC-16	115-0016
2	6RW	TC-26	116-0026
1	7RW	TC-17	115-0017
2	7RW	TC-27	116-0027
1	4RW	TD-14	117-0014
2	4RW	TD-24	118-0024
3	4RW	TD-34	122-4034
1	5RW	TD-15	117-0015
2	5RW	TD-25	118-0025
3	5RW	TD-35	122-4035
1	6RW	TD-16	117-0016
2	6RW	TD-26	118-0026
1	7RW	TD-17	117-0017
2	7RW	TD-27	118-0027

Electrodes

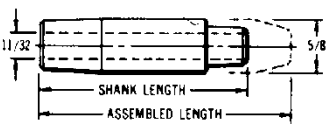
STRAIGHT SHANKS FOR FEMALE CAPS

SHANKS 4 RW TAPER



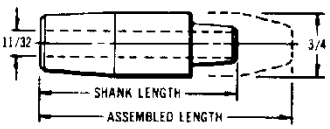
Shank Length	Assembled Length	Descripton	Item Number
1-1/2	2	TP-2406	163-2406
1-3/4	2-1/4	TP-2407	163-2407
2	2-1/2	TP-2408	163-2408
2-1/4	2-3/4	TP-2409	163-2409
2-1/2	3	TP-2410	163-2410
2-3/4	3-1/4	TP-2411	163-2411
3	3-1/2	TP-2412	163-2412
3-1/4	3-3/4	TP-2413	163-2413
3-1/2	4	TP-2414	163-2414

SHANKS 5 RW TAPER



1-1/2	2	TP-2506	163-2506
1-3/4	2-1/4	TP-2507	163-2507
2	2-1/2	TP-2508	163-2508
2-1/4	2-3/4	TP-2509	163-2509
2-1/2	3	TP-2510	163-2510
2-3/4	3-1/4	TP-2511	163-2511
3	3-1/2	TP-2512	163-2512
3-1/4	3-3/4	TP-2513	163-2513
3-1/2	4	TP-2514	163-2514

SHANKS 6 RW TAPER

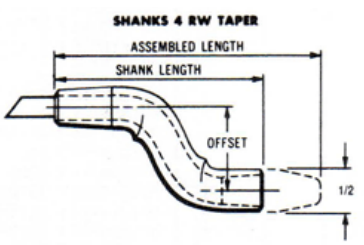


1-1/2	2	TP-2606	163-2606
2	2-1/2	TP-2608	163-2608
2-1/2	3	TP-2610	163-2610
3	3-1/2	TP-2612	163-2612

For improved cooling, female shanks are drilled through (to put water in contact with cap). Shanks may be ordered with blind water hole, upon request. (Special price)

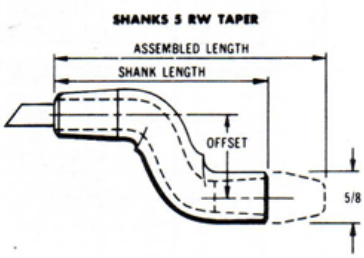
BENT SHANKS FOR FEMALECAPS

SHANKS 4 RW TAPER



Shank Length	Offset	Length	Description	Item Number
2-3/4	1/2	3-1/4	TP-2411-08	164-2442
2-3/4	3/4	3-1/4	TP-2411-12	164-2445
2-3/4	1	3-1/4	TP-2411-16	164-2447
3-1/4	1/2	3-3/4	TP-2413-08	164-2465
3-1/4	1-1/4	3-3/4	TP-2413-20	164-2480
3-1/2	1	4	TP-2414-16	164-2490

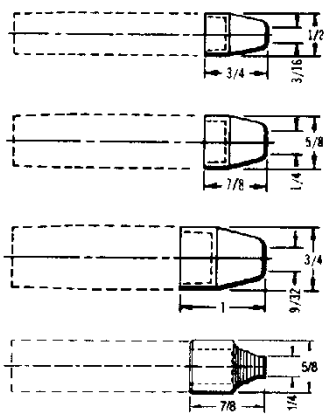
SHANKS 5 RW TAPER



2-3/4	1/2	3-1/4	TP-2511-08	164-2542
2-3/4	3/4	3-1/4	TP-2511-12	164-2545
2-3/4	1	3-1/4	TP-2511-16	164-2547
3-1/4	1/2	3-3/4	TP-2513-08	164-2565
3-1/2	1	4	TP-2513-16	164-2670
3-1/4	1-1/4	3-3/4	TP-2513-20	164-2580

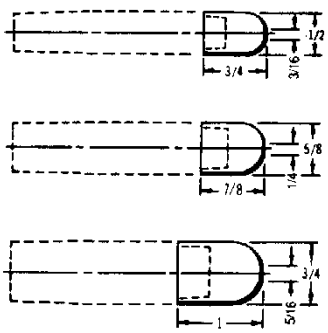
FEMALE CAPS

POINTED TIPS 'A'



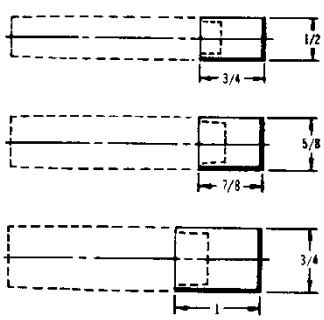
Alloy Class	Taper of Adapter Shank	Descrip-tion	Item Number
2	4RW	TP-24A	125-0241
2	5RW	TP-25A	125-0251
2	6RW	TP-26A	125-0261
Z	5RW	TP-25SZ	127-0251
	Other sizes available		
Z	4RW	TP-24SZ	127-0241

DOME TIPS 'B'



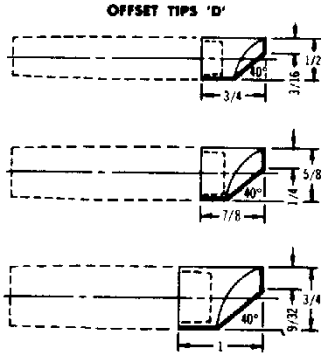
2	4RW	TP-24B	125-0242
2	5RW	TP-25B	125-0252
2	6RW	TP-26B	125-0262

FLAT TIPS 'C'



2	4RW	TP-24C	125-0243
2	5RW	TP-25C	125-0253
2	6RW	TP-26C	125-0263

OFFSET TIPS 'D'



2	4RW	TP-24D	125-0244
2	5RW	TP-25D	125-0254
2	6RW	TP-26D	125-0264

Nitrode and Z-Trode Replaces These Class 2 Caps

Nose Type	To Fit Adapter Size	Nitrode	Z-Trode	CMW	Electroloy	Hercules	Tipaloy	Tuffaloy	Weldaloy
A	RWMA 4 or Morse Taper 1	MA-24N	MA-24Z	MA-24	A-24	WA-24	CA-21	TA-24	WP-32
B		MB-24N	MB-24Z		B-24	WB-24	CB-21	TB-24	WP-35
C		MC-24N	MC-24Z		C-24	WC-24	CC-21	TC-24	WP-38
A	RWMA 5 or Morse Taper II	MA-25N	MA-25Z	MA-25	A-25	WA-25	CA-22	TA-25	WP-42
B		MB-25N	MB-25Z	MB-25	B-25	WB-25	CB-22	TB-25	WP-43
C		MC-25N	MC-25Z	MC-25	C-25	WC-25	CC-22	TC-25	WP-45
D		MD-25N	MD-25Z		D-25	WD-25	CD-22	TD-25	WP-47
E		ME-25N	ME-25Z		E-25	WE-25	CT-22	TE-25	WP-54
F		MF-25N	MF-25Z		F-25	WF-25	CR-22	TF-25	WP-49
A	RWMA 6	MA-26N	MA-26Z		A-26	WA-26	CA-26	TA-26	WP-56
B		MB-26N	MB-26Z		B-26	WB-26	CB-26	TB-26	WP-57
C		MC-26N	MC-26Z		C-26	WC-26	CC-26	TC-26	WP-58
A	RWMA 4 or Morse Taper I	FA-24N	FA-24Z			WA-F-24		TP-24A	WP-20
B		FB-24N	FB-24Z			WB-F-24		TP-25B	WP-21
C		FC-24N	FC-24Z			WC-F-24		TP-26C	WP-22
A	RWMA 5 or Morse Taper II	FA-25N	FA-25Z	MPA25		WA-F-25		TP-25A	WP-23
B		FB-25N	FB-25Z	MPB25		WB-F-25		TP-25B	WP-24
C		FC-25N	FC-25Z	MPC25		WC-F-25		TP-25C	WP-25
D		FD-25N	FD-25Z			WD-F-25		TP-25D	
E		FE-25N	FE-25Z			WE-F-25			
F		FF-25N	FF-25Z			WF-F-25			

NITRODE & Z-TRODE CAPS NIIRODE™ Outwelds Class 2

Nitrode is the most cost-efficient cap electrode available for resistance welding applications.Nitrode lasts up to six times longer than Class 2 electrodes. And it requires only one-fourth the dressing frequency. Plus, Nitrode·. permits no-slick welding of galvanized steel and other coated metals without special dressings or pastes. And due to its higher conductivity, Nitrode requires less power and amperage when used on both sides of the weldment. Composed of CDA Alloy C15760 dispersion-strengthened copper cold-formed by Nippert. Nitrode may be used in any capadaptive, water-cooled resistance welding applications requiring RWMA Class 2 electrodes.

Resistance-Welding Applications (Robotic Welding)	Cap Electrodes Material
Light-to-medium-gauge coated steels	Z-TRODE™ Zirconium Copper
Light-to-medium-gauge uncoated steels	
Heavy-gauge coated steels	NITRODE™ CDA 15760 Dispersion-Hardened Copper
Heavy-gauge uncoated steels	

Not all cap electrodes are equally appropriate for all applications.

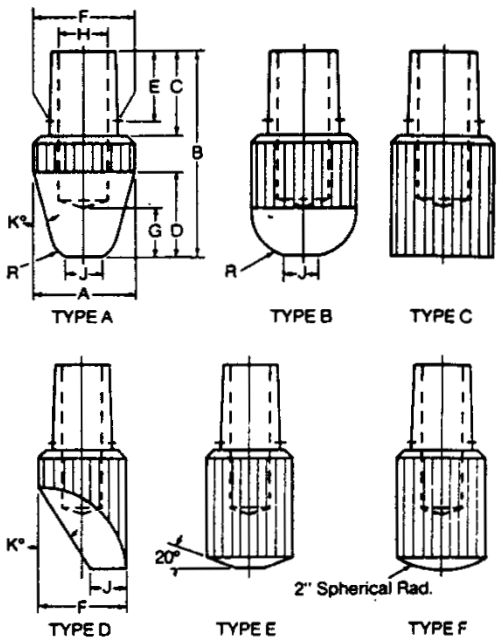
Z-TRODE, Cold-Formed Zirconium, Copper Cap Electrodes.

No-stick welding of galvanized steels. Nippert's Zirconium copper cap electrodes are the most cost- effective type of cap electrode for welding light·to-medium -gauge coated and uncoated steels. Since Zirconium copper doesn't stick. as chrome copper does. expensive downtime is eliminated. Z·TRODE cap electrodes are made I rom Zirconium copper which conforms to C15000 specifications. Not all Zirconium elec· trades being sold meet C15000 specifications and many have not been processed to obtain the proper combination of hardness and conductivity. Nippert manufactures its own cold heading material and cold forms its Z-TRODEs to ensure optimum properties. When properly processed. Zirconium copper. which gains its properties from heat treatment. precipitation hardening and cold work. also has chrome copper beat in terms of electrical conductivity. Zirconium copper has 90% IACS electrical conductivity; chrome copper is only 75 to 80% IACS electrical conductive. Match the cap electrode to the application. For welding of heavygauge coated and uncoated steels, there are materials that are more effective than Zirconium copper. For example, NITRODE® is the most cost effective cap electrode for resistance welding heavy-gauge coated and uncoated steel.

Nitrode and Z-Trode Specifications - Male

	Major Die	Overall Length	Seam Length	Knurl Length	Taper Gage Length	Taper Gage Dia.	Water Hole Depth	Water Hole Dia.	Welding Face Dia.	Angle	Radius
Type	A	B	C	D	E	F	G	H	J	K*	R
MA-24N	.500	1.125	.375	.375	.285	.375	.375	.281	.187	18.25	.150
MB-24N	.500	1.125	.375	.250	.285	.375	.375	.281	.187	--	.150
MC-24N	.500	1.125	.375	--	.285	.375	.375	.281	--	--	--
MA-25N	.625	1.250	.500	.500	.390	.415	.375	.320	.250	15.5	.210
MB-25N	.625	1.250	.500	.375	.390	.415	.375	.320	.250	--	.210
MC-25N	.625	1.250	.500	--	.390	.415	.375	.320	--	--	--
MD-25N	.625	1.250	.500	.650	.390	.415	.375	.320	.250	30.0	--
ME-25N	.625	1.250	.500	.068	.390	.415	.375	.320	.250	--	--
MF-25N	.625	1.250	.500	.025	.390	.415	.375	.320	--	--	--
MA-26N	.750	1.380	.625	.500	.500	.501	.375	.375	.281	13.5	.250
MB-26N	.750	1.380	.625	.375	.500	.501	.375	.375	.281	--	.250
MC-26N	.750	1.380	.625	--	.500	.501	.375	.375	--	--	--

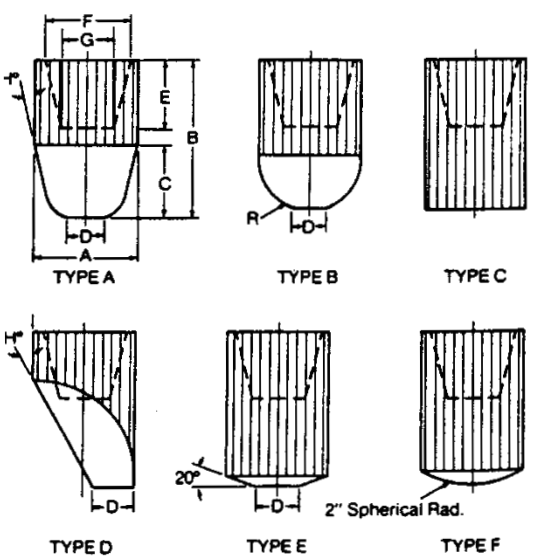
*note: Suffix Z for Z-Trode



Nitrode and Z-Trode Specifications - Female

	Major Die	Overall Length	Knurl Length	Welding Face Dia.	Water Hole Depth	Water Hole Dia.	Water Hole Dia.	Angle	Radius
Type	A	B	C	D	E	F	G	H*	R
FA-24N	.500	.840	.400	.180	.312	.394	.362	15.0	.120
FB-24N	.500	.840	.219	.180	.312	.394	.362	--	.210
FC-24N	.500	.840	--	--	.312	.394	.362	--	--
FA-25N	.625	.880	.500	.250	.344	.495	.459	17.0	.220
FB-25N	.625	.880	.280	.250	.344	.495	.459	--	.310
FC-25N	.625	.880	--	--	.344	.495	.459	--	--
FD-25N	.625	.880	--	.250	.344	.495	.459	40.0	--
FE-25N	.625	.880	--	.250	.344	.495	.459	--	--
FF-25N	.625	.880	--	.250	.344	.495	.459	--	--

*note: Suffix Z for Z-Trode

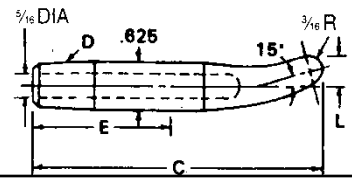


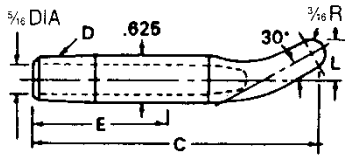
Electrodes

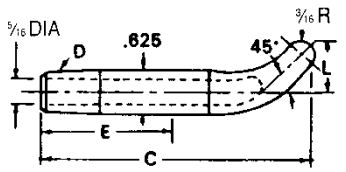
SINGLE BEND TYPE

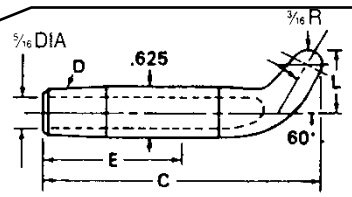
Part No.	Reference Length to cL of Face C	Taper D	Min. Straight Length E	Offset cL of Taper to cL of Face L	Part No.
3214-04-15 3219-04-15 32118-13-15	1-11/16 2-15/16 3-7/8	#1 MT 4RW	9/16 1-13/16 9/16	1/4 1/4 13/16	
3225-04-15 3229-04-15 32218-10-15	1-7/8 2-7/8 3-13/16	#2MT 5RW	13/16 1-13/16 15/16	1/4 1/4 5/8	
	3-5/8	#2MT 5RW	1-5/8	1/4	16-26015
3215-07-30 3219-07-30 32118-23-30	1-7/8 2-7/8 3-5/8	#1MT 4RW	11/16 1-11/16 13/16	7/16 7/16 1-7/16	
3226-09-30 32212-09-30 32220-24-30	2-1/16 3-1/16 3-3/16	#2MT 5RW	13/16 1-13/16 15/16	9/16 9/16 1-1/2	
	3-9/16	#2MT 5RW	1-5/8	7/16	16-26030
3215-10-45 32112-12-45 32118-33-45	1-11/16 2-7/8 3-1/8	#1MT 4RW	11/16 1-13/16 11-16	5/8 3/4 2-1/16	
3228-17-45 32214-17-45 32220-33-45	2-1/4 3 3-3/8	#2MT 5RW	13/16 1-9/16 15/16	1-1/16 1-1/16 2-1/16	
	3-7/16	#2MT 5RW	1-5/8	5/8	16-26045
3218-23-60 32116-23-60 32118-40-60	2 3 2-5/8	#1MT 4RW	13/16 1-13/16 13/16	1-7/16 1-7/16 2-1/2	
3212-25-60 32218-25-60 32220-38-60	2-3/8 3-1/8 3	#2MT 5RW	1-1/16 1-13/16 1-13/16	1-9/16 1-9/16 2-3/8	
	3-7/16	#2MT 5RW	1-5/8	13/16	16-26060
32216-35-75 32220-37-75 32220-43-75	2-5/16 2-11/16 2-3/8	#2MT 5RW	1-1/16 1-7/16 1-1/16	2-3/16 2-5/16 2-11/16	
	3-1/8	#2MT 5RW	1-5/8	1	
	2-7/8	#2MT 5RW	1-5/8	1-1/4	16-26090

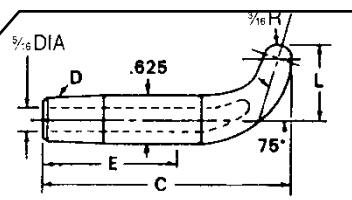
RADIUS BEND TYPE

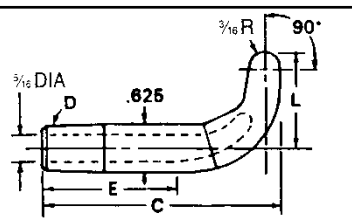


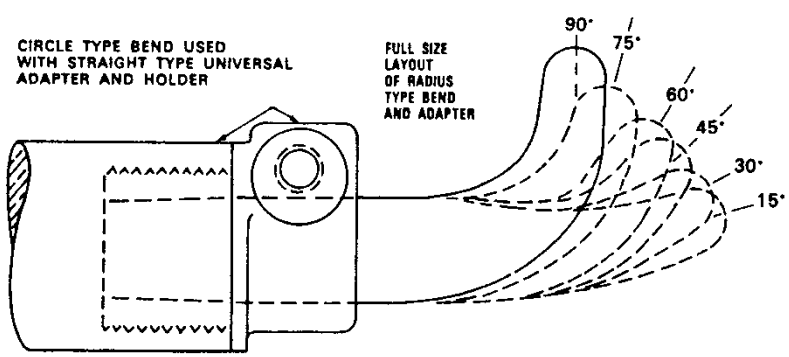












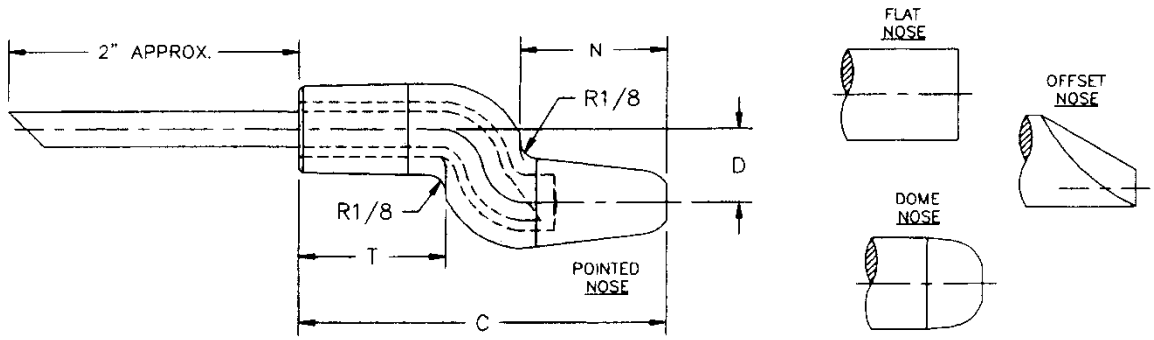
This series of electrodes is designed for use with the straight type universal adapter as shown.
Drawing 1/2 scale

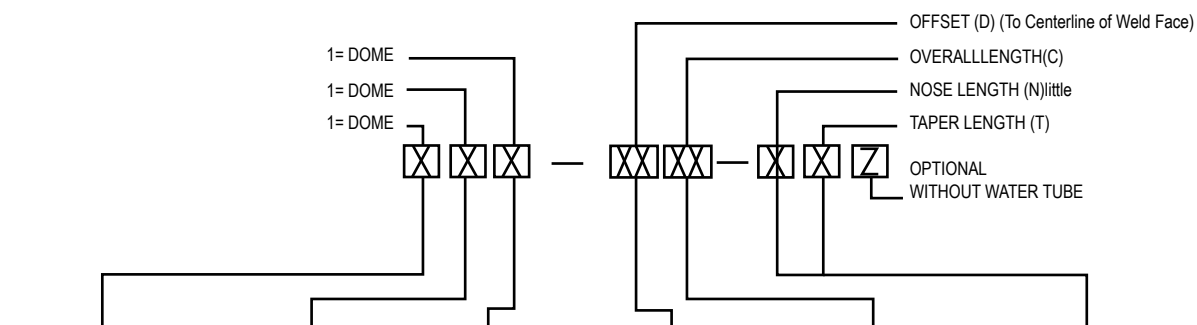
Electrodes

DOUBLE BEND

Double bend electrodes are cold formed from full hard straight electrodes, and have properties superior to those obtainable by casting or hot forging methods. Cooling tubes, unless otherwise specified are bent in place to provide coolant flow near the welding face as in the case of straight electrodes. These extra values assure you of longer electrode life, longer runs between dressings, and highest weld quality.

Class 2 material is standard for these electrodes.





1 =CLASS 1
3 =CLASS 2
5 =CLASS 3

1= DOME
2=*POINTED
3= FLAT
4= OFFSET

1=4RW 1MT
2=5RW 2MT

08 = 1/2"
12 =3/4"
16 = 1"
20=11/4"
24 = 1 1/2"
28 = 1 3/4"

32 = 2"
36 = 2 1/4"
40 = 2 1/2"
44 = 2 3/4"
48 = 3"
52= 3 1/4"
56= 3 1/2"
60=3 3/4'

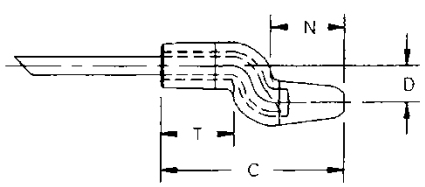
2 = 3/4"
3 = 7/8"
4 = 1"
** 5 = 1 1/8"
** 6 = 1 1/4"
** 7 = 11/2"
** 8 = 1 3/4"
** 9 = 2"

•• MAY NOT BE A STOCK ITEM
STANDARD 4RW NOSE LENGTH= 3/4'
STANDARD 4RW TAPER LENGTH = 7/8'
STANDARD 5RW NOSE & TAPER LENGTH = 1'

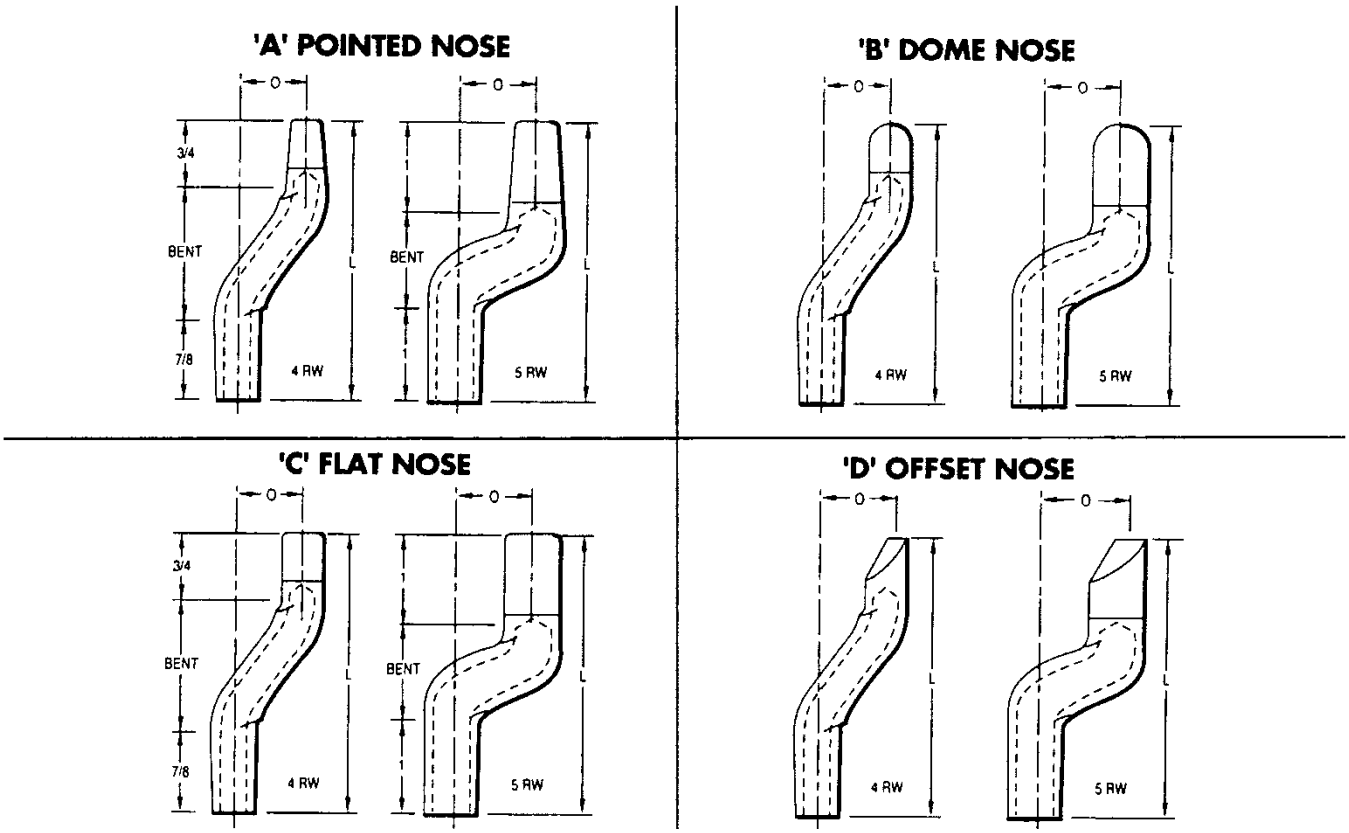
EXAMPLE

322-0840-44x

- 1" TAPER LENGTH (T)
- 1" nose lenght (C)
- 11/2" OVERALL LENGTH (C)
- 1/2" OFFSET (D)
- 5RW TAPER
- POINTED NOSE
- CLASS OF MATERIAL



Double-Bend, Additional Nose Designs



Key to Description

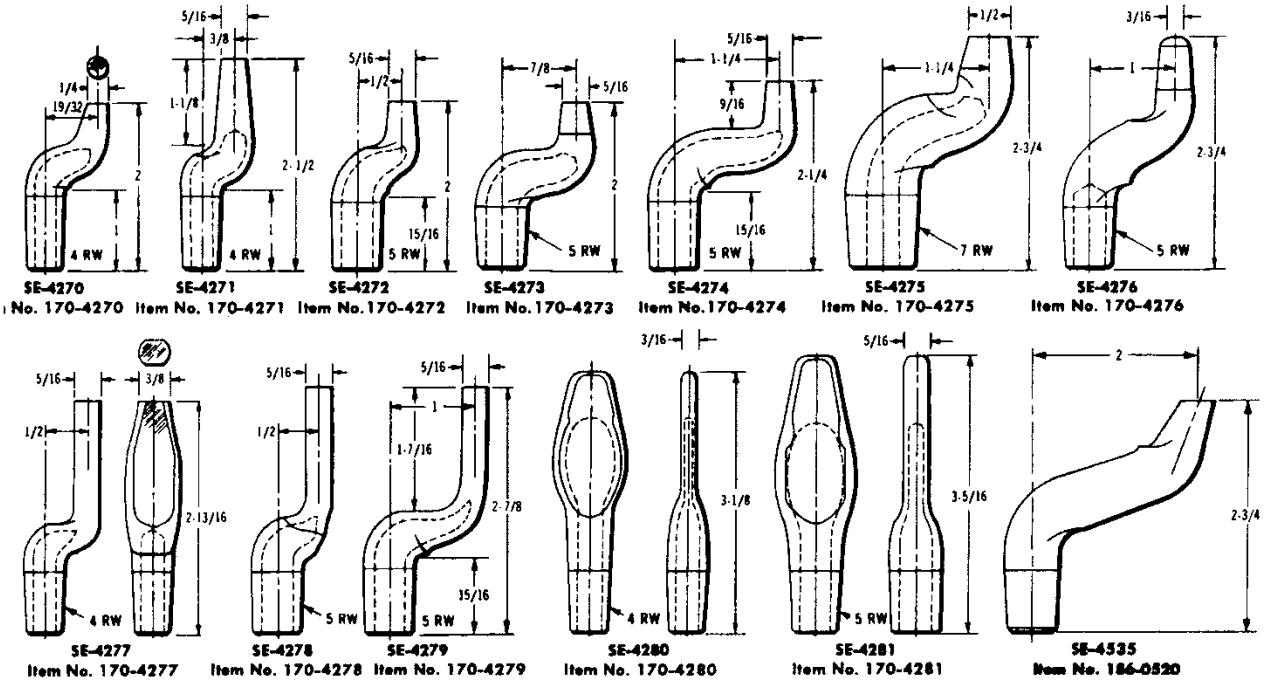
FX-YZLD-O

Example: FB-1438-16

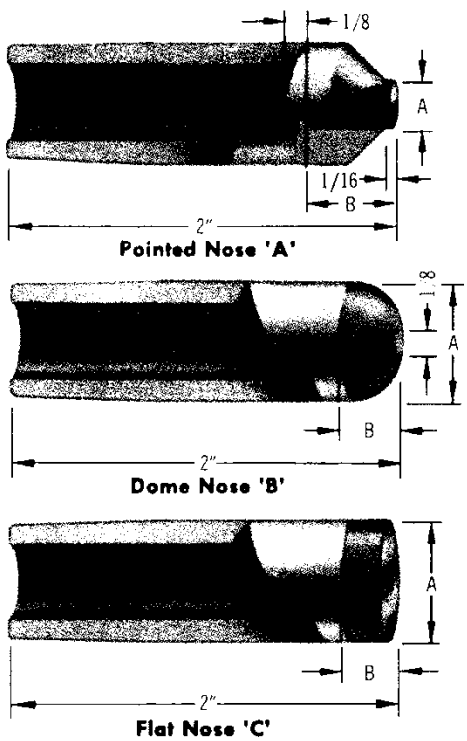
- F = Cold-F.ormed, Double-Bend Tips
- X= Nose Type
  - A
  - B
  - C
  - D
- Y = RWMA Alloy Class
  - 1 =Class 1
  - 2 =Class 2
- Z = RW Taper Number
  - 4=4RW
  - 5=5RW
- L = Length in inches
  - Refer to table for availability
- D = Additional Length in 16ths
- 0 = Offset in 16ths
  - Refer to table for availability

	OFFSET							
Length	1/4 Description	3/8 Description	1/2 Description	3/4 Description	1 Description	1-1/4 Description	1-1/2 Description	1-3/4 Description
1-1/2	FA-2518-4		FA-2518-8	FA-2518-12	FA-2518-16			
1-5/8	FA-25110-4		FA-25110-8	FA-25110-12	FA-25110-16			
1-3/4	FA-25112-4		FA-25112-8	FA-25112-12	FA-25112-16			
1-7/8	FA-25114-4		FA-25114-8	FA-25114-12	FA-25114-16			
2	FA-2520-4		FA-2520-8	FA-2520-12	FA-2520-16			
2-1/8	FA-2522-4		FA-2522-8	FA-2522-12	FA-2522-16			
2-3/16					FA-2523-16			
2-1/4	FA-25224-4		FA-2524-8	FA-2524-12	FA-2524-16			
2-3/8	FA-2526-4	FA-2526-6	FA-2526-8	FA-2526-12	FA-2526-16			
2-1/2	FA-2528-4		FA-2528-8	FA-2528-12	FA-2528-16	FA-2528-20	FA-2528-24	FA-2528-28
2-5/8	FA-25210-4		FA-25210-8	FA-25210-12	FA-25210-16	FA-25210-20	FA-25210-24	FA-25210-28
2-3/4	FA-25212-4		FA-25212-8	FA-25212-12	FA-25212-16	FA-25212-20	FA-25212-24	FA-25212-28
2-7/8	FA-25214-4		FA-25214-8	FA-25214-12	FA-25214-16	FA-25214-20	FA-25214-24	FA-25214-28
3	FA-2530-4		FA-2530-8	FA-2530-12	FA-2530-16	FA-2530-20	FA-2530-24	FA-2530-28
3-1/8	FA-2532-4		FA-2532-8	FA-2532-12	FA-2532-16	FA-2532-20	FA-2532-24	FA-2532-28
3-1/4	FA-2534-4		FA-2534-8	FA-2534-12	FA-2534-16	FA-2534-20	FA-2534-24	FA-2534-28
3-3/8	FA-2536-4	FA-2536-6	FA-2536-8	FA-2536-12	FA-2536-16	FA-2536-20	FA-2536-24	FA-2536-28
3-1/2	FA-2538-4		FA-2538-8	FA-2538-12	FA-2538-16	FA-2538-20	FA-2538-24	FA-2538-28

Electrodes

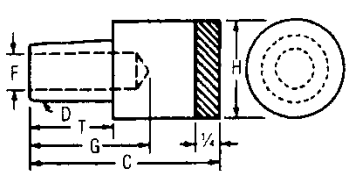


Double bend and flattened tips are made from bar stock. These are some of the standard designs available, but special designs can also be made. These are of Class 2 alloy; Class 1 alloy can also be ordered.



REFRACTORY METAL-FACED TIPS

Nose Type	Taper Number	Facing Alloy Class	Dimensions A	Dimensions B	Description
Pointed	4RW	14	3/16	3/8	A-1408-100M
	4RW	13	3/16	3/8	A-1408-100W
	5RW	11	1/4	3/8	A-1508-10W
	5RW	14	1/4	3/8	A-1508-100M
	5RW	13	1/4	3/8	A-1508-100W
Dome	4RW	11	.482	1/2	B-1408-10W
	5RW	11	.625	1/4	B-1508-10W
	5RW	13	.625	1/4	B-1508-100W
Flat	4RW	11	.482	1/2	C-1408-10W
	4RW	14	.482	1/2	C-1408-100M
	4RW	13	.482	1/2	C-1408-100W
	5RW	11	.625	1/4	C-1508-10W
	5RW	14	.625	1/4	C-1508-100M
	5RW	13	.625	1/4	C-1508-100W



Part Number	Weld Face Material	Overall Length C	Taper D	Water Hole Die F	Depth G	Weld Face Dia. H	Shank Length T
16-1392	CLASS 11	2	5RW or 2MT	3/8	1-1/2	1	7/8
16-1393		3			5/8	1	
16-1394		2			1-1/2	1-1/4	
16-1395		3-1/4			5/8	1-1/4	

Electrodes

SWIVEL TIPS

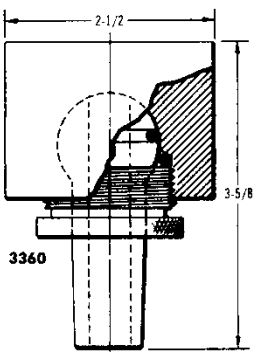
Swivel tips have ball-jointed swivel heads to compensate for minor misalignment, and to eliminate marking of the work surface. They are all machined from Class 2 alloy bar stock. The S-Series tip water hole does not reach the head. In the OS and OSH models the water does contact the head, and 0-rings are used to seal it. Class 1 and Class 3 heads are also available.

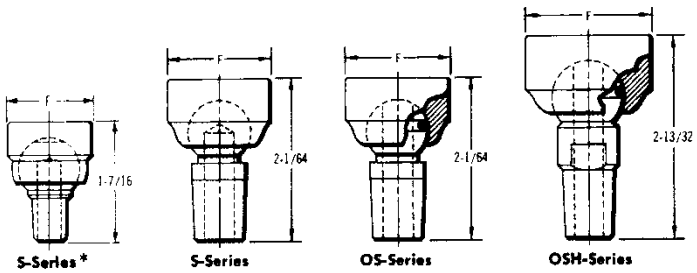
The Giant

The Giant swivel-head electrode for projection welding has a face 2-112 inches in diameter, a double 0-ring seal, and a replaceable head. It is ideal for accomplishing uniform setdown of multiple projections. If a larger one should be needed, we are prepared to supply it. 7RW

Note:

Standard swivel tilt is approximately 18', a 25' swivel is available on request. Add suffix "HS" to part number.

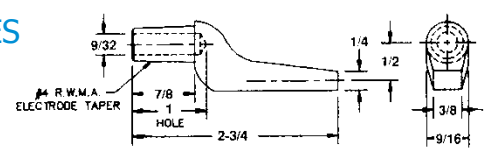




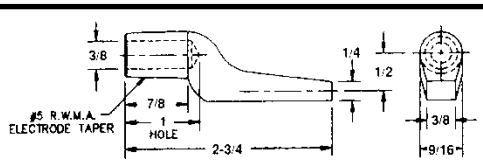
S-Series * (Tuffcap Design) | S-Series | OS-Series | OSH-Series

Taper Number	Face Dia. F"	S-Series Description	S-Series Item No.	OS-Series Description	OS-Series Item No.	OSH-Series Description	OSH-Series Item No.
5-CT*	7/8 1 1-1/4	S-248 S-249 S-250	182-0248 182-0249 182-0250				
4RW	7/8 1 1-1/4	S-348 S-350 S-351	182-0348 182-0350 182-0351	OS-348 OS-350 OS-351	182-1348 182-1350 182-1351		
5RW	7/8 1 1-1/4 1-1/2 2	S-349 S-353 S-354	082-0349 182-0353 182-0354	OS-349 OS-353 OS-354	182-1349 182-1353 182-1354	OSH-353 OSH-354 OSH-356 OSH-358	182-2353 182-2354 182-2356 182-2358
7RW	2-1/2					3360	182-3360

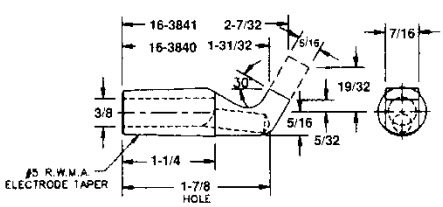
GUN ELECTRODES



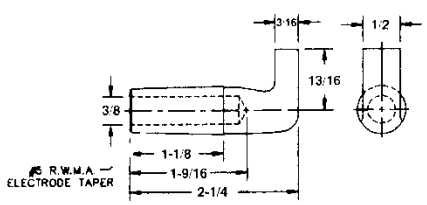
16-3820 CMW° 3
CASTING



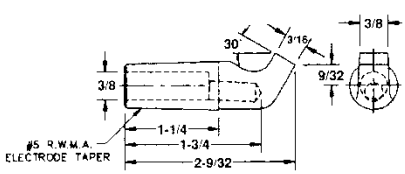
16-3821 CMW° 3
CASTING



16-3840 AND
16-3841 CMW° 3
COLD FORMED



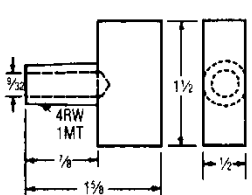
16-382120 CMW° 3
CASTING



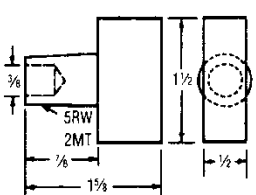
16-3847 CMW° 3
COLD FORMED*

BENT DIMENSIONS REFERENCE ONLY

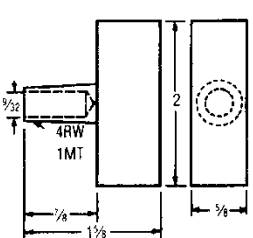
SQUARE AND RECTANGULAR FACED BACK-UP ELECTRODES



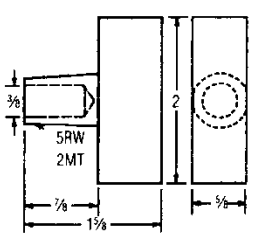
16-382158 CMW° 3 *CASTING*



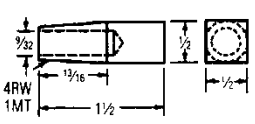
16-382160 CMW° 3 *CASTING*



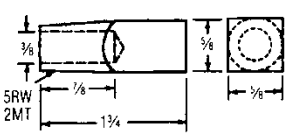
16-3111CMW° 3 *CASTING*



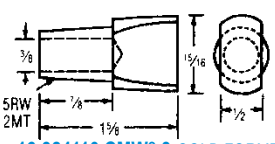
16-3121 CMW° 3 *CASTING*



16-3110 CMW° 3 *COLD FORMED*



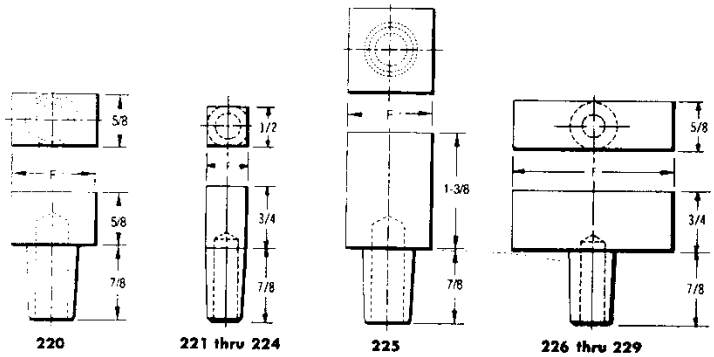
16-3120 CMW° 3 *COLD FORMED*



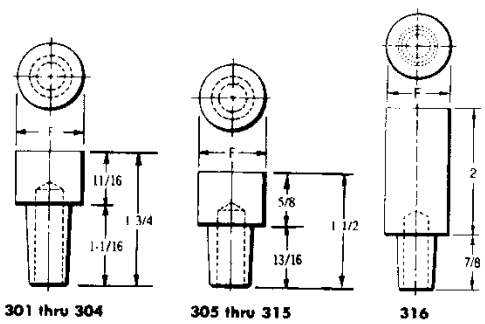
16-384110 CMW° 3 *COLD FORMED*

Electrodes

RECTANGULAR & SQUARE FACED ELECTRODES



These tips are all machined from bar stock.
Special designs can be made to order.



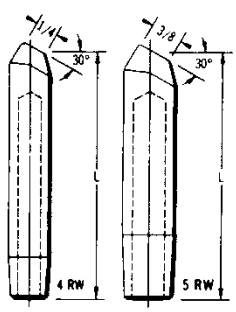
RECTANGULAR FACE

Alloy Class	Taper Number	Face "F"	Descrip-tion	Item Number
2	5RW	1	220	186-0220
2	4RW	1/2	221	186-0221
2	4RW	1	223	186-0223
2	5RW	1	224	186-0224
2	5RW	1	225	186-0225
2	5RW	2	226	186-0226
2	4RW	2	227	186-0227
2	5RW	1-1/2	228	186-0228
2	4RW	1-1/2	229	186-0229

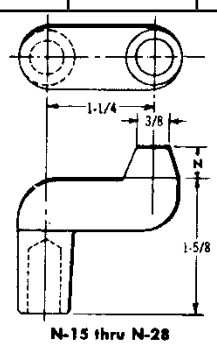
ROUND FACE

Alloy Class	Taper Number	Face "F"	Descrip-tion	Item Number
2	4RW	7/8	301	186-0301
1	4RW	7/8	302	186-0302
2	5RW	7/8	303	186-0303
1	5RW	7/8	304	186-0304
2	4RW	7/8	305	186-0305
1	4RW	7/8	306	186-0306
2	4RW	7/8	307	186-0307
1	5RW	7/8	308	186-0308
2	4RW	1	309	186-0309
1	4RW	1	310	186-0310
2	5RW	1	311	186-0311
1	5RW	1	312	186-0312
2	5RW	1-1/4	313	186-0313
2	5RW	1-1/2	315	186-0315
2	5RW	1	316	186-0316

These straight tips have welding faces angled 30°.

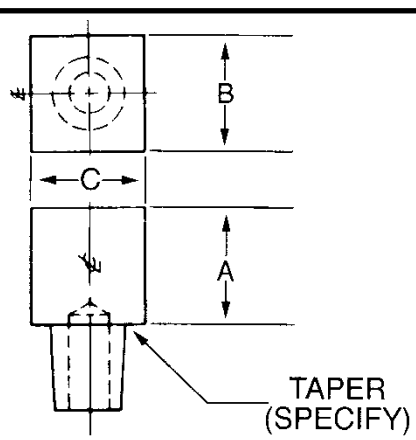


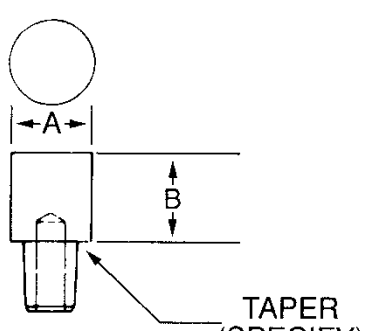
Alloy Class	Taper Number	Face "L"	Descrip-tion	Item Number
2	4RW	2	H-2408-30	145-2408
2	4RW	3	H-2412-30	145-2412
2	4RW	4	H-2416-30	145-2416
2	5RW	2	H-2508-30	145-2508
2	5RW	3	H-2512-30	145-2512
2	5RW	4	H-2516-30	145-2516



N-15 thru N-28

Alloy Class	Taper Number	Face "N"	Descrip-tion	Item Number
2	4RW	3/8	N-15	186-0015
2	4RW	3/4	N-16	186-0016
2	5RW	3/8	N-27	186-0027
2	5RW	3/4	N-28	186-0028

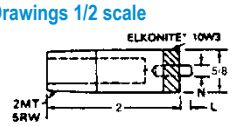
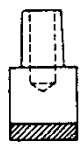
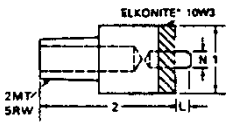
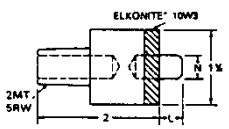


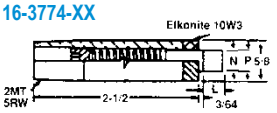
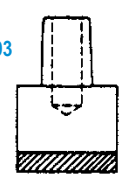
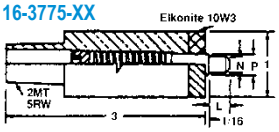
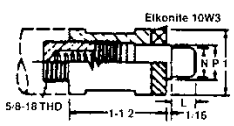
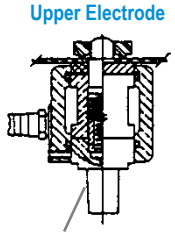
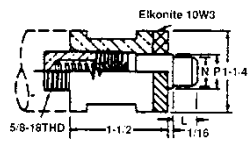


SPECIFY:
(A) DIAMETER
(B) DIMENSION
MORSE TAPER
(OR RW TAPER)
MATERIAL

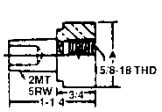
Electrodes

Note: All locating pins are made of specially treated aluminum having a surface hardness of approximately 55 RC on outside surface.

ASSEMBLED ELECTRODE	Taper Size "D"	Pilot Pin Dia. "N"	For Nut Thread Size	Pilot Pin Length "L"	Part No.	Typical Set-Up for Self Piloting Nuts
16-3764-XX Drawings 1/2 scale 	2MT	.082 .093 .100 .107	#4 #5 #6 3.5 mm	.093 .093 .093 .093	16-3764-04 16-3764-05 16-3764-06 16-3764-M3.5	 Upper Electrode 5/8 Dia. use 632050 1 Dia 16-1392  1-1/4 Dia. 16-1394
	5RW	.122 .129 .143 .155	4.0 mm #8 #10 5.0 mm	.156 .156 .156 .156	16-3764-M4 16-3764-08 16-3764-10 16-3764-M5	
16-3765-XX 	2MT	.166 .186 .192 .223	#12 6.0 mm 1/4 7.0 mm	.375 .375 .375 .375	16-3765-12 16-3765-M6 16-3765-25 16-3765-M7	
	5RW	.252 .257 .291	8.0 mm 5/16 9.0 mm	.375 .375 .375	16-3765-M8 16-3765-31 16-3765-M9	
16-3766-XX 	2MT	.306 .320 .359 .361	3/8 10 mm 11 mm 7/16	.375 .375 .375 .375	16-3766-38 16-3766-M10 16-3766-M11 16-3766-44	
	5RW	.388 .415 .455	12 mm 1/2 14 mm	.375 .375 .375	16-3766-M12 16-3766-50 16-3766-M14	

ASSEMBLED ELECTRODE Drawings 1/2 Scale	Pin or Thread Size	Pin Dia. "N"	Pilot Length "L"	For Nut Thread Pin Dia. "P"	Pilot Pin Size "N"	Part No.	Typical Set-Up for Non Piloting Nuts
16-3774-XX 	2MT	.082 .093 .100	.312 .312 .312	.140 .156 .171	#5 #5 #6	16-3774-04 16-3774-05 16-3774-06	Upper Electrode 5/8 Dia. use 632050 1 Dia. 16-1393 
	5RW	.129 .143 .186	.312 .312 .312	.196 .218 .250	#8 #10 6 mm	16-3774-08 16-3774-10 16-3774-M6	
16-3775-XX 	2MT	.166 .186 .192	.312 .312 .312	.248 .250 .281	#12 6 mm 1/4	16-3775-12 16-3775-M6 16-3775-25	
	5RW	.252 .257 .322	.312 .312 .312	.283 .343 .345	8 mm 5/16 10 mm	16-3775-M8 16-3775-31 16-3775-M10	
16-3785-XX 	5/8-18 Thread	.166 .186 .192 .252 .257 .320 .359 .388	.375 .375 .375 .375 .375 .375 .375 .375	.248 .250 .281 .283 .343 .409 .430 .492	#12 6 mm 1/4 8 mm 5/16 10 mm 11 mm 12 mm	16-3785-12 16-3785-M6 16-3785-25 16-3785-M8 16-3785-31 16-3785-M10 16-3785-M11 16-3785-M12	Pin is pushed down by the Upper Electrode 
16-3786-XX 	5/8-18 Thread	.166 .186 .192 .252 .257 .306 .320 .359 .361 .388 .415	.375 .375 .375 .375 .375 .375 .375 .375 .375 .375 .375	.248 .250 .281 .283 .343 .406 .409 .430 .468 .492 .531	#12 6 mm 1/4 8 mm 5/16 3/8 10 mm 11 mm 7/16 12 mm 1/2	16-3786-12 16-3786-M6 16-3786-25 16-3786-M8 16-3786-31 16-3786-38 16-3786-M10 16-3786-M11 16-3786-44 16-3786-M12 16-3786-50	See Adapter Below for 2MT 5RW

Use with 5/8-18 Thread Assemblies to convert to 2MT or 5RW Taper Shank



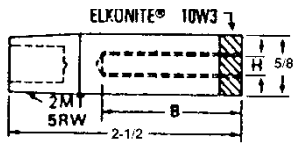
A	Part No.	Use With
1	18-7741	16-3785-XX
1-1/4	18-7742	16-3786-XX

Note: Electrode Assemblies 18-3785-XX and 18-3786-XX may also be used with 5/8-18Thread Holders 18-169, 18-170 and 18-171.

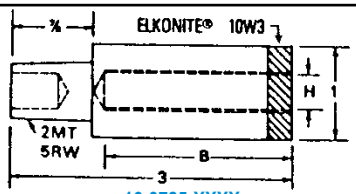
Electrodes

ASSEMBLED ELECTRODE

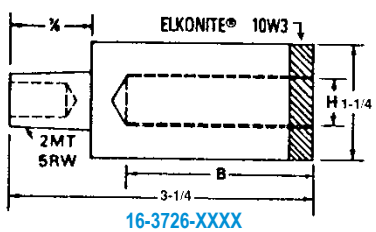
Drawings 1/2 Scale



16-3724-XXXX
MADE FROM 16-1353



16-3725-XXXX
MADE FROM 16-1393



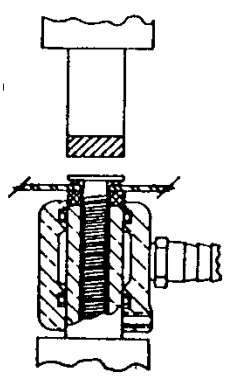
16-3726-XXXX
MADE FROM 16-1395

*Screw Thread Size	Insulation I.D. "H"	Part Number Assembled Electrode		
	Depth B	.375	.750	1.125
#4	.116	16-3724-1161	16-3724-1162	16-3724-1163
#5	.132	16-3724-1321	16-3724-1322	16-3724-1323
	Depth B	.500	1.00	1.500
#6	.140	16-3724-1401	16-3724-1402	16-3724-1403
--	.150	16-3724-1501	16-3724-1502	16-3724-1503
--	.157	16-3724-1571	16-3724-1572	16-3724-1573
#8	.169	16-3724-1691	16-3724-1692	16-3724-1693
	Depth B	.750	1.500	
#10	.191	16-3724-1911	16-3724-1912	
#12	.220	16-3724-2201	16-3724-2202	
.250	.254	16-3724-2541	16-3724-2542	
.250	.254	16-3725-2541	16-3725-2542	
	Depth B	1.00	2.00	
--	.277	16-3275-2771	16-3725-2772	
.312	.317	16-3725-3171	16-3725-3172	
--	.339	16-3725-3391	16-3725-3392	
--	.365	16-3725-3651	16-3725-3652	
.375	.380	16-3725-3801	16-3725-3802	
	Depth B	1.00	2.00	
--	.401	16-3726-4011	16-3726-4012	
--	.427	16-3726-4271	16-3726-4272	
.437	.444	16-3726-4441	16-3726-4442	
.500	.502	16-3726-5021	16-3726-5022	
	Depth B	1.00	2.00	
--	.552	16-3726-5521	16-3726-5522	
.625	.630	16-3726-6301	16-3726-6302	
--	.676	16-3726-6761	16-3726-6762	
--	.801	16-3726-8011	16-3726-8012	

For upper electrode use standard electrode:

5/8 Dia. 632050
1 Dia. 16-1392
1 1/4 Dia. 16-1394

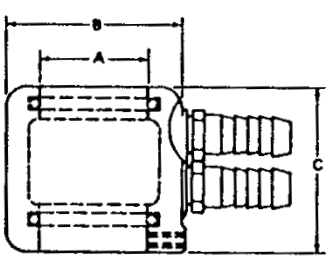
For Stud Electrode	Use Cooling Chamber
16-3724-XXXX	18-1340
16-3725-XXXX	18-1342
16-3726-XXXX	18-1343
See above	See above



External Water Cooling Chambers are designed to provide supplementary cooling in special, hard-to-cool applications. These cast aluminum jackets are securely sealed and locked in position over the external surface of 5/8", 7/8", 1", or 1-1/4" diameter electrodes. Standard water nipples connect to the regular water inlet and outlet hoses of these external cooling chambers.

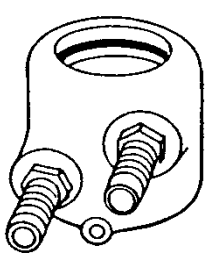
External Water Cooling Chambers are also recommended for additional cooling capacity on internally cooled applications operating at elevated temperatures.

One Piece Aluminum Castings - Rubber "O" Ring Seals - Standard Water Nipples - Allen Head Set-Screw Lock-On.

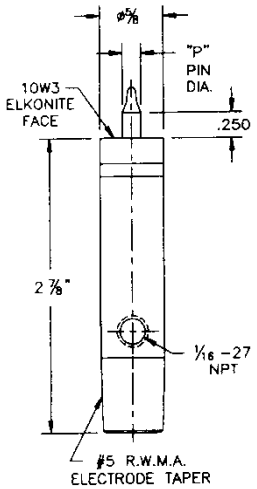


EXTERNAL ELECTRODE COOLING CHAMBERS

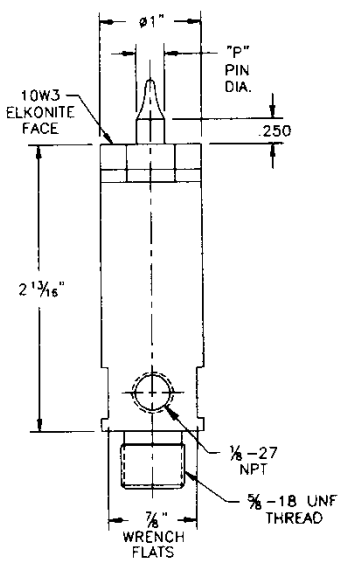
Part No.	To Fit A Dia. Electrode	O.D. B	Overall Length C
18-1340	5/8	1-1/4	1-1/2
18-1341	7/8	1-1/2	1-1/2
18-1342	1	1-3/4	1-1/2
18-1343	1-1/4	2	1-7/8



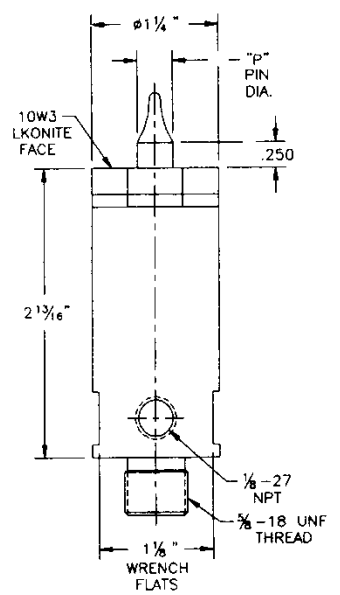
Electrodes

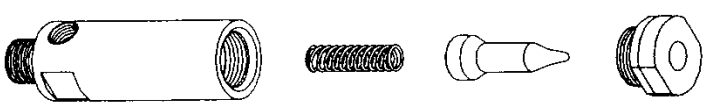


Nut Welding Assemblies	Screw Thread Size	"P"	CMWR 3	Spring	Ceramic Coated Stainless Steel Pin	ElkoniteR Fixed Cap
16-37725-04	#4	.142	16-37325	16-950078-01	16-950064-04	16-37725-C04
16-37725-05	#5	.158	16-37325	16-950078-01	16-950064-05	16-37725-C05
16-37725-06	#6	.173	16-37325	16-950078-01	16-950064-06	16-37725-C06
16-37725-M4	4MM	.187	16-37325	16-950078-01	16-950064-M4S	16-37725-CM4
16-37725-08	#8	.198	16-37325	16-950078-01	16-950064-08	16-37725-C08
16-37725-10	#10	.220	16-37325	16-950078-01	16-950064-10	16-37725-C10
16-37725-M5	5MM	.226	16-37325	16-950078-01	16-950064-M5S	16-37725-CM5
16-37725-12	#12	.250	16-37325	16-950078-01	16-950064-12	16-37725-C12
16-37725-M6	6MM	.266	16-37325	16-950078-01	16-950064-M6S	16-37725-CM6
16-37725-25	.250	.283	16-37325	16-950078-01	16-950064-25	16-37725-C25



Nut Welding Assemblies	Screw Thread Size	"P"	CMWR 3	Spring	Ceramic Coated Stainless Steel Pin	ElkoniteR Fixed Cap
16-37825-M4	4MM	.187	16-37825	16-950065-01	16-950064-M4	16-37825-CM4
16-37825-M5	5MM	.226	16-37825	16-950065-01	16-950064-M5	16-37825-CM5
16-37825-M6	6MM	.266	16-37825	16-950065-01	16-950064-M6	16-37825-CM6
16-37825-M7	7MM	.305	16-37825	16-950065-01	16-950064-M7	16-37825-CM7
16-37825-M8	8MM	.344	16-37825	16-950065-01	16-950064-M8	16-37825-CM8
16-37825-M9	9MM	.384	16-37825	16-950065-01	16-950064-M9	16-37825-CM9



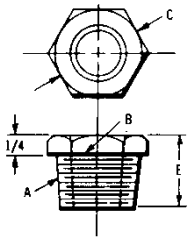


Nut Welding Assemblies	Screw Thread Size	"P"	CMWR 3	Spring	Ceramic Coated Stainless Steel Pin	ElkoniteR Fixed Cap
16-37826-M10	10MM	.423	16-37826	16-950065-01	16-950064-M10	16-37826-CM10
16-37826-M11	11MM	.463	16-37826	16-950065-01	16-950064-M11	16-37826-CM11
16-37826-M12	12MM	.502	16-37826	16-950065-01	16-950064-M12	16-37826-CM12

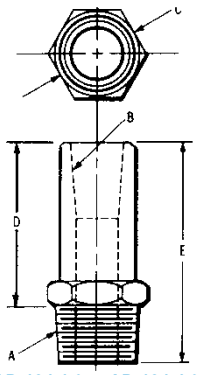
ADAPTERS

A Pipe Thread or Taper	B Taper Socket	C Body Size	D Body Length	E Over-All Length	Description	Item Number
1/2	4RW	1" Hex	1/4 3/8 5/8 7/8 1-1/8 1-3/8 1-5/8 1-7/8 2-1/8 2-3/8 2-5/8 2-7/8 3-1/8 3-3/8 4-3/8	7/8 1 1-1/4 1-1/2 1-3/4 2 2-1/4 2-1/2 2-3/4 3 3-1/4 3-1/2 3-3/4 4 5	AD-124-.8 AD-124-1.0 AD-124-1.2 AD-124-1.5 AD-124-1.7 AD-124-2.0 AD-124-2.2* AD-124-2.5 AD-124-2.7* AD-124-3.0 AD-124-3.2* AD-124-3.5 AD-124-3.7* AD-124-4.0 AD-124-5.0*	190-1408 190-1410 190-1412 190-1415 190-1417 190-1420 190-1425 190-1430 190-1435 190-1440
1/2	5RW	1" Hex	1/4 3/8 5/8 7/8 1 1-1/8 1-3/8 1-5/8 1-7/8 2-1/8 2-3/8 2-5/8 2-7/8 3-1/8 3-3/8 3-7/8	7/8 1 1-1/4 1-1/2 1-5/8 1-3/4 2 2-1/4 2-1/2 2-3/4 3 3-1/4 3-1/2 3-3/4 4 4-1/2	AD-125-.8 AD-125-1.0 AD-125-1.2 AD-125-1.5 AD-125-1.6* AD-125-1.7 AD-125-2.0 AD-125-2.2* AD-125-2.5 AD-125-2.7* AD-125-3.0 AD-125-3.2* AD-125-3.5 AD-125-3.7* AD-125-4.0 AD-125-4.5	190-1508 190-1510 190-1512 190-1515 190-1517 190-1520 190-1525 190-1530 190-1535 190-1540 190-1545
5/8	4RW	1" Hex	1/4 3/8 7/8 1-3/8	7/8 1 1-1/2 2	AD-584-.8 AD-584-1.0* AD-584-1.5* AD-584-2.0*	190-2408
5/8	5RW	1" Hex	1/4 3/8 5/8 7/8 1-1/8 1-3/8 1-7/8 2-3/8 3-3/8	7/8 1 1-1/4 1-1/2 1-3/4 2 2-1/2 3 4	AD-585-.8 AD-585-1.0* AD-585-1.2 AD-585-1.5 AD-585-1.7 AD-585-2.0* AD-585-2.5* AD-585-3.0" AD-575-4.0*	190-2508 190-2512 190-2515 190-2517
3/4	5RW	1.25	3/16 7/16 9/16 13/16 1-1/16 1-9/16 2-1/16 2-9/16 3-1/16 4-1/16	1-1/8 1-3/8 1-1/2 1-3/4 2 2-1/2 3 3-1/2 4 5	AD-345-1.1* AD-345-1.3* AD-345-1.5 AD-345-1.7 AD-345-2.0 AD-345-2.5 AD-345-3.0 AD-345-3.5 AD-345-4.0 AD-345-5.0	 190-3515 190-3517 190-3520 190-3525 190-3530 190-3535 190-3540 190-3550
3/4	6RW	1.25	5/16 7/16 9/16 1-1/16 1-9/16 1-13/16 2-1/16 2-9/16 3-1/16 3-9/16 4-1/16	1-1/4 1-3/8 1-1/2 2 2-1/2 2-3/4 3 3-1/2 4 4-1/2 5	AD-346-1.2* AD-346-1.3* AD-346-1.5 AD-346-2.0 AD-346-2.5 AD-346-2.7* AD-346-3.0 AD-346-3.5 AD-346-4.0 AD-346-4.5 AD-346-5.0	 190-3615 190-3620 190-3625 190-3630 190-3635 190-3640 190-3645 190-3650
3/4	7RW	1.25	9/16 1-1/16 1-9/16 2-1/16 2-9/16 3-1/16 3-9/16 4-1/16	1-1/2 2 2-1/2 3 3-1/2 4 4-1/2 5	AD-347-1.5 AD-347-2.0 AD-347-2.5 AD-347-3.0 AD-347-3.5 AD-347-4.0 AD-347-4.5 AD-347-5.0	190-3715 190-3720 190-3725 190-3730 190-3735 190-3740 190-3745 190-3750
4RW	5RW	7/8	1 2 3	2 3 4	AD-45-2 AD-45-3 AD-45-4	190-4520 190-4530 190-4540
5RW	4RW	7/8	1/4 1 1-1/2 2 3	1-1/8 2 2-1/2 3 4	AD-54-1 AD-54-2 AD-54-2.5* AD-54-3 AD-54-4	190-5410 190-5420 190-5430 190-5440
5RW	5RW	7/8	1 1-1/2 2 3 4	2 2-1/2 3 4 5	AD-55-2 AD-55-2.5* AD-55-3* AD-55-4* AD-55-5	190-5520
5RW 6RW 6RW 7RW	6RW 4RW 5RW 4RW	1" Hex 1" Hex 1" Hex 1" Hex	1-1/8 1/4 1/4 1/4	2 1-1/4 1-1/4 1-1/2	AD-56-2 AD-64-1 AD-65-1 AD-74-1	190-5620 190-6410 190-6510 190-7410
7RW	5RW	1" Hex	1/4 3/4 2-1/4 2-3/4	1-1/2 2 3-1/2 4	AD-75-1 AD-75-2 AD-73-3.5* AD-75-4*	190-7510 190-7520

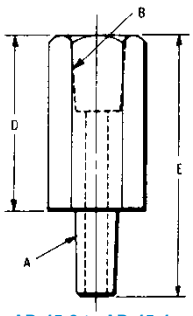
* Not commonly stocked - other adapters available upon request



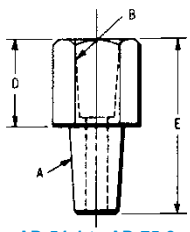
AD-124-.8, AD-125-.8,
AD-584-.8, AD-585-.8



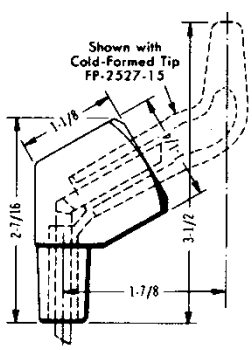
AD-124-1.0 to AD-124-4.0
AD-125-1.0 to AD-125-4.0
AD-345-1 .5 to AD-347-5.0



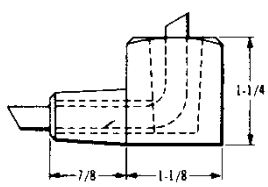
AD-45-2 to AD-45-4



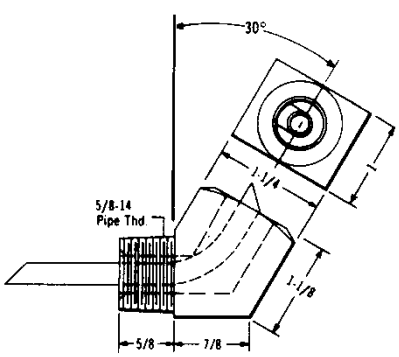
AD-54-1 to AD-75-2



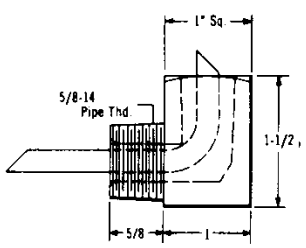
AD-55-30, for 5 RW Tip,
Item No. 190-9553



AD-55-90, for 5 RW Tip,
Item No. 190-9559
AD-54-90, for 4 RW Tip,
Item No. 190-9549



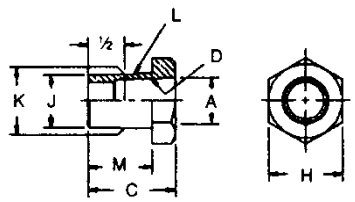
AD-584-30, for 4 RW Tip, Item No. 190-8430
AD-585-30, for 5 RW Tip, Item No. 190-8530



AD-584-90, for 4 RW Tip, Item No. 190-8490
AD-585-90, for 5 RW Tip, Item No. 190-8590

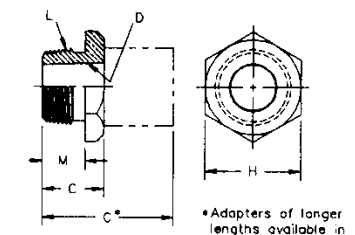
ADAPTERS

MALE TAPER TO FEMALE TAPER ADAPTERS



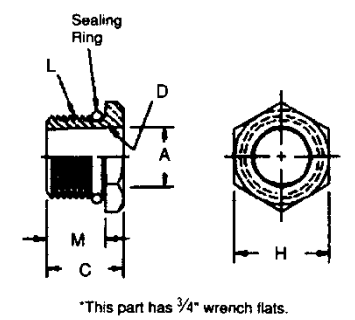
Adapter Part No.	MALE TAPER			FEMALE TAPER		Length Under Head M	Hex Over Flats H	Overall Length C
	Size L	Minor Dia J	Dia @ 1/2" K	Size D	Major Dia A			
18-741 18-742 18-7414	5RW or 2MT 7RW or 3MT 6RW	.588 .819 .706	.613 .844 .731	4RW or 1MT 5RW or 2MT 5RW	.463 .625 .625	7/8 1-3/16 7/8	7/8 1 1	1-3/16 1-1/2 1-3/16
18-7415 18-7416	4RW or 1MT 5RW or 2MT	.438 .588	.463 .613	5RW or 2MT 6RW	.625 .750	5/8 7/8	7/8 1	1-3/4 2-1/4

MALE PIPE THREAD TO FEMALE TAPER ADAPTERS



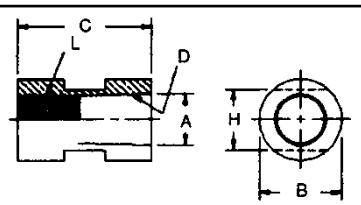
Adapter Part No.	Male Thread Size L	FEMALE TAPER		Length Under Head M	Hex Over Flats H	Overall Length C
		Size D	Major Dia A			
18-746-07 18-747-07 18-7485-07	1/2-14 PIPE 1/2-14 PIPE 1/2-14 PIPE	4RW or 1MT 5RW or 2MT 5RW Male Cap	.463 .625 .414	5/8 5/8 9/16	1 1 7/8	7/8 7/8 7/8
18-748-06 18-749-06	5/8-14 pipe 5/8-14 pipe	4RW or 1MT 5RW or 2MT	.463 .625	9/16 9/16	1 1	3/4 3/4
18-756-09 18-757-09 18-7576-09	3/4-14 pipe 3/4-14 pipe 3/4-14 pipe	4RW or 1MT 5RW or 2MT 6RW	.463 .625 .750	7/8 7/8 7/8	1-1/4 1-1/4 1-1/4	1-1/8 1-1/8 1-1/8

MALE THREAD TO FEMALE TAPER ADAPTERS

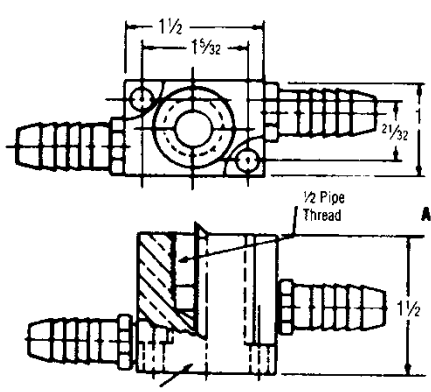


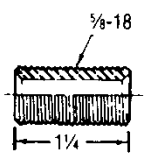
Adapter Part No.	Male Thread Size L	FEMALE TAPER		Length Under Head M	Dia or Hex H	Overall Length C	Sealing Ring Part Number
		Size D	Major Dia A				
18-750 18-751 *18-755	5/8-18 5/8-18 3/4-10	4RW or 1MT 5RW or 2MT 5RW or 2MT	.463 .625 .625	9/16 9/16 9/16	7/8 Hex 1 Hex 1 Dia	13/16 1-11/16 1-9/16	18-10060-11 18-10060-11 18-10060-12
18-770 18-771	7/8-14 7/8-14	4RW or 1MT 5RW or 2MT	.463 .625	5/8 5/8	1 Hex 1 Hex	13/16 13/16	18-76460 18-76460
18-7743	1-14	5/8 - 18 THD	--	5/8	1-1/4 Hex	1	18-10060-17
18-785 18-786 18-7863	1-14 1-14 1-14	4RW or 1MT 5RW or 2MT 6RW	.463 .625 .750	9/16 9/16 3/4	1-1/4 Hex 1-1/4 Hex 1-1/4 Hex	13/16 13/16 1-3/4	18-10060-17 18-10060-17 18-10060-17
18-787 18-7875 18-7876	1-14 1-14 1-14	7RW or 3MT 5RW or 2MT 6RW	.875 .625 .750	3/4 9/16 5/8	1-1/4 Hex 1-1/4 Dia 1-1/4 Dia	2-1/8 11/16 7/8	18-10060-17 18-10060-17 18-10060-17

FEMALE THREAD TO FEMALE TAPER ADAPTERS

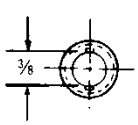


Adapter Part No.	Female Thread Size L	FEMALE TAPER		Outside Dia B	Over Wrench Flats H	Overall Length C
		Size D	Major Dia A			
18-753 18-754	5/8-18 5/8-18	4RW or 1MT 5RW or 2MT	.475 .625	1-1/4 1-1/4	3/4 3/4	1-5/8 1-5/8
18-7591 18-7592	3/4-10 3/4-10	4RW or 1MT 5RW or 2MT	.463 .625	1-1/4 Hex 1-1/4 Hex	1-1/4 1-1/4	1-3/4 1-3/4



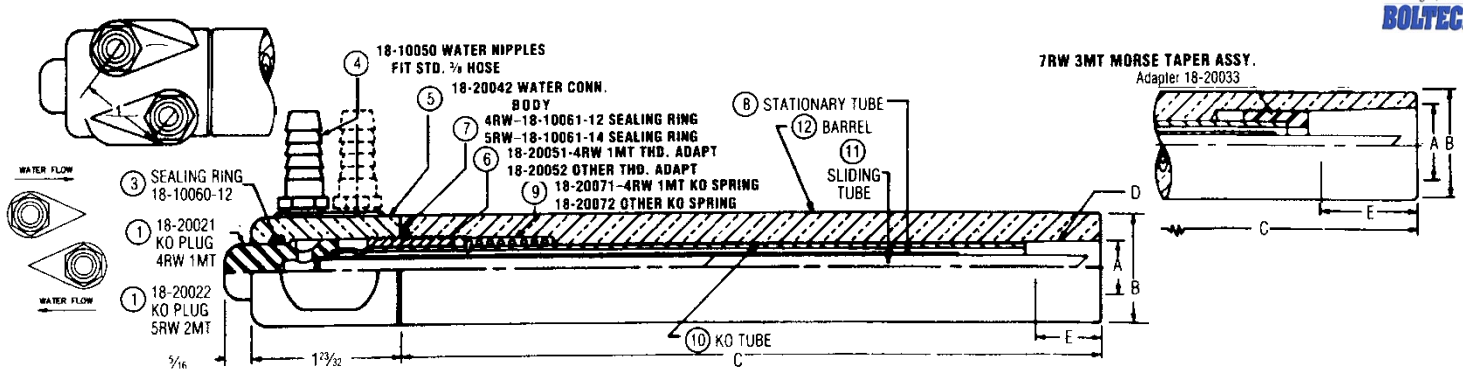


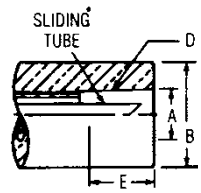
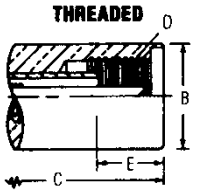
USE WITH 1/2 PIPE THREAD ADAPTERS LISTED ON THIS PAGE



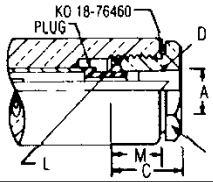
ADAPTER PART NO. 18-752

HOLDERS



	Holder Assembly Part Number	HOLDER SIZE A Major Taper Dia	B Barrel Dia	C Barrel Length	D Taper or Thread	E Engmt w/Std Elec	Water Conn. Hd Sub-Assy include Parts: 1 3 4 5 6 7	KO Tube Sub-Assy include Parts: 8 9 10 11	8 Stationary Tube	10 KO Tube	11 Sliding Tube	12 Barrel
TAPERED 	18-201 18-202 18-203 18-204	.463	3/4 7/8 1 1-1/4	3	4RW 1MT	1/2	18-20091	18-20095-3	18-10044-3	18-20031-3	18-10046-3	18-11110-3 18-11210-3 18-11310-3 18-11410-3
	18-206 18-207 18-208	.625	1 1-1/4 1-1/2	3	5RW 2MT	3/4	18-20092	18-20096-3	18-10045-3	18-20032-3	18-10047-3	18-11610-3 18-11710-3 18-11810-3
	18-211 18-212 18-213 18-214	.463	3/4 7/8 1 1-1/4	8	4RW 1MT	1/2	18-20091	18-20095-8	18-10044-8	18-20031-8	18-10046-8	18-11110-8 18-11210-8 18-11310-8 18-11410-8
	18-216 18-217 18-218	.625	1 1-1/4 1-1/2	8	5RW 2MT	3/4	18-20092	18-20096-8	18-10045-8	18-20032-8	18-10047-8	18-11610-8 18-11710-8 18-11810-8
	18-219 18-220	.875	1-1/4 1-1/2	8	7RW 3MT	1-1/8	18-20092	18-20096-58	18-10045-8	18-20032-58 & 18-20033	18-10047-8	18-11910-8 18-12010-8
	18-231 18-232 18-233 18-234	.463	3/4 7/8 1 1-1/4	12	4RW 1MT	1/2	18-20091	18-20095-12	18-10044-12	18-20031-12	18-10046-8	18-11110-12 18-11210-12 18-11310-12 18-11410-12
	18-236 18-237 18-238	.625	1 1-1/4 1-1/2	12	5RW 2MT	3/4	18-20092	18-20096-12	18-10045-12	18-20032-12	18-10047-8	18-11610-12 18-11710-12 18-11810-12
THREADED 	18-236-18 18-237-18 18-238-18	.625	1 1-1/4 1-1/2	18	5RW 2MT	3/4	18-20092	18-20096-18	18-10045-18	18-20032-18	18-10047-29	18-11610-18 18-11710-18 18-11810-18
	18-272 18-273 18-274	-	1 1-1/4 1-1/2	8	7/8-14	9/16	18-20092	18-20096-8	18-10045-8	18-20032-8	18-10047-8	18-17210-8 18-17310-8 18-17410-8
	18-275 18-276	-	1-1/4 1-1/2	8	1-1/4	3/4	18-20092	18-20096-8	18-10045-8	18-20032-8	18-10047-8	18-17510-8 18-17610-8

EJECTOR TYPE ADAPTERS 7/8-14 THREAD

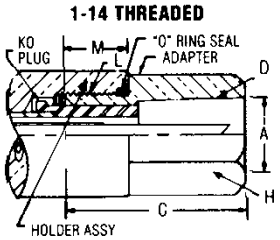
⅞-14 THREADED
USE METALLIC SEAL KO 18-76460 PLUG


Adapter Part No.	Male Thread Size L	FEMALE TAPER Size D	FEMALE TAPER Major Diameter A	Length Under Head M	Hex Over Flats H	Overall Length C	Sealing Ring Part No.	KO Plug Part No.
18-7702 18-7712	7/8-14 7/8-14	4RW 1MT 5RW 2MT	.463 .625	5/8 1/2	1 1	13/16 1-1/16	18-76460 18-76460	18-78501 18-7712-3

Use with Threaded Ejector Holders to make Replaceable Taper Holders

Part No.	Description Threaded Holder
18-272	7/8-14 Fem. Thd. 1 Dia
18-273	7/8-14 Fem. Thd. 1¼ Dia
18-274	7/8-14 Fem. Thd. 1½ Dia

EJECTOR TYPE ADAPTERS 1-14 THREAD

1-14 THREADED


18-7852 18-7862	1-14 1-14	4RW 1MT 5RW 2MT	.463 .625	9/16 7/16	1-1/4 1-1/4	13/16 1-1/16	18-10060-17 18-10060-17	18-78501 18-7712-3
18-7864 18-7872	1-14 1-14	6RW 7RW 3MT	.750 .875	3/4 3/4	1-1/4 1-1/4	1-3/4 2-1/8	18-10060-17 18-10060-17	18-78650 18-78701

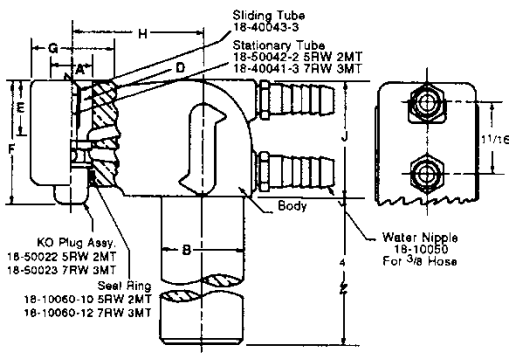
Use with Threaded Ejector Holders to make Replaceable Taper Holders

Part No.	Description Threaded Holder
18-276	1-14 Fem. Thd. 1½ Dia
18-276	1-14 Fem. Thd. 1½ Dia

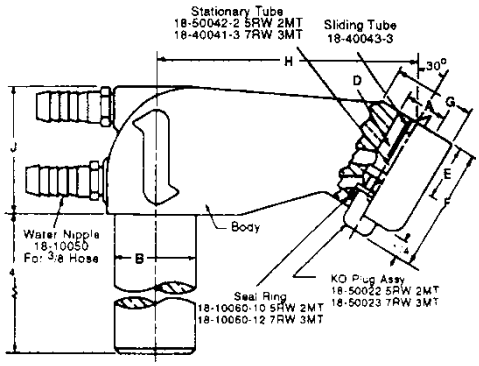
HOLDERS

EJECTOR TYPE

90° HEAD

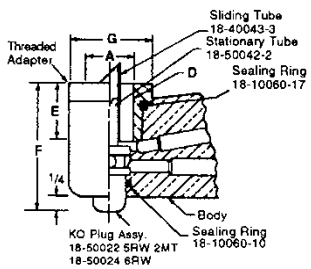


30° HEAD

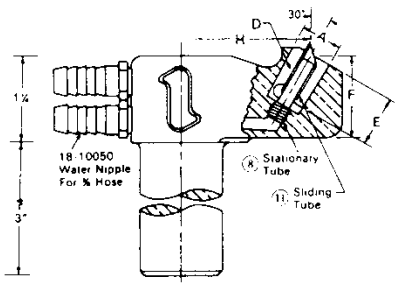


90° HEAD CONVENTIONAL SHANK

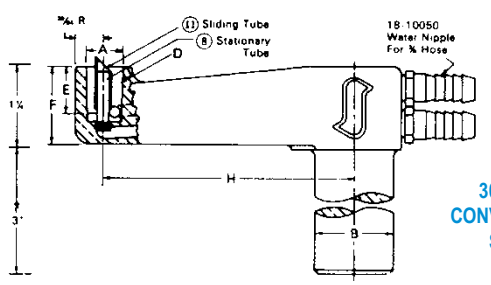
EJECTOR TYPE HOLDERS ALSO AVAILABLE WITH THREADED ADAPTOR FOR REPLACEABLE TAPER



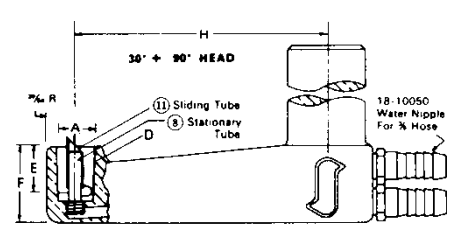
NON-EJECTOR TYPE



30° HEAD



30° HEAD CONVENTIONAL SHANK



30° HEAD REVERSE SHANK

Holder Assembly Number	Angle of Head	Major Taper Dia A	Shank Dia B	Taper D	Std Taper En-gage-ment E	Head Height F	Head Dia G	C.L. Shank Offset H	Head Thickness J
18-502 18-503 18-504	90°	.625	1 1-1/4 1-1/2	5RW 2MT	3/4	1-13/16	1-1/4	2	1-23/32
18-505 18-506	90°	.875	1-1/4 1-1/2	7RW 3MT	1-1/8	2-7/32	1-1/2	2	
18-522 18-523 18-524	90°	.625	1 1-1/4 1-1/2	5RW 2MT	3/4	1-13/16	1-1/4	4	1-7/8
18-525 18-526	90°	.875	1-1/4 1-1/2	7RW 3MT	1-1/8	2-7/32	1-1/2	4	
18-562 18-563 18-564	30°	.625	1 1-1/4 1-1/2	5RW 2MT	3/4	1-13/16	1-5/16	4	
18-565 18-566	30°	.875	1-1/4 1-1/2	7RW 3MT	1-1/8	2-7/32	1-9/16	4	

▼ CONVENTIONAL SHANK

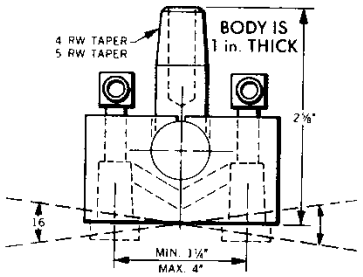
Holder Assembly Number	Angle of Head	Major Taper Dia A	Shank Dia B	Taper D	Std Taper Engage-ment E	Head Height F	Offset H	Sta-tionary Tube 8	Sliding Tube 11	Holder Assy No.
18-402 18-403 18-404	90°	.463	7/8 1 1-1/4	4RW 1MT	1/2	1-1/16	2	18-40041-1	18-40043-1	
18-407 18-408 18-409	90°	.625	7/8 1 1-1/4	5RW 2MT	3/4	1-1/4	2	18-40041-1	18-40043-2	
18-422 18-423 18-424	90°	.463	7/8 1 1-1/4	4RW 1MT	1/2	1-1/16	4	18-40041-1	18-40043-1	18-433
18-428 18-429	90°	.625	1 1-1/4	5RW 2MT	3/4	1-1/4	4	18-40041-1	18-40043-2	18-439
18-442 18-443 18-444	30°	.463	7/8 1 1-1/4	4RW 1MT	1/2	1	2	18-40041-1	18-40043-1	
18-448 18-449	30°	.625	1 1-1/4	5RW 2MT	3/4	1-1/4	2	18-40041-1	18-40043-2	
18-462 18-463 18-464	30°	.463	7/8 1 1-1/4	4RW 1MT	1/2	1	4	18-40041-1	18-40043-1	
18-468 18-469	30°	.625	1 1-1/4	5RW 2MT	3/4	1-1/4	4	18-40041-1	18-40043-2	

REVERSE SHANK ▲

HOLDERS

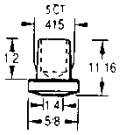
TEETER-TIP DUAL TIP ADAPTERS

LIGHT DUTY adapters have no. 4 or 5 RW shanks, tip spacing to 4 inches, tip sockets for W1 or %" diameter male caps, or 4 RW tips(%" cap sockets are standard).

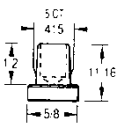


LIGHT DUTY

HEAVY DUTY adapters have shanks from 5 to 7 RW size, tip spacing to 6 inches, tip sockets for 1/2 or 5/8" diameter male caps, or 4 or 5 RW tips (4 RW sockets are standard). These adapters have a deeper, stronger body.

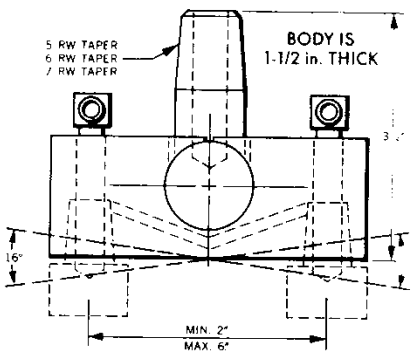


TRUNCATED CONE SE-6332
(Item No. 116-0522)



FLAT FACED SE-6296

Style	Shank Taper	Description	Tip Spacing Range (inches)	Socket Taper			
LIGHT Duty	4RW 4RW 5RW 5RW	TT-1408 TT-1416 TT-1508 TT-1516	1-1/4 to 2 2 to 4 1-1/2 to 2 2 to 4	4RW 4RW 4RW 4RW		4CT 4CT 4CT 4CT	5CT 5CT 5CT 5CT
HEAVY Duty	5RW 5RW 6RW 6RW 7RW 7RW	TT-15516 TT-15524 TT-15616 TT-15624 TT-15716 TT-15724	2 to 4 4 to 6 2 to 4 4 to 6 2 to 4 4 to 6	4RW 4RW 4RW 4RW 4RW 4RW	5RW 5RW 5RW 5RW 5RW 5RW	4CT 4CT 4CT 4CT 4CT 4CT	5CT 5CT 5CT 5CT 5CT 5CT



HEAVY DUTY

*** When ordering, also state exact tip spacing and tip socket size. Example: TT • 1508 • 1-1/2- 5CT. (SCT means 5/8" diameter cap, 4CT means 1/2" diameter cap.)**

EQUATIP DUAL TIP HOLDERS

EQUATIP HOLDERS

Tip Spacing & Mounting Style	For 5/8" Dia Tuffcap Caps		For No. 4 RW Tips	
	Descrip-tion	Item No.	Descrip-tion	Item No.
ONE-INCH SPACING:				
1-in shank	4050	350-4050	4055	350-4055
1-1/4 in shank	4051	350-4051	4056	350-4056
1-1/2 in shank	4052	350-4052	4057	350-4507
5RW adapter	4053	350-4053	4058	350-4058
Cylinder adapter**	4054	350-4054	4059	350-4059
1-1/2 INCH SPACING:				
1-in shank	4150	350-4150	4155	350-4155
1-1/4 in shank	4151	350-4151	4156	350-4156
1-1/2 in shank	4152	350-4152	4157	350-4157
5RW adapter	4153	350-4153	4158	350-4158
Cylinder adapter**	4154	350-4154	4159	350-4159

* without clamp

1/2-in dia Tuffcap caps (4 CT)

Nose Style	Alloy Class	Description	Item No.
Pointed	1 2	TA-14 TA-24	111-0014 112-0024
Dome	1 2	TB-14 TB-24	113-0014 114-0024
Flat	1 2	TC-14 TC-24	115-0014 116-0024
Offset	1 2	TD-14 TD-24	117-0014 118-0024

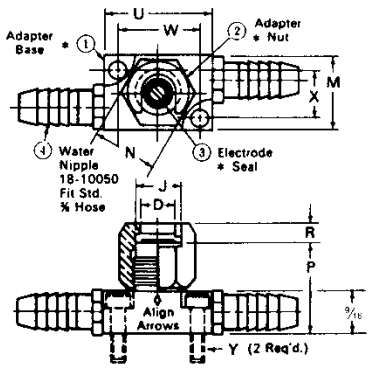
For LIGHT DUTY Welding - EQUATIP Adapter
The Equatip dual tip adapter works like the Equatip holder, but it is not water-cooled and is meant for less demanding jobs. It costs less, and is a little smaller, barrels being 5/8" apart. Its straight tips are TUFF-CAP caps, 1/2" in diameter.

4045, Item No. 350-4045-5RW
4046 . Item No. 350·4046-4RW

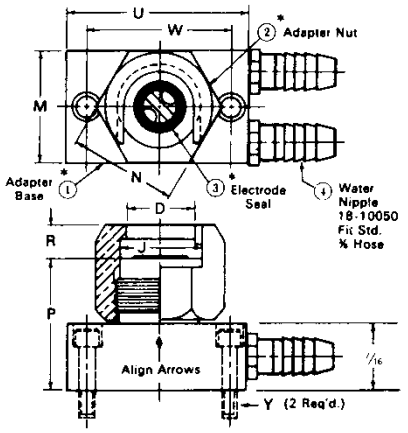
800 Series -For High Pressure Welding

SURFACE MOUNTED ADAPJERS

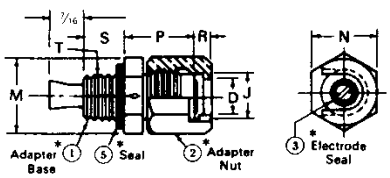
NUMBER 1 SIZE

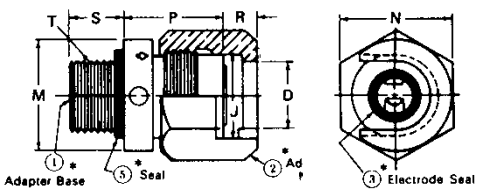


NUMBER 2 •nd 4 SIZES



THREADED ADAPTERS
May be used with 100-2OO and 300 Series Holders to make "Nu-Twist" ® Holder.



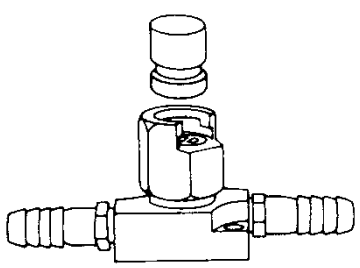


ADAPTER BASES ARE CMW® 3 METAL																
ADAPTER ASSEMBLY NUMBER			ADAPTER SIZE											1 Adapter Base	2 Adapter Nut	3 Electrode Seal	5 Seal
Size	Surface Mounted	Threaded	D	J	M	N	P	R	S	T Thread	U	W	Y				
1 1	18-801 -	- 18-811	1/2	5/8	1	7/8	1-1/4 15/16	1/4	9/16	5/8-18	1-1/2 -	1-5/32 -	No. 10-24 Scr	18-80110 18-81110	18-80150	18-10060-5	- 18-10060-11
2 2	18-802 -	- 18-812	15/16	1-1/8	1-1/2	1-1/2	1-13/16 1-5/16	7/16	- 3/4	- 1-14	2-1/2 -	2 -	No. 1/4-20 Scr -	18-80210 18-81210	18-80250	18-10060-1 18-10061-10	- 18-10060-17
4 4	18-804 -	- 18-814	1-7/16	1-5/8	2	2	1-13/16 1-5/16		- 3/4	- 1-1/2-12	3 -	2-3/8 -	No. 1/4-20 Scr -	18-80410 18-81410	18-80450	18-10061-14	- 18-10060-25

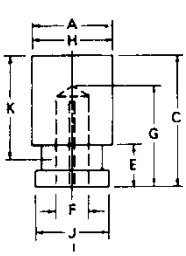
STANDARD "Nu-Twist" ELECTRODES,

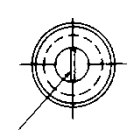
800 Series - For High Pressure Welding

- No tapers or threads
- Can be extracted with a simple turn of hexagon locking nut
- Any contour in electrode face can be located or relocated in a given position
- Water circulated to end of electrode for maximum cooling
- Silver plated contact surfaces on electrode and base for maximum conductivity
- Provides a simple, low-cost, standard type electrode for most special applications
- Electrodes shown can be modified with contours to provide faces required for most resistance welding applications

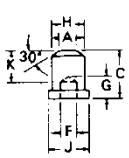


FLAT FACE





*This baffle is used in electrodes over 1" long to assure water circulation

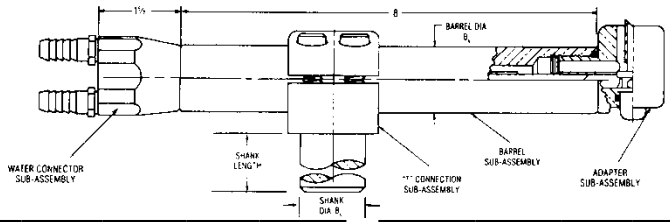


O FLAT AND O TRUNCATED TYPES

"Nu-Twist" ELECTRODES

Size	Type	ELECTRODE PART NO. CMW® 3	ELECTRODE PART NO. CMW® 100	H Body Dia.	A Welding Face Dia.	C Overall Length	E Adapter Clearance	F Water Hole Dia.	G Water Hole Depth	J Electrode Seat Dia.	K Electrode Ext. from Adapt.
1	0 Flat	338750 338030	538750 538030	1/2 1/2	1/2 1/2	3/4 1-1/2	- -	1/4 1/4	3/8 1-1/8	.625 .625	1/2 1-1/4
1	0 Trunc.	338750 338030	578750 578030	1/2 1/2	1/4 1/4	3/4 1-1/2	- -	1/4 1/4	3/8 1-1/8	.625 .625	1/2 1-1/4
1	Flat	338751 338031	538751 538031	5/8 5/8	5/8 5/8	3/4 1-1/2	5/16 5/16	1/4 1/4	3/8 1-1/8	.625 .625	1/2 1-1/4
2	Flat	338012 338052	538012 538052	1-1/4 1-1/4	1-1/4 1-1/4	1 2	5/8 5/8	1/2 1/2	1/2 1-1/2	1.125 1.125	1/2 1-1/2
4	Flat	338014 338054	538014 538054	1-3/4 1-3/4	1-3/4 1-3/4	1 2	5/8 5/8	3/4 3/4	1/2 1-1/2	1.625 1.625	1/2 1-1/2

HOLDERS

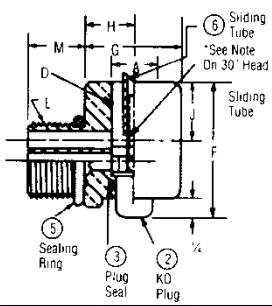


Part No.	Head Angle	Barrel Dia Bb	Shank Dia. Bs	Shank Length L	Head Assy	Barrel Assy	"T" Conn. Assy
4RW 1MT							
18-601 18-602	90° 30°	1	7/8	3	18-764 18-765	18-701	18-725
18-603 18-604	90° 30°	1	1	3	18-764 18-765		18-726
18-605 18-606	90° 30°	1-1/4	1-1/4	3-1/2	18-764 18-765	18-702	18-727
18-607 18-608	90° 30°	1-1/4	1-1/2	4	18-764 18-765		18-730
5RW 2MT							
18-611 18-612	90° 30°	1	7/8	3	18-766 18-767	18-701	18-725
18-613 18-614	90° 30°	1	1	3	18-766 18-767		18-726
18-615 18-616	90° 30°	1-1/4	1-1/4	3-1/2	18-766 18-767	18-702	18-727
18-617 18-618	90° 30°	1-1/4	1-1/2	4	18-766 18-767		18-730
18-621 18-622	Straight Straight	1 1	7/8 1	3		18-701	18-725 18-726
18-623 18-624	Straight Straight	1-1/4 1-1/4	1-1/4 1-1/2	3-1/2 4	18-768	18-702	18-727 18-730
18-651 18-652	90° 30°	1-1/4	1-1/4	3-1/2	18-780 18-781		18-727
18-657 18-658	90° 30°	1-1/4	1-1/2	4	18-780 18-781	18-704	18-730

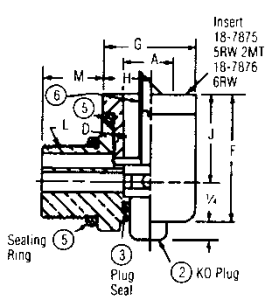
Part No.	Head Angle	Barrel Dia Bb	Shank Dia. Bs	Shank Length L	Head Assy	Barrel Assy	"T" Conn. Assy
5RW 2MT							
18-655 18-656	90° 30°	1-1/2	1-1/4	4	18-780 18-781	18-705	18-728
18-653 18-654	90° 30°	1-1/2	1-1/2	4	18-780 18-781	18-705	18-729
18-671 18-672	Straight Straight	1-1/4 1-1/2	1-1/4 1-1/2	3-1/2 4		18-704 18-705	18-727 18-729
18-673 18-674	Straight Straight	1-1/2 1-1/4	1-1/4 1-1/2	4	18-784	18-705 18-704	18-728 18-730
5RW 2MT with Threaded Adapter							
18-6515 18-6525	90° 30°	1-1/4	1-1/4	3-1/2	18-7805 18-7815	18-704	18-727
18-6535 18-6545	90° 30°	1-1/2	1-1/2	4	18-7805 18-7815	18-705	18-729
6RW with Threaded Adapter							
18-6516 18-6526	90° 30°	1-1/4	1-1/4	3-1/2	18-7806 18-7816	18-704	18-727
18-6536 18-6546	90° 30°	1-1/2	1-1/2	4	18-7806 18-7816	18-705	18-729
7RW 3MT							
18-661 18-662	90° 30°	1-1/4	1-1/4	3-1/2	18-782 18-783	18-704	18-727
18-665 18-666	90° 30°	1-1/2	1-1/4	4	18-782 18-783	18-705	18-728
18-663 18-664	90° 30°	1-1/2	1-1/2	4	18-782 18-783	18-705	18-729

MALE THREAD TO FEMALE TAPER ADAPTERS

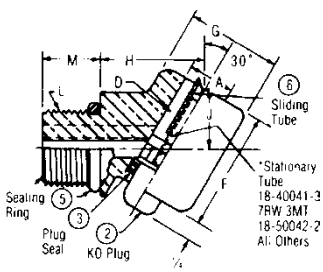
90° TYPE



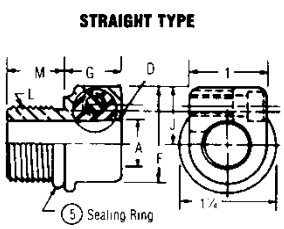
ADAPT WITH INSERT



30° TYPE



STRAIGHT TYPE

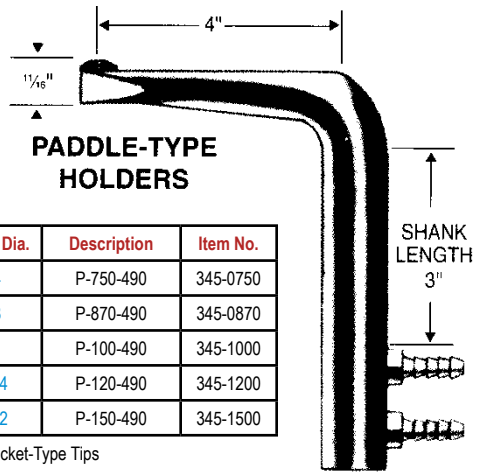


Assy Part No.	Adapter Angle	MALE THREAD L Size Thread	MALE THREAD M Length	FEMALE TAPER D Size	FEMALE TAPER A Major Dia.	F Overall Head Height	G Head Length	H End Barrel to C.L. of Taper	J CL Barrel to C.L. of Taper	2 K.O. Plug Part No.	3 K.O. Plug Seal Part No.	5 Sealing Ring Part No.	6 Sliding Tube Part No.
18-764 18-765	90° 30°	7/8-14	9/16	4RW 1MT	.463	1-9/16	1 Dia	19/32 1-1/16	13/16 15/32	18-50021	18-10060-8	18-76460	18-50041-1
18-766 18-767 18-768	90° 30° Straight	7/8-14	9/16	5RW 2MT	.625	1-13/16 1-13/16 1-1/4	1 Dia 1-1/16 D 3/4	19/32 1-11/32 -	1-1/16 53/64 3/4	18-50022 18-50022 -	18-10060-10	18-76460	18-40043-3 18-40043-3 -
18-780 18-781 18-784	90° 30° Straight	1-14	3/4	5RW 2MT	.625	1-13/16 1-13/16 1-1/4	1-1/4 D 1-5/16 D 3/4	21/32 1-3/8 -	1-1/16 13/16 3/4	18-50022 18-50022 -	18-10060-10	18-10060-17	18-40043-3 18-40043-3 -
18-782 18-783	90° 30°	1-14	3/4	7RW 3MT	.875	2-3/16	1-1/2 D 1-9/16 D	25/32 1-3/8	1-3/16 13/16	18-50023	18-10060-12	18-10060-17	18-40043-4 18-40043-4
*18-7805 *18-7815	90° 30°	1-14	3/4	5RW 2MT	.625	1-13/16	1-1/4 D 1-5/16 D	21/32 1-3/8	1-1/16 13/16	18-50022	18-10060-10	18-10060-17	18-40043-3 18-40043-3
*18-7806 *18-7816	90° 30°	1-14	3/4	6RW	.750	1-15/16	1-1/4 D 1-5/16 D	21/32 1-7/8	1-3/16 59/64	18-50022	18-10060-10	18-10060-17	18-40043-3 18-40043-3

*** These adapters have threaded inserts 18-7875--5RW 2MT or 18-7876--#6 RW Taper**

HOLDERS

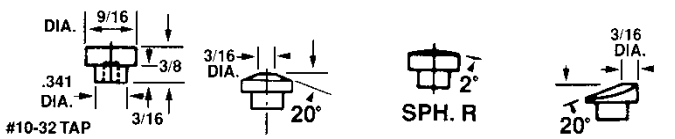
PADDLE-TYPE HOLDERS



Shank Dia.	Description	Item No.
3/4	P-750-490	345-0750
7/8	P-870-490	345-0870
1	P-100-490	345-1000
1-1/4	P-120-490	345-1200
1-1/2	P-150-490	345-1500

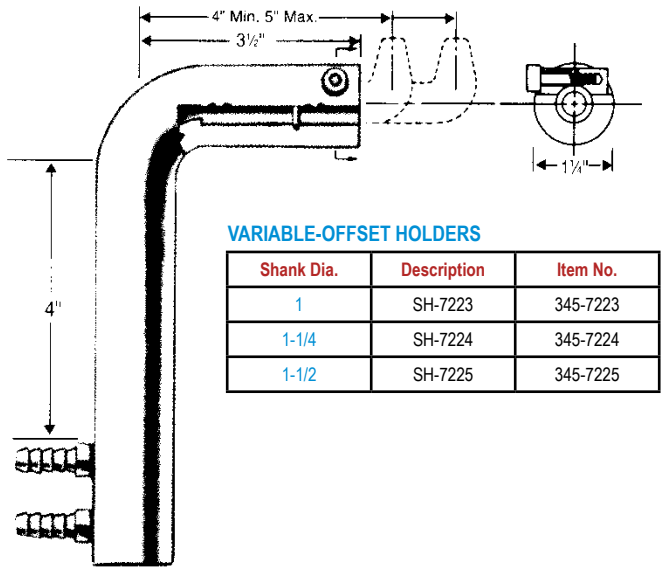
Use Socket-Type Tips

Socket Type Welding Electrodes



FLAT FACE	CONE FACE	RADIUS FACE	OFFSET FACE
CL-2 SE-3099	SE-3101	SE-3110	SE-3102
CL-3 SE-3111	SE-3113	SE-3133	SE-3123

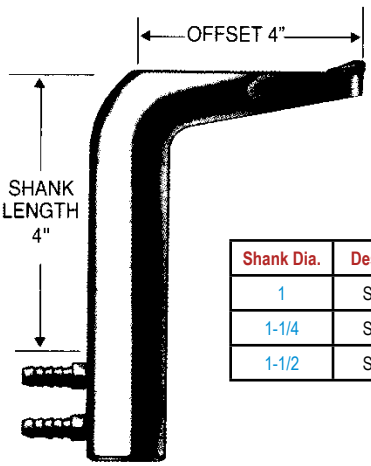
VARIABLE-OFFSET HOLDERS



VARIABLE-OFFSET HOLDERS

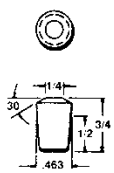
Shank Dia.	Description	Item No.
1	SH-7223	345-7223
1-1/4	SH-7224	345-7224
1-1/2	SH-7225	345-7225

HEAVY-DUTY Paddle-Type Holders and Tips

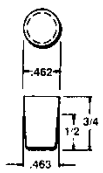


Shank Dia.	Description	Item No.
1	SH-7194	345-7194
1-1/4	SH-7195	345-7195
1-1/2	SH-7196	345-7196

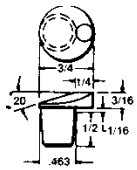
TRUNCATED CONE
SE-3247
Item No. 170-3247

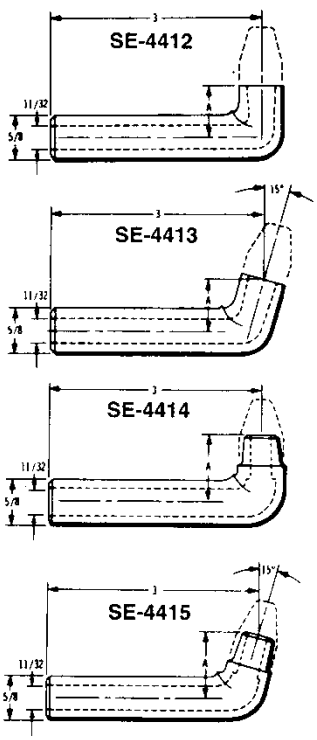


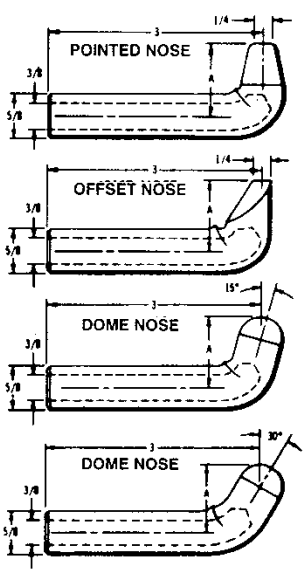
FLAT FACED
SE-3249
Item No. 170-3249



OFFSET
SE-3248
Item No. 170-3248







STRAIGHT-SHANK TUFFCAP SHANKS

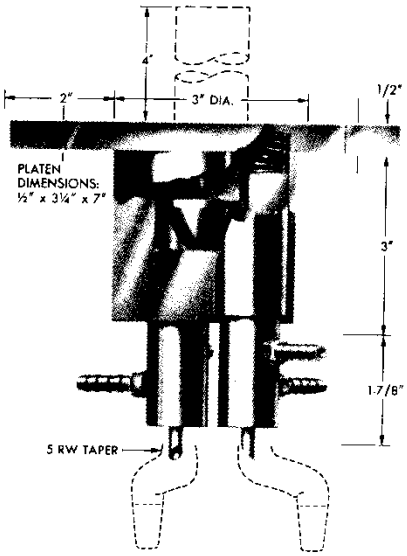
Tuffcap Cap	Nose Length	Angle	Description	Item Number
Type	"A"			
Male	3/4"	90°	SE-4412	170-4422
Male	3/4"	15°	SE-4413	170-4423
Female	1"	90°	SE-4414	170-4424
Female	1"	15°	SE-4415	170-4425

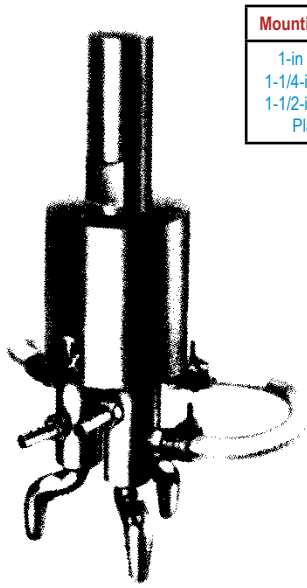
STRAIGHT-SHANKTIPS

Type of Tip	Nose Length "A"	Description	Item Number
Pointed	1"	SE-4408-1	170-4408
Offset	1"	SE-4409-1	170-4409
15° Dome	1"	SE-4410-1	170-4410
30° Dome	1"	SE-4411-2	170-4411
Pointed	2"	SE-4408-2	170-4418
Offset	2"	SE-4409-2	170-4419
15° Dome	2"	SE-4410-2	170-4420
30° Dome	2"	SE-4411-2	170-4421

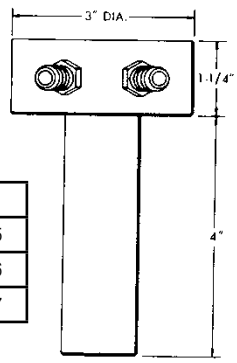
HOLDERS

TRISPACER TRIPLE TIP HOLDER





Mounting Style	Description	Item No.
1-in Shank	4040	350-4040
1-1/4-in Shank	4041	350-4041
1-1/2-in Shank	4042	350-4042
Platen	4043	350-4043



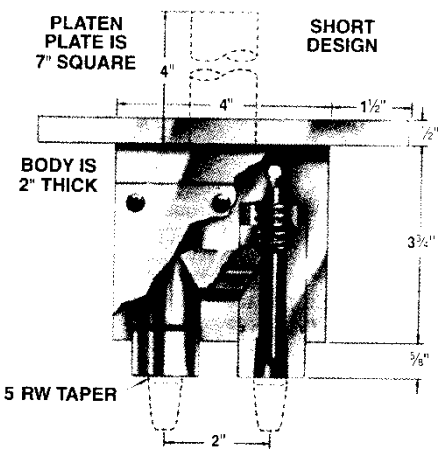
LOWER ELECTRODE

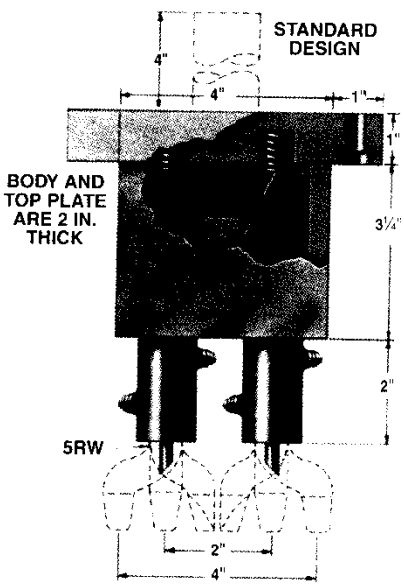
Shank Dia.	Description	Item No.
1	4025	350-4025
1-1/4	4026	350-4026
1-1/2	4027	350-4027

EQUA-PRESS DUAL TIP HOLDERS

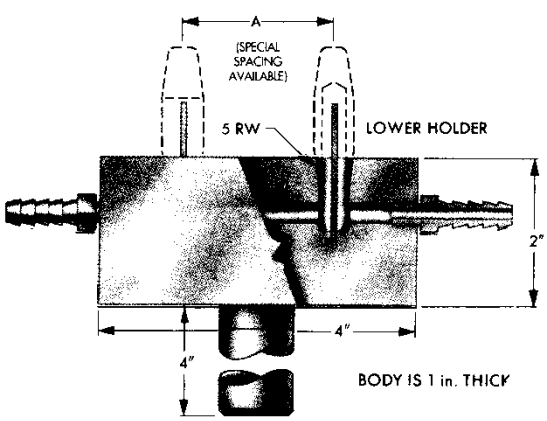
Mounting Style	STANDARD DESIGN		SHORT DESIGN	
	Description	Item No.	Description	Item No.
1-in Shank	4010	350-4010	4015	350-4015
1-1/4-in Shank	4011	350-4011	4016	350-4016
1-1/2-in Shank	4012	350-4012	4017	350-4017
Platen	4013	350-4013	4018	350-4018

Note: For best results, position the holder so that a line drawn through the electrode centers is at, or nearly at, right angles to the direction of the welder arms. Otherwise, the magnetic field between the arms can cause an excess of current to flow through the inboard electrode.





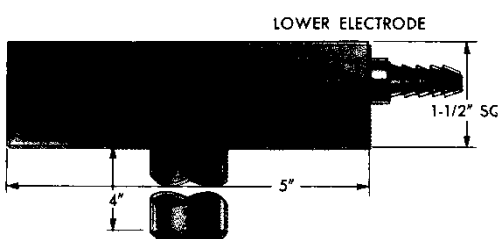
LOWER HODERS & ELECTRODES



SPECIAL LOWER HOLDER

Style	Shank Dia. (inches)	Description*	A Tip Spacing Range (inches)
4" Body	1 1-1/4 1-1/2	4030 4031 4032	1-1/4 to 3
8" Body	1 1-1/4 1-1/2	8030 8031 8032	3 to 6

*When ordering, specify center distance and either 4RW or 5RW sockets.

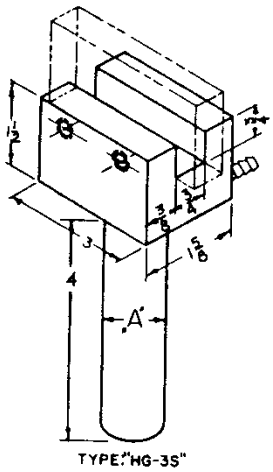


LOWER ELECTRODE

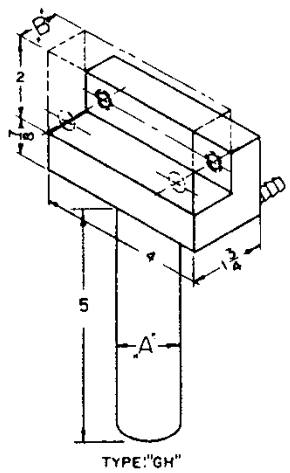
Shank Dia.	Description
1	4020
1-1/4	4021
1-1/2	4022

HOLDERS

BAR DIE HOLDERS (WATER COOLED) FOR CROSSED WIRE WELDING,



PART NO.	A DIA.
HG4-3S	1"
HG5-3S	1-1/4"
HG6-3S	1-1/2"



PART NO.	A DIA.
HG-4	1"
HG-5	1-1/4"
HG-6	1-1/2"

INSERT

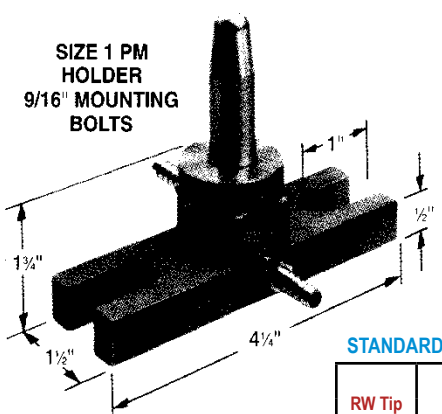
PART NO.	A DIA.
HGI-3-2	3/4"
HGI-4-2	1"
HGI-3-3	3/4"
HGI-4-3	1"

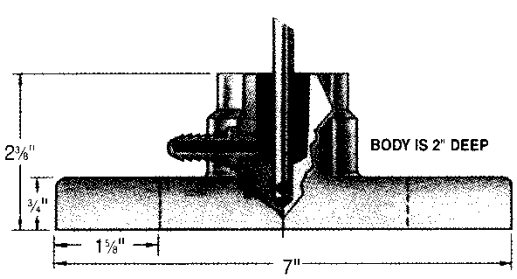
NOTE: Othersizes available.

WELDING DATA

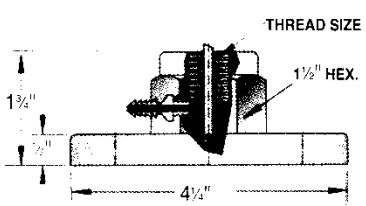
WIRE DIA INCHES	COLD DRAWN WIRE			
	WELD TIME CYCLES	WELD FORCE LBS	WELD CURRENT AMPS	WELD STRENGTH LBS
15% SET-DOWN				
1/16	5	100	600	450
1/8	10	125	1,800	975
3/16	17	360	3,300	2,000
1/4	23	580	4,500	3,700
5/16	30	825	6,200	5,100
3/8	40	1,100	7,400	6,700
7/16	50	1,400	9,300	9,600
1/2	60	1,700	10,300	12,200
30% SET-DOWN				
1/16	5	150	800	500
1/8	10	260	2,650	1,125
3/16	17	600	5,000	2,400
1/4	23	850	6,700	4,200
5/16	30	1,450	9,300	6,100
3/8	40	2,060	11,300	8,350
7/16	50	2,900	13,800	11,300
1/2	60	3,400	15,800	13,600
50% SET-DOWN				
1/16	5	200	1,000	550
1/8	10	350	3,400	1,250
3/16	17	750	6,000	2,500
1/4	23	1,240	8,600	4,400
5/16	30	2,000	11,400	6,500
3/8	40	3,000	14,400	8,800
7/16	50	4,450	17,400	11,900
1/2	60	5,300	21,000	14,600

PLATEN-MOUNTED HOLDERS





SIZE 2 PM HOLDER 3/4" MOUNTING BOLTS



STANDARD TIP PM HOLDERS

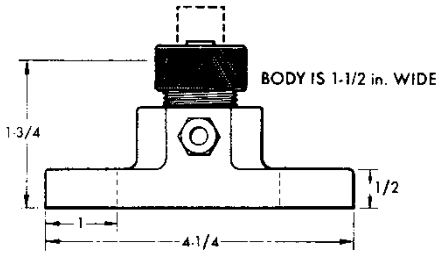
RW Tip Socket	Size 1 (small)		Size 2 (large)	
	Descrip-tion	Item No.	Descrip-tion	Item No.
4	4560	350-4560	4570	350-4570
5	4561	350-4561	4571	350-4571
6	4562	350-4562*	4572	350-4572*
7	4563	350-4563	4573	350-4573

* Item not normally stocked

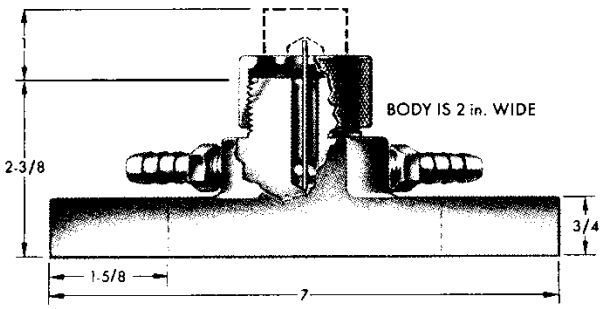
THREADED PM HOLDERS

Thread Size	Size 1	Size 2
5/8-11	350-4580	350-4590
3/4-10	350-4581	350-4591
7/8-14	350-4582	350-4592

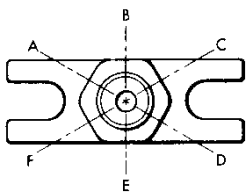
HOLDERS



Size 1 PM holder (9/16-in. mounting bolts)
Code No. 4510, Item No. 350-4510



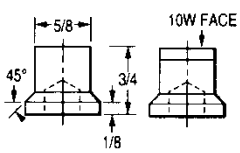
Size 2 PM holder (3/4-in. mounting bolts)
Code No. 4520, Item No. 350-4520



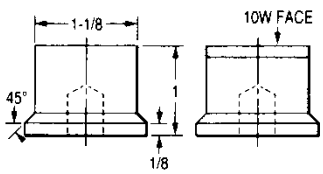
Hose Connections: You may specify where you want the hose connectors in the hexagonal base. Select any two of the six possible locations and specify by using the symbols shown on the diagram (connector locations: A-B, or A-D, etc.). Position A-C is standard. (A-F and C-D are not possible.)

HIGH PRESSURE TIPS

FLAT FACED

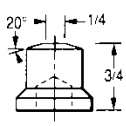


Size 1 PMC-2503
Item No. 180-2203
Item No. 180-2203-10W

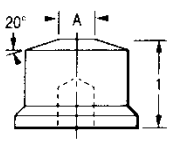


Size 2 PMC-2104
Item No. 180-1040
Item No. 180-2104-10W

TRUNCATED CONE



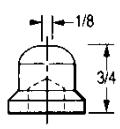
Size 1 PME-2503
Item No. 180-2303



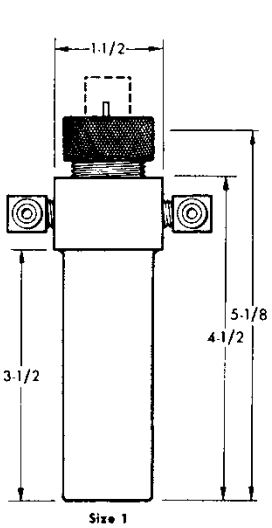
Size 2

"A"	Description	Item No.
1/4	PME-21041	180-1041
5/16	PME-21042	180-1042
3/8	PME-21043	180-1043
7/16	PME-21044	180-1044
1/2	PME-21045	180-1045

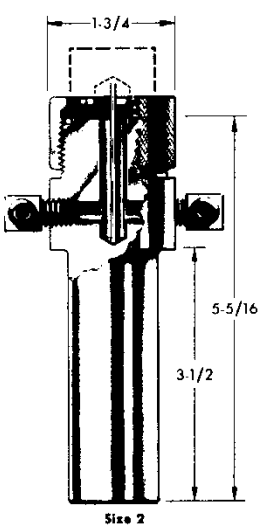
DOME NOSED



Size 1 PME-2503
Item No. 180-2103



Size 1

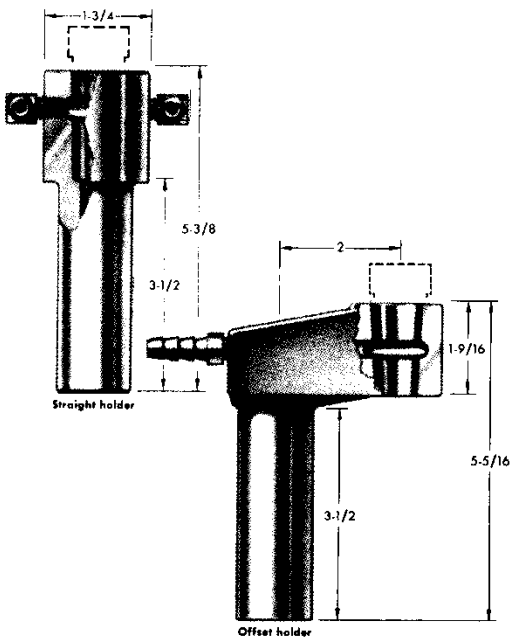


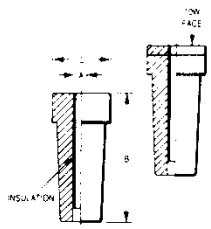
Size 2

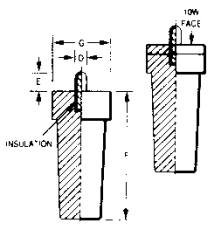
Size	Barrel Dia.	Descrip-tion	Item No.
1	1	4511	350-4511
1	1-1/4	4512	350-4512
1	1-1/2	4513	350-4513
2	1-1/4	4521	350-4521
2	1-1/2	4522	350-4522

HOLDERS

U.S. PAT. NO. 3,504,159 CANADA PAT. NO. 858,060







Several standard electrode holders are manufactured to accommodate stud-and-nut electrode tips. These holders are available in these basic types:

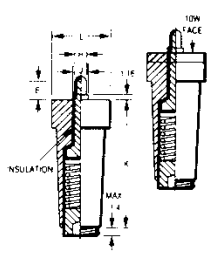
Straight Holders - Straight nut-and-stud-electrode holders are of the same high quality as the standard straight holders made for spot welder arm mounting. Coolant is brought to the tip and circulated around it. Holders are available in three barrel diameters.

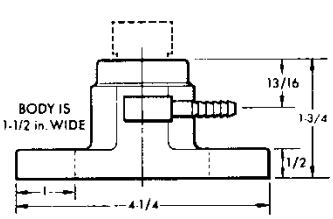
Straight Holders Barrel Diameter	A Dia	B Length	For 1" Dia Electrodes		For 1-1/2" Dia Electrodes	
			Description	Item Number	Description	Item Number
1	1-3/4	5-3/8	4530	350-4530		
1-1/4	1-3/4	5-3/8	4531	350-4531		
1-1/2	1-3/4	5-3/8	4532	350-4532		
1	2	5-3/4			4535	350-4535
1-1/4	2	5-3/4			4536	350-4536
1-1/2	2	5-3/4			4537	350-4537

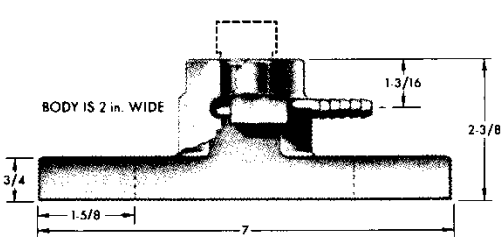
Offset Holders -To fit the special geometry of oddshaped parts, we offer 2-inch offset nut-and-stud electrode holders, made in three shank sizes.

OFFSET HOLDERS

Offset Holders Shank Dia	For 1" Dia Electrodes		For 1-1/2" Dia Electrodes	
	Description	Item Number	Description	Item Number
1	4540	350-4540	4546	350-4546
1-1/4	4541	350-4541	4547	350-4547
1-1/2	4542	350-4542		







STUD ELECTRODES

A For Stud Dia	B Electrode Length	C Electrode Dia	Description	Item No.	With 10W Face Refractory - Item Number
.150	2-1/4	1	400	175-4001	175-4001-10W
.164			401	175-4011	175-4011-10W
.190			402	175-4021	175-4021-10W
.216			403	175-4031	175-4031-10W
1/4			404	175-4041	175-4041-10W
5/16			405	175-4051	175-4051-10W
3/8			406	175-4061	175-4061-10W
6mm			506	175-5061	175-5061-10W
7mm			507	175-5071	175-5071-10W
9mm			509	175-5091	175-5091-10W
10mm			510	175-5101	175-5101-10W
3/8	2-3/4	1-1/2	436	175-4361	175-4361-10W
7/16			437	175-4371	175-4371-10W
1/2			438	175-4381	175-4381-10W
9/16			439	175-4391	175-4391-10W
5/8			440	175-4401	175-4401-10W
11/16			441	175-4411	175-4411-10W
3/4			442	175-4421	175-4421-10W
10mm			510-2	175-5102	175-5102-10W
12mm			512-2	175-5122	175-5122-10W

SELF-PILOTED-NUT ELECTRODES

D For Nut Dia	E Pin Length	F Electrode Length	G Electrode Dia	Description	Item Number	With 10W Face Refractory - Item Number
.164	3/16	2-1/4	1	411	175-4111	175-4111-10W
.190	3/16			412	175-4121	175-4121-10W
.216	1/4			413	175-4131	175-4131-10W
1/4	5/16			414	175-4141	175-4141-10W
5/16	5/16			415	175-4151	175-4151-10W
3/8	3/8			416	175-4161	175-4161-10W
6mm	1/4			606	175-6061	175-6061-10W
7mm	5/16			607	175-6071	175-6071-10W
9mm	3/8			609	175-6091	175-6091-10W
10mm	3/8			610	175-6101	175-6101-10W
3/8	3/8	2-3/4	1-1/2	456	175-4561	175-4561-10W
7/16	3/8			457	175-4571	175-4571-10W
1/2	7/16			458	175-4581	175-4581-10W
9/16	7/16			459	175-4591	175-4591-10W
5/8	1/2			460	175-4601	175-4601-10W
11/16	1/2			461	175-4611	175-4611-10W
3/4	5/8			462	175-4621	175-4621-10W
10mm	3/8			610-2	17-6102	175-6102-10W
12mm	7/16			612-2	17-6122	175-6122-10W

NON-PILOTED-NUT ELECTRODES

H For Nut Dia	J Pilot Dia	K Electrode Length	L Electrode Dia	Description	Item Number	With 10W Face Refractory - Item Number
.164	0.18	2-1/4	1	421	175-4211	175-4211-10W
.190	0.215			422	175-4221	175-4221-10W
.216	0.24			423	175-4231	175-4231-10W
1/4	0.275			424	175-4241	175-4241-10W
5/16	0.345			425	175-4251	175-4251-10W
3/8	0.405			426	175-4261	175-4261-10W
6mm	0.261			706	175-7061	175-7061-10W
7mm	0.3			707	175-7071	175-7071-10W
9mm	0.385			709	175-7091	175-7091-10W
10mm	0.425			710	175-7101	175-7101-10W
3/8	0.437	2-3/4	1-1/2	476	175-4761	175-4761-10W
7/16	0.562			477	175-4771	175-4771-10W
1/2	0.625			478	175-4781	175-4781-10W
9/16	0.687			479	175-4791	175-4791-10W
5/8	0.75			480	175-4801	175-4801-10W
10mm	0.453			710-2	175-7102	175-7102-10W
12mm	0.595			712-2	175-7122	175-7122-10W

PM Holders T-Slot Spacing	Holder Size	For 1" Dia Electrodes		For 1-1/2" Dia Electrodes	
		Description	Item Number	Description	Item Number
3-1/2	1PM	4515	350-4515		
5 & 6	2PM	4525	350-4525	4526	350-4526

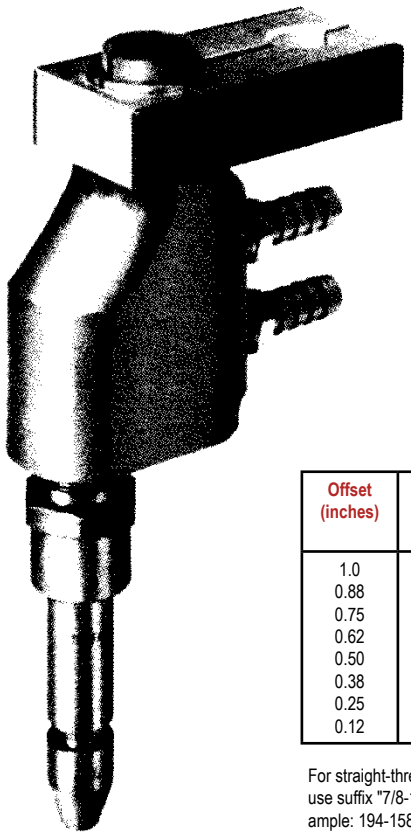
CYLINDER-MOUNTED HOLDERS, page 30

CYLINDER-MOUNTED HOLDERS

These standard-tip holders are mounted directly to air or hydraulic cylinder pistons. They are ideal for assembling special multi-head resistance welding equipment. Current and coolant water are brought to each of the holders in a
set-up separately.

Electrode adapters for the tip diameter being used and in lengths to suit your set-up are ordered separately. Water tubes, for carrying water into the tip, should also be ordered separately.

Offset holders are offered in eight offset sizes from 1/8 to 1 inch. The standard models have a 1/2-NPT adapter socket, to hold adapters for 4 & 5RW tips. Ordering a 3/4- NPT socket will permit adapters for 6 & 7RW tips to be
used.

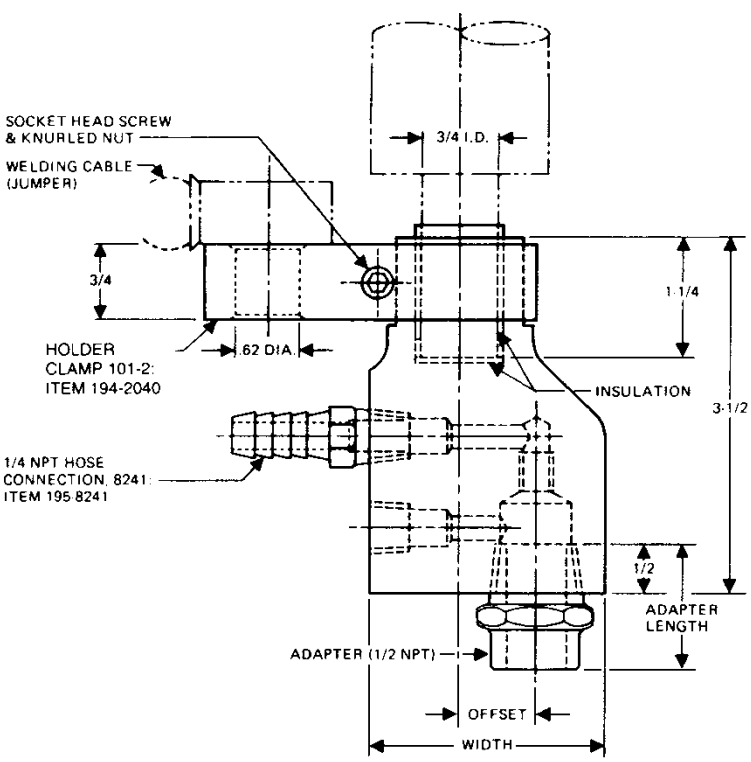


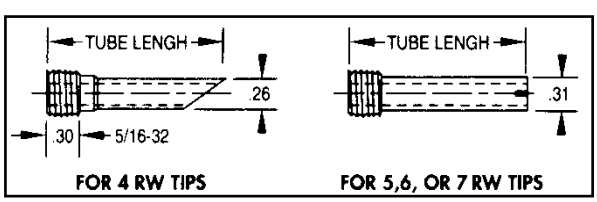
OFFSET HOLDERS

Offset (inches)	Width (Inches)	4 & 5 RW Item No. 1/2" Pipe	6 & 7 RW Item No. 3/4" Pipe
1.0	2.5	194-1588	194-1598
0.88	2.5	194-1587	
0.75	2.31	194-1586	194-1596
0.62	2.18	194-1585	
0.50	2.06	194-1584	194-1594
0.38	1.94	194-1583	
0.25	1.81	194-1582	
0.12	1.68	194-1581	

For straight-thread adapters use suffix "7/8-14 N.F." Example: 194-1588-7/8-14 NF.

ORDER CLAMP SEPARATELY





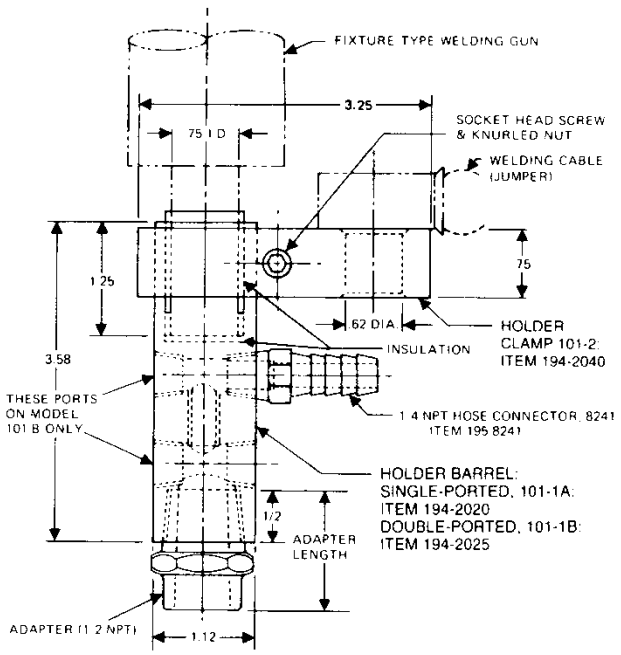
STATIONARY WATER TUBES

Length	For 4RW Use		For 5RW, 6RW or 7RW Use	
	Description	Item No.	Description	Item No.
3/4	301-.7	194-3107	312-.7	194-3207
1	301-1.0	194-3110	312-1.0	194-3210
1-1/4	301-1.2	194-3112	312-1.2	194-3212
1-1/2	301-1.5	194-3115	312-1.5	194-3215
1-3/4	301-1.7	194-3117	312-1.7	194-3217
2	301-2.0	194-3120	312-2.0	194-3220
2-1/2	301-2.5	194-3125	312-2.5	194-3225
3	301-3.0	194-3130	312-3.0	194-3230
3-1/2	301-3.5	194-3135	312-3.5	194-3235
4	301-4.0	194-3140	312-4.0	194-3240
4-1/2	301-4.5	194-3145	312-4.5	194-3245

To determine distance adapter sticks out from holder, deduct 112-in from length of adapter selected. Water tubes 112-in. longer than adapter will install approximately fZush with adapter face.

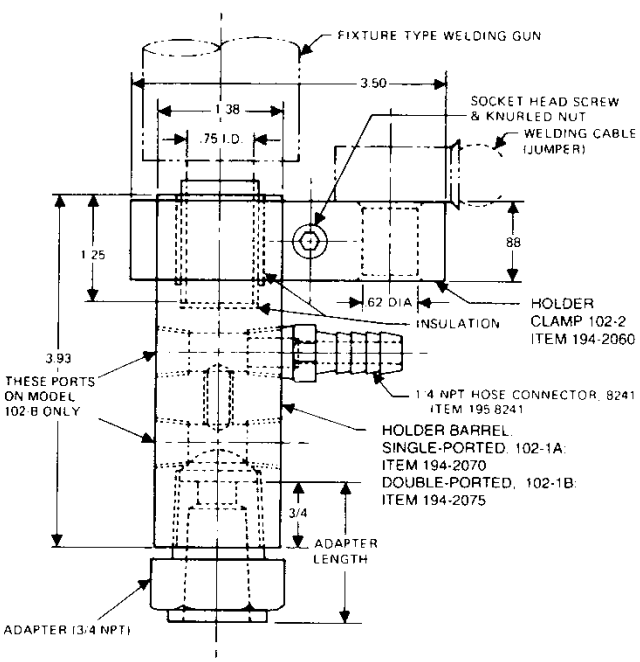
Cylinder-Mounted Holders

101 SERIES HOLDERS (For 4 & 5 RW Tips)



To determine distance adapter sticks out from holder, deduct 1/ 2' from length of adapter selected. Water tubes 1/2" longer than adapter will install approximately (lush with adapter face.

102 SERIES HOLDERS (For 6 & 7 RW Tips)

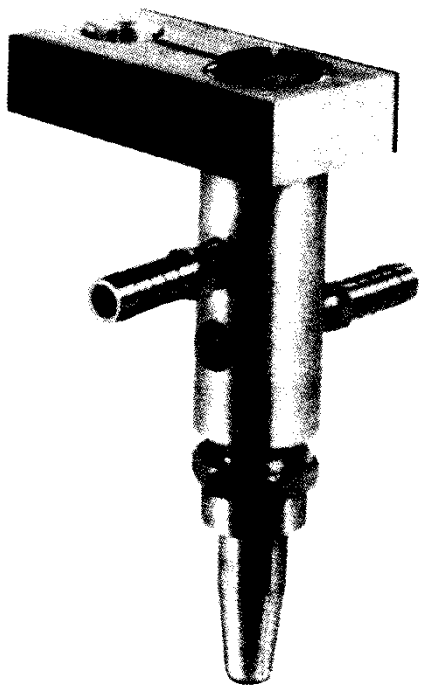


To determine distance adapter sticks out from holder deduct 3/4" from length of adapter selected. Water tubes 3/4" longer than adapter will install approximately flush with adapter face.

STRAIGHT HOLDERS

Straight holders are available in two sizes, to carry tips having four different diameters. Series 101 holders are for 4 & 5RW tips, and Series 102 holders are for 6 & 7RW tips. They may be ordered with one or two sets of coolant ports .

Mating electrical contact surfaces of both the barrels and the clamp are silver plated. Item Numbers for replacement barrels and clamp parts are called out on the drawings.



CLAMP AND BARREL ARE SEPARATE PARTS

Adapters, water connectors and water tubes are sold separately.

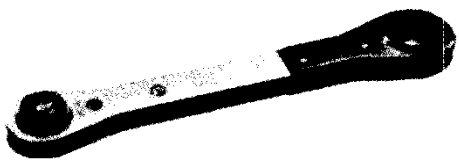
HOLDERS

Holders for Tip Sizes	Number of Coolant Parts					
	One Set		Two Sets		Clamp	
	Description	Item No.	Description	Item No.	Description	Item No.
4 & 5 RW	101-A	194-2020	101-B	194-2025	101-2	194-2040
6 & 7 RW	102-A	194-2070	102-B	194-2075	102-2	194-2060

ACCESSORIES

TIP SOCKET REAMERS

Hole in reamer center permits water tube entry; no need to dismantle holder. 4 RW; Item #601-0004; 5 RW, Item #601·0005; 6 RW, Item #601-0006; 7 RW, Item #601-0007. To ream or dress sockets to hold male caps. 4 RW, Item #601·0014; 5 RW, Item #601-0015; 6 RW, Item #601-0016. #601-0015; 6 RW, Item #601-0016.

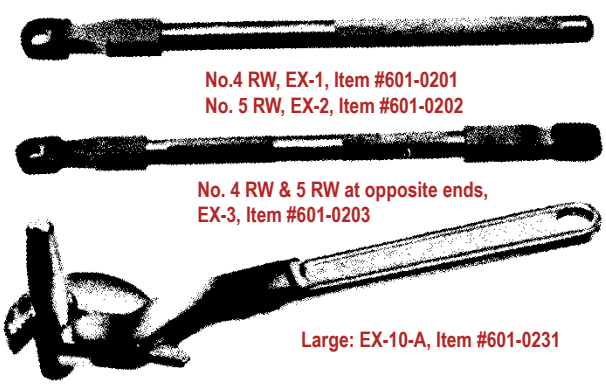


TIP DRESSING TOOL

To remove mushroomed nose material on a pair of tips of 4 or 5 RW size, having pointed or dome noses. Other nose design dressers on special order. Dresser, Item #601-01 02; Dresser cutter, Item #601-01 03.

RADIUS TIP FILE

To restore original contours of welding tips use this two-inch radius file. Item #601-0120.

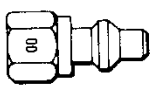


No.4 RW, EX-1, Item #601-0201
No. 5 RW, EX-2, Item #601-0202

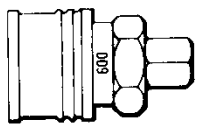
No. 4 RW & 5 RW at opposite ends, EX-3, Item #601-0203

Large: EX-10-A, Item #601-0231

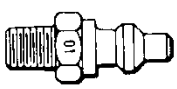
QUICK-CONNECT COUPLINGS - With automatic shut-oUse these couplings to make up efficient, trouble-free coolant systems. Any plug shown will mate with any socket shown. Always put the socket on the upstream side of a connection. Its built-in valve will automatically close upon disconnection.



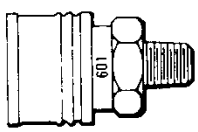
⅛" NPT female plug
Item No. 601-0300



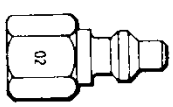
⅛" NPT female socket
Item No. 601-0314



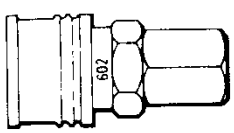
⅛" NPT male plug
Item No. 601-0301



⅛" NPT male socket
Item No. 601-0315

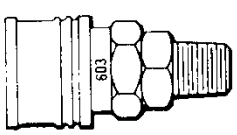


¼" NPT female plug
Item No. 601-0302

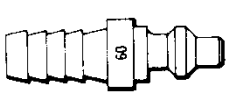


¼" NPT female socket
Item No. 601-0316

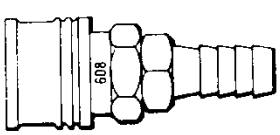
¼" NPT male plug
Item No. 601-0303



¼" NPT male socket
Item No. 601-0317



⅜" hose plug
Item No. 601-0309

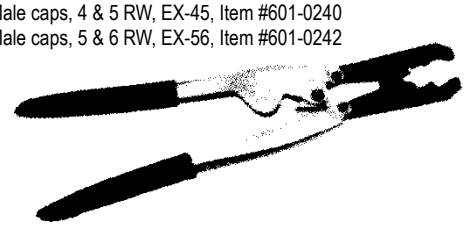


⅜" hose socket
Item No. 601-0320

WELDING TIP EXTRACTORS

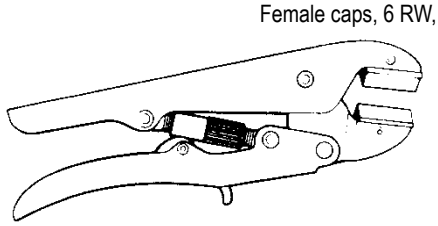
CAP EXTRACTORS

Male caps, 4 & 5 RW, EX-4 Item #601-021 0
Male caps, 4 & 5 RW, EX-45, Item #601-0240
Male caps, 5 & 6 RW, EX-56, Item #601-0242

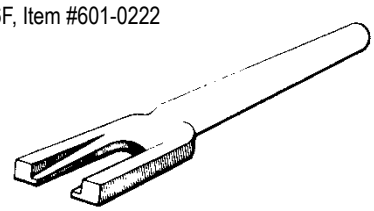


Male cap extractor has long-lever handles for easier cap removal. In two dual-size models: EX-45 and EX-56.

Female caps, 4 RW, EX-4F, Item #601-0220
Female caps, 5 RW, EX-5F, Item #601-0221
Female caps, 6 RW, EX-6F, Item #601-0222



Toggle-type male cap extrac-tor, model EX-4 adjusts to handle size 4 & 5 RW shanks and caps.



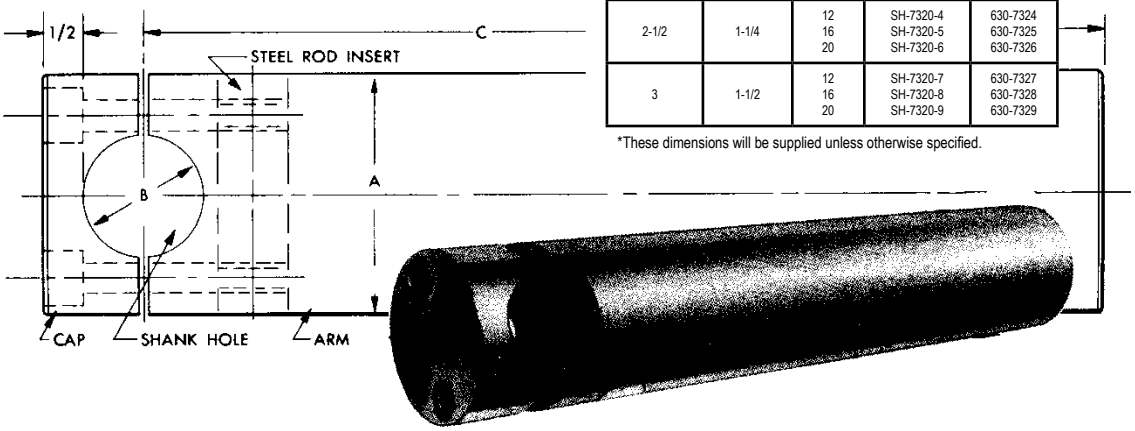
Female cap extractors are made for three Tuffcap shank sizes: ModelsEX-4F,EX-5F, and EX-6F.

ACCESSORIES

WELDER ARMS

A Arm Dia	B Hole Dia*	C Arm Length	Description	Item No.
2	1	12 16 20	SH-7320-1 SH-7320-2 SH-7320-3	630-7321 630-7322 630-7323
2-1/2	1-1/4	12 16 20	SH-7320-4 SH-7320-5 SH-7320-6	630-7324 630-7325 630-7326
3	1-1/2	12 16 20	SH-7320-7 SH-7320-8 SH-7320-9	630-7327 630-7328 630-7329

*These dimensions will be supplied unless otherwise specified.

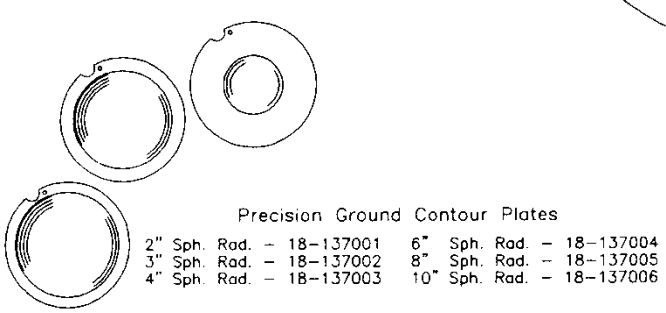


Electrode holder shanks can be attached to these arms from the front, by bolting the cap over them. This means no extra clearance is required between the arms to allow running a shank up (or down) into a hole in the arm. It makes the insertion of multiplewelding holders, (which are bulkier than simple straight holders) much easier.

One of the most common failures of welder arms is the destruction of the bolt hole threads, due to the relatively soft copper involved. The arms have a transverse steel bar insert in which the bolt hole threads are cut. This provides greatly increased thread life.

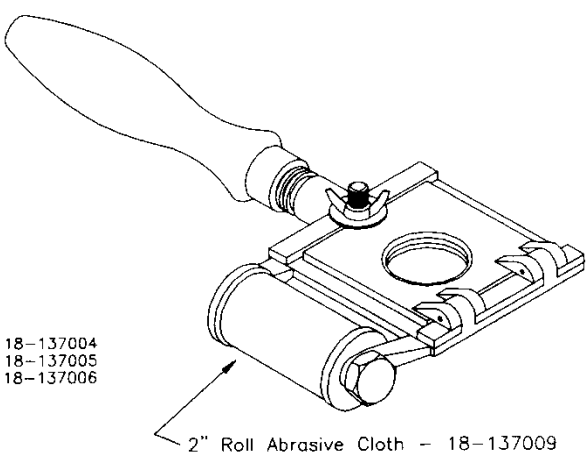
Standard arm configurations are shown in the table. Special arms are also available.

ELECTRODE DRESSERS
PART #18-1370



Precision Ground Contour Plates

2" Sph. Rad. – 18–137001
3" Sph. Rad. – 18–137002
4" Sph. Rad. – 18–137003
6" Sph. Rad. – 18–137004
8" Sph. Rad. – 18–137005
10" Sph. Rad. – 18–137006



Electrodes Dressed to Any Radius without Removal from Welder

In certified resistance welding and where clean, strong welds are necessary on a production basis the Maintain-A-Contour Dresser pays big dividends. Its use not only assures consistent quality welds in aircraft metals, but saves valuable production time in all dressing operations.

The Maintain-A-Contour Dresser is supplied with a spool of 240 grit cloth, and one set of (2 per set) precision ground contour plates. Specify the size radius (2, 3, 4, 6, 8, 1 0") plates required.

Plates with special radii are availble on special request. The abrasive cloth is standard 2" width.

Extended Type - Small

Used for precision dressing of worn electrode tips on portable gun welders, short-stroke stationary welders and multiple-point welders when tips are spaced a minimum of 1-1 /2" apart. The chuck-mounted blade features Electrode Dressers exclusive "floating blade" action, which automatically centers the blades on the electrode.

Complete Assembly - Small Extended Series

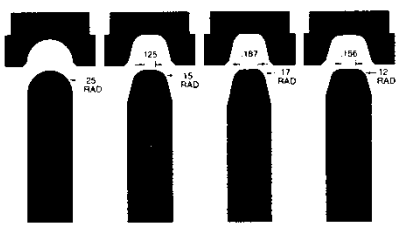
Extended Type - Large

Openings on each side of the chuck provide for necessary chip clearance, enabling high speed operation. Chuck body can be press-fit into power-dressing tools. It is also threaded 3/8" - 24 for use on portable drills, drill presses, right-angle drills or lathes.

Complete Assembly - Large Extended Service

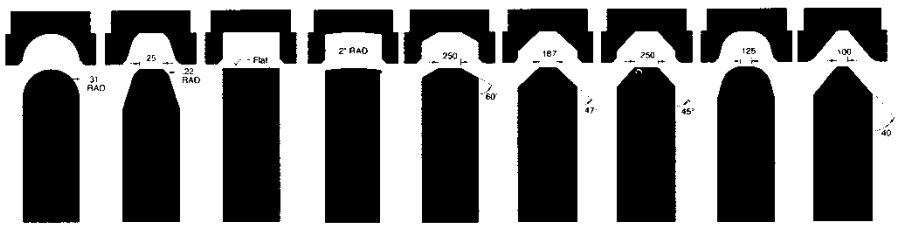
For No. 4RW Electrodes
Use Chuck No. C-1, Nut N-1, Ring No. R-2

Use Blade No. BE-1 | Use Blade No. BE-30 | Use Blade No. BE-44 | Use Blade No. BE-57



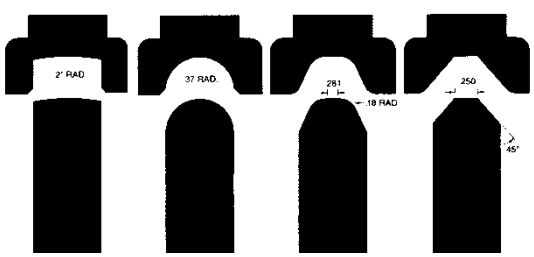
For No. 5RW Electrodes
Use Chuck No. C-1, Nut N-1, Ring No. R-1

Use Blade No. BE-2 | Use Blade No. BE-11 | Use Blade No. BE-12 | Use Blade No. BE-14 | Use Blade No. BE-21 | Use Blade No. BE-22 | Use Blade No. BE-26 | Use Blade No. BE-40 | Use Blade No. BE-88



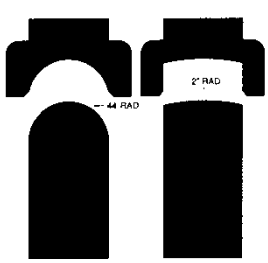
For No. 6RW Electrodes
Use Chuck No. C-2, Nut N-2

Use Blade No. BEL-15 | Use Blade No. BEL-17 | Use Blade No. BEL- 36 | Use Blade No. BEL- 38



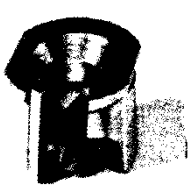
For No. 7RW Electrodes
Use Chuck No. C-2, Nut N-3

Use Blade No. BEL- 23 | Use Blade No. BEL- 27



Flush-Type Tapered:

Flush-Type Tapered model has practically all the features of the Flush-Type Straight model and is used for dressing tapered electrodes. It has the same overall height of 3/4" for use where space is limited. Can be used with pneumatic tool or for occasional use with an adaptor.



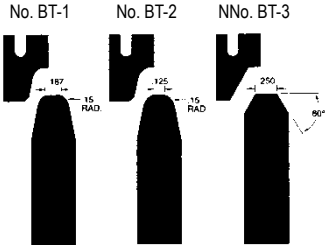
Complete Assembly Flush Tapered Series

Adaptor:
Allows both straight and tapered Flush-Type dressers to be used with drill presses, portable or right-angle drills. Threaded 3/8" - 24.

Adaptor No. AD-1

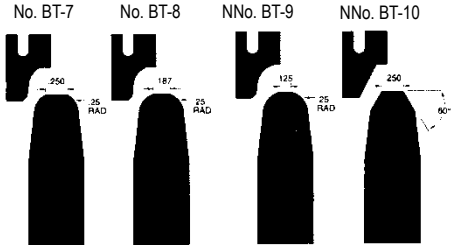
For No. 4RW Pointed Electrodes
Use Chuck No. C-3 for all

Use Blade No. BT-1 | Use Blade No. BT-2 | Use Blade NNo. BT-3



For No. 5RW Pointed Electrodes
Use Chuck No. C-4 for all

Use Blade No. BT-7 | Use Blade No. BT-8 | Use Blade NNo. BT-9 | Use Blade NNo. BT-10



SS-1

Stud Shank:
For use with any extended series chuck or adaptor.

Note: All parts shown -nut, ring, blade and chuck are required to make a complete, extended-type electrode dresser. Nut and chuck are standard size for all electrodes shown on selection chart. Ring and blade vary according to electrode diameter and are so specified on the chart.

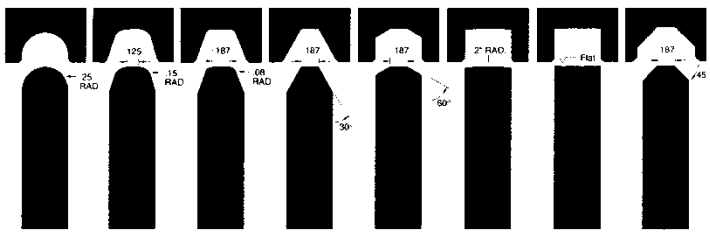
Flush-Type Straight:

This simple, compact, two-piece dresser (blade and chuck) has an overall height of only 3/4". Because of its small size, it is ideal for dressing straight electrodes where the center-to-center distance between points is 3/4" or more. Operates flush with the face of a pneumatic dresser tool; also can be used with an Adaptor or Extension for virtual universal use. Unique "floating blade" action insures smooth cutting action, uniform dressing and long service under all conditions.

Complete Assembly-
Flush Series

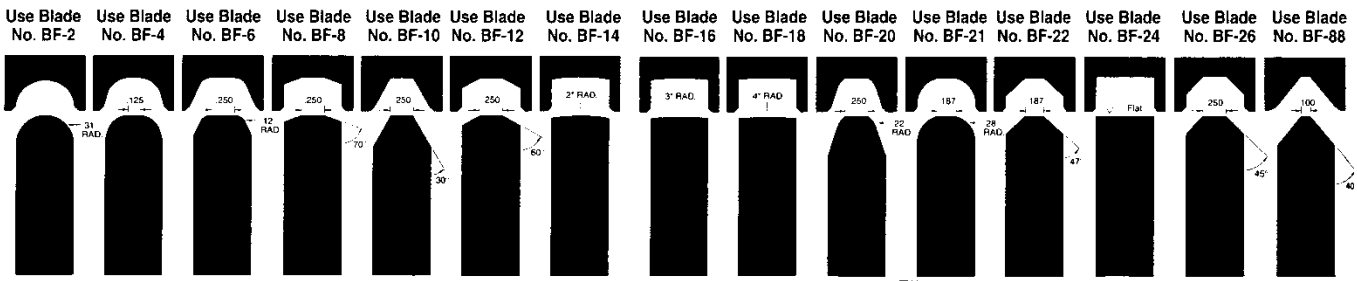
For No. 4RW Electrodes
Use Chuck No. C-6 for all

Use Blade No. BF-1 | Use Blade No. BF-3 | Use Blade No. BF-5 | Use Blade No. BF-9 | Use Blade No. BF-11 | Use Blade No. BF-13 | Use Blade No. BF-23 | Use Blade No. BF-25



For No. SRW Electrodes
Use Chuck No. C-5 for all

Use Blade No. BF-2 | Use Blade No. BF-4 | Use Blade No. BF-6 | Use Blade No. BF-8 | Use Blade No. BF-10 | Use Blade No. BF-12 | Use Blade No. BF-14 | Use Blade No. BF-16 | Use Blade No. BF-18 | Use Blade No. BF-20 | Use Blade No. BF-21 | Use Blade No. BF-22 | Use Blade No. BF-24 | Use Blade No. BF-26 | Use Blade No. BF-88



ELECTRODE DRESSER BLADE SELECTION CHART

Match your tip to this chart and order accordingly. Do not forget to order appropriate chuck assembly

How to order;
To order the exact blade(s) for your requirements:

1. Pick the model: Extended, Flush Straight, Flush Tapered
2. Pick the profile you use
3. Order blade and chuck by designated number.
(Remember to order Ring and Nut where applicable).

Extended

Chuck	For Electrode No.	Ring	Extended Ring	Nut
C-1	No. 4RW	R-2	R-8	N-1
C-1	No. 5RW	R-1	R-7	N-1

Extended Chuck C1

Flush Straight

Chuck	For Electrode No.
C-6	No. 4RW
C-5	No. 5RW

Flush Taper

Chuck	For Electrode No.
C-3	No. 4RW
C-4	No. 5RW

Complete Assembly

Chuck No. C-1

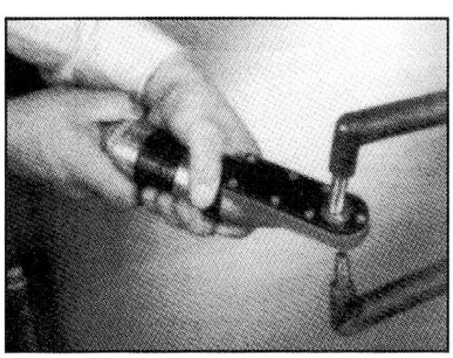
Blade No. BE (1-88)

Nut No. N-1

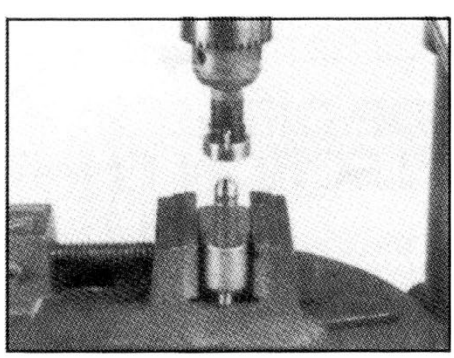
Ring No. R-1, R-2 R-7, R-8

THE CUTIING ACTION

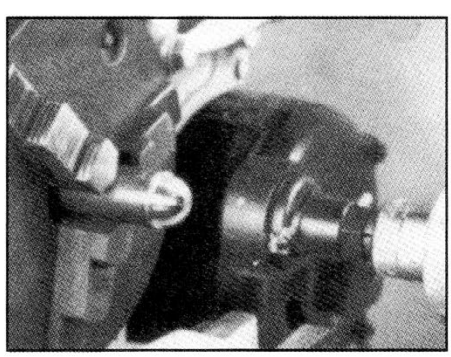
The quickest, easiest, most accurate method of dressing electrodes, automatic or pneumatic cutters virtually eliminate downtime. Each tip can be precisely dressed in seconds, even without removing the tip from the machine, providing a long-lasting surface for uniform welding.



Dressing with a pneumatic tool.



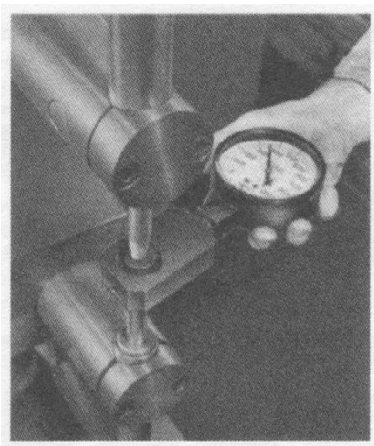
Drill press with small extended series.



Lathe with large extended series.

ACCESSORIES

WELD FORCE GAUGES



Resistance welding set-up and troubleshooting will be a lot easier with a weld force gauge. It will let you know what weld pressure you're getting at any time. Pressure is one of the three variables (along with heat and time) that must be correct if good welds are to be made.

Force gauges eliminate the shortcomings of computing weld pressure. Figuring from a standard air gauge reading can be inaccurate because weld cables or water hoses can impede strokes, or the air gauge itself may be incorrect. And when using lever-action rocker-arm welding equipment, determining weld
pressure involves more complex computations to allow for the ratios present.

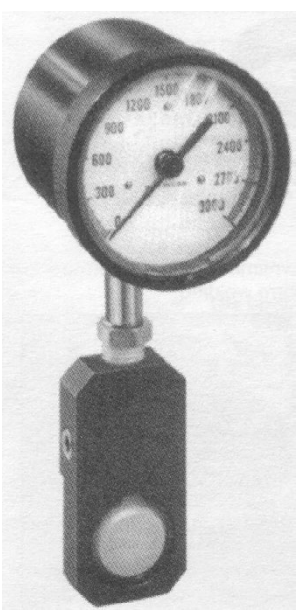
These are compact, direct-reading instruments. They operate on a closed and sealed hydraulic system, and require no maintenance.

Large force gauge with maximum reading of 10,000 lb. Item No. 601-8100

Digital-Hydraulic Force Gauge with maximum reading of 3,000 lb. Item No. 601-3000D

2000-lb force gauge with 12-in. flexible extension. Item No. 601-8020-12.

The 6,000 - and 1 O,OOOib. gauges are not insulated; weld current must be turned off. The 2,000 - and 6,0001b. gauges are available in models with a flexible metal connecting hose between sensor and gauge. This makes gauge reading easier in hard-to-see locations.



HIGH PRECISION GAUGE

This is the most precise force gauge available anywhere. It is accurate to within 1/2 of one percent of actual reading, and it is permanently calibrated. Maximum reading is 3000 lb, in 20-lb increments. (Other capacities available on special order.) Flexible extension model, too. High precision digital gauges are available in both metric and English units

STANDARD GAUGE DESCRIPTION

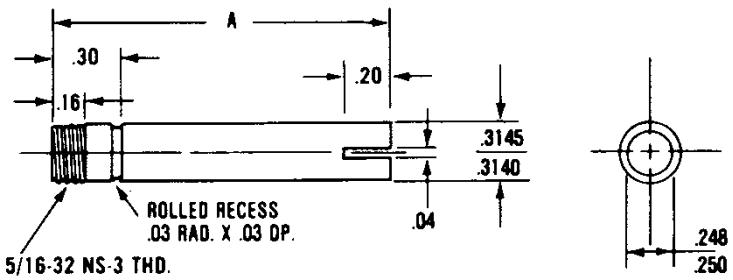
Maximum Reading	Increment Every	Opening Required	Extension Length	Item No.
2000 lb (900 kg)	50 lb (20 kg)	5/8 in. (16 mm)	- -	61-8020*
2000 lb (900 kg)	50 lb (20 kg)	5/8 in. (16 mm)	12 in. (309 mm)	601-8020-12
5000 lb	100 lb	1 in.	-	601-5000
5000 lb	100 lb	1 in.	18 in.	601-5000-18
10000 lb	200 lb1	1 in.	-	601-8100
5000 kg	100 kg	25.4 mm	-	601-8201
3000 lb	1 kg	11/16 in.	-	601-3000D
PRECISION GAUGE DESCRIPTION				
3000 LB	20 LB	5/8 in.	-	601-8030
3000LB	20 LB	5/8 in.	12 in.	601-8030-12
SPECIAL GAUGE SIZES				
50 lb 100 lb 250 lb 500 lb 1000 lb 25,000 lb	Consult Factory			

·A molded plastic carrying case is available Item No. 601-6019

ACCESSORIES

WATER DEFLECTOR TUBES & ADAPTERS

NOTE:
USE WITH TELESCOPING
WATER TUBE INSERTS
HF-201 & HF-202



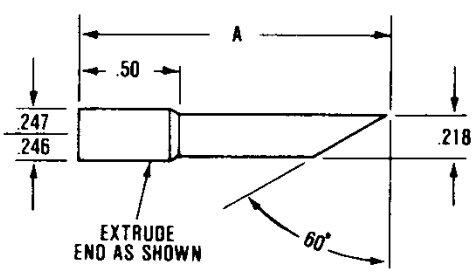
MATERIAL 5/16 O.D. BRASS

Order As	A
HF-101-6	.75
HF-101-7	.88
HF-101-8	1.00
HF-101-9	1.12
HF-101-10	1.25
HF-101-11	1.38
HF-101-12	1.50
HF-101-13	1.62
HF-101-14	1.75

Order As	A
HF-101-15	1.88
HF-101-16	2.00
HF-101-17	2.12
HF-101-18	2.25
HF-101-19	2.38
HF-101-20	2.50
HF-101-21	2.62
HF-101-22	2.75
HF-101-23	2.88

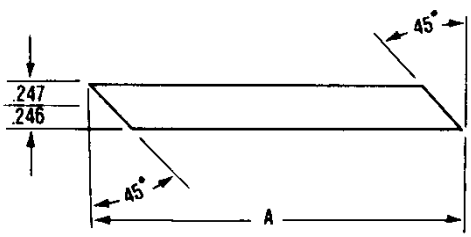
Order As	A
HF-101-24	3.00
HF-101-25	3.12
HF-101-26	3.25
HF-101-27	3.38
HF-101-28	3.50
HF-101-29	3.62
HF-101-30	3.75
HF-101-31	3.88
HF-101-32	4.00

WATER DEFLECTOR TUBES



MATERIAL .218 O.D. x .020 WALL
S EAMLESS COPPER TUBING
HF-201 Series

Order As	Order As	A
HF-201-5	HF-202-5	1.25
HF-201-6	HF-202-6	1.50
HF-201-7	HF-202-7	1.75
HF-201-8	HF-202-8	2.00
HF-201-9	HF-202-9	2.25
HF-201-10	HF-202-10	2.50
HF-201-11	HF-202-11	2.75
HF-201-12	HF-202-12	3.00
HF-201-13	HF-202-13	3.25
HF-201-14	HF-202-14	3.50



MATERIAL 1/4 O.D. x .032 WALL
BRASS TUBING
HF-202 Series

Order As	Order As	A
HF-201-15	HF-202-15	3.75
HF-201-16	HF-202-16	4.00
HF-201-17	HF-202-17	4.25
HF-201-18	HF-202-18	4.50
HF-201-19	HF-202-19	4.75
HF-201-20	HF-202-20	5.00
HF-201-21	HF-202-21	5.25
HF-201-22	HF-202-22	5.50
HF-201-23	HF-202-23	5.75
HF-201-24	HF-202-24	6.00

RAW MATERIALS

COPPER ALLOY BAR STOCK

SQUARES Class II & III	WEIGHT /FT.
1/2 X 1/2	.96
5/8 X 5/8	1.50
3/4 X 3/4	2.16
1 X 1	3.84
1-1/4 X 1-1/4	6.00
1-1/2 X 1-1/2	8.64
1-3/4 X 1-3/4	12.00
2X2 1	5.36

PLATE SIZES	WEIGHT /FT.
1/4 3/8	Thickness X Width X Length X.322 = Total Weight
1/2 5/8	
3/4 1	
1-1/4 1-1/2	
1-3/4 2	
2-1/2 3	
4	

CLASS II & CLASS III PLATE:
Cut to your specifications.

Most items are in Stock.
Others available upon request.

ROUNDS Class II & III	WEIGHT /FT.
1/8	.048
3/16	.106
1/4	.189
5/16	.296
3/8	.426
7/16	.577
.482	.701
1/2	.758
9/16	.961
5/8	1.18
3/4	1.70
7/8	2.32
1	3.03
1-1/8	3.84
1-1/4	4.74
1-3/8	5.76
1-1/2	6.82
1-3/4	9.36
2	12.12
2-1/2	13.44
2-1/4	15.48
2-1/2	18.96
2-3/4	23.00
3	27.14
3-1/8	29.64
3-1/4	32.20
3-1/2	37.30
3-5/8	39.11
4	48.70
4-1/8	51.80
5	74.40
5-1/8	78.19
6	107.14
6-1/8	111.68
7	145.87
7-1/8	151.13

RECTANGLES Class II & III	WEIGHT /FT.
1/8 X 3/4	.36
1/8 X 1	.48
1/8 X 1-1/4	.60
1/8 X 1-1/2	.72
1/8 X 2	.96
1/8 X 3	1.45
1/8 X 4	1.93
1/4 X 1/2	.48
1/4 X 3/4	.72
1/4 X 1	.96
1/4 X 1-1/2	1.44
1/4 X 2	1.92
3/8 X 3/4	1.08
3/8 X 1	1.45
3/8 X 1-1/2	2.17
3/8 X 2	2.91
1/2 X 5/8	1.21
1/2 X 3/4	1.44
1/2 X 1	1.92
1/2 X 1-1/4	2.40
1/2 X 1-1/2	2.88
1/2 X 2	3.84
1/2 X 2-1/2	4.80
1/2 X 3	5.76
5/8 X 3/4	1.80
5/8 X 1	2.40
5/8 X 1-1/2	3.60
5/8 X 2	4.80
3/4 X 1	2.88
3/4 X 1-1/2	4.32
3/4 X 2	5.76
3/4 X 2-1/2	7.20
3/4 X 3	8.64
7/8 X 1	3.38
1 X 1-1/4	4.85
1 X 1-1/2	5.76
1 X 1-3/4	6.72
1 X 2	7.68
1 X 2-1/2	9.60
1 X 3	11.52
1-1/4 X 1-1/2	7.20
1-1/2 X 1-3/4	10.14
1-1/2 X 2	11.52
1-1/2 X 3	17.28

Refractory Metal Composite materials are a combination of tungsten or tungsten carbide combined with copper or silver. The manufacturing process is to press the refractory (tungsten or tungsten carbide), sinter the pressed compact at a high temperature, and infiltrate with copper or silver. All this is done under very closely controlled conditions. The result is a relatively hard material with superior arc and wear resistance, high physical properties at elevated temperatures, and good electrical and thermal conductivity.
The mechanical and physical properties vary with composition. The thermal and electrical conductivity increases with the amount of copper or silver, while the hardness, strength and resistance to mechanical wear increase with the amount of tungsten or tungsten carbide. The application will determine the material choice. •

RESISTANCE WELDING

The high physical and mechanical properties, as well as the thermal and electrical conductivity of refractory metal composites, make these materials very suitable for die inserts and electrode facings, flash and butt welding dies, and hot upsetting. They can also solve heat balance problems.

REFRACTORY METAL COMPOSITES
TYPICAL PROPERTIES

	RWMA GROUP B	Nominal Composition % Weight	Rockwell Hardness	Electrical Conductivity % IIACS	Ultimate Tensile Strenght PSI	Cross Breaking Stregth PSI	Density GMS/ CC	Thermal Expansion* In./In.˚Cx10^{-6} at 20˚	Thermal Conductivity W/CM-˚C 20-400˚C	Specific Heat J/KG-˚C at 20˚	Electrical Resistivity Micro·Ohm-CM at 20˚	Typical Resistance Welding Applications
CW55	-	45 Cooper 55 Tungsten	79 B	55	63,000	110,000	12.50	11.80	2.40	251	3.13	Flash and butt welding die inserts requinng h1gh elect neal and thermal conductivity. Electrode facings for the weld1ng of stmnless steel.
CW68	-	32 Copper 68 Tungsten	88 B	52	75,000	130,000	13.93	10.90	2.10	219	3.32	
CW70	Class 10	30 Copper 70 Tungsten	90 B	50	85,000	140,000	14.18	10.77	2.01	214	3.45	Light duty projection weld1ng d1es where weld pressures are medium to light.
CW75	Class 11	25 Copper 75 Tungsten	94 B	48	90,000	150,000	14.70	10.22	1.89	201	3.59	Used for facings and Inserts for flash and butt welding d1es, projection welding 75 Tungsten electrodes, seam welding bearing inserts, facmgs for eletro-torm1ng and electrotorging dies. Often used for EDM electrodes for greater wear ratios.
CW78	Class 11& 12*	22 Copper 78 Tungsten	96 B	46	94,000	160,000	15.12	9.30	1.84	194	3.74	CW78 - Used where a slightly harder matenal 1s required for the same applications as CW75.
CC80	Class 12	20 Copper 80 Tungsten	98 B	44	96,000	170,000	15.56	9.20	1.82	188	3.92	Heavy duty projection welding electrodes, d1e facings for electro-forming and SO Tungsten electroforging, also facings for upsetting of nvets and studs.
CW85	-	15 Copper 85 Tungsten	102 B	36	75,000	170,000	16.19	7.97	1.75	176	4.79	Applicable where expansion problems exist in high heat applications. Very 85 Tungsten resistant to wear and erosion in high temperature conditions. Because of the high 10Copper tungsten content, these materials have a lower thermal conductivity and will not dissipate heat as quickly as will the materials with a high copper content.
CW90	-	10 Copper 90 Tungsten	106 B	28	70,000	150,000	17.06	6.49	1.47	163	6.16	
CWA75**	-	25 Copper 75 Tungsten	109 B	28	160,000	200,000	14.60	-	-		6.16	Supplied in fully heat-treated condition and must be heat-treated after brazing. Used where temperatures and pressures are relatively h1gh for electro-forging and 75 Tungsten electncal upsetting.
TC50	-	50 Copper 50 Tungsten	94 B	47	70,000	140,000	11.27	12.2	-		3.67	Light duty projection weld1ng d1es where pressures are not extreme but where 50 Tungsten-Carbide abrasion may be encountered
TC56	-	44 Copper 56 Tungsten	99 B	42	75,000	160,000	11.67	11.5	-		4.10	Where abras1on 1s encountered for heavy duty projection weld1ng electrode and die 56 T ungsten-<:arbide fac1ngs for electro-formmg and electro-forg1ng
TC70	-	30 Copper 70 Tungsten	37 C	30	85,000	180,000	12.60	9.8	-		5.75	An extremely hard material, h1ghly res1stant to wear, for electro-forging and upsetting. 70 Tungsten-Carbide Impractical to mach1ne and should be ground
TCA70**	-	30 Copper 70 Tungsten	47 C	18	150,000	220,000	12.60	-	-		9.58	Extremely hard material requiring gnnd1ng. Supplied 1n fully heaHreated condition and must be heat-treated after braz1ng. Used in very abrasive applications for 70 Tungsten-Carbide electrical upsetting and electro-torg1ng.
Molybdenum	Class 14	100 Molybdenum	92-98 B	33	100,000	-	10.15	5.40	1.15	260	5.20	Commonly used in electro-brazing applications and in welding nonferrous matenals. i.e., copper braid, and where sticking IS a problem. Somewhat difficult to machine.
Tungsten	Class 13	1 00 Tungsten	35-50 C	30	100,000	-	19.10	4.40	1.25	140	5.50	Tungsten is used in similar applications as molybdenum. It is extremely hard, has very good high temperature properties and is resistant to abrasion. It normally is ground to shape because it is extremely difficult to machine.
Diemitech™	-	92.5 Tungsten Balance: Ni Fe Mo	30 C	14	125,000	-	17.60	4.60	1.20	134	12.30	This material is used for electro-brazing electrodes and hot upsetting pins and cavities. It has very good high temperature properties, resists wear at elevated temperatures, and as a result Balance: Ni Fe Mo of its high thermal conductivity, has a good rate of heat dissipation.

Properties are typical and should not be used for specifications
* Can be made to meel RWMA CL 12 specifications
** Fully heat treated

Conversion Factors:
Thermal Conductivity W/CM • ˚C x .2388 • CAL/GM • SEC • ˚C
Specific Heat J/KG • ˚C X .0002388. CAL/GM • ˚C

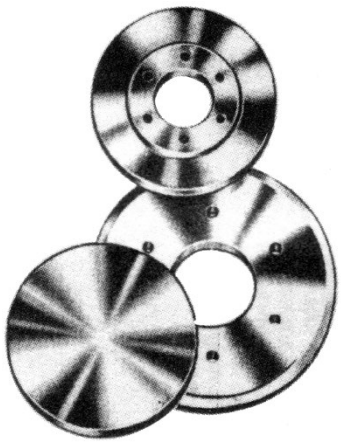
SEAM WELD WHEELS

Table of contents

SEAM WELDING WHEELS

Seam Welding Wheels are individually forged to insure maximum grain refinement and proper grain flow, resulting in strong, tight, uniform welds, even under high pressures.

Our wheels can be supplied, rough forged, machined blanks or finished machined to print specifications.



ALLOY	PRINCIPAL ELEMENTS	CDA	RWMA GROUP A	HARDNESS ROCKWELL (MIN.)	% I.A.C.S. (MIN.)
CL-1	Copper, Cadmium	16200	Class 1	55B (1" thk. max.)	80
CL-2	Copper Chromium	18200	Class 2	65B	75
CL 2 PREMIUM	Copper, Chromium	18200	Class 2	75B (1" thk. max.)	75
CL-3	Copper, Nickel, Beryllium	17510	Class 3	90B	45
CL-3BF	Copper, Nickel, Silicon	18000	Class 3	90B	45
CL-4	Copper, Beryllium	17200	Class 4	38C	23

CL-1 Recommended for spot and seam welding aluminum, magnesium (and their alloys), coated metals and hot rolled steel.

CL-2 Recommended for spot and seam welding cold and hot-rolled steel and coated materials; current carrying shafts and arms; back-up bars for both resistance and arc welding and electrical carrying structural parts.

CL-2 Premium Recommended for above but where higher pressures are present.

CL-3/CL-3BF Recommended for spot and seam welding stainless steel and high temperature heat resisting alloys requiring high weld forces; flat welding dies; back-up bars; projection welding electrodes; high strength, high conductivity and electrical components.

ORDER PLACEMENT BY FAX

To place your order, simply copy this page, fill out the following order specifications and fax to: 330-797-7543

Name: _____ Company: _____

Phone: (___) _____ Fax:(____) _____ P.O./Order No. _____

*(T) Thickness: ___ _ (W) Width: __ _ (O.L.) Outside Length: _____

Shape - Type: □ C □ J □ L □ F Hole Pattern: □ A □ B □ C □ D □ E

X= ____ Y= ____ Z= ____ Hole Diameter: _____

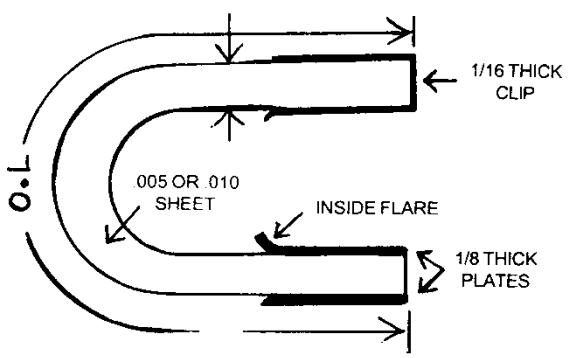
□ 1/16 Clips □ 1/8 Plates □ Loose & Bolted Sheet Thickness: □ .005 □ .01 0

Standard Construction:

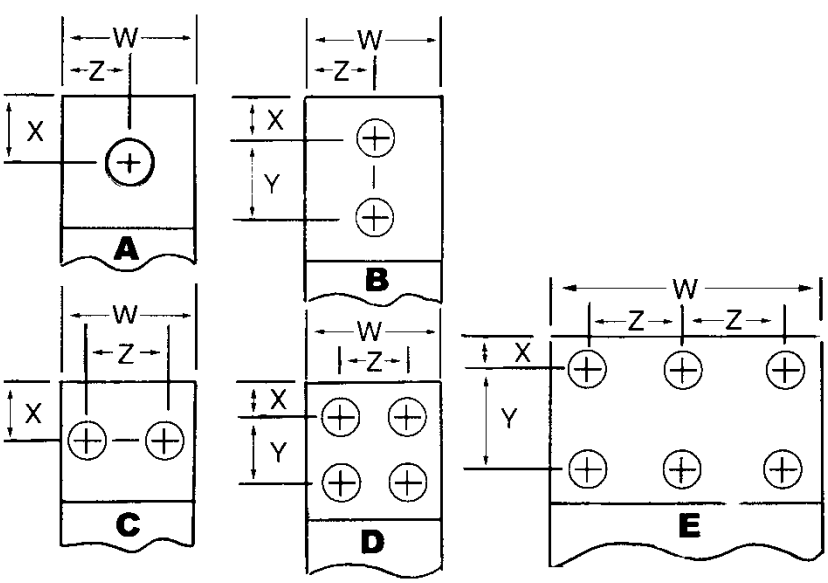
.005 or .010 thick cu. sheet fastened with 1/16 thick clips or 1/8 thick plates, riveted, ground smooth and contacts silver plated. (Loose and bolted ends available).

If you are unsure of what sheet thickness (.005- .01 0) or type of end treatment to use, we will use the best type of construction and materials to suit your application.

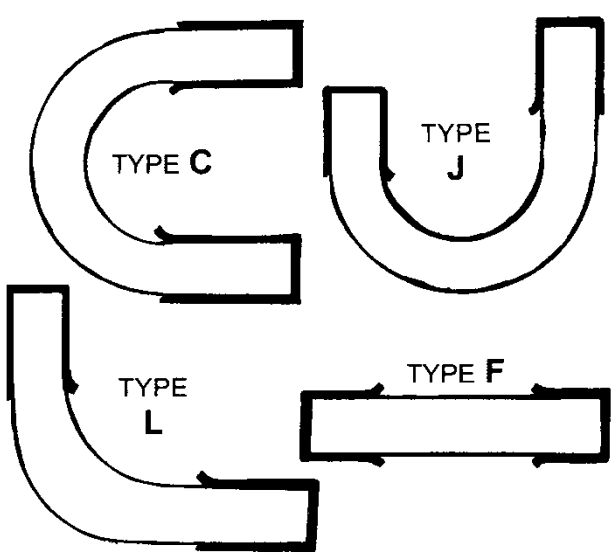
*(T) THICKNESS
Does not include Clips or Plates



STANDARD HOLE PATTERNS



STANDARD SHAPES



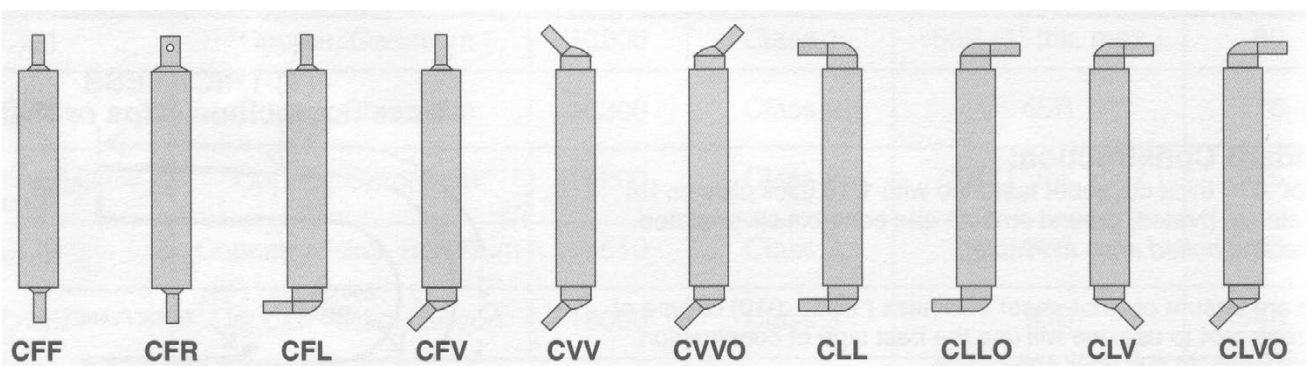
These Air-Cooled Jumpers will meet your every welding requirement for this type of cable. Jumpers are available in circular mill sizes from 400MCM to 2,000MCM as a standard. Other circular sizes are available upon request.

Terminals can be furnished with any desired angle. See terminal style (angle) and dimension chart below.

Furnished as standard, unless otherwise ordered:

1. The 1 1.4" width and corresponding thickness will be furnished up to and including the 1200MCM size,
2. The 1500MCM size will be furnished in the 1%" width
3. The 2000MCM size will be furnished in the 1W'width.

TERMINAL (ANGLE DATA)



MCM	1-1/4" Wide	1-3/8" Wide	1-1/2" Wide
400	3/8	-	-
500	7/16	-	-
600	1/3	7/16	-
750	5/8	9/16	-
1000	3/4	11/16	5/8
1200	7/8	13/16	3/4
1500	-	1-1/16	1
2000	-	-	1-7/16

When ordering Air-Cooled Jumpers Specify:
Example: 50 pcs ACJ/750MCM Terminal CFF-18"

TERMINAL LENGTH:

The contact surface length of Air-Cooled Cable Jumpers is 19!1s". Other lengths can be furnished if ordered.

BOLT HOLE SIZE:

All Air-Cooled Jumpers are drilled 17/32" unless otherwise ordered.

SINGLE CONDUCTOR, WATER COOLED JUMPER CABLES

Single Conductor, Water-Cooled Cable Jumpers feature a wide variety of terminals designed to meet all required applications.

Water-Cooled Cable jumpers are available as standard in 300MCM - 350MCM - 400MCM - 500MCM - 600MCM - 750MCM and 1 OOOMCM sizes. Other circular mill sizes and/or special terminals can be furnished on request.

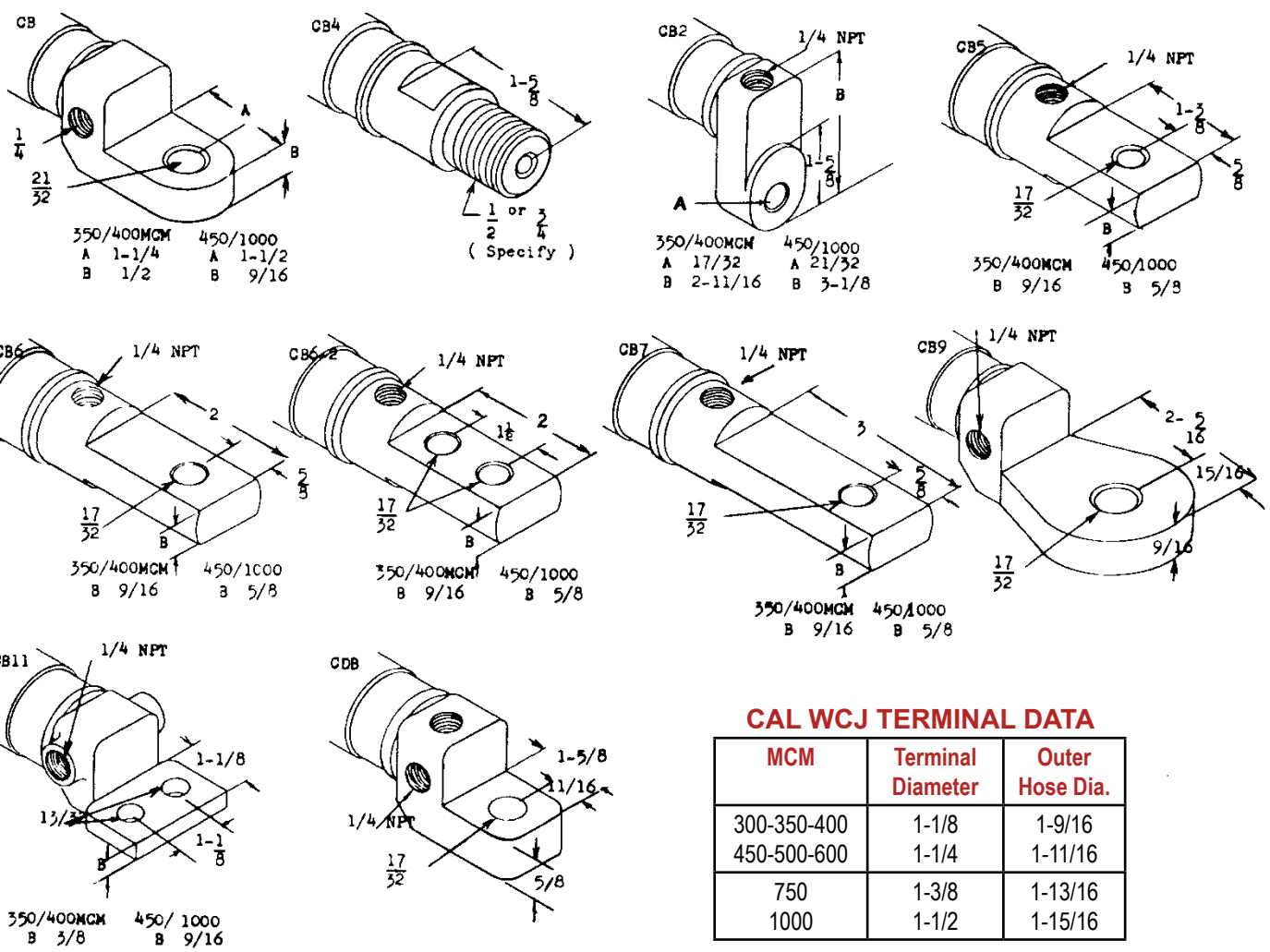
These Cables feature both extruded copper and cast copper terminals depending on the terminal configuration. A phosphorous bronze spring is centered within the copper conductor rope:

1) to minimize the possibility of restricted water flow should the cable be subjected to acute bending during operation and

2) to act as a filter for broken copper strands and other foreign material to prevent clogged water passages.

The copper conductor ropes are stranded to our specifications for flexibility and long life. The outer cover is a one braid rubber hose specifically sized for flexibility and terminal diameter. The special stranding plus the special sizing put together a combination resulting in a quality cable jumper.

TERMINALS FOR WATER COOLED CABLE JUMPERS (WCJ)



CAL WCJ TERMINAL DATA

MCM	Terminal Diameter	Outer Hose Dia.
300-350-400 450-500-600	1-1/8 1-1/4	1-9/16 1-11/16
750 1000	1-3/8 1-1/2	1-13/16 1-15/16

Terminals furnished as shown unless changes are specified.

CABLES

DUAL CONDUCTOR, WATER COOLED JUMPER CABLES (WCJ)

DUAL Conductor, Water-Cooled Cables feature a wide variety of terminals designed to meet all required applications.

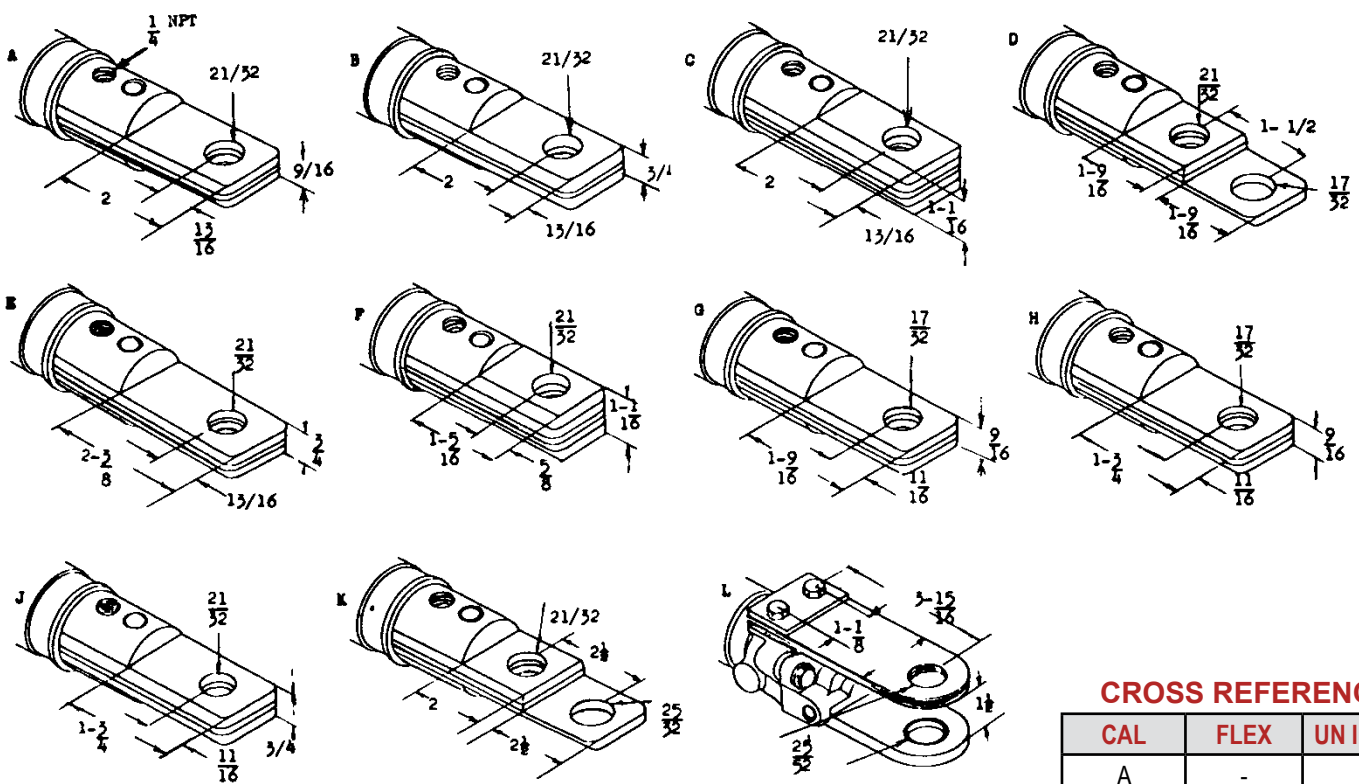
The use of extruded copper bar for the terminal and the SILVER BRAZING of the conductor ropes to the terminal ELIMINATES ALL SOLDERED JOINTS. All terminals from extruded copper bar give 1 00% conductivity. The only exception to the above is our terminal
K which is a cast terminal.

The cable features copper conductor ropes, each separated by a neoprene separator. These ropes are arranged alternately in a positive negative relationship within this neoprene extrusion thus giving alternate
polarity to the electrical forces and reducing excessive vibration and "kick".

The positive conductors are grouped at each end and stamped into a fitting which is then silver brazed to the terminal. The negative conductors, by the same process, for the other half of the cable.

The whole assembly is enclosed in a one braid rubber hose cover, specifically sized for flexibility and single circuit water flow. High grade micarta insulation is used to separate and insulate the terminals from
each other. A single "0" ring principle, is used between the terminals to provide a positive water seal. A metal band at each end completes the assembly. See the terminal drawing below.

All water ports are 1f4 NPT unless ordered otherwise.



CAL TERMINAL DATA

MCM	TERMINAL DIAMETER	OUTER HOSEDIA.
257 & 300 400	1 3/8 1 5/8	1 1/2 1 11/16
450 & 500 600 & 650	1 5/8 1 7/8	1 3/4 2
800	2	2 1/8

CROSS REFERENCE

CAL	FLEX	UN I FLEX
A 8	- 12R	- F-75
C D	17H 17T	F FIT
E F	12RX 17HC	F-75-L FA
G H	9L 9L4	N LN
J K	12R2 -	LF -
L	-	-

CABLES

The following information is based on individual cable thermal limitations, and will demonstrate the correct method for determining circular mil requirements for all types of cables displayed in this catalogue.

Regardless of the type cable which may be of interest first consult the Conversion Factor & Duty Cycle Chart with the known factors:

EXAMPLE:

Cycles of current "on time" per weld 6
Number of welds per minute 60
Amperes per weld 16,000
Kickless Cable length ..... 1 0 Ft.

Step 1
Lay one side of a straight edge across the 6 cycles of current "on time" on the left hand vertical scale of the Conversion Factor & Duty Cycle Chart.

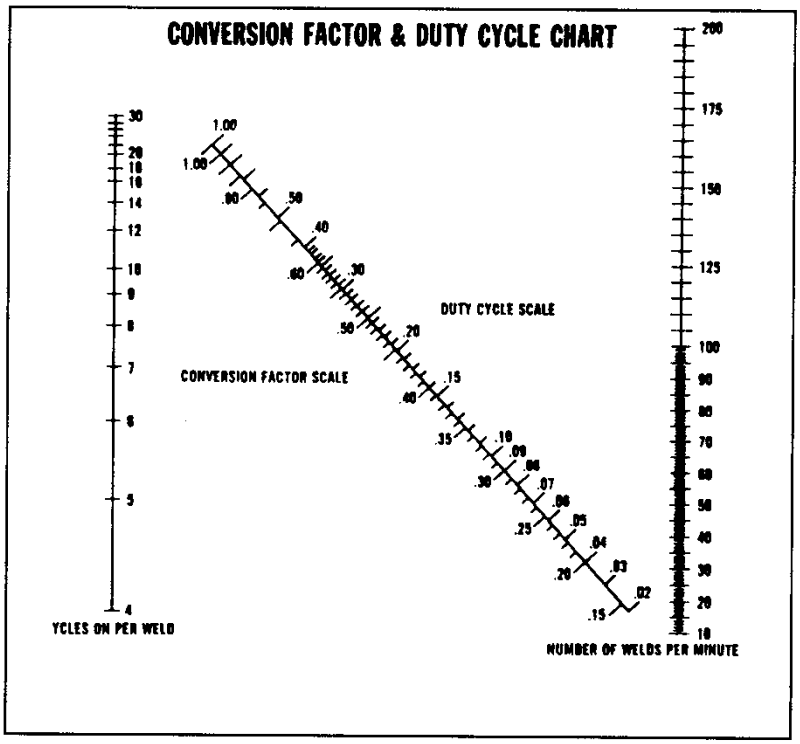
Step 2
Lay the other side of the straight edge across the 60 welds per minute of the vertical right hand scale.

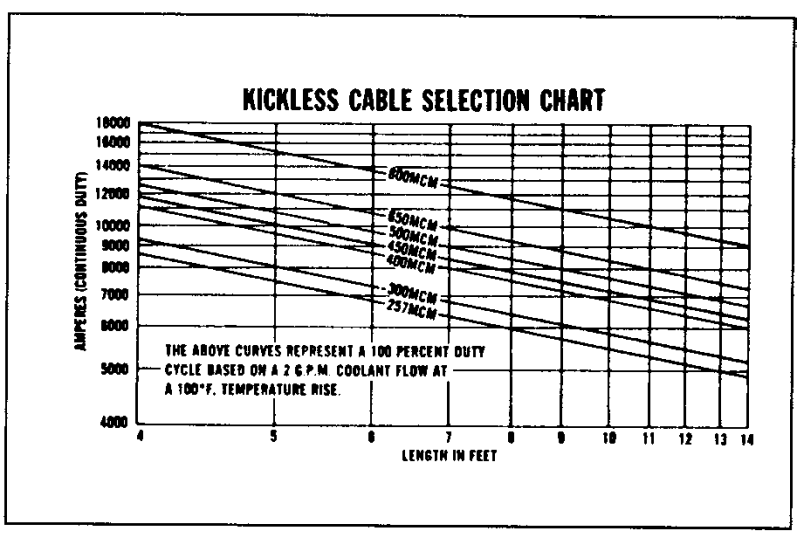
Step3
At the point of intersection with the center slanted scale, a .32 Conversion Factor is indicated by the lower scale. (A duty cycle of .1 0 or 10% is identified by the lower scale, which in this case is not of interest.)

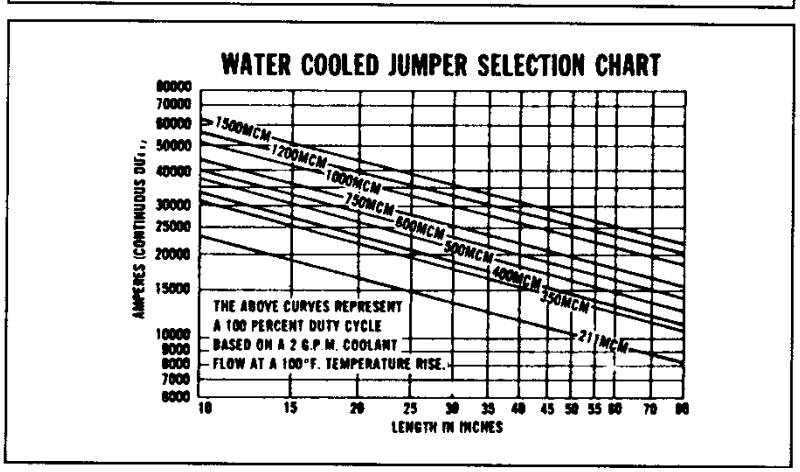
Step 4
Multiply the required current of 16,000 amperes by the .32 Conversion Factor which will amount to a "Continuous Duty Current" of 5,120 amperes.

Step 5
Proceeding to the Kickless Cable Selection Chart, draw a horizontal line across the chart from the 5,120 amperes point on the vertical left hand scale.

Step 6
Draw a vertical line from the 10 ft. point on the lower horizontal scale.



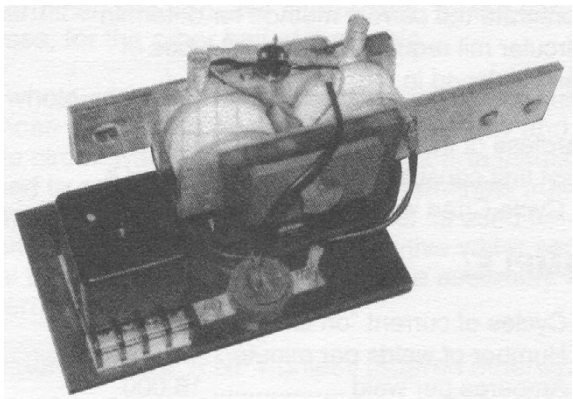




THYRISTORS

DA SERIES WATER COOLED THYRISTOR IGNITRON TUBE REPLACEMENT

Resistance Welding controls using ignitron tubes can now be easily updated by replacing them with a solid state controller.



Replacement units up to 3300 amperes RMS welding rating suitable for supply voltages up to 500 volts are available for use with transformers up to 750 KVA.

The replacement unit consists of:

a] a high surge thyristor contactor with a special busbar for direct connection to one ignitron mounting bracket.
b) an adapter module which attenuates the ignitron firing pulses to a level suitable for triggering the thyristors.
c) an over-temperature thermostat.
d) an M.O.V. voltage surge suppressor.

COMPARISON

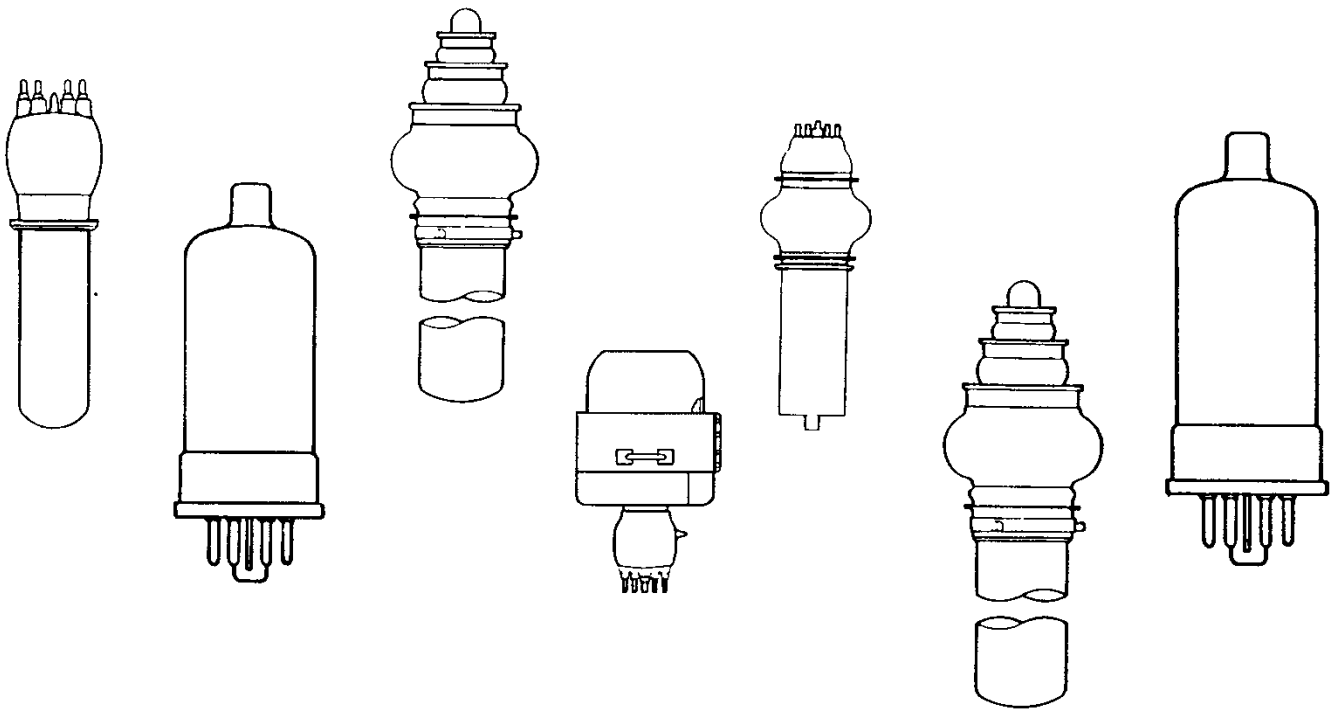
	IGNITRONS	THYRISTORS
Service Life	Several Years	Multiple of ignitron life
Shelf Life	Limited by loss of vacuum	Unlimited
Handling	Critical - Must Be Kept Upright	No Limitation
Efficiency	Low	High
Forward Voltage Drop	High- 15V.	Low- 1.5 V.
Trigger Power	High- 200 V., 10 AMPS	Low - 3 V ., 250 MA
Holding Current	High - 20 AMPS	Low- 200 MA
Mounting Position	Vertical Only	Any
Thermal Resistance to Cooling	Average	Low
Mechanical Strength	Good - Mercury can splash and destroy ignitron	Excellent -Very Rugged
Replacement	Normal	Half the time to change two ignitron tubes

INSTALLATION

a) remove ignitrons
b) install conversion unit in the left ignitron position by the fixed mounting lug. - L 1 with two existing bolts.
c) connect to H1 with flexible lead
d) connect left ignitor lead Z1 to pin 4 and right ignitor lead Z2 to pin 5
e) connect thermostat and water hoses
f) switch on main power and check to see if light on top of unit is lit. If not, ignitor leads should be reversed.
g) try trial weld, light should go out or dim during weld cycle, depending on heat control setting.

IGNITRON SIZE	MODEL NUMBER
B	DAB-800
C	DAC-1200
D	DAD-2500
E	DAE-3300

TUBES

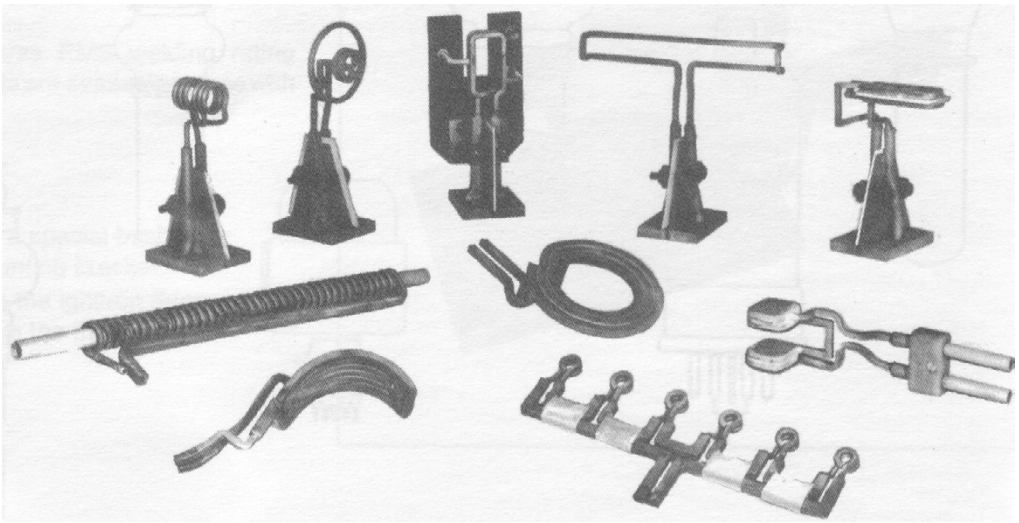


The following fast moving tubes are for induction heaters and resistance welders.
Tube requirement not listed as well as pricing is available upon request.

TUBE TYPE		TUBE TYPE	
5550	Ignitron	833A	Oscillator
5551A	Ignitron	5606A	Oscillator
5552A	Ignitron	5666	Oscillator
5553A	Ignitron	5771/356	Oscillator
5563A	Ignitron	6399	Oscillator
NL 1031	Ignitron	6400	Oscillator
NL 1051 A	Ignitron	6400A	Oscillator
		6696A	Oscillator
575A	Rectifier	F6800A	Oscillator
872A	Rectifier	6925	Oscillator
6895	Rectifier	7092	Oscillator
		7805	Oscillator
250A	Thyratron	F81 04	Oscillator
5632/C3J	Thyratron	CX-1140	Oscillator
5665/C16J	Thyratron		
5869	Thyratron		
5870/344C	Thyratron		

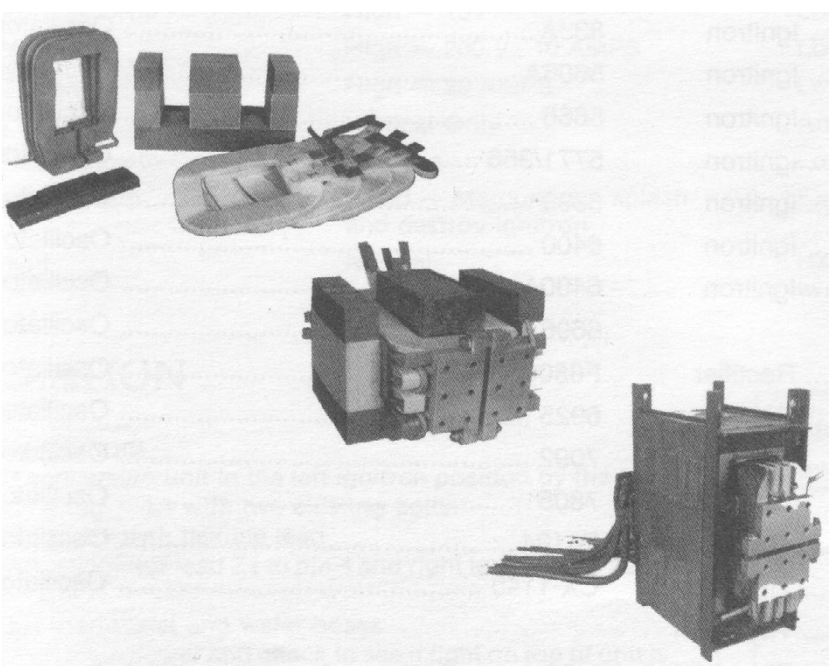
INDUCTION HEATING WORK COILS

Let us repair or build the induction heating work coil you need for ANY job, saving you, money and valuable downtime. Whether to OEM specifications or custom designed and built, find out how quickly we respond.



TRANSFORMERS

Our experience in the manufacturing of standard and custom built resistance welding and induction heating (plate and RF output) transformers is unsurpassed.



The process of resistance welding makes it possible to join most metals, similar or dissimilar. Bonds of adequate strength are obtainable for an extremely wide range of applications. Selecting electrodes of the proper alloy is a most important consideration in producing good welds at the required speed. The chart below is a valuable guide to this selection.

The weldability of two materials as expressed in the following chart has been derived after careful laboratory study and field survey of many factors which influence the welding or resultant weld of the metals.

The factors include:
1. Thermal and electrical conductivity
2. Metallurgical properties
3. Nature of resultant weld or alloy
4. Weld strength
5. Relative accuracy in control of welding conditions necessary

The weldability of metals as shown in the chart applies only when conventional spot welding methods are used on similar thicknesses of material. However, many metal combinations which are listed as having a "poor weldability" may be satisfactorily joined by using a special setup or procedure.

Electrode Materials For SPOT WELDING Similar and Dissimilar Metals

	Tungsten Molybdenum	Magnesium	Nickel Alloys	Nickel	Stainless Steel	Chrome Steel	Cadmium Plate	Galvanized Steel Zn.Plate	Terne Plate	Tin Plate	Scaly Steel	C.R. Steel	Phosphor Bronze	Silicon Bronze	Nickel Silver	Cupro Nickel	Brass Yellow	Brass Red	Copper	Aluminum Alloys	Aluminum	C.P. Titanium
Commercially Pure Titanium																						A (I) (II) / (I) (II) 1
Aluminum 2S-3S		C I 1 5	E II 2 5	E II 2 3	H I 2 3 4	H II 3 8	E I 3 4 9	D I 3 4 9	D I 3 4 9	D I 3 4 9		E II 3 4	D II 2 5	D II 2 5			D II 5	E II 2	H V 2	C I 1	C I 1	
Aluminum Alloys Duralumin 52S-17S-24S		C I 1 5	E II 2	E II 2 3	H I 2 3 4	H II 3 8	E (I) (II) 3 4 9	D I 3 4 9	D I 3 4 9	D I 3 4 9		E II 3 4	D II 2 5	D II 2 5			D II 6	E II 2	E V 2	D 1		
Copper—Pure	H II V 3	H I V 5	E II V	E II V 3 6	H I V 2 3 4	H II V 3 4	(I) (II) V 3 9	H I V 3 4 9	H I V 3 4 9	H I V 3 4 9		H II V 3 4	D II V 5 6	D II V 5 6	D II V 5 6	D II D 5 6	D II V 6	E II V 6	K V 2			
Brass—Red 5-25% Zinc		H I II 5	D II V 6	D II V 6	H II V	H II V	(I) (II) V 6	H I V 6	H I V 6	(I) (II) V 6		H II II 3 4	D II V 6	D II V 6	D II V 6	D II V	D II II	E II II 5 6				
Brass—Yellow 25-40% Zinc		E I II 5	D II IV 6	D II II 6	H II IV	H II IV	(I) (II) IV 6	E I IV 6	E (I) (II) IV 6	E I IV 6		E II IV 3 4	C II IV 1	C II IV 1	C II IV 1	C II IV 1	C II IV 1	C II IV 1	C II II 1			
Cupro-Nickel		D I II 2 5	C II II	C VI II	E (I) (II) II 2	E II II 2 8	E (I) (II) II 2	E I II 2	E (I) (II) II 2	E (I) (II) II 2	H (I) (II) II 7	E II II 3	C II II 1	C II II 1	C II II	C II II	B II II 1					
Nickel Silver		D I II 2 5	C II II	C VI II	E (I) (II) II 2	E II II 2 8	E (I) (II) II 2	E I II 2	E (I) (II) II 2	E I II 2	H (I) (II) II 7	E II II 3	C II II 1	C II II 1	B II II 1							
Silicon Bronze		D I II 2 5	C II II	D II II	E (I) (II) II	E II II 8	E I II	E (I) (II) II	E I II	E (I) (II) II	H (I) (II) II 7	D II II 3	C II II 1	B II II 1								
Phosphor Bronze Grades A, C, & D		E I II 2 5	D II II	D II II	E (I) (II) II	E II II 8	E (I) (II) II	E I II	E (I) (II) II	E I II	H (I) (II) II 7	D II II 3	B II II 1									
C. R. Steel H. R. Steel—Clean	D II II 3		D II II 3	D II II 3	B II III	B II II 8	C II II	C I II	B (I) (II) II 6	C I II	E (I) (II) II 7	A II II 1										
Scaly H. R. Steel	H II (I) (II) 3 7				D (I) (II) 7	D II (I) (II) 7 8	D II (I) (II) 7	D I (I) (II) 6 7	D (I) (II) 6 7	D I (I) (II) 6 7	E (I) (II) 7											
Tin Plate	E II I 9	E I I 5 9	D I I 3 9	D II I 9	C (I) (II) I	C II I 8	D (I) (II) I 9	C I I 6 9	D (I) (II) I 6 9	D I I 6 9												
Terne Plate	E II (I) (II) 9	E I I 5 9	D I I 3	D II I 9	C II I	C II I 8	C (I) (II) I	C I I 6	C I I 6													
Galvanized Steel Zinc Plate	E II I 9	E I (I) (II) 5 9	D II ◯ 3	D II II 9	C II I	C II I 8 9	C I I 9	C (I) (II) 9														
Cadmium Plate	E II I 9	E I I 5	D I I 3	D II I 9	C II I	C II I 8	C I I 9															
Chrome Plate	D II II 8		D II II 8	D II II 8	B III (I) (II) 8	B II II 8																
Stainless Steel 18-8 Type	D II I 2 5		D II II	D III (I)	A III (I) (II) 1																	
Nickel Grade A	D II II 2 5		C II II 1	B II II 1																		
Nickel Alloys Monel Nichrome (High Res.)	D II II 2 5		B II II 1																			
Magnesium Alloys	D I I 1 5																					
Molybdenum Tungsten	D II II 2 5																					

BLOCK INTERPRETATION

WELD-ABILITY	ELECTRODE AGAINST
ELECTRODE AGAINST	SPECIAL INFORMA-TION

WELDABILITY

As a basis for comparison cold rolled (mild) steel has been chosen and its weldability designated as "excellent."

A—Excellent
B—Very Good
C—Good
D—Fair
E—Poor
H—Very Poor
K—Impractical

ELECTRODES

I– CMW® 28
II– CMW® 3, CMW® 328 *for longer life*
III– CMW® 100
IV–ELKONITE® 10W3
V–ELKON® 100M*
VI–ELKONITE® 1W3 or TC-5

***ELKON® 100 W may be substituted. ELKONITE® 10W3 or TC-10 may be interchanged.**
Electrode materials in circles are second choice.

SPECIAL INFORMATION

1. Good weld strength.
2. May be welded under special conditions.
3. Low weld strength.
4. No actual weld nugget occurs, a "stick" is obtained.
5. Welding conditions must be accurately controlled.
6. Keep electrode clean to prevent sticking to the work.
7. Good practice recommends cleaning steel before welding.
8. Use one flat tip to minimize distortion or discoloration.
9. Coating may dissolve in other metals or burn away.

REFRACTORY METALS/PROPERTIES & APPLICATIONS

RWMA Class	Type	Density GM/CC	Electrical Conductivity % I.A.C.S.I	Hardness Rockwell	Cross Breaking Strength p.s.i.	Application
10	(Eikonite) Copper Tungsten	12.8	50-55	78-858	120,000	Flash or butt weld die facing when high conductivity and malleability are are desired. Electrical oil immersed breaker facing.
11	(Eikonite) Copper Tungsten	14.2	44.48	98-1008	150,000	Medium pressure projection weld die facing. Electrodes for electrical discharge machining.
12	(Eikonite) Copper Tungsten	14.6	40-44	100-1028	160,000	Electric upsetting. Electro forging. Electrodes for electrical discharge machining.
13	Tungsten	19	30	69-71A		Electro-broxing of electrode material. Cross-wire welding of nonferrous material.
14	Molybdenurr	9.9	30	85.958		Spotwelding on copper and copper alloy.

ALLOYS-APPLICATIONS

RWMA Class	Types of Welding	Materials - Usually Spot or Seam Welded		Standard Applications	
1	Spot Butt Seam Flash	Scaly Metal Galvanized Iron Terne Plate	Aluminum		
2	Spot Seam Flash Butt Projection	Pickled Hot Rolled Steel Cold Rolled Steel Silver Nickel Phosphor Bronze Silicon Bronze	Stainless Steel Some Aluminum Alloys Terne Plate Galvanized Iron Magnesium	Tips Wheels Rod Rolled Bar Forgings Castings	Shafts Bushings Plate Dies
3	Spot Seam Projetion	Stainless Steel Nichrome Monel Metal Heavy Gauge Steel		Casting Rod Wheels Forgings	Shafts Bushings Inserts Rolled Plate

PROJECTION WELDING DATA

Design & Welding Data for Projection Welding Low Carbon Steels

Thickness of Thinner Outside Piece Inches	PROJECTION DESIGN		ELECTRODE DIAMETERS		Electrode Force Pounds	Weld Time (Cycles) (60 Cycles per Second)	Hold Time (Cycles) Minimum	Welding Current Amperes (Approx)	Diameter of Fused Zone Dw Inches	Minimum Shear Strength (Single Projection Only) (For Steels Having Strength of 100,000 psi amd below) Pounds	Minimum Contacting Overlap L Inches
	Base Diameter of Projection Dp Inches	Height of Projection H Inches	Minimum d Inches	Minimum D Inches							
0.010	0.055	0.015	0.125	1/2	50	3	3	2,800	0.112	150	1/8
0.012	0.055	0.015	0.125	1/2	80	3	3	3,100	0.112	200	1/8
0.014	0.055	0.015	0.125	1/2	100	3	3	3,400	0.112	250	1/8
0.016	0.067	0.017	0.187	1/2	115	4	4	3,600	0.112	250	1/8
0.021	0.067	0.017	0.187	1/2	150	6	6	4,000	0.140	380	5/32
0.025	0.081	0.020	0.187	1/2	200	6	8	4,500	0.140	525	3/16
0.031	0.094	0.022	0.187	1/2	300	8	8	5,100	0.169	740	7/32
0.034	0.094	0.022	0.187	1/2	350	10	10	5,400	0.169	900	7/32
0.044	0.119	0.028	0.250	5/8	480	13	14	6,500	0.169	1,080	9/32
0.050	0.119	0.028	0.250	5/8	580	16	16	7,100	0.225	1,500	9/32
0.062	0.156	0.035	0.312	7/8	750	21	20	8,400	0.225	2,100	3/8
0.070	0.156	0.035	0.312	7/8	900	24	24	9,200	0.281	2,550	3/8
0.078	0.187	0.041	0.375	7/8	1,050	26	30	10,500	0.281	2,950	7/16
0.094	0.218	0.048	0.500	7/8	1,300	32	30	11,800	0.281	3,700	1/2
0.109	0.250	0.054	0.500	7/8	1,650	38	36	13,300	0.338	4,500	5/8
0.125	0.281	0.060	0.500	7/8	1,900	45	40	15,000	0.338	5,200	11/16
0.140	0.312	0.066	0.625	1	2,300	60	45	15,700	0.437	6,000	3/4
0.156	0.343	0.072	0.625	1	2,800	80	50	17,250	0.500	7,500	13/16
0.171	0.375	0.078	0.750	1	3,300	105	50	18,600	0.562	8,500	7/8
0.187	0.406	0.085	0.750	1	3,900	125	50	20,000	0.562	10,000	15/16
0.203	0.437	0.091	0.875	1-1/4	4,500	145	55	21,500	0.625	12,000	1
0.250	0.531	0.110	1.000	1-1/4	6,600	230	60	26,000	0.687	15,000	1-1/4

RESISTANCE WELDING OF ALUMINUM

AC Spot Welding - Typical Machine Settings

Sheet Thickness Inches	Electrode Tip Contour Sphere, Radius	Time, Cycles	Current Amps	Welding Force Pounds
0.016 0.020	1 - Flat 1 - Flat	4 5	15,000 18,000	320 340
0.025 0.032	2 - Flat 2 - Flat	6 4	21,800 27,000	390 800
0.040 0.051	3 - Flat 3 - Flat	5 6	28,000 29,500	880 1,000
0.064 0.081	3 - Flat 4	8 10	33,200 38,500	1,150 1,430
0.102 0.128	6 6	15 15	44,000 53,000	1,800 2,400

LOW CARBON STEEL SPOT WELDING DATA CHART

SINGLE IMPULSE WELDING

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				
Thick-ness of Each of the Two Work Pieces Inches	Electrode Dia & Shape		Min. Weld Spac-ing (Note 4) Inches	Min. Con-tacting Overlap (Note 8) Inches	Weld Time (Note 7) Cycles	Elec-trode Force Pounds	Welding Current Amps	Dia of Fused Zone Inches	Average Tensile Shear Strength +14% Pounds	Weld Time (Note 7) Cycles	Elec-trode Force Pounds	Welding Current Amps	Dia of Fused Zone Inches	Average Tensile Shear Strength +17% Pounds	Weld Time (Note 7) Cycles	Elec-trode Force Pounds	Welding Current Amps	Dia of Fused Zone Inches	Average Tensile Shear Strength +20% Pounds
	Min. D Inches	Max. d Inches																	
.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	460	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	19	500	9000	.26	2150	48	250	6800	.25	2050
.078	5/8	9/16	1-1/8	11/16	21	1100	13300	.31	3225	36	650	10400	.30	3025	58	325	7900	.28	2900
.094	5/8	9/16	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	12200	.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

SINGLE IMPULSE SPOT WELDING OF GALVANIZED STEEL

Thickness of Each of the Two Work Pieces		Electrode Diameter		Weld Minimum Center Distance	Minimum Contacting Overlap	Weld Time	Electrode Force	Welding Current (Minimum)	Average Tensile Shear Strength	Nugget Diameter
Inches	Gage	D Inches	d Inches	Inches	Inches	Cycles	Pounds	Amperes	Pounds	Inches
.022	26	5/8	3/16	3/8	7/16	8	310	8800	550	.15
.031	23	5/8	3/16	1/2	7/16	12	450	9400	1000	.16
.036	21	5/8	3/16	3/4	1/2	14	550	10000	1180	.17
.051	18	5/8	7/32	7/8	9/16	19	800	11000	1900	.20
.064	16	7/8	1/4	1-1/16	5/8	23	1050	12200	2580	.24
.078	14	7/8	5/16	1-3/8	11/16	32	1350	13800	3600	.29
.093	13	7/8	11/32	1-5/8	3/4	41	1700	15800	4800	.34
.108	12	7/8	11/32	1-13/16	13/16	55	2200	18000	6470	.39
.123	11	7/8	13/32	2	7/8	63	2500	20400	7600	.44
.138	10	7/8	7/16	2-1/4	1-1/8	72	3000	24000	9020	.49

SCHEDULE FOR SPOT WELDING STAINLESS STEEL

Thickness "T" of Thinnest Outside Piece	Electrode Diameter and Shape		Electrode Force	Weld Time Cycles	Welding Current (Approx) AMPS		Minimum Contacting Overlap	Minimum Weld Spacing	Diameter of Fused Zone	Minimum Shear Strength Pound		
										Ultimate Tensile Strength of Metal		
Inches	D inches Minimum	d inches Maximum	Pound	(60 per Second)	Tensile Strength Below 150000 Psi	Tensile Strength 150000 Psi and Higher	Inches	Centerline to Centerline Inches	Inches (Approx)	70000 Up to 90000 Psi	90000 Up to 150000 Psi	150000 Psi and Higher
0.006	3/16	3/32	180	2	2000	2000	3/16	3/16	0.045	60	70	85
0.008	3/16	3/32	200	3	2000	2000	3/16	3/16	0.055	100	130	145
0.010	3/16	1/8	230	3	2000	2000	3/16	3/16	0.065	150	170	210
0.012	1/4	1/8	260	3	2100	2000	1/4	1/4	0.076	185	210	250
0.014	1/4	1/8	300	4	2500	2200	1/4	1/4	0.082	240	250	320
0.016	1/4	1/8	330	4	3000	2500	1/4	5/16	0.088	280	300	380
0.018	1/4	1/8	380	4	3500	2800	1/4	5/16	0.093	320	360	470
0.021	1/4	5/32	400	4	4000	3200	5/16	5/16	0.100	370	470	500
0.025	3/8	5/32	520	5	5000	4100	3/8	7/16	0.120	500	600	680
0.031	3/8	3/16	650	5	6000	4800	3/8	1/2	0.130	680	800	930
0.034	3/8	3/16	750	6	7000	5500	7/16	9/16	0.150	800	920	1100
0.040	3/8	3/16	900	6	7800	6300	7/16	5/8	0.160	1000	1270	1400
0.044	3/8	3/16	1000	8	8700	7000	7/16	11/16	0.180	1200	1450	1700
0.050	1/2	1/4	1200	8	9500	7500	1/2	3/4	0.190	1450	1700	2000
0.056	1/2	1/4	1350	10	10300	8300	9/16	7/8	0.210	1700	2000	2450
0.062	1/2	1/4	1500	10	11000	9000	5/8	1	0.220	1950	2400	2900
0.070	5/8	1/4	1700	12	12300	10000	5/8	1-1/8	0.250	2400	2800	3550
0.078	5/8	5/16	1900	14	14000	11000	11/16	1-1/4	0.275	2700	3400	4000
0.094	5/8	5/16	2400	16	15700	12700	3/4	1-3/8	0.285	3550	4200	5300
0.109	3/4	3/8	2800	18	17700	14000	13/16	1-1/2	0.290	4200	5000	6400
0.125	3/4	3/8	3300	20	18000	15500	7/8	2	0.300	5000	6000	7600

RESISTANCE WELDING ELECTRODE MAINTENANCE

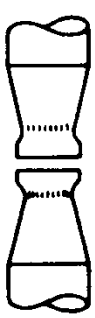
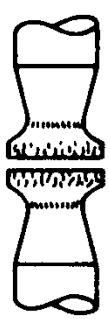
The chart below shows graphically the importance of Electrode Maintenance. This is important for maintaining the quality of the weld, showing the results of extra loads added to the welding machine and equipment. After reading the data on the chart, draw your own conclusions.

YOU CAN'T AFFORD TO NEGLECT YOUR ELECTRODES!

Keep your Electrodes dressed for maximum production and quality welds.

A TIP DRESSER WILL PAY DIVIDENDS!

We can supply you with Tip Files, hand operated Tip Dressers, or Pneumatic Power driven Dressers.
Design or type will depend on your production requirements.

400% TOO SMALL (A)	PROPER NEW TIPS (B)	56% TOO LARGE (C)	125% TOO LARGE (D)	300% TOO LARGE (E)	525% TOO LARGE (F)	800% TOO LARGE (G)
						
Approx. 1/01 sq. in. at 1/8" Dia. 	Approx. 1/20th sq. in. at 1/4" Dia. 	Approx. 1/13th sq. in. at 5/16" Dia. 	Approx. 1/9th sq. in. at 3/8" Dia. 	Approx. 1/5th sq. in. at 1/2" Dia. 	Approx. 1/3rd sq. in. at 5/8" Dia. 	Approx. 1/2 sq. in. at 3/4" Dia. 
2,460 Amperes only would be required (∗)	9,823 Amperes would be required (∗)	15,337 Amperes would be required (∗)	22,100 Amperes would be required (∗)	39,300 Amperes would be required (∗)	61,350 Amperes would be required (∗)	88,500 Amperes would be required (∗)
127,640 lbs. sq. in. pressure (♦)	31 ,960 lbs. sq. in. pressure (♦)	20,470 lbs. sq. in. pressure (♦)	14,200 lbs. sq. in. pressure (♦)	7,990 lbs. sq. in. pressure (♦)	5,120 lbs. sq. in. pressure (♦)	3,500 lbs. sq. in. pressure (♦)
RESULT: Four times too much pressure current. Very servere indentation and spitting from high current density **CORRECTION:** Cut to pressure to 1/4 Cut current to 1.4	**RESULT:** Correct pressure, current, tips,Excellent weld. This is the size tip (new) for which the pressure time and current are adjusted.	**RESULT:** Only 60% of proper pressure current. Borderline weld. Lower strength. Last diameter size tolerated unless current and pressure were set between the 1/4 and 5/16 size tips.	**RESULT:** Only43% of required pressure and current. Welds would be unacceptable. If the current or time were increased with tips in this condition a large weak weld would result.	**RESULT:** Only 25% of required current and pressure. No weld would be made if tips were left in this condition.	**RESULT:** Only 16% of required current and pressure. This is a very serious condition and the only cure is to dress the tips back to (B) condition.	**RESULT:** Only 11% of needed current and pressure. This is an absurd (though often seen) condition that only heats a spot.

(∗) Current density required for this gage to be 200,000 amps. per sq. in. Setting is 9,900 amps for condition (B)
(♦) Five inch diameter air cylinder A 80 lbs. air pressure -1570 lbs. on ram.

WELD DEFECTS & POSSIBLE CAUSES

A) Expulsion at weld interface

1 . Dirty, scaly material
2. Poor fit up
3. Squeeze time - short
4. Weld force - low
5. Weld current too high or weld time too long
6. Poor follow-up

B) Surface expulsion, electrode sticking

1 . Squeeze time - short
2. Weld force - low
3. Dirty, scaly material
4. Tips dirty (require dressing)
5. Weld current too high or weld time too long

C) Electrode mushrooming

1. Weld time too long
2. Weld force too high
3. Weld current high
4. Insufficient cooling
5. Electrode area too small
6. Electrode alloy too soft

D) Excessive weld indentation

1 . Weld time too long
2. Weld force too high
3. Poor fit up
4. Weld current too high

E) Little or no weld nugget

1. Weld time too short
2. Weld force too high
3. Weld current too low
4. Electrode face too large
5. Poor heat balance
6. Welds too close together
7. Machine not turned to “Weld”
8. Dirty or coated material
9. Tap switch off
1 0. Control malfunction

F) Cracks in weld nugget

1 . Hold time too short
2. Weld force too low
3. Dirty, scaly material
4. Poor follow-up

G) Displaced weld nugget

1 . Electrode misaligned
2. Weld force too low
3. Poor fit up

H) Weld not holding

1. Electrode misaligned
2. Weld force too low
3. Poor fit-up of parts
4. Poor follow up
5. Incorrect weld projections (projection weld only)
6. Weld current too low
7. Poor setup of tooling
8. Weld time too low

I) Flash butt welding - weld not holding

1. Tool alignment incorrect
2. Poor fit up of part
3. Insufficient upset
4. Clamp jaw skid
5. Insufficient clamp pressure
6. Flashing current too high or too low
7. Flashing time too long or too short
8. Weld current cutoff too long or too short

APPLICATION DATA SHEET

Spot Welding Galvanized Low-Carbon Steel

Material Thick-ness notes 1, 2 & 3	Electrode Diameter and Shape note 4			Net Electrode Force	Welding Current (approx)	Weld Time	Weld Nugget Size	Minimum Tension - Shear Strength	Minimum Weld Spacing	Minimum Contact-ing Overlap
Inches	D Inches	d Inches	Oc Degree	Pound	Amps	Cy-cles	Inches	Pounds	Inches	Inches
0.022	5/8	3/16	120	300	13000	8	0.15	550	5/8	5/8
0.030	5/8	3/16	120	400	13000	10	0.16	1000	5/8	5/8
0.036	5/8	1/4	120	500	13500	12	0.19	1180	3/4	5/8
0.039	5/8	1/4	120	650	14000	13	0.21	1400	3/4	5/8
0.052	5/8	1/4	120	725	14500	18	0.22	1700	7/8	11/16
0.063	3/4	1/4	120	850	15500	22	0.24	2500	1-1/8	3/4
0.078	3/4	5/16	120	1200	19000	24	0.28	3200	1-1/4	7/8
0.093	3/4	3/8	120	1400	21000	30	0.34	4200	1-1/2	1
0.108	7/8	3/8	120	1750	20000	37	0.40	5900	1-3/4	1-1/8
0.123	7/8	3/8	120	2000	20000	42	0.48	7200	2	1-1/8

NOTES:
1. Materi al must be free from dirt. grease. paint etc. prior to welding , but may have ligh t oil.
2. Two equal metal thi ckne sses of each gage
3. Commercial coating weight is 1.25 oz. per square foot.
4. Electrode Materiai -RWMA Group A, Cla ss 2. CMW"'3
5. Water Cooling : 2 gallons per minute . Projections should be larger in diameter for galvani zed than for uncoated mate rial .

Projection Welding Galvanized Low-Carbon Steel

Material Thickness notes 1, 2 & 3	Electrode Diameter and Shape note 4		Net Electrode Force	Welding Current (approx)	Weld Time	Weld Nugget Size	Minimum Tension - Shear Strength (For single projections only)	Projection Size	
Inches	D Inches	d Inches	Pound	Amps	Cycles	Inches	Pound	Diameter Inches	Height Inches
0.039	5/8	3/8	250	10000	15	0.15	925	0.187	0.041
0.063	5/8	7/16	400	11500	20	0.25	2050	0.218	0.048
0.078	3/4	1/2	550	16000	25	0.25	2700	0.250	0.054
0.093	3/4	1/2	750	16000	30	0.30	4300	0.250	0.054
0.108	7/8	1/2	950	22000	33	0.31	4900	0.250	0.054

NOTES:
1. Material must be free from dirt, grease, paint et c. prior to welding , but may have light oil.
2. Two equal metal thicknesses of each gage.
3. Commercial coating weight is 1.25 oz. per square fo ot.
4. Electrode Materiai-RWMA Group A, Class 2. CMW" 3.
5. Pre ss ure -tight joints require stripping the zinc coating prior to welding.
6. Nominal electrode diameter ranges between 8 to 10 inches .
From American Welding Society "Recommended Practices for Resistance Welding "

Seam Welding Galvanized Low-Carbon Steel

Material Thickness notes 1, 2 & 3	Electrode Width and Shape note 4		Net Electrode Force	Welding Current (approx)	Weld Time		Welding Speed	Welds per Inch	Minimum Contacting Overlap
					Heat Time	Cool Time			
Inches	W Inches	E Inches	Pounds	Amps	Cycles	Cylcles	Inch/Min	W/Inch	Inches
0.015	3/8	1/4	900	15000	2	2	120	7.5	3/8
0.036	1/2	1/4	1100	18000	4	2	60	10.0	1/2
0.039	1/2	1/4	1200	19000	4	3	60	9.0	1/2
0.052	1/2	1/4	1350	20000	5	1	90	7.0	9/16
0.063	1/2	5/16	1500	19800	8	2	54	7.0	5/8
0.078	5/8	5/16	1850	23000	10	7	30	7.0	11/16